2007 Summer Research Fellowships

The University of Georgia Honors Program
Creating a Culture of Undergraduate Inquiry
CURO 2007 Summer Research Fellowships

The Center for Undergraduate Research Opportunities (CURO) awards Summer Research Fellowships to academically talented undergraduates who participate in research during the summer term at the University of Georgia. The number of Summer Research Fellowships varies from year to year, based on funding. Successful applicants receive a financial award of $2,500 or $3000 and present their research at the CURO undergraduate research symposium. (Those students who receive $3000 must use $500 toward presenting their research at a regional or national conference.)

In order to be selected for a Summer Research Fellowship, interested students must have at least a 3.4 GPA, along with thirty hours of UGA credit, and must also be willing to commit to the following:

1. Enroll in two sequential Honors undergraduate research courses: HONS 4960H and HONS 4970H or HONS 4970H and HONS 4980H. (Students who wish to complete a thesis during the summer should check with Dr. Kleiber and their faculty research mentor. If approval is granted, the student will register for HONS 4980H and HONS 4990H.) Students who are awarded the fellowship must register for these classes for the regular summer session before they are eligible to receive fellowship monies. If, during the course of the fellowship, the student withdraws from these classes for any reason, the stipend must be returned in full. CURO Fellows must resign from any other UGA employment to be eligible for funding and may not be enrolled in any other courses. CURO will create 6 hours of Honors research courses for the student in OASIS.

2. Submit an abstract of the summer research to Dr. Pamela Kleiber by the last day of finals of the summer semester, for possible presentation at the annual CURO Symposium the following spring. Fellowship recipients are required to attend the upcoming Symposium, even if their abstract is not selected for presentation.

3. Participate in panel discussions with the Associate Director throughout the year to encourage an appreciation for undergraduate research at UGA.

Students who will be using human subjects in their research must be granted human subjects approval by the Institutional Review Board (IRB) at UGA in order to receive the fellowship. The human subjects application may be submitted to the IRB after the student is selected as a Summer Fellow, but the application must be approved before the student can receive the stipend.

Students who will be traveling internationally as part of their research must complete additional paperwork through CURO and the Office of International Education and are required to purchase travel insurance (approximately $1 per day) through the Office of International Education for their time abroad.
2007 Selection Committee

Dr. E. M. (Woody) Beck, Professor, Sociology
Dr. Diane Bates Morrow, Associate Professor, History and African-American Studies
Dr. Fran Teague, Meigs Professor, English
Dr. Daniel Promislow, Professor, Genetics
Dr. Jean Martin-Williams, Professor, Brass
Dr. Rodney Mauricio, Associate Professor, Genetics
Dr. Loris Magnani, Professor, Physics & Astronomy
Dr. Regina A. Smith, Associate Vice President for Research
Chair: Dr. Pamela Kleiber, Associate Director, Honors Program and CURO

Special thanks to the sponsors of the 2007 Summer Research Fellowships

Honors Program
Office of the Vice President for Research
Biomedical and Health Sciences Institute
Interdisciplinary Toxicology Program
UGA Alumni Association
Jane and Bill Young Scholarship
Letter from the Directors

June 12, 2007

Dear UGA Faculty and Students:

We are delighted and honored to name 27 CURO Summer Research Fellows for 2007, each of whom is pictured in this handbook with a summary of his or her faculty-mentored research project. The goal of the CURO Summer Research Fellowships is to provide opportunities for intensive, immersive, faculty-guided research experiences for academically talented undergraduates. The program advances the students’ knowledge and abilities to think critically, solve problems, and contribute to greater understanding of the world.

The CURO 2007 Summer Research Fellowships are funded through the Honors Program, the Office of the Vice President for Research, the Biomedical and Health Sciences Institute, the Interdisciplinary Toxicology Program, the UGA Alumni Association, and the Jane & Bill Young Scholarship.

We are exceptionally proud of the quality of the contributions of present and past CURO Summer Fellows with the mentorship of faculty researchers and their graduate students. The summer fellowship program has contributed to building a culture of undergraduate inquiry at the University of Georgia, and the CURO Summer Fellows serve as ambassadors who share their enthusiasm and expertise in a variety of professional forums on campus as well as at regional, national and international meetings.

Please join us in congratulating these young scholars on the occasion of being awarded these prestigious fellowships.

Sincerely yours,

David S. Williams  
Pamela B. Kleiber  
Director, Honors Program,  
Foundation Fellows, and CURO  
Associate Director, Honors Program and CURO
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Objective: My summer research project addresses the text-music relationships exhibited in Hugo Wolf’s art song settings of Eduard Mörike’s *Peregrina I* and *Peregrina II*. Mörike’s *Peregrina* texts were a significant milestone in his poetic output; these texts were written in response to his experiences with Maria Meyer, a gypsy woman with whom he had a brief affair. Although it was initially a positive force in his life, the relationship left Mörike shattered and haunted; ultimately he channeled his feelings of loss and emptiness into the *Peregrina* poems, which are filled with psychological and sexual tension. This literary representation of complex psychology attracted Wolf to Mörike’s texts. An extremely gifted reader of poetry, Wolf’s exposure to the emerging psychoanalytical writings of Sigmund Freud allowed him to discern the underlying conflict between Mörike’s various layers of consciousness and their representation within his poetry. Wolf’s reception of Mörike’s poems led to a new kind of art song—one that interpreted lyrics meticulously and aimed for the extension of musical language in order to communicate the psychoanalytical traits of the *Peregrina* song texts.

My project will pair psychoanalytical theories with advanced chromatic and harmonic analysis to explore how the competition between Mörike’s consciousness and sub-consciousness manifests in Wolf’s art songs. Specifically, I wish to address the following questions:

- How does Wolf employ more sophisticated techniques to extend musical language?
- How does Wolf use double-tonic complexes, chromatic mediant relationships, directional tonality, and tonicizations?
- How do these techniques relate or reflect the words?
- How are deeper meanings of phrases and specific words transferred into music?
- What impact on form, texture, timbre, and dynamics will the words have?
- How does Wolf represent the mood of the two *Peregrina* poems?

My project will draw heavily upon my experience as a double major in music theory and German, which enable me to more fully explore the text-music relationships demonstrated in the Wolf-Mörike art songs. Previous scholarship has approached Wolf’s music either from a musicological perspective (lacking sufficient theoretical analysis), or solely from a literary point of view. Dr. John Turci-Escobar, Assistant Professor of Music Theory, and Dr. Max Reinhart, Professor of German, will be guiding my research on this project.

Final Product: An in-depth analysis of *Peregrina I* and *Peregrina II* will be submitted to the UGA Student Music Research Symposium and to Music Theory Southeast, a branch of the international Society for Music Theory.

*Faculty Research Mentors: Dr. John Turci-Escobar, Music Theory
Dr. Max Reinhart, German*
Converting Ferrochelatase into a Cytochrome c Like Protein

CURO Summer Research Fellow: Joseph Burch

Ferrochelatase is the last enzyme in the heme biosynthesis pathway. Ferrochelatase catalyzes the insertion of ferrous iron into protoporphyrin IX. As such, ferrochelatase represents a protein that transiently binds heme. The crystal structure of heme is now known, so contacts between the protein and porphyrin macromolecule can be identified. If there were some way to help the heme bind, the ferrochelatase would be a true heme protein, like a cytochrome. The goal of this project is to form a cytochrome like protein from ferrochelatase. This protein will be a model system for various studies that may provide insight into wild type ferrochelatase. These mutations will give clues to normal ferrochelatase activity and function. Another application of a ferrochelatase cytochrome protein would be using it as an electron carrier for other areas of research.

In order to create a self-synthesizing cytochrome like protein, eight mutants of ferrochelatase will be engineered to possibly form a covalent bond between the ferrochelatase protein and the newly synthesized heme. In each of these mutants, one amino acid will be mutated into a cysteine residue in an attempt to form a covalent bond with the vinyl group substituents of the protoporphyrin molecule while it is in the active site of ferrochelatase. Mutants will be prepared using the Quik Change site-directed mutagenesis kit (Stratagene, La Jolla, CA). Purified proteins will be used to perform acid-acetone extractions. The acid-acetone extraction will remove any heme that is not tightly bound and will show whether any heme is covalently bound to the ferrochelatase. Crystals will be grown using the hanging drop method in the EasyXtal™ crystallization tool. Using these crystals, protein structures can then be determined via crystal diffraction. These structures can then be used to confirm the presence of a covalent bond to produce a cytochrome c like protein. The physical and chemical properties of the engineered protein will be studied to determine if it can function as an electron carrier, like cytochrome c, or as a peroxidase in catalase type of enzyme.

Faculty Research Mentor: Dr. Harry Dailey, Microbiology and Biochemistry & Molecular Biology
Pectin is a family of polysaccharides present in the cell wall of all plants. Since pectin is so abundant in the cell wall, it provides many of the biochemical properties that contribute to the growth and development of the plant. A specific family of enzymes involved in pectin biosynthesis known as Galacturonosyltransferases (GalATs) catalyze the transfer of galactosyluronic acid (GalA) residues from uridine diphosphate-GalA (UDP-GalA) to the growing pectic polysaccharide chain. The first gene that encodes a pectin GalAT in *Arabidopsis thaliana*, known as *GAlactUronosylTransferase1* (GAUT1), was previously identified through a proteomic approach using partially-purified, detergent-solubilized membrane protein preparations. BLAST analyses indicate the existence of a family of 14 genes with high-sequence similarity to GAUT1. To understand the biological significance of the GAUT genes in pectin synthesis, it is important to understand where within the plant their expression occurs.

For the summer research fellowship, I propose to analyze the expression of each GAUT gene in *Arabidopsis* through utilization of a β-Glucuronidase (GUS) reporter gene system. First, the sequence of each gene will be examined using bioinformatics to determine the promoter region. The promoter will be amplified from *Arabidopsis* genomic DNA and inserted into a cloning vector for replication. Using restriction digestion, the promoter region will be removed from the cloning vector and inserted upstream of the GUS gene in the vector pBI101. The pBI101 vector harboring the promoter:GUS construct will be transformed through an *Agrobacterium*-mediated method into *Arabidopsis* plants. The transformed plants will be histochemically stained for detection of GUS activity and the tissue and cell-type specific expression of each GAUT gene will be analyzed. GUS expression data will reflect the temporal and spatial regulation of genes in *Arabidopsis* plants grown under specific environmental conditions and at specific developmental stages. It will also provide detailed resolution, which is an advantage when compared to other expression analyses (e.g., microarray studies) which generally reflect expression in tissues containing multiple cell types. A comparison of GAUT gene expression will provide information about potential GAUT gene redundancy. Such information is useful in the interpretation and design of GAUT mutant studies. In summary, GUS expression of the GAUT genes will provide quantitative data needed to help determine the biological function of the GAUT gene family.


*Faculty Research Mentor: Dr. Debra Mohnen, Biochemistry & Molecular Biology*
Ecoregional Conservation Among Indigenous Communities in Cotacachi, Ecuador

CURO-OVPR Summer Research Fellow: Lee Ellen Carter

Study Rationale: Indigenous communities around the world are currently facing tremendous pressure from newly introduced contemporary tourist practices. Cotacachi, Ecuador is one such context. Cotacachi, a biologically rich area in the Northern Andes of Ecuador, is comprised of forty indigenous communities where approximately 18,000 Cotacacheños reside. The Cotacacheños continue to practice their century-old traditions through their textile industry, businesspeople, clothing and use of their native language, Quichua. Because Cotacachi is directly beside the Cotacachi-Cayapas Ecological Reserve, this region has been protected and conserved for many centuries and has become one of the most well known cultural landscapes of Latin America, and is, therefore, currently undergoing a shift from traditional practices toward contemporary tourist industry practices. These new ideas are not only impacting the traditions and cultural practices in the ecoregion, but also the environmental conservation practices that have a great impact on the lives of the Cotacacheños.

Research Question: How do the cultural processes of the Cotacacheños influence the conservation practices being conducted in the Andean highland region where the indigenous communities reside? What impact do these practices have on the ecoknowledge and environmental ethics of the Cotacacheños? Furthermore, how does the increasing ecotourism of Cotacachi impact the indigenous communities, both culturally and ecologically?

Research Design: The research design for the Cotacachi project is qualitative, an ethnographic case study. A variety of data collection methods, all congruent with the use of a qualitative research design, will be used to gain an extensive understanding of this topic. At least thirty in-depth longitudinal interviews, including indigenous community leaders and citizens, heads of nonprofit ecological conservation organizations in Cotacachi and throughout Ecuador, and heads of tourism – including ecotourism – agencies in Cotacachi, will be the primary method of gathering data for the research project. All interviewees will be selected in a non-probability fashion and will be sampled to 1) achieve maximum variety and 2) access persons to be key informants. Access to these interviewees will be obtained through my faculty mentor, Dr. Fausto Sarmiento, as well as other academic and professional contacts. I will also conduct focus groups and standardized surveys among community residents, and I will observe the cultural practices of the indigenous community, some of whose members will be provided open-ended questionnaires. Furthermore, I will perform an extensive review of relevant scientific literature associated with cultural conservation and landscape stewardship with traditional ecological knowledge practices among indigenous communities in the Andean highlands. Prior to my fieldwork in Ecuador, I will prepare for my interviews, surveys, and other methodology through research in the United States. To gather field data, I will spend approximately five weeks in Ecuador. During this time, I will start the ethnographic research by living within an indigenous community to gain a first-hand view of their societal processes and foster acquisition of both Spanish and Quichua. I will also spend this time to obtain the other necessary interviews with leaders of various organizations previously mentioned. Following my fieldwork in Ecuador, I will analyze the data that was collected to prepare a concise and thorough paper to be used in research symposiums, academic publications, and as my senior thesis.

Implications: Ultimately, this research will attempt to understand the ecological and geographical influences on the sociocultural processes of Cotacachi, Ecuador by conducting an ethnographic case study. The research has the potential to provide approaches to further understand the connections between indigenous societies and their environments, including conservation, ecotourism, ecoknowledge, environmental ethics, and their unique traditions. Furthermore, this research has the capability of assisting the indigenous communities further in preserving the land that they have resided on for so many centuries.

Faculty Research Mentor: Dr. Fausto Sarmiento, Geography
The objective of this project is to establish standards for performing fecal egg count (FEC) reduction tests for determining drug resistance in nematode parasites of horses. More specifically, the effects of sample handling on FEC data will be investigated.

1. Additional trials will be completed to test the effect of storage temperature and time on equine FEC, and to test the length of time a sample can lie on the floor of the stall and still be considered fresh in terms of optimal parasite egg recovery. These trials will be completed by obtaining fecal samples, storing them under the variable conditions, and performing repeated egg counts at specified time intervals.

2. Sources of variation between repeated FEC will be tested. Variation between different samples from the same horse, between different tests on sub-samples of the same fecal sample, and between different tests of the same sample aliquot (only a small percentage of each sample is actually examined for each FEC) will be examined. This protocol will be carried out by collecting five separate daily fecal samples during one week, storing them properly (as previously determined in item #1), and completing a total of 30 egg counts for each of the five fecal samples.

3. A fecal egg count reduction test will be performed after the optimal parameters have been determined. Fecal samples will be taken from ten horses for three days in a row, and FEC will be performed on those samples. Then, the horses will be treated with anthelmintics. Ten days later, fecal collection will occur for three days in a row, and FEC will be performed. The results of the fecal egg count reduction tests will be tested against existing statistical models that have recently been developed by Dr. Kaplan and Dr. Vidyashankar (statistician at Cornell University who is collaborating on this project).

4. An Honors thesis will be written.

Faculty Research Mentor: Dr. Ray Kaplan, Infectious Diseases
The Youth of Roswell Voices: A Linguistic Analysis

CURO-OVPR Summer Research Fellow: Joshua Dunn

I plan to work with a team from the UGA Linguistics Department, which includes my faculty mentor Dr. William Kretzschmar, on an ongoing project called Roswell Voices. In short, the objective of the Roswell Voices program is to gather linguistic data from interviews with the different generational groups in the city of Roswell, and to use this data to examine how language relates to social identity. As the team describes the process, the collected data will be able to show a correlation between language change across generations and the town of Roswell’s progression from being a settlement for mill workers, to being a suburb of Atlanta, to now being an “edge city,” with a separate identity from the metropolis of Atlanta. The question to answer, then, is: How do the phonetics, lexicon, and syntax of a speaker contribute to his or her cultural identity of considering Roswell his or her home?

This summer, I will assist Roswell Voices by gathering data from the youngest generation in question, those aged 18 to 35. As most of their work has focused on older members of the community, I propose to sample an independent cluster of four to six interviews with this younger generation in order to augment the work done by the team so far. Following the same procedures as in earlier interviews, the subjects will be approached through personal acquaintances, and will be balanced between the white and African American population of the town. I will follow the basic format of interviews previously conducted with older subjects. The interviews will combine a conversation of life in Roswell with both a question-and-answer session and fixed-format elicitation in which the subjects will read words from note cards. By processing the data collected in the interviews I hope to qualitatively determine what makes the young subject a citizen of Roswell, drawing upon the content and language use of the subject’s speech. In addition to conducting the interviews, I propose to transcribe the words of the interview in normal spelling, with acoustical phonetic analysis of selected words as identified in the transcript. The audio of the interview, recorded directly onto CD stock, will be preserved in .wav format. When the data is properly archived, I can then work to interpret it, and try to determine how the youth specifically associate with the city of Roswell in their speech.

I will be able to work with experienced members of the team to learn the proper way of archiving data in linguistic research. Through my research I will learn how to use the recording equipment and transcription and encoding techniques used in the Roswell Voices project, which in turn I can use to further my own linguistic research in the future. As a resident of the same North Fulton area which contains the city of Roswell, I view this research opportunity as a platform to perform future research in the other communities of North Fulton. The recent incorporations of the cities of Johns Creek, Milton, and Sandy Springs present an interesting question to whether these areas, too, can be characterized with their own linguistic identity. Another interesting question to explore might be to interview Hispanic subjects, as there has been a large influx of Spanish speaking people in recent years. Performing research with Roswell Voices would then not only be a valuable experience in itself, with my contribution to research in the 18-35 age bracket, but also a way to establish a method which I could apply to future research among the other suburbs and “edge cities” of Atlanta.

Faculty Research Mentor: Dr. William Kretzschmar, Linguistics
Recycling of monosaccharides released from storage polysaccharides, cell walls and glycoproteins that are degraded during cell wall reconstruction is an important pathway for generating rapid building blocks to facilitate growth of tissues. In this salvage pathway, each monosaccharide is phosphorylated by kinase activity to a sugar-1-phosphate. The sugar-1-phosphate is then converted to the appropriate nucleotide (NDP)-sugar by NDP-sugar pyrophosphorylase activity. It is then the NDP-sugar that serves as the activated sugar donor for the biosynthesis of polysaccharides and glycoproteins, which facilitates tissue growth.

Arabinose is an essential sugar residue of cell wall polysaccharides. A gene encoding a putative arabinose kinase (Ara1) was identified by genetic screen, and its ara1 plant mutant lacks the ability to convert in vivo arabinose to arabinose-1-phosphate. The encoded Ara1 consists of three domains: a galactokinase-like domain, speculated to carry arabinose kinase function; a potential transmembrane domain; and a large N-terminus domain for which the function is unknown. There are discrepancies regarding the biochemical properties of the kinase, its subcellular localization, and its biological function, which must be resolved in order to further understanding of the salvage pathway.

The goal of my proposed research is (1) to identify the functional domain(s) of recombinant arabinose kinase and its enzyme sugar specificity (2) to identify if the GFP tagged kinase is cytosolic or membrane bound and its specific subcellular localization.

Participating in undergraduate research in the past 6 months has allowed me to become proficient in the laboratory techniques necessary for my proposed CURO research project. The CURO fellowship will allow me to continue my research with the added ability to contribute my entire time to the success of the research along with providing me the opportunity to present my findings among fellow undergraduate researchers. Such an opportunity will be invaluable in preparing me for my future career in the scientific field.

Faculty Research Mentor: Dr. Maor Bar-Peled, Complex Carbohydrate Research Center
Developing Methodologies for the Study of Small ORFs in *P. furiosus*

*CURO Summer Research Fellow: James Gordy*

The organism *Pyrococcus furiosus* is an anaerobic hyperthermophile within the domain Archaea. In nature, it lives at an optimal temperature of 100°C in underwater solfatarics – volcanic regions emitting sulfurous gases. Since the genome’s sequencing in 2001, *P. furiosus* has become almost like the *E. coli* of archaons, with many genomic and proteomic studies bent on discovering how this organism functions under such stressful conditions. Much has been learned, but for this organism far more is left to find.

One problem is that the discovery of new ORFs (open reading frames) of the genome is based purely on contrived computer algorithms. Each ORF represents a possible protein coding sequence, but the computer algorithms aren’t perfect, and many ORFs, especially the smaller ones, get skipped over and are therefore not annotated in the genomic databases. Dr. Adams’s lab a few years ago created a new algorithm able to pick up the smaller ORFs that fell through the cracks of previous programs, but nothing is known about the ORFs or about their possible coded proteins. The current standard technique for finding transcriptionally active sections of the genome involve microarrays, but it is close to impossible to retrieve conclusive data from a microarray for a small ORF. That is where I come in.

The focus of my research has been and will continue to be on developing efficient methods for finding, studying, and characterizing transcriptionally active small ORFs and the proteins they code for. The main component of my research revolves around the QPCR machine (quantitative polymerase chain reaction), which quantifies the relative amount of DNA present in a sample. Last semester, I used QPCR to prove the existence of transcription products from small ORFs that database information showed to be good protein-coding candidates. This semester, with the ORFs I proved to have gene products, I will be using strand specific primers to prove whether or not the protein comes from the section of the genome as it is annotated. The next step will be to use the process of primer extension to find the exact location and lengths of the genes.

This summer, I will want to progress this research in two ways. First, I will use processes such as mass spectroscopy, gel electrophoresis, and others to isolate, characterize, and sequence the proteins to discover their functions and to ensure that their peptide sequences match their respective mRNA sequences. Secondly, I will develop the QPCR methods further so that they can be performed on a larger scale, instead of just a few ORFs at a time. Along those lines, I would also be working with the computing sector of our lab to figure out how to use these methods in conjunction with our current bioinformatics projects such as making a more efficient database system for the genome and proteome of *P. furiosus*. In summary, I am working on developing a system of methodologies to properly study small ORFs and their transcripts. So far, no one else has bothered to do so, because most proteins are large. However, some very important proteins such as rubedoxin and insulin are quite small, so we think that ORFs should not be overlooked because of their size. The smaller ones could be just as biologically active.

*Faculty Research Mentor: Dr. Michael Adams, Biochemistry & Molecular Biology*
This ethnomusicology project proposes the first scholarly documentation of the intercultural music synthesis occurring between the Athens music community and the Athens Latino and Hispanic community. While no one has researched the music of Athens’ Latino and Hispanic people, those already researching and assisting these populations in Athens-Clarke County include Dr. Paul Matthews (Co-Director of CLASE) and Dr. Paul Duncan (Assistant Director of LACSI) of the University of Georgia, Partners for Prosperous Athens, Eco Latino Magazine, and Mexican American Business Chamber. Additionally, Dr. Roy Kennedy, professor of music therapy at the Hugh Hodgson School of Music, has begun working with the Oasis Católico at Pinewoods, using music to foster communication between the university and the Latino community. According to my principal informant, Sister Margarita, the Pinewoods estate community includes a diverse population of Peruvians, Colombians, Salvadorians, Guatemalans, Mexicans, Cubans, Argentineans, and Venezuelans. Evidence of the musical tastes, creativity and influence of this community can be seen and heard in the Spanish masses conducted at St. Joseph’s Catholic Church, Spanish-language Protestant church services, and local grocery stores, music stores, and restaurants such as Los Compadres and La Jalisco Supermercado.

This study of Latino and Hispanic musical contributions to Athens-Clarke County will result in an increased awareness that the “vast collective pool of human creativity [is] an enormous ecosystem where the traits of one type of being are complementary to and symbiotic with those of another.” ¹ Questions that will be targeted are the following: To what extent is the musical participation of the Latin and Hispanic communities already enriching Athens-Clarke County? How are the Latino and Hispanic cultures using music to maintain identities? How are they using music to integrate into the larger Athens-Clarke communities?

Employing a methodology used effectively by Art Rosenbaum to document traditional music and musicians of rural Georgians,² this project will include interviewing music makers within the Latino and Hispanic communities, recording and transcribing examples of the musicians’ works, photographing the music makers within their musical environment, and synthesizing all findings in a multimedia exhibition for the Clarke County community at large. Ultimately the project will enhance understanding of the vibrant resources present within the Latino and Mexican communities of Athens-Clarke County.

Faculty Research Mentor: Dr. David Schiller, Musicology

The United States, which has one of the safest food supplies in the world, has an estimated 76 million cases of foodborne illness annually (Moore et al., 2006). The most common cause of bacterial foodborne illness is Campylobacter (US Food and Drug Administration, 2006). Campylobacter, which is a Gram-negative rod-shaped bacterium, frequently colonizes the intestinal tract of animals, such as chickens, without inducing disease (US Food and Drug Administration, 2006). However, human ingestion of Campylobacter-contaminated products causes infection (US Food and Drug Administration, 2006). In studies, Campylobacter is shown to frequently contaminate 20-100% of raw chicken (US Food and Drug Administration, 2006). Although Campylobacter is found in birds and mammals, the high prevalence of Campylobacter in poultry is especially important to the United States, which is a major supplier of poultry in the international market (Schupska, 2006). Georgia greatly contributes to the United States’ poultry supply as the number one producer of broilers (Schupska, 2006). In Georgia, poultry represents greater than fifty-percent of the state’s agriculture (Schupska, 2006).

Because of the importance of poultry in the United States’ economy and the high prevalence of Campylobacter infection, the United States Department of Agriculture (USDA) searches for a means of reducing Campylobacter infections (US Department of Agriculture, 2006). The USDA supports research to better understand Campylobacter to better control and monitor the pathogen (US Department of Agriculture, 2006). According to the USDA, the decrease of pathogen loads in animals presented for slaughter often contributes to the decrease in pathogen loads in products (Food Safety and Inspection Service, 2003). Because of this, the USDA cites research relating to interventional methods to reduce Campylobacter in poultry as one of its highest research necessities (Food Safety and Inspection Service, 2003).

Although Campylobacter is known to reside in the intestine of chickens, it is not known if one region of the intestine exhibits greater concentration of Campylobacter compared to other regions. Knowing where the greatest concentrations of Campylobacter exist can direct more effective antimicrobial interventions during evisceration and other slaughter procedures (US Department of Agriculture, 2006).

With my research, the objective is to determine where in the chicken intestine Campylobacter is most concentrated. Using an in situ probe, specific for Campylobacter, the pathogen will be detected. In an effort to determine which region contains the highest pathogen load, tissue samples will be taken from various regions of the chicken intestine. The data gained from my research has the potential to help improve the economy by facilitating more targeted antimicrobial interventions to increase safety levels of poultry. With more targeted interventions, it is believed levels of foodborne illness will decrease (US Department of Agriculture, 2006). Also, a more targeted approach of antimicrobial therapy strengthens the agricultural economy by helping slow down the rate of increase in antimicrobial resistance among Campylobacter pathogens. Such research can not only help the economy but also generate a pathway for the creation of a system to monitor food supply safety levels (Food Safety and Inspection Service, 2003). A national system to monitor poultry safety levels has the potential to aid in the detection of intentional assaults on United States agriculture (Food Safety and Inspection Service, 2003).

Data obtained from this research has vast implications with its potential to improve the economy, safety of the food supply, and health of the public. Although better understanding Campylobacter pathogenesis is important to the United States agricultural economy, information gained can be used to help improve safety levels in developing poultry markets in other parts of the world, thus improving the food safety and consumer health worldwide.

Faculty Research Mentor: Dr. Corrie Brown, Pathology
The research I will conduct involves situations in which international, domestic, and religious law collide. Violence has recently resurfaced within countries of Southeast Asia that are home to overwhelming Muslim majorities. This violence results from the struggles of domestic governments to both appease international organizations and remain secular democracies and, at the same time, to appease their domestic constituents through the integration of Shari’a law, or the law of Islam, into their domestic legal systems. These domestic governments are engaged in a difficult balancing act. If they decide to integrate Shari’a law into their mainly secular laws and deviate from the democratic ideals for which many of the international organizations in question stand, international organizations threaten to cut off the financial aid that countries such as Bangladesh, one of the poorest countries in the world, so badly need. At the same time, if these domestic governments refuse the incorporation of Shari’a law, radical Islamic groups may resort to the use of political violence in order to make known their dissatisfaction and to intimidate the government into complying with their demands. How can countries compromise the legal demands from abroad and those from home while avoiding the negative repercussions with which they are faced?

Religious extremist groups have targeted those who represent secular law within Southeast Asian countries for their refusal to incorporate Shari’a law into legislation, courts, and other facets of the government. Judges, lawyers, and members of the state legislature have all fallen victim to targeted killings or what some might consider acts of terrorism. Nevertheless, while many Western countries are increasingly involving themselves in Middle Eastern affairs with the hopes of establishing secular democracies across the region, they seem to lack an in-depth understanding of why it has been so difficult for these countries to establish governments with the ability to separate church, or in this case Islam, and state. Therefore, it is necessary to further explore which areas of secular and Shari’a law come into conflict and what can be done to reach a compromise involving these systems. Furthermore, the development of policies capable of extinguishing the threat of political violence directed towards these governments in peril is equally imperative to the establishment of stable democracies that can govern over their both secular and devoutly religious communities.

For this project, I will use Bangladesh and Indonesia as case studies. Both Bangladesh and Indonesia have engaged in this difficult act of balancing the interests of international organizations upon which they rely heavily for monetary aid and the overwhelmingly large Muslim majorities upon which politicians rely heavily for re-election and political power. Indonesia, though, has already implemented solutions in order to suppress the political violence that this conflict between secular and Shari’a law has given rise to. Therefore, the question I hope to answer through my research is, have these policies been successful in ending the political violence and could they be implemented in other countries? I will conduct such research combining both a qualitative and quantitative approach using data collected through Dr. Stephen Shellman’s Project Civil Strife. The quantitative data I hope to acquire through Project Civil Strife will enable me to better explain the dynamic relationship between all of the actors involved: international organizations, judges, domestic politicians, dissident groups, and the general populous. The qualitative research will involve investigating the pivotal court cases that involve conflicts of international, domestic, and religious law as well as the adjudication of such cases. Through these approaches combined, I hope to have ample information to formulate a series of hypotheses this summer concerning in what cases the intersection of international, domestic, and religious law sparks political violence and what policies best address these sparks before they erupt into wildfires.

Faculty Research Mentor: Dr. Stephen Shellman, International Affairs
Using Surface Enhanced Raman Spectroscopy for the Detection of Pathogens

CURO Summer Research Fellow: Anna Hudson

There is a critical need for a more accurate and more rapid method for diagnosing infectious pathogens. Current methods are severely limited in sensitivity and accuracy, or are time consuming and expensive. The development of a better technique for detecting low levels of infectious pathogens would aid in intervention approaches, treatment strategies, as well as redefining the need for hospital admission. Overall, better diagnosis of pathogens translates into better protection of public health.

The analytical technique of interest is Surfaced Enhanced Raman Spectroscopy (SERS). In SERS, the Raman effect is greatly improved when molecules are close to a rough metal surface, such as gold or silver nanorods. The Raman effect, or Raman scattering, is when photons that are scattered from striking an atom or molecule have a different energy from that of the incident photons. Raman scattering is characteristic of a particular atom or molecule, and therefore, it is a very useful analytical technique. However, the usefulness of SERS has been hindered by the development of a simple reproducible procedure for creating SERS-active substrates. Recent research at the University of Georgia has shown that a nanofabrication technique based on glancing angle vapor deposition (GLAD) can produce silver nanorod substrates that are SERS-active.

The objective of this research is to understand the nanorod structural design (size, shape, orientation) produced by GLAD and how it affects SERS spectra, and to develop an immunoassay based on these substrates for the detection of pathogens, especially mycoplasma. In addition to this genus of bacteria, various viruses are of particular interest, including human immunodeficiency virus (HIV) and rotavirus, both of which cause thousands of deaths worldwide every year. It is believed that the development of a SERS-based bioanalytical technique will have significant advantages in terms of speed, accuracy, and cost for detecting current clinical threats or future bioterrorism agents.

Faculty Research Mentor: Dr. Richard Dluhy, Chemistry
Unbiased Isolation and Carbohydrate Mapping of Alpha-Dystroglycan
CURO-Jane and Bill Young Scholarship Summer Research Fellow: Andy Kragor

The majority of proteins on the surface of cells are decorated with sugars. These “sugar sidechains” have been repeatedly demonstrated to affect protein structure, stability, and activity. A specific class of sugar modifications, the O-linked sugars, has been demonstrated to play a significant role in diabetes, muscular dystrophy, leprosy, and most recently, cancer. Lance Wells’ laboratory, in conjunction with the labs of Michael Tiemeyer and Carl Bergmann, has embarked on a project to identify and quantify changes in sugar structures and attachment sites on the protein alpha-dystroglycan (α-DG) in normal and cancerous tissue. α-DG is critical for interactions of the cell with its environment. As such, it is an outstanding candidate for affecting cellular movement and adhesion, which are central in the development and spread of cancer. It is therefore not surprising that global, undefined changes in α-DG sugar sidechains have been correlated with the aggressiveness of certain cancers.

I will be isolating dystroglycans from various cell types and tissues and assisting in the mapping of all the carbohydrate structures on the dystroglycans that I isolate. The isolation protocols involve a variety of chromatographic techniques that I have been learning this semester, and include ion-exchange, lectin affinity, and size exclusion chromatography. In addition I will be using SDS-PAGE and Western Blot analysis, as well as trypsin digestion coupled to LC-ion-trap mass spectrometry, to provide proof of purity of the dystroglycan. I expect that the purification protocol will need to be altered depending both on the tissue type and whether it is from a healthy or diseased organ, as this will affect the glycans on the surface, which in turn affect the physical properties of the protein. The carbohydrate mapping strategy makes extensive use of the linear ion-trap mass spectrometer.

I will also be working in conjunction with other members of the Bergmann lab to understand how the changes in surface glycosylation will affect the dystroglycan’s ability to bind proteins in the extracellular matrix. This will require the use of surface plasmon resonance technology. The project I am working on is currently funded by the Muscular Dystrophy Association and will lay the groundwork for a future grant to the National Cancer Institute and/or the American Cancer Society. The grant would focus on specific changes observed in the sugars on α-DG that can be used as a diagnostic marker and are causally related to changes in cell motility and adhesion during cancer. My work will be principally supervised by Drs. Wells and Bergmann.

Faculty Research Mentors: Dr. Lance Wells, Complex Carbohydrate Research Center  
Dr. Carl Bergmann, Complex Carbohydrate Research Center

Creating a Culture of Undergraduate Inquiry
**Introduction:** *Magnaporthe grisea*, a filamentous Ascomycete fungus, is the causal agent of rice blast disease, which is responsible for the annual loss of about 200 million tons of rice output worldwide. The genome of *M. grisea* has been sequenced, and many genome characteristics have been described. The fungus encodes about 800 proteins that are secreted under various growth conditions. Some of these extracellular proteins (ECPs) may serve an integral role in causing the disease. Such pathogenic proteins are potential targets for the design of novel, environmentally sage fungicides.

Map-based cloning techniques are allowing the isolation and characterization of pathogenic protein encoding genes, such as virulent genes and avirulence genes which control fungal pathogenicity and host specificity, respectively. An ongoing proteomics project in this laboratory has identified by mass spectrometry about 100 ECP species from *M. grisea*. Among the identified *M. grisea* ECPs, two (MgEcp22 and MgEcp23) with unknown functions are present exclusively in rice leaves infested by *M. grisea*. It is possible that these two proteins are either pathogenicity factors or some type of signal molecules that interact with the plant host to determine disease.

**Research Proposal:** Previous research initiated by Evan Conroy (2004) involved the knockout mutagenesis of MgEcp22 and MgEcp23 genes in order to assay their roles in rice blast disease. In light of Conroy’s work, the need for a dependable expression vector capable of overexpressing various genes-of-interest has arisen. My project attempts just the opposite of Conroy’s work: rather than observing the effects of a deficiency of MgEcp22 and MgEcp23, we wish to observe the effects of an excess amount of MgEcp22 and MgEcp23 delivered inside plant host tissues.

Currently, I have constructed an expression cassette, pWH102, which carries the complementary DNA sequence of the MgEcp22 gene under the control of a regular promoter, P_{CES1}. The MgEcp22 and MgEcp23, as well as other noteworthy ECP genes, will also be cloned into a yeast–shuttle vector under the control of a strong and constitutively expressed promoter, P_{RPP2} (RPP2 stands for Ribosomal Protein P2 from *M. grisea*) using the yeast gap-repairing (YGR) technique. While the traditional restriction-ligation cloning method is currently proving the more reliable route, the (YGR) procedure will provide an affordable and high-throughput cloning format in expressing many other genes-of-interest within *M. grisea*. Regardless the cloning method, each protein expressed will be a secreted fusion protein that includes the ECP sequence and a tandem epitope-purification tag at the C-, or N- terminus.

The cloned expression constructs will be transformed into *M. grisea*, and the expression of the *M. grisea* ECP fusion proteins will be evaluated and purified using properties of the fused tandem tag. If time allows, we will also examine the pathogenicity and other phenotypes of the ECP-overexpressed *M. grisea* strains. Furthermore, the probable formation of protein complexes between any of the ECPs and a host protein or proteins during infection will also be investigated and characterized using current proteomics technologies.

Through the above experiments I wish to answer the following questions:

1. Is Yeast Gap-Repairing a suitable alternative to traditional cloning methods in the high-throughput -omics era?
2. What roles do MgEcp22 and MgEcp23 play during the interactions between *M. grisea* and its plant host? Specifically, does an excess of either ECP bear consequences for the pathogenicity of *M. grisea*?
3. Does MgEcp22, MgEcp23 or other MgEcps forms complexes with host molecules?
4. What implications does the research have regarding fungal disease control and food security in general?

**Faculty Research Mentor:** Dr. Alan Darvill, Complex Carbohydrate Research Center
The protein K-Ras, a mutated form of Ras, is a well known oncogene that is responsible for 30% of all cancers, including 90% of pancreatic cancers and 50% of colon cancers. Ras is a GTPase vital to cell growth, and therefore preventing Ras activation in cancer cells could stop them from spreading. Most proteins in the Ras family contain a CaaX motif, where C is cysteine, a is an aliphatic amino acid, and X is a variety of amino acids and activate through a three step process (Fig. 1). The first activation step involves the addition of a farnesyl group to the cysteine. This step has been a major focus of research, and several inhibitors have been developed to prevent farnesylation. Nevertheless, the inhibited cells are able to use a similar geranylgeranyl group instead of a farnesyl group, and the activation process continues unhindered. After the farnesyl/geranylgeranyl addition, a prenyl-protein-specific protease removes the aaX series from the CaaX motif. In yeast, Ste24p and Rce1p catalyze this process, but in humans, only Rce1p is capable of proteolytically processing Ras. After prenylation, the exposed C-terminal prenyl-cysteine is methylated by isoprenylcysteine carboxyl methyltransferase (ICMT), which along with Rce1p, is located on the endoplasmic reticulum. Inhibiting these steps could disrupt the activation of K-Ras and therefore open new leads for anti-cancer therapeutics by providing a starting point to halt cancerous cell growth.

Rce1p is the only enzyme in animals that can process Ras; therefore, it is an excellent target for small molecule-based inhibition of the activation process. By screening an NIH library, Dr. Walter Schmidt (BCMB, UGA) found that the most promising inhibitor of Rce1p and Ste24p was quinolinol 1 (Fig. 2). Quinolinol 2 was also a good inhibitor. The library contained analogs of 1 with different R; substituents, but did not explore variations at R. This proposal seeks to synthesize quinolinols 3 and 4 with various R; substituents to further explore the structure-activity relationships (SARs) for the inhibition of Rce1p and Ste24p. These R; derivatives of 1 and 2 are novel compounds that have the potential to inhibit Rce1p. The synthesis begins with 8-quinolinol, whose hydroxy group is protected. The protected quinolinol alkylates a variety of aromatic aldehydes. The resulting alcohol is oxidized to the ketone, which will undergo reductive amination with either aniline (R; = H) or 4-aminobenzoic acid (R; = CO2H). Deprotections, if necessary, followed by HPLC purification, will provide the target compounds. Compound 5 will be synthesized to test the necessity of the hydroxy group at R; . The goal of this research is to synthesize the compounds 3 and 4 in an effort to discover an effective inhibitor of Rce1p and Ste24p. Dr. Schmidt's lab will assay the ability of the quinolinol derivatives to inhibit Rce1p and Ste24p. From these data, SARs will be established, which will inform future synthetic work.

Figure 1: Ras Processing

Figure 2: Quinoline-Based Target and Proposed R; Modifications


Faculty Research Mentor: Dr. Timothy Dore, Biochemistry & Molecular Biology
Molecular Inhibition of Independent Phospholipase A\textsubscript{2} and its Effect on Prostate Cancer Growth

CURO-Interdisciplinary Toxicology Program Summer Research Fellow: Prashant Monian

Phospholipase A\textsubscript{2} (PLA\textsubscript{2}) are a family of enzymes that catalyze the hydrolysis of the sn-2 position of glycerophospholipids, leading to production of free fatty acids and lysophospholipids. One of these esterified fatty acids, arachidonic acid (AA), is metabolized into prostaglandin E\textsubscript{2} (PGE\textsubscript{2}). A previous study has shown that PGE\textsubscript{2} stimulates proliferation in human prostate cancer cell lines. Because PLA\textsubscript{2} regulate the release of arachidonic acid, they are thought to affect the growth of prostate cancer cells and tumors.

One such enzyme, Ca\textsuperscript{2+}-independent iPLA\textsubscript{2} appears to play a role in the provision of arachidonic acid in the cell along with phospholipid remodeling, regulation of store operated calcium channels and apoptosis. Selective inhibition of iPLA\textsubscript{2} could thus decrease the growth of human prostate cancer cells. One possible means for iPLA\textsubscript{2} inhibition would be to use siRNA nucleotides, synthesized chemically by screening the cDNA associated with production of iPLA\textsubscript{2} for unique sequences, and then designing primers for these sequences. The siRNA nucleotide could then be incorporated into a protein complex that recognizes and cleaves the target mRNA.

This work tests the hypothesis that treatment of human prostate cancer cells (PC-3) with siRNA plasmids against iPLA\textsubscript{2} will decrease cell growth. Basic cell counting under a microscope and mitochondrial function will be used to measure the rate of cell growth. Findings from this study will help establish the efficiency of using siRNA technology to inhibit iPLA\textsubscript{2} activity, and thus determine its effect on prostate cancer growth.

Faculty Research Mentor: Dr. Brian S. Cummings, Pharmaceutical & Biomedical Sciences
The Effect of Antagonizing Stress Receptors in Rats During Repeated Exposure to Restraint Stress

CURO-OVPR Summer Research Fellow: Neil Naik

Stress causes an array of physiological, metabolic and behavioral responses in humans and animals, many of which are initiated by activation of corticotrophin releasing factor receptors (CRFR). Previous studies in the Harris laboratory have shown that when rats are subjected to three hours of restraint stress on each of three days they have a reduced food intake and lose weight on the days that they are stressed. In the days after stress, food intake of the stressed rats returns to normal, but the rats do not regain the weight that they lost during stress. Because people who are overweight or obese often regain weight that they lose by dieting, it is important to understand what mechanisms are activated by stress that allows the stressed rats to maintain their weight loss.

The areas of the brain that are known to be important in regulating body weight are the hypothalamus and the brain stem. The third ventricle of the brain is adjacent to many of the hypothalamic nuclei. Experiments in the Harris laboratory have shown that if a CRFR antagonist is infused into the third ventricle just before each of the three periods of restraint stress the stress-induced weight loss is partially prevented. Because the half-life of the receptor antagonist (astressin) is relatively short but the systems that are activated by stress may be prolonged, this experiment will test whether continuous antagonism of the stress receptors on the days of stress is more effective in blocking weight loss of restrained rats.

Male Sprague Dawley rats will be fitted cannulas aimed at the third ventricle. Appropriate placement of cannulas will be tested one week later by ensuring that the rats drink after an infusion of angiotensin II. The daily body weights and food intakes of the rats will be measured daily for 5 days for baseline measurements. The rats will then be divided into three groups and an Alzet miniosmotic pump will be attached to the cannula. These pumps deliver 0.25ul test solution/hr for 7 days. One group will be fitted with pumps that deliver sterile saline to the third ventricle. The other two groups will be fitted with pumps that deliver astressin. Two different doses of astressin will be tested as a high dose of astressin may increase body weight and food intake. Half of the rats in each of the infusion groups will be exposed to 3 hours of restraint stress for three days, starting the day after the pumps are attached. The day after the end of the restraint the pumps will be disconnected from the cannulas. Daily body weight and food intake will be measured for ten days after the end of stress to determine whether either of the doses of astressin has inhibited weight loss in restrained rats.

Faculty Research Mentor: Dr. Ruth Harris, Food & Nutrition
Genetic Studies on the Roles of KITL in Regulating the Proliferation and Apoptosis of Primordial Germ Cells in Mice

CURO-BHSI Summer Research Fellow: Natalie Nesmith

Kit ligand (KITL) and its receptor KIT are required for the development and proliferation of germ cells, melanocytes, and hematopoietic cells in humans, mice and many other vertebrates. Of particular interest to our lab is the role of KITL in the differentiation and development of germ cells in mice.

Germ cell development is initiated when a certain amount of primordial germ cells (PGCs) are specified from somatic cells during gastrulation. PGCs first associate with the gut, then actively migrate toward the genital ridge where they lose their motility. Because of proliferation and suppression of apoptosis, PGC numbers increase rapidly during this time period and both processes are mediated by KITL. Recent studies from our lab have shown that proliferation of PGCs in the gut is partially dependent on KITL but PGC proliferation is completely dependent on KITL once these cells migrate from the gut. Still unknown, though, is whether KITL-mediated control of apoptosis also differs between premigratory and migratory PGCs.

This project will catalog the effects of different Kitl mutations on proliferation and apoptosis of PGCs at several stages of development. Observations that reveal preferential effects of specific Kitl mutations on either process will lead to a better understanding of the function of KITL. Since the KITL network is a prime example of cellular regulation and communication, more detailed understanding of its function has a number of clinical applications in multiple areas including reproductive health and the ability to manipulate and regulate the cellular signaling pathway.

Faculty Research Mentor: Dr. Mary Bedell, Genetics
In the ancient world, the tales of greatest struggle and triumph were captured and immortalized in the lines of epic verse. Distinguished from the rest, this genre of poetry reflects the grand scale of human interaction, stories of those who were greater than the common man and of the events that made them so. While this tradition is widely considered to have been at its peak in the Classical age, those epic works outside of this time period receive far less attention and credit for the stories they tell and the heroes they praise.

In the first work of literature to come from the New World, Don Alonso de Ercilla y Zúñiga captures the story of the battle between the Spanish conquistadors and the Mapuche people in his epic poem, *La Araucana*. Living in what is now Chile, the Mapuche were the only people that denied victory to the expanding Incan empire, and were renowned for their ferocity in war. When the Spanish attempted to take their lands, again the Mapuche showed their strength, and thus began the Arauco War. It should be noted, though, that while this project is designed to investigate the early years of the Arauco War, the Mapuche people never surrendered. To this day, they have still never recognized foreign rule, and while they live on reservations set aside by the Chilean government, they are still at odds with the descendants of the Spanish rulers.

During the mid-1500s, part of the Spanish custom in doing battle with the natives of the New World included the capture of locals, hoping to gain certain insight into either the new terrain or the enemy itself. One of the captured Mapuche was a young boy named Lautaro. He lived for several years with the Spanish and eventually became the servant of the Spanish commander, Pedro de Valdivia. Lautaro learned many things about these strange people, including their tactics, their weapons, and their horses, and after enough time in the presence of the enemy, he returned to his people to share this knowledge. Through his insight, the Mapuche became much more successful in defending against the conquistadors. Lautaro devised a military strategy combining the knowledge of his land and the vulnerabilities of the Spanish, and was able to destroy several cities before his ultimate death in a surprise attack, possibly due to a betrayal by one of his own.

In the midst of the many heavily worked epics of Western history, *La Araucana* is given much less attention, and in the study of the poem itself, the role of Lautaro is studied even less frequently. It is my goal to research and analyze his influences, especially his military tactics and contributions. I plan to accomplish this through a close reading of Lautaro’s appearances in the epic, in English translations and in the original Spanish text, as well as through in-depth reading of historical accounts and studies of the Mapuche people. Any attention given to specific military tactics will be assisted by referencing specific texts in that area of study.

*Faculty Research Mentor: Dr. Ángel Nicolás Lucero, Spanish Literature*
Developing a Biocontrol Agent for Chinese Privet, *Ligustrum sinense*

**CURO Summer Research Fellow: Tulsi Patel**

My research this summer will focus on initiating development of a biological control method for the exotic weed *Ligustrum sinense*. This proposal is based on the hypothesis that a host specific or modified broad host range fungal mutant that overproduces an amino acid that is toxic to *L. sinense* can be used to control the weed. I will be working under the guidance of Dr. Scott Gold in the Department of Plant Pathology at the University of Georgia. Dr. Gold's research focuses on the genetic interactions required for pathogenesis in fungi. In an effort to control Georgia’s #1 invasive plant, Dr. Gold and I started work this fall on this new *Ligustrum sinense* project, which I am pioneering.

*Ligustrum sinense*, commonly known as Chinese Privet is a rapidly growing invasive shrub that was introduced to the United States as an ornamental plant. Privet escaped cultivation in the 1930s and now invades millions of acres of land in the southeastern United States. Privet has the potential to alter ecosystems by forming dense thickets in the undergrowth of natural forests and reducing the amount of light, water, nutrition, and space available to native species. Because birds and small animals easily disperse Privet seeds, it has the potential to convert the diverse forests of the Southeast into a monoculture shrub-land. Moreover, the only effective control measure available is a costly combination of physical removal and herbicide application. The long-term goal of this project is therefore to identify a cost-effective bio-control agent for this exotic weed.

Our approach to develop a cost-effective biological control agent involves various steps. The first of these steps is to identify amino acids that are toxic to Privet. Amino acids regulate specific chemical pathways in living organisms—increasing the concentrations of certain amino acids can create an imbalance in the plant’s metabolic activities, which can eventually kill the plant. During my research last semester, I generated numerous rooted Privet plantlets from geographically diverse cuttings and treated them individually with 8 amino acids. After performing the preliminary experiment, I have concluded that lysine, methionine, and valine are three amino acids that appear most toxic to Privet. To verify the results from this initial experiment, I will run three identical trials during the summer so that the data can be statistically analyzed. I am currently working on determining the minimal effective concentration for each inhibitory amino acid. This experiment will also be repeated during the summer. The next step in the project will be to obtain a pathogenic fungus that could be mutated to secrete large amounts of toxic amino acid. Finding a potential host-specific pathogen involves literature surveys and personal communications. The University of Georgia has an international collaboration with Shanghai Academy of Agricultural Sciences and I will communicate with scientists there about possible control agents. Additional wild *Ligustrum* species are native to the western United States (*Ligustrum ovalifolium*); I will explore the possibility of identifying effective host specific pathogens through contacts with researchers there. This summer I will also contact a government regulatory agency, USDA-APHIS, to learn the restrictions placed on the importation and usage of pathogens either domestic or foreign.

However, before importing a host-specific pathogen, I will first test the experimental principle on *S. rolfsii*, a broad host range fungus. I will create a mutant of this fungus by exposing the fungus to ultraviolet rays or mutagenic chemicals. After identification of a high level secretor, I will inoculate Privet with this mutant to test its pathogenicity and verify the potential of the experimental procedure. If the experiment is successful for *S. rolfsii*, I will repeat it to create a host-specific mutant and test its pathogenicity and host specificity.

Additionally, during the course of the summer, I will use Chinese Privet to explore the current thinking of the ornamental industry with regards to the control of invasive species. I will conduct a survey to learn more about the Green industry’s attitudes and control mechanisms toward invasive plant release.

The success of this project will provide us with a fungal mutant that will secrete excess amounts of an amino acid that is detrimental to Chinese Privet but does not affect native species. The principle used in this project could then be used as a model to create efficient biocontrol agents for other exotic weeds like Kudzu.

Faculty Research Mentor: Dr. Scott Gold, Plant Pathology
Manner of Hammer Stone Use in Wild Capuchin Monkeys

CURO-OVPR Summer Research Fellow: Tomas Pickering

Background: Recently, in Piauí, Brazil, wild bearded capuchin monkeys (Cebus lipidinosus) have been documented using stone tools to crack open palm nuts. The stone hammers that the monkeys use typically weigh one kilogram, which is equivalent to 25-40% of an adult monkey’s body weight. Manipulation of these relatively heavy stones, that must be transported at least short distances to anvil sites and must be lifted in order to strike at the desired palm nut, has led to innovations in behavior made by the monkeys such as bipedalism during transportation.

Objectives: Under the guidance and direction of Dr. Dorothy Fragaszy, I will assist in a seven-week trip (June 25th to August 11th) to Brazil in order to study the kinematics of tool use by the capuchin monkeys. This will include an analysis of primate locomotion and positional behavior, for example, quadrupedalism versus bipedalism, forelimb mechanics, and posturing. An analysis of the movement through space and time (acceleration) of the hammer stone during use will also be of primary importance. The goal will be to collect the kinematic data in order to aid in the overall understanding of the importance of the nut cracking behavior and how it relates to the monkey’s natural history.

Methods: Preceding travels it will be necessary to learn and practice with technologies that will be used during field research and also acquire some basic knowledge of Portuguese. The collection of data on the kinematics of tool use will be done using cameras. At least two cameras will be established to record side and frontal views of the monkeys carrying hammer stones and striking palm nuts with the stones. Following, a frame by frame analysis of multiple joint movements will be done. Acceleration of the hammer stone will be determined by imbedding a wireless accelerometer into the stones that are placed into the field site where a group of habituated capuchins (N=15) frequent almost daily; data will be streamed into nearby laptops and stored. Analysis of accelerometer data will be done using the “LabView” computer software program. Any additional time will be used to help document other available food resources to the monkeys for purposes of aiding to the greater ecological significance of this behavior.

Significance: This project will improve understanding of the overall function of this unusual nut cracking behavior in wild capuchin monkeys. The reference point we are creating on hard-fruit feeding via tool use of a New World monkey is important to our understanding of tool use development in the phylogenetically distant hominid line.

Faculty Research Mentor: Dr. Dorothy M. Fragaszy, Biology
Hirano bodies are intracellular, paracrystalline, actin-rich structures that are most commonly found in the brains of humans suffering from neurodegenerative diseases. Their purpose and structure are not well understood, but their possible link to the prevention, cure, and further understanding of neurodegenerative diseases has made their study worthwhile. Previously, Dicytostelium (slime mold) was used to test if myosin II was essential for the formation of Hirano bodies in cells. Temperature-sensitive myosin II and mutated 34 kD protein were expressed constitutively in Dicytostelium cells. Hirano bodies formed in the cells at permissive temperatures while the cells at non-permissive temperatures died. Hirano bodies were counted and electron microscopy was performed. Myosin II was required for the formation of Hirano bodies, but the characterization was incomplete. Since expression was constitutive, it was impossible to determine how Hirano bodies contributed to cell death.

In order to complete the characterization of the molecular mechanism of Hirano body formation, I have been working with Drs. Marcus Fechheimer and Ruth Furukawa in creating an improved plasmid. Over the course of the year, I have worked on constructing a plasmid with an inducible promoter for the expression of the mutated 34 kD protein fused to red fluorescent protein. The inducible promoter will allow the expression of the 34kD protein to be turned on and off so I may observe how the Dictyostelium cells operate with the functional and nonfunctional myosin II. The vector I am creating will contain a blasticidin resistant cassette so that only the cells resistant to the blasticidin and expressing the red fluorescent protein will be studied.

By the end of this semester, the vector process should be completed or in its final stages. I will use this summer to perform experiments using the vector so that I may study Hirano bodies. My experiments will focus on how Hirano bodies form and observe how they contribute to cell death. Hirano bodies will be counted, and I will perform fluorescence and electron microscopy and western blotting on the Dicytostelium cells. Over the summer, I will further my understanding of cellular biology, improve my technique and efficiency in the lab, and learn several new techniques. These techniques include transforming Dictyostelium, manipulating protein expression in a cell, performing microscopy and western blots. Ultimately, this will lead me to better understand the research process and how Hirano bodies form.

*Faculty Research Mentor: Dr. Marcus Fechheimer, Cellular Biology*
Characterization of *Mycobacterium shottsii*

**CURO Summer Research Fellow: Purvi Sheth**

*Mycobacterium shottsii* is an acid-fast bacterium that was discovered in the spleens of several striped bass exhibiting ulcerative lesions in the Chesapeake Bay. This bacterium is of interest to investigators seeking to determine whether it causes the fish lesions. Vaccinologists are also interested in this bacterium. Its inability to grow above 30°C and relatedness to *Mycobacterium tuberculosis* suggests that it might be suitable for development as an intra-nasal tuberculosis vaccine. An initial characterization of *M. shottsii* was published by Rhodes and colleagues in 2003. The goal of the CURO summer research project will be to continue the characterization of this bacterium.

One emphasis of the project will be to investigate whether nutritional supplementation can enhance the growth rate of *M. shottsii*. This bacterium has a very slow doubling time in broth or on agar plates. Because growth on plates can take several weeks for colonies to be visible without a magnifying glass, the focus of this project will be growth in broth cultures. The bacterium grows in Middlebrook 7H9 broth supplemented with OADC (oleic acid, albumin, dextrose, and catalase) and Tween-80. Various nutritional supplements will be examined to determine if they allow *M. shottsii* to grow faster. A literature review of the growth requirements of other *Mycobacterium* species will be undertaken to help select candidate supplements to be tested. To be tested first will be ferric pyrophosphate, chicken egg, and pyruvate, as they have benefited the growth of other mycobacteria. Growth will be monitored in parallel supplemented and nonsupplemented cultures by measuring the optical densities at 600 nm.

This project will also examine antibiotic resistance in *M. shottsii*. This project will examine antibiotics that have been used for molecular cloning in other *Mycobacterium* species. In particular, the antibiotics kanamycin and hygromycin will be studied. A colorimetric assay using Alamar blue is used to determine the minimum inhibitory concentration (MIC) of drugs against *M. tuberculosis*. We will modify this assay for MIC determinations by *M. shottsii*. The assay will be performed in sterile 96-well dishes. Bacterial culture will be added to wells containing increasing amounts of each antibiotic. Sterile Alamar blue solution will be added to each well. Triplicate samples for each antibiotic concentration will be prepared. Cultures will be incubated at room temperature over several weeks and monitored for color change (from blue to pink). The drug concentration at which the color change is observed will indicate the MIC.

The final goal of this project will be to determine whether *M. shottsii* has a mycobacteriophage L5 attachment site on its chromosome. This site is used in other mycobacteria to integrate DNA into the chromosome, thereby allowing a gene to be present in single copy. Other researchers in the laboratory have successfully transformed *M. shottsii* with a multi-copy plasmid encoding a mycobacterial plasmid origin of replication, green fluorescent protein, and resistance to kanamycin. Therefore, a suicide plasmid encoding the mycobacteriophage L5 attachment site and integrase, and resistance to kanamycin will be electroporated into *M. shottsii* and plated onto 7H11 agar supplemented with OADC Tween-80 and 25 μg/ml kanamycin. If colonies appear, they will be screened by PCR for DNA specific to the suicide plasmid. If the DNA is present, then it will support the hypothesis that *M. shottsii* has an L5 attachment site.

*Faculty Research Mentor: Dr. Russell Karls, Microbiology*
Gender and Role Meanings: A Cross-Cultural Comparison

CURO Summer Research Fellow: Traci Tucker

I will use my CURO Summer Research Fellowship to fund research of Chinese-American relations under the guidance of Dr. Dawn Robinson. As globalization becomes an increasing force in contemporary society, progressively more Chinese businessmen are placed in business-oriented interactions with American businesswomen and vice versa. I wish to examine how differing cultural sentiments and expectations of gender roles between these two cultures affect workplace interactions.

Affect Control Theory provides a means of investigating these consequences as well as how such interactions are transforming cultural expectations. The cultural basis of the theory provides an opportunity to investigate cross-cultural interactions in a variety of contexts. However, few researchers have taken advantage of the opportunity to expand Affect Control Theory to this type of application, and these potentially far-reaching and significant implications have gone unexplored. Furthermore, as one of the few formalized, mathematical theories in Social Psychology, Affect Control Theory provides a precision and a depth that is rare in the contemporary study of social interaction.

A Clarke International Scholarship will be funding a two-week journey to Guangzhou, China to collect a Chinese dataset under the supervision of a renowned Affect Control Theorist at Sun Yat-sen University. I will combine this scholarship with a CURO Summer Research Fellowship. This research fellowship will provide the funding necessary for me to collect a corresponding American dataset, perform an in-depth analysis, and begin the working foundations of a thesis upon returning to the University of Georgia.

Faculty Research Mentor: Dr. Dawn T. Robinson, Sociology
Does Writing Ability Signal Academic Excellence?  
Evidence from the New Scholastic Aptitude Writing Section (SATW)  
CURO-UGA Alumni Association Summer Research Fellow: Jessica Van Parys

What Am I Studying? My research intends to determine if scores on the new writing section of the Scholastic Aptitude Test (SATW) are better able to predict collegiate academic success for incoming first-year students. I hope to answer several questions on this topic. First, does the SATW help predict student success in college more accurately than the old version of the SAT? Second, do scores on the new SAT disproportionately predict success for certain types of students (e.g. English majors versus Chemistry majors)? Finally, based on the research findings, what are the implications for students, admissions offices, and education policymakers?

Why Is This Study Important? Presumably, policymakers altered the SAT format to provide a test that better reflects important skills. It could also help admissions offices at colleges and universities better differentiate among candidates for admission. Universities admit students for a variety of reasons, but most commonly, they choose students who are most likely to succeed academically. Both students and the university suffer when dropout rates and academic probation rates are high. If a university can predict a student’s capacity for collegiate success, the student and the university are matched appropriately, and both parties benefit. Thus, it is important to evaluate how much predictive power measurement tools (e.g. the SATW) have in determining such success. Ceteris paribus, if the SATW does not better predict levels of student achievement, then the policy change was unproductive. In that case, high school students should spend less time on, and contribute fewer resources toward, preparing for the writing section. Similarly, universities should not use the SATW in their admissions decisions. Moreover, students, school districts, and universities may choose to emphasize alternative mechanisms to predict student achievement (e.g. high school end-of-course tests). Overall, it is important to understand the implications of new policies, as it is inefficient to promote policies that fail to provide helpful results.

Which Methods Will I Use? I will employ multi-variable regression analyses on student-level data from the University of Georgia Admissions, Financial Aid, and Registrar’s offices. I will limit my attention to the current first-year students because this is the first cohort of students who took the SATW. Professors Christopher Cornwell and David Mustard have permission to obtain and use these data to examine questions pertaining to student behavior and achievement in college. They will, however, need to update this data set at the end of this academic year.

My research will examine the determinants of a number of outcome variables, such as GPA, GPA in one’s intended major, the number of credit hours students complete, and the number of classes from which they withdraw. I will determine whether the new SATW exam helps explain these outcome variables while controlling for factors such as high school grade-point average (GPA), math and verbal SAT scores, gender, race, financial aid package offered (e.g. HOPE), and geographic region or school district.

Faculty Research Mentor: Dr. David B. Mustard, Economics
Through the summer research fellowship and in collaboration with the administrators of the Multicultural Archive of Georgia, I will conduct rigorous research, primarily through interviews, on the Civil Rights Movement in Georgia. The research will be based on the actions of the citizens from Atlanta, Athens, Albany, Savannah, Camilla, Americus, and other places in Georgia during the movement and will examine how the citizens were catalysts in desegregation and equal rights. The information compiled will be added to the online archive that the administrators have created specifically to aid teachers and students in their research of information on the Civil Rights Movement in Georgia. I also intend to personalize the process to include some research of my own.

A concept that I colorfully coin as “Beauty Imposed” is a controversial issue highly debated in the African American culture. This idea, in basic terms, explores the images of beauty held by members of the African American community and how much these images are influenced by the media, generations of cultural conditioning, and popular culture. Recent research has revealed that “color schemes,” or the different shades of skin, affect ideas of beauty for African Americans, especially in their consideration of the opposite sex within the culture. In addition, certain physical features are preferred over others, and varying stigmas, mostly negative, are attached to members of the culture based on the lack of particular physical features.

I will condense and reveal the results of recent research on these contemporary aesthetics in African American culture. In addition, I intend to compare the results with findings of my own. I want to uncover the images of beauty imposed on African Americans, particularly women, during the Civil Rights Movement. I will focus primarily on the concepts exposed in the arts and literature of the Black Aesthetic during the Black Arts Movement, which existed almost concurrently with the Civil Rights Movement. I will compare the concepts illustrated in the literature and arts from the movements with information given from the primary sources by incorporating questions from my personal research into the interviews. My findings will hopefully reveal the ideas of beauty in the African American culture prior and up to the Civil Rights Movement and the similarities the notions of beauty have to contemporary aesthetics.

The results of my research will provide a better understanding of the unique styles and different concepts of beauty within the African American culture and show how the different styles conform to or reject the standardized notion of beauty within the culture. In addition, I intend to simultaneously alleviate the negative perspectives that African American women may have of themselves when they do not conform to the standardized notions of beauty prevalent to the culture, by disrupting the imposed negativity of any conditioned thoughts and images of beauty.

Faculty Research Mentor: Dr. Barbara McCaskill, African American Studies and English
CURO Summer Research Fellow: Karen Wong

Since I currently do research under Dr. Whitford, we will utilize the summer as an in-depth extension of our current research. The three main goals for the summer are to complete the final revisions on our “Political and Social Foundations for Environmental Sustainability” paper, to finish our transfer pricing research, and to start a new project on social entrepreneurship.

Environmental sustainability is the long-term preservation of our environment for the future. The purpose of our essay is to quantitatively investigate several possible foundations for environmental sustainability, as measured across countries with varying geography, development patterns, social customs, and political arrangements. We first test two central hypotheses about the roles of democracy and federalism. Our study asks if democracy increases environmental sustainability and if federalism reduces sustainability. We also assess the roles of organized groups representing different kinds of environmental interests, development paths, and religious orientations. We find little evidence for variation in sustainability levels given variation in either democracy or federalism. However, we find that the effect of economic development (both current and historical) depends on the measurement of sustainability. Stress and vulnerability are affected by business practices and international environmental organizations (but environmental systems are not), and the effect of Protestant religious affiliations depends on our measurement of sustainability. Although these findings show no clear political foundation, they portray a complex and varied set of foundations for environmental sustainability.

Since we only have revisions left on the sustainability paper, the second thrust of our research will focus on the transfer pricing paper. The purposes of the transfer pricing project are to provide a broad overview of regulatory compliance in the international political economy, to consider the role and reasons for different regulatory policies, to see how these policies influence investment and productivity, and to model transfer pricing regimes (rules) across OECD countries, to consider evidence for how some countries depart from the norm, and to provide explanations for why those departures exist. Our main conceptual argument in this paper is that firms don’t like uncertainty and regulatory decisions can reduce this uncertainty. Since transfer pricing is very important to large firms crossing jurisdictions, we will narrow the scope of our research by focusing on regulatory decisions in the context of transfer pricing. To reduce the uncertainty inherent in transfer pricing, APAs (Advanced Pricing Agreements) help reduce uncertainty. In our paper, we ask why some nations allow APAs, while others do not. We assess the roles of broad regulatory regime quality, legal origins, political systems, corporate tax rates, and tax dependence of countries in their likelihood of adopting APAs. We will then formulate a model and explain deviations away from the norm such as Italy and Japan.

Lastly, we will start research on social entrepreneurship. Social entrepreneurship is business organizations or ventures that advance a social, philanthropic mission through business methods. We will study international social entrepreneurship in a comparative context.

Faculty Research Mentor: Dr. Andrew Whitford, Political Science
Appendix A

CURO 2006 Summer Research Fellows

Sarah Breevoort, CURO-BHSI Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
*Construction of Three Reelp Mutant Plasmids to Aid in the Characterization of Reelp Enzymatic Activity*

Lauren Coffey, CURO Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Susan Fang, CURO Summer Research Fellow
Prof. Christopher Hocking, Studio Foundations

Courtney Grant, CURO-BHSI Summer Research Fellow
Dr. Julie Coffield, Department of Physiology and Pharmacology
*An Investigation of Botulinum Neurotoxin Interactions on RhoA Activity Using In Vitro Assays*

Erica Hall, CURO-BHSI Summer Research Fellow
Dr. Julie Kissinger, Department of Genetics

Adele Handy, CURO-UGA Alumni Association Summer Research Fellow
Dr. Greg Robinson, Department of Chemistry

Celan Hardman, CURO Summer Research Fellow
Prof. Joe Norman, Drawing and Painting

Sana Hashmi, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center
*Alteration of Alpha-Dystroglycan and Cancer Progression*

Matthew Haney, CURO Summer Research Fellow
Dr. Larry Nackerud, School of Social Work
*Courrie – Not Email: Implications for Government Regulation of a Social Phenomenon. A Case Study of Language in France*

Maggie Mills, CURO-NSF/SPIA Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Anna-Marieta Moise, CURO-BHSI Summer Research Fellow
Dr. Andrea Hohmann, Department of Psychology
*Neurochemical Basis of Social Defeat in Syrian Hamsters: Role of Endogenous Cannabinoids*

Lamar Moree, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center

Jesse Oakley, CURO Summer Research Fellow
Dr. Laurie Fowler, Department of Ecology
*Economic Incentives for Private Land Conservation and Sustainable Development: Research into Environmental Policy in Costa Rica and Georgia*
CURO 2007 Summer Research Fellowships

Katie Orlemanski, CURO-OVPR Summer Research Fellow
Dr. Patricia Richards, Department of Sociology

Reclaiming “Development” within the Context of Low-Income Neighborhoods

Danielle Pearl, CURO-OVPR Summer Research Fellow
Dr. Keith Langston, Germanic and Slavic Languages

Press Freedom, E.U. Accession, and Democracy in Croatia

Daniel Perry, CURO Summer Research Fellow
Dr. David Landau, Department of Physics and Astronomy

Andrew Pierce, CURO Summer Research Fellow
Dr. Thomas McNulty, Department of Sociology

Richard Piercy, CURO-OVPR Summer Research Fellow
Dr. Cory Momany, Department of Pharmaceutical and Biomedical Sciences

Kurinji Pandiyan, CURO Summer Research Fellow
Dr. Steven Holloway, Department of Geography

Understanding Public Space in a New Urbanist Development

Mandy Redden, CURO-BHSI Summer Research Fellow
Dr. Robert Arnold, Department of Pharmaceutical and Biomedical Sciences

Towards a More Effective Delivery System for Anti-Cancer Drugs

Eva Bonney Reed, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology

Lisa Rivard, CURO-Toxicology Summer Research Fellow
Dr. Jeff Fisher, Toxicology

Sonia Talathi, CURO-OVPR Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences

Effectiveness of Ca2+-Independent Phospholipase A2 Inhibitors in the Induction of Chemotherapeutic-Induced Cancer Cell Death

Erika Vinson, CURO Summer Research Fellow
Dr. Richard Siegesmund, Art Education

Joshua Watkins, CURO Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs

The Price of Victory: When Leaders Underestimate the Cost of War

Daniel Weitz, CURO-OVPR Summer Research Fellow
Dr. Gary Bertsch, Department of International Affairs

The Impact of a European Union Nuclear Weapons Free Zone on the International Non-Proliferation Regime

Shannon Yu, CURO-BHSI Summer Research Fellow
Dr. Nancy Manley, Department of Genetics
Appendix B

CURO 2005 Summer Research Fellows

Grace Anglin, CURO-OVPR Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
*Family Focused Emotion Communication Training*

Ashley Beebe, CURO Summer Research Fellow
Dr. James R. Holmes, Center for International Trade and Security
*The Influence of Media on Economic Policy in Brazil and Argentina*

Ingrid Bloom, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
*Differentiation of Human Embryonic Stem Cells into Endothelial Progenitors*

Ian Lewis Campbell, CURO Summer Research Fellow
Dr. Glenn Wallis, Department of Religion
*Theories of Mythology and the Way That Myths Have Affected Social and Political Formation*

Kimberly Coveney, CURO-CIT Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
*Role of iPLA2 in Phospholipid Metabolism in Chemotherapeutic-Induced Cancer Cell Death*

William Collier, CURO-OVPR Summer Research Fellow
Dr. Amy D. Rosemond, Institute of Ecology
*Analysis of an Exotic Species’ Interactions with Native Aquatic Trophic Dynamics: Quantifying the Effects of the North American Beaver (Castor canadensis) on Sub-Antarctic Stream Food Webs in the Cape Horn Archipelago, Chile*

John Crowe, CURO Summer Research Fellow
Prof. Mark Callahan, Ideas for Creative Exploration
*AUX Launch: Art, Representation, and Commerce on the Web*

Katie Griffith, CURO Summer Research Fellow
Dr. Diana Ranson, Department of Romance Languages
Dr. Judith Preissle, College of Education
*Assessing Cultural Values and Political Beliefs in a Nicaraguan Classroom: A Participant Observation*

Matthew Haney, CURO-CTEGD Summer Research Fellow
Dr. Rick Tarleton, Department of Cellular Biology
*Antibody Depletion of Highly Abundant Proteins in Trypanosoma cruzi for the Fine-Tuning of Proteomic Analysis*

Ned Hembree, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
*Rcl and Ste24 Inhibition by Dipeptidyl Acyloxymethyl Ketones: A Potential Target for Cancer Therapeutics*

Alicia Higginbotham, CURO Summer Research Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
*Christopher Logue's Iliad: A Work in Translation*
Scott Jacques, CURO Summer Research Fellow
Dr. Mark Cooney, Department of Sociology
The Social Reality of Young, Middle Class Drug Dealers

Lisa Jordan, CURO Summer Research Fellow
Dr. Ruth Harris, Department of Food and Nutrition
The Effect of Leptin on Sympathetic Nerve Activity in White Adipose Tissue

Carey Kirk, CURO-OVPR Summer Research Fellow
Dr. David Z. Saltz, Department of Theatre and Film Studies
The Effectiveness of Drama Techniques in Treating People Suffering from Trauma

Andrew Leidner, CURO-CTEGD Summer Research Fellow
Dr. Pejman Rohani, Institute of Ecology
Coevolutionary Behavior and Interference between Fatal Diseases

Jon McGough, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
The Role of Female Choice in Sexual Selection of Drosophila pseudoobscura

Tatyana Nienow, CURO-BHSI Summer Research Fellow
Dr. Walter K. Schmidt, Department of Genetics
Adapting Yeast for the Study of Pitrilysin and Other M16A Enzymes

Erika Porter, CURO-BHSI Summer Research Fellow
Dr. Charles H. Keith, Department of Cellular Biology
Intrinsic Fluorimetric Imaging of Neural Activation in Cultured Cells and Zebrafish

Kurinji Pandiyan, CURO-CAES Summer Research Fellow
Dr. Raj Rao, Department of Animal and Dairy Science
Genomic Instability of Human Embryonic Stem Cells

Kelly Proctor, CURO-OVPR Summer Research Fellow
Dr. Lee B. Becker, College of Journalism and Mass Communication
Differences in Environmental Reporting: China and the United States

Rebecca Trupe, CURO Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Family Focused Emotion Communication Training

Russ Richardson, CURO Summer Research Fellow
Dr. Ron Carroll, Institute of Ecology
Sugarcane Processing Waste as a Soil Amendment on Organic, Shade-Grown Coffee under Simulated Drought Conditions for Control of Plant-Parasitic Nematodes

Dustin Williams, CURO-BHSI Summer Research Fellow
Dr. Scott T. Dougan, Department of Cellular Biology
Development of Transgenic Zebrafish to Understand How Activation of Hyal-2 Leads to Tumor Formation

Fei Yang, CURO Summer Research Fellow
Dr. Janet Westpheling, Department of Genetics
Regulation of Branched-Chain Amino Acid Catabolism in Streptomyces coelicor: Applications for Metabolic Engineering of Polyketide Antibiotic Biosynthesis
Stephanie Yarnell, CURO Summer Research Fellow
Dr. Carl Bergmann, Complex Carbohydrate Research Center
Appendix C

CURO 2004 Summer Research Fellows

Cara Altimus, CURO Summer Research Fellow
Dr. Jonathan Arnold, Department of Genetics
Isolation of a Light Receptor in the Biological Clock of N. crassa

Westin Amberge, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
Guided Differentiation of Human Embryonic Stem Cells into Endothelial Cells: Focusing on the Ulex Europaeus Agglutin I Lectin

Namrata Asuri, CURO Summer Research Fellow
Dr. Sidney Kushner, Department of Genetics
Analysis of the Role of Ribosomal S1 in the Polyadenylation Pathway of Eschericia coli

Erin Bohan, CURO-OVPR Summer Research Fellow
Dr. Katarzyna Jerzak, Department of Comparative Literature
The Reconciliation of Selves: The Emigrant Experience in America

Rebecca Brantley, CURO-OVPR Summer Research Fellow
Ms. Ashley Callahan, Georgia Museum of Art
The Early Fashion Design of Mariska Karasz and the Influence of Her Native Hungary

Josef Broder, CURO Summer Research Fellow
Dr. Andrew Sornborger, Department of Mathematics
Techniques in High Noise Image Analysis

Beau Bryan, CURO-BHSI Summer Research Fellow
Dr. Michael Pierce, Department of Biochemistry and Molecular Biology
N-Cadherin Gl

Susannah Chapman, CURO Summer Research Fellow
Dr. Virginia Nazarea, Department of Anthropology
Designing Sui Generis Systems for Traditional Plants and Associated Local Knowledge

Clayton Griffith, CURO-OVPR Summer Research Fellow
Dr. Amy Rosemond, Institute of Ecology
The Effect of the North American Beaver (Castor Canadensis), an Exotic Herbivore, on the Composition, Structure, and Regeneration of the Riparian Vegetation of Sub-Antarctic Forested Streams in Chile

Christopher Hale, CURO-BHSI Summer Research Fellow
Dr. Thomas F. Murray, Department of Physiology and Pharmacology
Adolescence as a Distinct Period of Vulnerability to Nicotine Addiction

Catherine Hudson, CURO-BHSI Summer Research Fellow
Dr. Harry Dailey, Department of Microbiology and Biochemistry and Microbiology
Negatively Affecting the Heme Biosynthetic Pathway in “Escherichia coli”
Douglas Jackson, CURO Summer Research Fellow  
Dr. Nigel Adams, Department of Chemistry  
Reactions of Protonated Carboxylic Acid Ions with Amines in the Interstellar Medium

Andrew Leidner, CURO-BHSI Summer Research Fellow  
Dr. Pejman Rohani, Institute of Ecology  
Parasitoid Behavior and Evolutionary Dynamics

Janel Long, CURO-OVPR Summer Research Fellow  
Dr. Jean Martin-Williams, School of Music  
The Partitas of Franz Krommer and Natural Horn Technique

John McWhorter, CURO-BHSI Summer Research Fellow  
Dr. Daniel Colley, Department of Microbiology  
Induction of the Regulatory Ligand PD-L2 and the Co-regulatory Receptor PD-1 on CD4 Lymphoctes  
During Early Experimental Schistosomiasis Mansoni

William Parker, CURO Summer Research Fellow  
Dr. Marly Eidsness, Department of Chemistry  
Trigger Factor

Gehres Paschal, CURO-OVPR Summer Research Fellow  
Dr. J. David Puett, Department of Biochemistry and Molecular Biology  
Activating Mutations of the Lutropin/Choriotgonadotropin Receptor Associated with Familial Precocious Puberty, Male Psudohermaphorditism, Hypogonadism, Amenorrhea, Leydig cell Hyperplasia, and Metastatic Thyroid Carcinoma

Kevin Patrick, CURO Summer Research Fellow  
Dr. James Anderson, Department of Classics  
Cicero and the Foundations of a Legal Education at Rome

Katherine Price, CURO Summer Research Fellow  
Dr. Janet Westpheling, Department of Genetics  
Site Specific Chromosomal Integration Mediated by Bacteriophage Integrase

Matthew Rudy, CURO Summer Research Fellow  
Dr. Marly Eidsness, Department of Chemistry  
Analysis of Cotranslational Protein Folding in E-coli and Determination of the Role of the Trigger Factor Gene in the Folding Process

Desiree Smith, CURO Summer Research Fellow  
Dr. Roberta Fernandez, Department of Romance Languages  
Projecting a Positive Educational Experience for Latina/os in the South

Christopher Stokes, CURO-OVPR Summer Research Fellow  
Dr. Randy Kamphaus, School of Professional Studies  
Family Health and Classroom Behavior: A Pilot Study

Shana Strickland, CURO-BHSI Summer Research Fellow  
Dr. Kimberly Shipman, Department of Psychology  
Emotional Regulation and Coping Skills in Maltreated Children
Adam Stroupe, CURO Summer Research Fellow
Dr. Boris Striepen, Department of Cellular Biology
*Drug and Nutrient Trafficking in the Human Pathogen Cryptosporidium parvum*

Teerawit Supakorndej, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry and Molecular Biology

Tendoh Timoh, CURO Summer Research Fellow
Dr. Marly Eidsness, Department of Chemistry
*Fluorophore-modified Nascent Polypeptides*

Jora Vaso, CURO-OVPR Summer Research Fellow
Dr. Katarzyna Jerzak, Department of Comparative Literature
*The Effect of Communism on the Works of Andric, Kadare, and Szymborska*

Leslie Wolcott, CURO-OVPR Summer Research Fellow
Dr. Betty Jean Craige, Center for Humanities and Arts
*The Environment in Georgia’s Literature, Past and Present*
Appendix D

CURO 2003 Summer Research Fellows

Anthony Anfuso, CURO Summer Research Fellow
  Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
  Developing a Fast Plant Expression System to Identify Biosynthetic Genes Involved in Pectin Synthesis

Tiffany Beal, CURO-BHSI Summer Research Fellow
  Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
  Determining How Pectins Inhibit Cancer Growth and Metastasis

Robert Brady, CURO Summer Research Fellow
  Dr. Nader Amir, Department of Psychology
  Malleability of Interpretation Bias in Social Anxiety and General Anxiety

Josef Broder, CURO Summer Research Fellow
  Dr. Chi N. Thai, Department of Biological and Agricultural Engineering
  Operational Characteristics of a Mobile Spectral Imaging System for Plant Health Detection

Martha Rose Calamaras, CURO Summer Research Fellow
  Dr. Kim Shipman, Department of Psychology
  Emotional Understanding in Abused and Neglectful African-American Families

Daniel del Portal, CURO-BHSI Summer Research Fellow
  Dr. Marcus Fechheimer, Department of Cellular Biology
  The Physiological Role of Hirano Bodie

Dustin Dyer, CURO Summer Research Fellow
  Dr. Guigen Zang, Department of Biological and Agricultural Engineering
  Dr. Michael Geller, Department of Physics and Astronomy
  Energy Dissipation in Nanomechanical Resonators

Sarah Fritts, CURO Summer Research Fellow
  Dr. John P. Carroll, School of Forest Resources
  An Inventory and Assessment of Medicinal Plants and Animals Used by Makuleke Traditional Healers on the Northern Boundary of the Kruger National Park, South Africa

Betsy Goodwin, CURO-BHSI Summer Research Fellow
  Dr. Ronald Blount, Department of Psychology
  A Study of the Psychology of Pediatric Pain and Chronic Illness

Patrick Gosnell, CURO Summer Research Fellow
  Prof. Ben Reynolds, Department of Photography
  The Beautiful and the Absurd

Paulette Andrea Greene, CURO-BHSI Summer Research Fellow
  Dr. Wyatt Anderson, Department of Genetics
  Conspecific Sperm Precedence and Speciation in Drosophila pseudoobscura
Andrea Haltiner, CURO-BHSI Summer Research Fellow
  Dr. Ruth Harris, Department of Foods and Nutrition
  *The Effects of Leptin on Leptin Receptor Expression in High-Fat Fed Mice*

Luke Hoagland, CURO-BHSI Summer Research Fellow
  Dr. Marcus Fechheimer, Department of Medical Cellular Biology
  *The Role of Myosin II in Hirano Body Development and the Impact of Hirano Bodies on Cell Viability*

Christopher “Kit” Hughes, CURO Summer Research Fellow
  Prof. Mark Callahan, School of Art
  *Tagging*

Steven Jocoy, CURO Summer Research Fellow
  Dr. Michael Bender, Department of Genetics

Leena Kukkarni, CURO Summer Research Fellow
  Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
  *Identification Characterization of Enzymes and Gene Products Involved in the Synthesis of Pectic Polymers Using Mucilage as Acceptors*

Valerie Marshall
  Dr. Ben Blount, Department of Anthropology

Ashley Neary
  Dr. Susan Sanchez, Department of Medical Microbiology and Parasitology
  *Sensitive and Specific Detection of Fungal Keratitis in Horses*

Ngozi Ogbuehi, CURO Summer Research Fellow
  Dr. Mary Alice Smith, Department of Environmental Health Science
  *Comparing Apoptosis During Different Stages of Limb Development in Chick Embryos*

Melissa Payton, CURO Summer Research Fellow
  Dr. Lillian Eby, Department of Psychology
  *Antecedents and Consequences of Networking Behavior for Individuals Seeking Reemployment*

John Drew Prosser, CURO Summer Research Fellow
  Dr. Wyatt Anderson, Department of Genetics
  *Kin Recognition in Drosophila paulistorum*

Ryan Rhome, CURO Summer Research Fellow
  Dr. Jan Westpheling, Department of Genetics
  *Analysis of bkdR Protein Function in Stephtomyces coelicolor and S. avermitilis*

Susan Ritger, CURO-BHSI Summer Research Fellow
  Dr. Duncan C. Ferguson, Department of Physiology and Pharmacology
  *Immunoreactivity and Bioactivity of Recombinant Thyrotropins (TSH)*

Ben Solomon, CURO Summer Research Fellow
  Dr. Kevin McCully, Department of Exercise Science
  *Measuring Age Related Changes in Muscle Compliance Using Ultrasound*
Mary Tolcher, CURO Summer Research Fellow  
Dr. Tim Hoover, Department of Microbiology  
*Identification of Developmentally Regulated Proteins in the Budding Bacterium Hyphomonas neptunium*

Meghan Wilson, CURO-BHSI Summer Research Fellow  
Dr. James Lauderdale, Department of Cellular Biology  
*Pax 6b*

Ryan Wilson, CURO Summer Research Fellow  
Roger Moore, Department of Landscape Architecture

Thomas Wood, CURO Summer Research Fellow  
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology  
*Analysis and Characterization of CAAX Proteases*
Appendix E

CURO 2002 Summer Research Fellows

Nadia Behizadeh
   Dr. Tricia Lootens, Department of English

Ashley D. Chadha
   Dr. Michael McEachern, Department of Genetics
   Characterization of stn-1 M1 mutant in K. lactis

Emily Decrescenzo
   Dr. Susan Sanchez, Department of Biochemistry and Molecular Biology
   Development of a Detection Method for TSST-1 exotoxin from Staphylococcus aureus Associated with Toxic Shock Syndrome in Horses Directly from Clinical Samples

Ivy Forkner
   Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
   Functional Expression of Putative Biosynthetic Genes for Pectin: A Plant Polysaccharide with Anti-Cancer Activity

Cory S. Gresham
   Dr. James B. Stanton, Department of Pathology
   Dr. Corrie C. Brown, Department of Pathology
   Development of a Reverse Transcriptase-Polymerase Chain Reaction Based Assay for the Detection and Differentiation of Dolphin Morbillivirus and Porpoise Morbillivirus

Nowell Hesse
   Dr. Maor Bar-Peled, Department of Plant Biology
   Identification of Nucleotide-Sugar Biosynthetic Genes Involved in Glycoconjugate Synthesis

Matt Hoffman
   Dr. Will York, Department of Biochemistry and Molecular Biology
   Comparative Structural Analysis of Xyloglucans from Plants in the Subclass Asteridea

Parker Hudson III
   Dr. Mary Bedell, Department of Genetics

Britt Johnson
   Dr. Janet Westpheling, Department of Genetics
   The Use of Generalized Transduction for Combinatorial Biosynthesis of Novel Antibiotics

LeeAnn Jones
   Dr. Massimo Palmarini, Department of Medical Microbiology
   Mechanisms of JSRV-Induced Cell Transformation In Vivo

Jenna Lee
   Dr. Andrew Herod, Department of Geography
   A Study of Sustainable Economic Development in Croatia
Judson A. Lewis  
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CURO 2001 Summer Research Fellows

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Dr. Debra Mohnen, Complex Carbohydrate Research Center
Progress toward the Partial Purification of a Pectin Biosynthetic Gene

David Cureton
Dr. Janet Westpheling, Department of Genetics
Development of an In Vitro Packaging System for a Streptomyces Bacteriophage

Jon E. Davis
Dr. Gary Bertsch, Department of Political Science
Identifying the Risks of China’s Nuclear Weapons Command-and-Control System in the Event of Political Crisis

Sayan De
Dr. Max Reinhart, Department of Germanic and Slavic Languages
The Progress and Modernization of Former East German Healthcare after Communism

Lawrence Dougherty
Dr. Daniel Promislow, Department of Genetics
Exploring Olfactory Response in Drosophila melanogaster and Evolutionary Theory of Aging

Matt Edwards
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Evaluating the Moscow Center for Export Control’s Role as a Non-Proliferation Epistemic Community Member

Ben Emanuel
Dr. Frances Teague, Department of English
Shakespeare on Screen: Henry in Hollywood

Jeff Halley
Dr. Sheng Cheng Wu, Department of Biochemistry and Molecular Biology
Cell Wall-Degrading Enzymes from the Fungus That Causes the Devastating Rice Blast Disease

Peter Harri
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Gene Expression in Leishmania: Control of Protein Synthesis in Leishmania 5’ Untranslated Regions

Amanda Hudson
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Screening Mutant Yeast Strains for Abnormalities in the Localization of snoRNA

Kenneth Miller
Dr. Timothy Dore, Department of Chemistry
Synthesis and Use of Caged Compounds to Explore Cellular Processes

Lorina Naci
Professor William Paul, Jr., School of Art
Each morning I get up with one word in mind: plastik...
CURO 2007 Summer Research Fellowships

Lynn Nguyen
Dr. Mark Wheeler, Department of Dance
Chinese Classical Dance

Cori Pelletier
Dr. Roy Grant, Department of Music Therapy
Music Therapy with Premature Infants

Kate Smith
Dr. Kenneth S. Latimer, Department of Pathology
Immunohistochemical (IHC) Detection of Natural Killer Cells in Fish

Buudoan V. Tran
Dr. Karl N. Kirschner, Complex Carbohydrate Research Center
Dr. Robert J. Woods, Complex Carbohydrate Research Center
Parameter Development and Application of the Glycam Force Field for Sialic Acid Derivatives

John Woodruff
Dr. Harry Dailey, Department of Microbiology
The Generation of Mutations in the n-Terminal Region of the Protoporphyrinogen Oxidase of Bacillus subtilis to Create a Protein Capable of Mitochondrial Targeting in Mammalian Cells

Creating a Culture of Undergraduate Inquiry
2007 Summer Research Fellowships

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CURO
Center for Undergraduate Research Opportunities

2007 Summer Research Fellowships

The University of Georgia Honors Program

Creating a Culture of Undergraduate Inquiry
CURO Summer Research Fellowships

The Center for Undergraduate Research Opportunities (CURO) awards Summer Research Fellowships to academically talented undergraduates who participate in research during the summer term at the University of Georgia. The number of Summer Research Fellowships varies from year to year, based on funding. Successful applicants receive a financial award of $2,500 or $3000 and present their research at the CURO undergraduate research symposium. (Those students who receive $3000 must use $500 toward presenting their research at a regional or national conference.)

In order to be selected for a Summer Research Fellowship, interested students must have at least a 3.4 GPA, along with thirty hours of UGA credit, and must also be willing to commit to the following:

1. Enroll in two sequential Honors undergraduate research courses: HONS 4960H and HONS 4970H or HONS 4970H and HONS 4980H. (Students who wish to complete a thesis during the summer should check with Dr. Kleiber and their faculty research mentor. If approval is granted, the student will register for HONS 4980H and HONS 4990H.) Students who are awarded the fellowship must register for these classes for the regular summer session before they are eligible to receive fellowship monies. If, during the course of the fellowship, the student withdraws from these classes for any reason, the stipend must be returned in full. CURO Fellows must resign from any other UGA employment to be eligible for funding and may not be enrolled in any other courses. CURO will create 6 hours of Honors research courses for the student in OASIS.

2. Submit an abstract of the summer research to Dr. Pamela Kleiber by the last day of finals of the summer semester, for possible presentation at the annual CURO Symposium the following spring. Fellowship recipients are required to attend the upcoming Symposium, even if their abstract is not selected for presentation.

3. Participate in panel discussions with the Associate Director throughout the year to encourage an appreciation for undergraduate research at UGA.

Students who will be using human subjects in their research must be granted human subjects approval by the Institutional Review Board (IRB) at UGA in order to receive the fellowship. The human subjects application may be submitted to the IRB after the student is selected as a Summer Fellow, but the application must be approved before the student can receive the stipend.

Students who will be traveling internationally as part of their research must complete additional paperwork through CURO and the Office of International Education and are required to purchase travel insurance (approximately $1 per day) through the Office of International Education for their time abroad.
2007 Selection Committee

Dr. E. M. (Woody) Beck, Professor, Sociology
Dr. Diane Bates Morrow, Associate Professor, History and African-American Studies
Dr. Fran Teague, Meigs Professor, English
Dr. Daniel Promislow, Professor, Genetics
Dr. Jean Martin-Williams, Professor, Brass
Dr. Rodney Mauricio, Associate Professor, Genetics
Dr. Loris Magnani, Professor, Physics & Astronomy
Dr. Regina A. Smith, Associate Vice President for Research
Chair: Dr. Pamela Kleiber, Associate Director, Honors Program and CURO

Special thanks to the sponsors of the 2007 Summer Research Fellowships

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Letter from the Directors

June 12, 2007

Dear UGA Faculty and Students:

We are delighted and honored to name 27 CURO Summer Research Fellows for 2007, each of whom is pictured in this handbook with a summary of his or her faculty-mentored research project. The goal of the CURO Summer Research Fellowships is to provide opportunities for intensive, immersive, faculty-guided research experiences for academically talented undergraduates. The program advances the students’ knowledge and abilities to think critically, solve problems, and contribute to greater understanding of the world.

The CURO 2007 Summer Research Fellowships are funded through the Honors Program, the Office of the Vice President for Research, the Biomedical and Health Sciences Institute, the Interdisciplinary Toxicology Program, the UGA Alumni Association, and the Jane & Bill Young Scholarship.

We are exceptionally proud of the quality of the contributions of present and past CURO Summer Fellows with the mentorship of faculty researchers and their graduate students. The summer fellowship program has contributed to building a culture of undergraduate inquiry at the University of Georgia, and the CURO Summer Fellows serve as ambassadors who share their enthusiasm and expertise in a variety of professional forums on campus as well as at regional, national and international meetings.

Please join us in congratulating these young scholars on the occasion of being awarded these prestigious fellowships.

Sincerely yours,

David S. Williams
Director, Honors Program, Foundation Fellows, and CURO

Pamela B. Kleiber
Associate Director, Honors Program and CURO
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Objective: My summer research project addresses the text-music relationships exhibited in Hugo Wolf’s art song settings of Eduard Mörike’s Peregrina I and Peregrina II. Mörike’s Peregrina texts were a significant milestone in his poetic output; these texts were written in response to his experiences with Maria Meyer, a gypsy woman with whom he had a brief affair. Although it was initially a positive force in his life, the relationship left Mörike shattered and haunted; ultimately he channeled his feelings of loss and emptiness into the Peregrina poems, which are filled with psychological and sexual tension. This literary representation of complex psychology attracted Wolf to Mörike’s texts. An extremely gifted reader of poetry, Wolf’s exposure to the emerging psychoanalytical writings of Sigmund Freud allowed him to discern the underlying conflict between Mörike’s various layers of consciousness and their representation within his poetry. Wolf’s reception of Mörike’s poems led to a new kind of art song—one that interpreted lyrics meticulously and aimed for the extension of musical language in order to communicate the psychoanalytical traits of the Peregrina song texts.

My project will pair psychoanalytical theories with advanced chromatic and harmonic analysis to explore how the competition between Mörike’s consciousness and sub-consciousness manifests in Wolf’s art songs. Specifically, I wish to address the following questions:

- How does Wolf employ more sophisticated techniques to extend musical language?
- How does Wolf use double-tonic complexes, chromatic mediant relationships, directional tonality, and tonicizations?
- How do these techniques relate or reflect the words?
- How are deeper meanings of phrases and specific words transferred into music?
- What impact on form, texture, timbre, and dynamics will the words have?
- How does Wolf represent the mood of the two Peregrina poems?

My project will draw heavily upon my experience as a double major in music theory and German, which enable me to more fully explore the text-music relationships demonstrated in the Wolf-Mörike art songs. Previous scholarship has approached Wolf’s music either from a musicological perspective (lacking sufficient theoretical analysis), or solely from a literary point of view. Dr. John Turci-Escobar, Assistant Professor of Music Theory, and Dr. Max Reinhart, Professor of German, will be guiding my research on this project.

Final Product: An in-depth analysis of Peregrina I and Peregrina II will be submitted to the UGA Student Music Research Symposium and to Music Theory Southeast, a branch of the international Society for Music Theory.

Faculty Research Mentors: Dr. John Turci-Escobar, Music Theory  
Dr. Max Reinhart, German
Converting Ferrochelatase into a Cytochrome c Like Protein

CURO Summer Research Fellow: Joseph Burch

Ferrochelatase is the last enzyme in the heme biosynthesis pathway. Ferrochelatase catalyzes the insertion of ferrous iron into protoporphyrin IX. As such, ferrochelatase represents a protein that transiently binds heme. The crystal structure of heme is now known, so contacts between the protein and porphyrin macromolecule can be identified. If there were some way to help the heme bind, the ferrochelatase would be a true heme protein, like a cytochrome. The goal of this project is to form a cytochrome like protein from ferrochelatase. This protein will be a model system for various studies that may provide insight into wild type ferrochelatase. These mutations will give clues to normal ferrochelatase activity and function. Another application of a ferrochelatase cytochrome protein would be using it as an electron carrier for other areas of research.

In order to create a self-synthesizing cytochrome like protein, eight mutants of ferrochelatase will be engineered to possibly form a covalent bond between the ferrochelatase protein and the newly synthesized heme. In each of these mutants, one amino acid will be mutated into a cysteine residue in an attempt to form a covalent bond with the vinyl group substituents of the protoporphyrin molecule while it is in the active site of ferrochelatase. Mutants will be prepared using the Quik Change site-directed mutagenesis kit (Stratagene, La Jolla, CA). Purified proteins will be used to perform acid-acetone extractions. The acid-acetone extraction will remove any heme that is not tightly bound and will show whether any heme is covalently bound to the ferrochelatase. Crystals will be grown using the hanging drop method in the EasyXtal™ crystallization tool. Using these crystals, protein structures can then be determined via crystal diffraction. These structures can then be used to confirm the presence of a covalent bond to produce a cytochrome c like protein. The physical and chemical properties of the engineered protein will be studied to determine if it can function as an electron carrier, like cytochrome c, or as a peroxidase in catalase type of enzyme.

Faculty Research Mentor: Dr. Harry Dailey, Microbiology and Biochemistry & Molecular Biology
Pectin is a family of polysaccharides present in the cell wall of all plants. Since pectin is so abundant in the cell wall, it provides many of the biochemical properties that contribute to the growth and development of the plant. A specific family of enzymes involved in pectin biosynthesis known as Galacturonosyltransferases (GalATs) catalyze the transfer of galactosyluronic acid (GalA) residues from uridine diphosphate-GalA (UDP-GalA) to the growing pectic polysaccharide chain. The first gene that encodes a pectin GalAT in Arabidopsis thaliana, known as GAUctUronosylTransferase1 (GAUT1), was previously identified through a proteomic approach using partially-purified, detergent-solubilized membrane protein preparations. BLAST analyses indicate the existence of a family of 14 genes with high-sequence similarity to GAUT1. To understand the biological significance of the GAUT genes in pectin synthesis, it is important to understand where within the plant their expression occurs.

For the summer research fellowship, I propose to analyze the expression of each GAUT gene in Arabidopsis through utilization of a β-Glucuronidase (GUS) reporter gene system. First, the sequence of each gene will be examined using bioinformatics to determine the promoter region. The promoter will be amplified from Arabidopsis genomic DNA and inserted into a cloning vector for replication. Using restriction digestion, the promoter region will be removed from the cloning vector and inserted upstream of the GUS gene in the vector pBI101. The pBI101 vector harboring the promoter:GUS construct will be transformed through an Agrobacterium-mediated method into Arabidopsis plants. The transformed plants will be histochemically stained for detection of GUS activity and the tissue and cell-type specific expression of each GAUT gene will be analyzed. GUS expression data will reflect the temporal and spatial regulation of genes in Arabidopsis plants grown under specific environmental conditions and at specific developmental stages. It will also provide detailed resolution, which is an advantage when compared to other expression analyses (e.g., microarray studies) which generally reflect expression in tissues containing multiple cell types. A comparison of GAUT gene expression will provide information about potential GAUT gene redundancy. Such information is useful in the interpretation and design of GAUT mutant studies. In summary, GUS expression of the GAUT genes will provide quantitative data needed to help determine the biological function of the GAUT gene family.


Faculty Research Mentor: Dr. Debra Mohnen, Biochemistry & Molecular Biology
Ecoregional Conservation Among Indigenous Communities in Cotacachi, Ecuador

CURO-OVPR Summer Research Fellow: Lee Ellen Carter

Study Rationale: Indigenous communities around the world are currently facing tremendous pressure from newly introduced contemporary tourist practices. Cotacachi, Ecuador is one such context. Cotacachi, a biologically rich area in the Northern Andes of Ecuador, is comprised of forty indigenous communities where approximately 18,000 Cotacacheños reside. The Cotacacheños continue to practice their century-old traditions through their textile industry, businesspeople, clothing and use of their native language, Quichua. Because Cotacachi is directly beside the Cotacachi-Cayapas Ecological Reserve, this region has been protected and conserved for many centuries and has become one of the most well known cultural landscapes of Latin America, and is, therefore, currently undergoing a shift from traditional practices toward contemporary tourist industry practices. These new ideas are not only impacting the traditions and cultural practices in the ecoregion, but also the environmental conservation practices that have a great impact on the lives of the Cotacacheños.

Research Question: How do the cultural processes of the Cotacacheños influence the conservation practices being conducted in the Andean highland region where the indigenous communities reside? What impact do these practices have on the ecoknowledge and environmental ethics of the Cotacacheños? Furthermore, how does the increasing ecotourism of Cotacachi impact the indigenous communities, both culturally and ecologically?

Research Design: The research design for the Cotacachi project is qualitative, an ethnographic case study. A variety of data collection methods, all congruent with the use of a qualitative research design, will be used to gain an extensive understanding of this topic. At least thirty in-depth longitudinal interviews, including indigenous community leaders and citizens, heads of nonprofit ecological conservation organizations in Cotacachi and throughout Ecuador, and heads of tourism – including ecotourism – agencies in Cotacachi, will be the primary method of gathering data for the research project. All interviewees will be selected in a non-probability fashion and will be sampled to 1) achieve maximum variety and 2) access persons to be key informants. Access to these interviewees will be obtained through my faculty mentor, Dr. Fausto Sarmiento, as well as other academic and professional contacts. I will also conduct focus groups and standardized surveys among community residents, and I will observe the cultural practices of the indigenous community, some of whose members will be provided open-ended questionnaires. Furthermore, I will perform an extensive review of relevant scientific literature associated with cultural conservation and landscape stewardship with traditional ecological knowledge practices among indigenous communities in the Andean highlands. Prior to my fieldwork in Ecuador, I will prepare for my interviews, surveys, and other methodology through research in the United States. To gather field data, I will spend approximately five weeks in Ecuador. During this time, I will start the ethnographic research by living within an indigenous community to gain a first-hand view of their societal processes and foster acquisition of both Spanish and Quichua. I will also spend this time to obtain the other necessary interviews with leaders of various organizations previously mentioned. Following my fieldwork in Ecuador, I will analyze the data that was collected to prepare a concise and thorough paper to be used in research symposiums, academic publications, and as my senior thesis.

Implications: Ultimately, this research will attempt to understand the ecological and geographical influences on the sociocultural processes of Cotacachi, Ecuador by conducting an ethnographic case study. The research has the potential to provide approaches to further understand the connections between indigenous societies and their environments, including conservation, ecotourism, ecoknowledge, environmental ethics, and their unique traditions. Furthermore, this research has the capability of assisting the indigenous communities further in preserving the land that they have resided on for so many centuries.

Faculty Research Mentor: Dr. Fausto Sarmiento, Geography
Parameters Affecting Fecal Egg Count Data for Determining Drug Resistance in Nematode Parasites of Horses

CURO-BHSI Summer Research Fellow: Kimberly DeLisi

The objective of this project is to establish standards for performing fecal egg count (FEC) reduction tests for determining drug resistance in nematode parasites of horses. More specifically, the effects of sample handling on FEC data will be investigated.

1. Additional trials will be completed to test the effect of storage temperature and time on equine FEC, and to test the length of time a sample can lie on the floor of the stall and still be considered fresh in terms of optimal parasite egg recovery. These trials will be completed by obtaining fecal samples, storing them under the variable conditions, and performing repeated egg counts at specified time intervals.

2. Sources of variation between repeated FEC will be tested. Variation between different samples from the same horse, between different tests on sub-samples of the same fecal sample, and between different tests of the same sample aliquot (only a small percentage of each sample is actually examined for each FEC) will be examined. This protocol will be carried out by collecting five separate daily fecal samples during one week, storing them properly (as previously determined in item #1), and completing a total of 30 egg counts for each of the five fecal samples.

3. A fecal egg count reduction test will be performed after the optimal parameters have been determined. Fecal samples will be taken from ten horses for three days in a row, and FEC will be performed on those samples. Then, the horses will be treated with anthelmintics. Ten days later, fecal collection will occur for three days in a row, and FEC will be performed. The results of the fecal egg count reduction tests will be tested against existing statistical models that have recently been developed by Dr. Kaplan and Dr. Vidyashankar (statistician at Cornell University who is collaborating on this project).

4. An Honors thesis will be written.

Faculty Research Mentor: Dr. Ray Kaplan, Infectious Diseases
The Youth of Roswell Voices: A Linguistic Analysis

CURO-OVPR Summer Research Fellow: Joshua Dunn

I plan to work with a team from the UGA Linguistics Department, which includes my faculty mentor Dr. William Kretzschmar, on an ongoing project called Roswell Voices. In short, the objective of the Roswell Voices program is to gather linguistic data from interviews with the different generational groups in the city of Roswell, and to use this data to examine how language relates to social identity. As the team describes the process, the collected data will be able to show a correlation between language change across generations and the town of Roswell’s progression from being a settlement for mill workers, to being a suburb of Atlanta, to now being an “edge city,” with a separate identity from the metropolis of Atlanta. The question to answer, then, is: How do the phonetics, lexicon, and syntax of a speaker contribute to his or her cultural identity of considering Roswell his or her home?

This summer, I will assist Roswell Voices by gathering data from the youngest generation in question, those aged 18 to 35. As most of their work has focused on older members of the community, I propose to sample an independent cluster of four to six interviews with this younger generation in order to augment the work done by the team so far. Following the same procedures as in earlier interviews, the subjects will be approached through personal acquaintances, and will be balanced between the white and African American population of the town. I will follow the basic format of interviews previously conducted with older subjects. The interviews will combine a conversation of life in Roswell with both a question-and-answer session and fixed-format elicitation in which the subjects will read words from note cards. By processing the data collected in the interviews I hope to qualitatively determine what makes the young subject a citizen of Roswell, drawing upon the content and language use of the subject’s speech. In addition to conducting the interviews, I propose to transcribe the words of the interview in normal spelling, with acoustical phonetic analysis of selected words as identified in the transcript. The audio of the interview, recorded directly onto CD stock, will be preserved in .wav format. When the data is properly archived, I can then work to interpret it, and try to determine how the youth specifically associate with the city of Roswell in their speech.

I will be able to work with experienced members of the team to learn the proper way of archiving data in linguistic research. Through my research I will learn how to use the recording equipment and transcription and encoding techniques used in the Roswell Voices project, which in turn I can use to further my own linguistic research in the future. As a resident of the same North Fulton area which contains the city of Roswell, I view this research opportunity as a platform to perform future research in the other communities of North Fulton. The recent incorporations of the cities of Johns Creek, Milton, and Sandy Springs present an interesting question to whether these areas, too, can be characterized with their own linguistic identity. Another interesting question to explore might be to interview Hispanic subjects, as there has been a large influx of Spanish speaking people in recent years. Performing research with Roswell Voices would then not only be a valuable experience in itself, with my contribution to research in the 18-35 age bracket, but also a way to establish a method which I could apply to future research among the other suburbs and “edge cities” of Atlanta.

Faculty Research Mentor: Dr. William Kretzschmar, Linguistics
The Arabinose Kinase Project

CURO-BHSI Summer Research Fellow: Katie Flake

Recycling of monosaccharides released from storage polysaccharides, cell walls and glycoproteins that are degraded during cell wall reconstruction is an important pathway for generating rapid building blocks to facilitate growth of tissues. In this salvage pathway, each monosaccharide is phosphorylated by kinase activity to a sugar-1-phosphate. The sugar-1-phosphate is then converted to the appropriate nucleotide (NDP)-sugar by NDP-sugar pyrophosphorylase activity. It is then the NDP-sugar that serves as the activated sugar donor for the biosynthesis of polysaccharides and glycoproteins, which facilitates tissue growth.

Arabinose is an essential sugar residue of cell wall polysaccharides. A gene encoding a putative arabinose kinase (Ara1) was identified by genetic screen, and its ara1 plant mutant lacks the ability to convert in vivo arabinose to arabinose-1-phosphate. The encoded Ara1 consists of three domains: a galactokinase-like domain, speculated to carry arabinose kinase function; a potential transmembrane domain; and a large N-terminus domain for which the function is unknown. There are discrepancies regarding the biochemical properties of the kinase, its subcellular localization, and its biological function, which must be resolved in order to further understanding of the salvage pathway.

The goal of my proposed research is (1) to identify the functional domain(s) of recombinant arabinose kinase and its enzyme sugar specificity (2) to identify if the GFP tagged kinase is cytosolic or membrane bound and its specific subcellular localization.

Participating in undergraduate research in the past 6 months has allowed me to become proficient in the laboratory techniques necessary for my proposed CURO research project. The CURO fellowship will allow me to continue my research with the added ability to contribute my entire time to the success of the research along with providing me the opportunity to present my findings among fellow undergraduate researchers. Such an opportunity will be invaluable in preparing me for my future career in the scientific field.

Faculty Research Mentor: Dr. Maor Bar-Peled, Complex Carbohydrate Research Center
Developing Methodologies for the Study of Small ORFs in *P. furiosus*

**CURO Summer Research Fellow: James Gordy**

The organism *Pyrococcus furiosus* is an anaerobic hyperthermophile within the domain Archaea. In nature, it lives at an optimal temperature of 100°C in underwater solfatarics – volcanic regions emitting sulfurous gases. Since the genome’s sequencing in 2001, *P. furiosus* has become almost like the *E. coli* of archaeons, with many genomic and proteomic studies bent on discovering how this organism functions under such stressful conditions. Much has been learned, but for this organism far more is left to find.

One problem is that the discovery of new ORFs (open reading frames) of the genome is based purely on contrived computer algorithms. Each ORF represents a possible protein coding sequence, but the computer algorithms aren’t perfect, and many ORFs, especially the smaller ones, get skipped over and are therefore not annotated in the genomic databases. Dr. Adams’s lab a few years ago created a new algorithm able to pick up the smaller ORFs that fell through the cracks of previous programs, but nothing is known about the ORFs or about their possible coded proteins. The current standard technique for finding transcriptionally active sections of the genome involve microarrays, but it is close to impossible to retrieve conclusive data from a microarray for a small ORF. That is where I come in.

The focus of my research has been and will continue to be on developing efficient methods for finding, studying, and characterizing transcriptionally active small ORFs and the proteins they code for. The main component of my research revolves around the QPCR machine (quantitative polymerase chain reaction), which quantifies the relative amount of DNA present in a sample. Last semester, I used QPCR to prove the existence of transcription products from small ORFs that database information showed to be good protein-coding candidates. This semester, with the ORFs I proved to have gene products, I will be using strand specific primers to prove whether or not the protein comes from the section of the genome as it is annotated. The next step will be to use the process of primer extension to find the exact location and lengths of the genes.

This summer, I will want to progress this research in two ways. First, I will use processes such as mass spectroscopy, gel electrophoresis, and others to isolate, characterize, and sequence the proteins to discover their functions and to ensure that their peptide sequences match their respective mRNA sequences. Secondly, I will develop the QPCR methods further so that they can be performed on a larger scale, instead of just a few ORFs at a time. Along those lines, I would also be working with the computing sector of our lab to figure out how to use these methods in conjunction with our current bioinformatics projects such as making a more efficient database system for the genome and proteome of *P. furiosus*. In summary, I am working on developing a system of methodologies to properly study small ORFs and their transcripts. So far, no one else has bothered to do so, because most proteins are large. However, some very important proteins such as rubedoxin and insulin are quite small, so we think that ORFs should not be overlooked because of their size. The smaller ones could be just as biologically active.

**Faculty Research Mentor:** Dr. Michael Adams, Biochemistry & Molecular Biology
Latino and Hispanic Musical Influences on Athens-Clarke County

CURO Summer Research Fellow: Jana Hanchett

This ethnomusicology project proposes the first scholarly documentation of the intercultural music synthesis occurring between the Athens music community and the Athens Latino and Hispanic community. While no one has researched the music of Athens’ Latino and Hispanic people, those already researching and assisting these populations in Athens-Clarke County include Dr. Paul Matthews (Co-Director of CLASE) and Dr. Paul Duncan (Assistant Director of LACSI) of the University of Georgia, Partners for Prosperous Athens, Eco Latino Magazine, and Mexican American Business Chamber. Additionally, Dr. Roy Kennedy, professor of music therapy at the Hugh Hodgson School of Music, has begun working with the Oasis Católico at Pinewoods, using music to foster communication between the university and the Latino community. According to my principal informant, Sister Margarita, the Pinewoods estate community includes a diverse population of Peruvians, Colombians, Salvadorians, Guatemalans, Mexicans, Cubans, Argentineans, and Venezuelans. Evidence of the musical tastes, creativity and influence of this community can be seen and heard in the Spanish masses conducted at St. Joseph’s Catholic Church, Spanish-language Protestant church services, and local grocery stores, music stores, and restaurants such as Los Compadres and La Jalisco Supermercado.

This study of Latino and Hispanic musical contributions to Athens-Clarke County will result in an increased awareness that the “vast collective pool of human creativity is an enormous ecosystem where the traits of one type of being are complementary to and symbiotic with those of another.” 1 Questions that will be targeted are the following: To what extent is the musical participation of the Latin and Hispanic communities already enriching Athens-Clarke County? How are the Latino and Hispanic cultures using music to maintain identities? How are they using music to integrate into the larger Athens-Clarke communities?

Employing a methodology used effectively by Art Rosenbaum to document traditional music and musicians of rural Georgians, 2 this project will include interviewing music makers within the Latino and Hispanic communities, recording and transcribing examples of these musicians’ works, photographing the music makers within their musical environment, and synthesizing all findings in a multimedia exhibition for the Clarke County community at large. Ultimately the project will enhance understanding of the vibrant resources present within the Latino and Mexican communities of Athens-Clarke County.

Faculty Research Mentor: Dr. David Schiller, Musicology

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Campylobacter in the Crypts
CURO-BHSI Summer Research Fellow: Laura Harrison

The United States, which has one of the safest food supplies in the world, has an estimated 76 million cases of foodborne illness annually (Moore et al., 2006). The most common cause of bacterial foodborne illness is Campylobacter (US Food and Drug Administration, 2006). Campylobacter, which is a Gram-negative rod-shaped bacterium, frequently colonizes the intestinal tract of animals, such as chickens, without inducing disease (US Food and Drug Administration, 2006). However, human ingestion of Campylobacter-contaminated products causes infection (US Food and Drug Administration, 2006). In studies, Campylobacter is shown to frequently contaminate 20-100% of raw chicken (US Food and Drug Administration, 2006). Although Campylobacter is found in birds and mammals, the high prevalence of Campylobacter in poultry is especially important to the United States, which is a major supplier of poultry in the international market (Schupska, 2006). Georgia greatly contributes to the United States’ poultry supply as the number one producer of broilers (Schupska, 2006). In Georgia, poultry represents greater than fifty-percent of the state’s agriculture (Schupska, 2006).

Because of the importance of poultry in the United States’ economy and the high prevalence of Campylobacter infection, the United States Department of Agriculture (USDA) searches for a means of reducing Campylobacter infections (US Department of Agriculture, 2006). The USDA supports research to better understand Campylobacter to better control and monitor the pathogen (US Department of Agriculture, 2006). According to the USDA, the decrease of pathogen loads in animals presented for slaughter often contributes to the decrease in pathogen loads in products (Food Safety and Inspection Service, 2003). Because of this, the USDA cites research relating to interventional methods to reduce Campylobacter in poultry as one of its highest research necessities (Food Safety and Inspection Service, 2003).

Although Campylobacter is known to reside in the intestine of chickens, it is not known if one region of the intestine exhibits greater concentration of Campylobacter compared to other regions. Knowing where the greatest concentrations of Campylobacter exist can direct more effective antimicrobial interventions during evisceration and other slaughter procedures (US Department of Agriculture, 2006).

With my research, the objective is to determine where in the chicken intestine Campylobacter is most concentrated. Using an in situ probe, specific for Campylobacter, the pathogen will be detected. In an effort to determine which region contains the highest pathogen load, tissue samples will be taken from various regions of the chicken intestine. The data gained from my research has the potential to help improve the economy by facilitating more targeted antimicrobial interventions to increase safety levels of poultry. With more targeted interventions, it is believed levels of foodborne illness will decrease (US Department of Agriculture, 2006). Also, a more targeted approach of antimicrobial therapy strengthens the agricultural economy by helping slow down the rate of increase in antimicrobial resistance among Campylobacter pathogens. Such research can not only help the economy but also generate a pathway for the creation of a system to monitor food supply safety levels (Food Safety and Inspection Service, 2003). A national system to monitor poultry safety levels has the potential to aid in the detection of intentional assaults on United States agriculture (Food Safety and Inspection Service, 2003).

Data obtained from this research has vast implications with its potential to improve the economy, safety of the food supply, and health of the public. Although better understanding Campylobacter pathogenesis is important to the United States agricultural economy, information gained can be used to help improve safety levels in developing poultry markets in other parts of the world, thus improving the food safety and consumer health world wide.

Faculty Research Mentor: Dr. Corrie Brown, Pathology
Democracy and the Choice of Law: 
The Intersections of Shari’a, Domestic and International Law 
CURO-OVPR Summer Research Fellow: Clare Hatfield

The research I will conduct involves situations in which international, domestic, and religious law collide. Violence has recently resurfaced within countries of Southeast Asia that are home to overwhelming Muslim majorities. This violence results from the struggles of domestic governments to both appease international organizations and remain secular democracies and, at the same time, to appease their domestic constituents through the integration Shari’a law, or the law of Islam, into their domestic legal systems. These domestic governments are engaged in a difficult balancing act. If they decide to integrate Shari’a law into their mainly secular laws and deviate from the democratic ideals for which many of the international organizations in question stand, international organizations threaten to cut off the financial aid that countries such as Bangladesh, one of the poorest countries in the world, so badly need. At the same time, if these domestic governments refuse the incorporation of Shari’a law, radical Islamic groups may resort to the use of political violence in order to make known their dissatisfaction and to intimidate the government into complying with their demands. How can countries compromise the legal demands from abroad and those from home while avoiding the negative repercussions with which they are faced?

Religious extremist groups have targeted those who represent secular law within Southeast Asian countries for their refusal to incorporate Shari’a law into legislation, courts, and other facets of the government. Judges, lawyers, and members of the state legislature have all fallen victim to targeted killings or what some might consider acts of terrorism. Nevertheless, while many Western countries are increasingly involving themselves in Middle Eastern affairs with the hopes of establishing secular democracies across the region, they seem to lack an in-depth understanding of why it has been so difficult for these countries to establish governments with the ability to separate church, or in this case Islam, and state. Therefore, it is necessary to further explore which areas of secular and Shari’a law come into conflict and what can be done to reach a compromise involving these systems. Furthermore, the development of policies capable of extinguishing the threat of political violence directed towards these governments in peril is equally imperative to the establishment of stable democracies that can govern over their both secular and devoutly religious communities.

For this project, I will use Bangladesh and Indonesia as case studies. Both Bangladesh and Indonesia have engaged in this difficult act of balancing the interests of international organizations upon which they rely heavily for monetary aid and the overwhelmingly large Muslim majorities upon which politicians rely heavily for re-election and political power. Indonesia, though, has already implemented solutions in order to suppress the political violence that this conflict between secular and Shari’a law has given rise to. Therefore, the question I hope to answer through my research is, have these policies been successful in ending the political violence and could they be implemented in other countries? I will conduct such research combining both a qualitative and quantitative approach using data collected through Dr. Stephen Shellman’s Project Civil Strife. The quantitative data I hope to acquire through Project Civil Strife will enable me to better explain the dynamic relationship between all of the actors involved: international organizations, judges, domestic politicians, dissident groups, and the general populous. The qualitative research will involve investigating the pivotal court cases that involve conflicts of international, domestic, and religious law as well as the adjudication of such cases. Through these approaches combined, I hope to have ample information to formulate a series of hypotheses this summer concerning in what cases the intersection of international, domestic, and religious law sparks political violence and what policies best address these sparks before they erupt into wildfires.

Faculty Research Mentor: Dr. Stephen Shellman, International Affairs

Creating a Culture of Undergraduate Inquiry
There is a critical need for a more accurate and more rapid method for diagnosing infectious pathogens. Current methods are severely limited in sensitivity and accuracy, or are time consuming and expensive. The development of a better technique for detecting low levels of infectious pathogens would aid in intervention approaches, treatment strategies, as well as redefining the need for hospital admission. Overall, better diagnosis of pathogens translates into better protection of public health.

The analytical technique of interest is Surfaced Enhanced Raman Spectroscopy (SERS). In SERS, the Raman effect is greatly improved when molecules are close to a rough metal surface, such as gold or silver nanorods. The Raman effect, or Raman scattering, is when photons that are scattered from striking an atom or molecule have a different energy from that of the incident photons. Raman scattering is characteristic of a particular atom or molecule, and therefore, it is a very useful analytical technique. However, the usefulness of SERS has been hindered by the development of a simple reproducible procedure for creating SERS-active substrates. Recent research at the University of Georgia has shown that a nanofabrication technique based on glancing angle vapor deposition (GLAD) can produce silver nanorod substrates that are SERS-active.

The objective of this research is to understand the nanorod structural design (size, shape, orientation) produced by GLAD and how it affects SERS spectra, and to develop an immunoassay based on these substrates for the detection of pathogens, especially mycoplasma. In addition to this genus of bacteria, various viruses are of particular interest, including human immunodeficiency virus (HIV) and rotavirus, both of which cause thousands of deaths worldwide every year. It is believed that the development of a SERS-based bioanalytical technique will have significant advantages in terms of speed, accuracy, and cost for detecting current clinical threats or future bioterrorism agents.

Faculty Research Mentor: Dr. Richard Dluhy, Chemistry
Unbiased Isolation and Carbohydrate Mapping of Alpha-Dystroglycan

CURO-Jane and Bill Young Scholarship Summer Research Fellow: Andy Kragor

The majority of proteins on the surface of cells are decorated with sugars. These “sugar sidechains” have been repeatedly demonstrated to affect protein structure, stability, and activity. A specific class of sugar modifications, the O-linked sugars, has been demonstrated to play a significant role in diabetes, muscular dystrophy, leprosy, and most recently, cancer. Lance Wells’ laboratory, in conjunction with the labs of Michael Tiemeyer and Carl Bergmann, has embarked on a project to identify and quantify changes in sugar structures and attachment sites on the protein alpha-dystroglycan (α-DG) in normal and cancerous tissue. α-DG is critical for interactions of the cell with its environment. As such, it is an outstanding candidate for affecting cellular movement and adhesion, which are central in the development and spread of cancer. It is therefore not surprising that global, undefined changes in α-DG sugar sidechains have been correlated with the aggressiveness of certain cancers.

I will be isolating dystroglycans from various cell types and tissues and assisting in the mapping of all the carbohydrate structures on the dystroglycans that I isolate. The isolation protocols involve a variety of chromatographic techniques that I have been learning this semester, and include ion-exchange, lectin affinity, and size exclusion chromatography. In addition I will be using SDS-PAGE and Western Blot analysis, as well as trypsin digestion coupled to LC-ion-trap mass spectrometry, to provide proof of purity of the dystroglycan. I expect that the purification protocol will need to be altered depending both on the tissue type and whether it is from a healthy or diseased organ, as this will affect the glycans on the surface, which in turn affect the physical properties of the protein. The carbohydrate mapping strategy makes extensive use of the linear ion-trap mass spectrometer.

I will also be working in conjunction with other members of the Bergmann lab to understand how the changes in surface glycosylation will affect the dystroglycan’s ability to bind proteins in the extracellular matrix. This will require the use of surface plasmon resonance technology. The project I am working on is currently funded by the Muscular Dystrophy Association and will lay the groundwork for a future grant to the National Cancer Institute and/or the American Cancer Society. The grant would focus on specific changes observed in the sugars on α-DG that can be used as a diagnostic marker and are causally related to changes in cell motility and adhesion during cancer. My work will be principally supervised by Drs. Wells and Bergmann.

Faculty Research Mentors: Dr. Lance Wells, Complex Carbohydrate Research Center
Dr. Carl Bergmann, Complex Carbohydrate Research Center
**Functional Analysis of the Magnaporthe grisea Secretome**

**CURO-BHSI Summer Research Fellow: Brian Laughlin**

**Introduction:** *Magnaporthe grisea*, a filamentous Ascomycete fungus, is the causal agent of rice blast disease, which is responsible for the annual loss of about 200 million tons of rice output worldwide. The genome of *M. grisea* has been sequenced, and many genome characteristics have been described. The fungus encodes about 800 proteins that are secreted under various growth conditions. Some of these extracellular proteins (ECPs) may serve an integral role in causing the disease. Such pathogenic proteins are potential targets for the design of novel, environmentally safe fungicides.

Map-based cloning techniques are allowing the isolation and characterization of pathogenic protein encoding genes, such as virulent genes and avirulence genes which control fungal pathogenicity and host specificity, respectively. An ongoing proteomics project in this laboratory has identified by mass spectrometry about 100 ECP species from *M. grisea*. Among the identified *M. grisea* ECPs, two (MgEcp22 and MgEcp23) with unknown functions are present exclusively in rice leaves infested by *M. grisea*. It is possible that these two proteins are either pathogenicity factors or some type of signal molecules that interact with the plant host to determine disease.

**Research Proposal:** Previous research initiated by Evan Conroy (2004) involved the knockout mutagenesis of MgEcp22 and MgEcp23 genes in order to assay their roles in rice blast disease. In light of Conroy’s work, the need for a dependable expression vector capable of overexpressing various genes-of-interest has arisen. My project attempts just the opposite of Conroy’s work: rather than observing the effects of a deficiency of MgEcp22 and MgEcp23, we wish to observe the effects of an excess amount of MgEcp22 and MgEcp23 delivered inside plant host tissues.

Currently, I have constructed an expression cassette, pWH102, which carries the complementary DNA sequence of the MgEcp22 gene under the control of a regular promoter, \( P_{CES1} \). The MgEcp22 and MgEcp23, as well as other noteworthy ECP genes, will also be cloned into a yeast–shuttle vector under the control of a strong and constitutively expressed promoter, \( P_{RPP2} \) (RPP2 stands for Ribosomal Protein P2 from *M. grisea*) using the yeast gap-repairing (YGR) technique. While the traditional restriction-ligation cloning method is currently proving the more reliable route, the (YGR) procedure will provide an affordable and high-throughput cloning format in expressing many other genes-of-interest within *M. grisea*. Regardless the cloning method, each protein expressed will be a secreted fusion protein that includes the ECP sequence and a tandem epitope-purification tag at the C-, or N-terminus.

The cloned expression constructs will be transformed into *M. grisea*, and the expression of the *M. grisea* ECP fusion proteins will be evaluated and purified using properties of the fused tandem tag. If time allows, we will also examine the pathogenicity and other phenotypes of the ECP-overexpressed *M. grisea* strains. Furthermore, the probable formation of protein complexes between any of the ECPs and a host protein or proteins during infection will also be investigated and characterized using current proteomics technologies.

Through the above experiments I wish to answer the following questions:

1. Is Yeast Gap-Repairing a suitable alternative to traditional cloning methods in the high-throughput -omics era?
2. What roles do MgEcp22 and MgEcp23 play during the interactions between *M. grisea* and its plant host? Specifically, does an excess of either ECP bear consequences for the pathogenicity of *M. grisea*?
3. Does MgEcp22, MgEcp23 or other MgEcp forms complexes with host molecules?
4. What implications does the research have regarding fungal disease control and food security in general?

**Faculty Research Mentor: Dr. Alan Darvill, Complex Carbohydrate Research Center**
The protein K-Ras, a mutated form of Ras, is a well known oncogene that is responsible for 30% of all cancers, including 90% of pancreatic cancers and 50% of colon cancers. Ras is a GTPase vital to cell growth, and therefore preventing Ras activation in cancer cells could stop them from spreading. Most proteins in the Ras family contain a CaaX motif, where C is cysteine, a is an aliphatic amino acid, and X is a variety of amino acids and activate through a three step process (Fig. 1). The first activation step involves the addition of a farnesyl group to the cysteine. This step has been a major focus of research, and several inhibitors have been developed to prevent farnesylation. Nevertheless, the inhibited cells are able to use a similar geranylgeranyl group instead of a farnesyl group, and the activation process continues unhindered. After the farnesyl/geranylgeranyl addition, a prenyl-protein-specific protease removes the aaX series from the CaaX motif. In yeast, Ste24p and Rce1p catalyze this process, but in humans, only Rce1p is capable of proteolytically processing Ras. After prenylation, the exposed C-terminal prenyl-cysteine is methylated by isoprenylcysteine carboxyl methyltransferase (ICMT), which along with Rce1p, is located on the endoplasmic reticulum. Inhibiting these steps could disrupt the activation of K-Ras and therefore open new leads for anti-cancer therapeutics by providing a starting point to halt cancerous cell growth.

Rce1p is the only enzyme in animals that can process Ras; therefore, it is an excellent target for small molecule-based inhibition of the activation process. By screening an NIH library, Dr. Walter Schmidt (BCMB, UGA) found that the most promising inhibitor of Rce1p and Ste24p was quinolinol 1 (Fig. 2). Quinolinol 2 was also a good inhibitor. The library contained analogs of 1 with different R1 substituents, but did not explore variations at R2. This proposal seeks to synthesize quinolinols 3 and 4 with various R2 substituents to further explore the structure-activity relationships (SARs) for the inhibition of Rce1p and Ste24p. These R2 derivatives of 1 and 2 are novel compounds that have the potential to inhibit Rce1p. The synthesis begins with 8-quinolinol, whose hydroxy group is protected. The protected quinolinol alkylates a variety of aromatic aldehydes. The resulting alcohol is oxidized to the ketone, which will undergo reductive amination with either aniline (R1 = H) or 4-amino benzoic acid (R1 = CO2H). Deprotections, if necessary, followed by HPLC purification, will provide the target compounds. Compound 5 will be synthesized to test the necessity of the hydroxy group at R3. The goal of this research is to synthesize the compounds 3 and 4 in an effort to discover an effective inhibitor of Rce1p and Ste24p. Dr. Schmidt's lab will assay the ability of the quinolinol derivatives to inhibit Rce1p and Ste24p. From these data, SARs will be established, which will inform future synthetic work.

Phospholipase A₂ (PLA₂) are a family of enzymes that catalyze the hydrolysis of the sn-2 position of glycerophospholipids, leading to production of free fatty acids and lysophospholipids. One of these esterified fatty acids, arachidonic acid (AA), is metabolized into prostaglandin E₂ (PGE₂). A previous study has shown that PGE₂ stimulates proliferation in human prostate cancer cell lines. Because PLA₂ regulate the release of arachidonic acid, they are thought to affect the growth of prostate cancer cells and tumors.

One such enzyme, Ca²⁺-independent iPLA₂ appears to play a role in the provision of arachidonic acid in the cell along with phospholipid remodeling, regulation of store operated calcium channels and apoptosis. Selective inhibition of iPLA₂ could thus decrease the growth of human prostate cancer cells. One possible means for iPLA₂ inhibition would be to use siRNA nucleotides, synthesized chemically by screening the cDNA associated with production of iPLA₂ for unique sequences, and then designing primers for these sequences. The siRNA nucleotide could then be incorporated into a protein complex that recognizes and cleaves the target mRNA.

This work tests the hypothesis that treatment of human prostate cancer cells (PC-3) with siRNA plasmids against iPLA₂ will decrease cell growth. Basic cell counting under a microscope and mitochondrial function will be used to measure the rate of cell growth. Findings from this study will help establish the efficiency of using siRNA technology to inhibit iPLA₂ activity, and thus determine its effect on prostate cancer growth.

Faculty Research Mentor: Dr. Brian S. Cummings, Pharmaceutical & Biomedical Sciences
The Effect of Antagonizing Stress Receptors in Rats During Repeated Exposure to Restraint Stress

CURO-OVPR Summer Research Fellow: Neil Naik

Stress causes an array of physiological, metabolic and behavioral responses in humans and animals, many of which are initiated by activation of corticotrophin releasing factor receptors (CRFR). Previous studies in the Harris laboratory have shown that when rats are subjected to three hours of restraint stress on each of three days they have a reduced food intake and lose weight on the days that they are stressed. In the days after stress, food intake of the stressed rats returns to normal, but the rats do not regain the weight that they lost during stress. Because people who are overweight or obese often regain weight that they lose by dieting, it is important to understand what mechanisms are activated by stress that allows the stressed rats to maintain their weight loss.

The areas of the brain that are known to be important in regulating body weight are the hypothalamus and the brain stem. The third ventricle of the brain is adjacent to many of the hypothalamic nuclei. Experiments in the Harris laboratory have shown that if a CRFR antagonist is infused into the third ventricle just before each of the three periods of restraint stress the stress-induced weight loss is partially prevented. Because the half-life of the receptor antagonist (astressin) is relatively short but the systems that are activated by stress may be prolonged, this experiment will test whether continuous antagonism of the stress receptors on the days of stress is more effective in blocking weight loss of restrained rats.

Male Sprague Dawley rats will be fitted cannulas aimed at the third ventricle. Appropriate placement of cannulas will be tested one week later by ensuring that the rats drink after an infusion of angiotensin II. The daily body weights and food intakes of the rats will be measured daily for 5 days for baseline measurements. The rats will then be divided into three groups and an Alzet mini-osmotic pump will be attached to the cannula. These pumps deliver 0.25ul test solution/hr for 7 days. One group will be fitted with pumps that deliver sterile saline to the third ventricle. The other two groups will be fitted with pumps that deliver astressin. Two different doses of astressin will be tested as a high dose of astressin may increase body weight and food intake. Half of the rats in each of the infusion groups will be exposed to 3 hours of restraint stress for three days, starting the day after the pumps are attached. The day after the end of the restraint the pumps will be disconnected from the cannulas. Daily body weight and food intake will be measured for ten days after the end of stress to determine whether either of the doses of astressin has inhibited weight loss in restrained rats.

Faculty Research Mentor: Dr. Ruth Harris, Food & Nutrition
Genetic Studies on the Roles of KITL in Regulating the Proliferation and Apoptosis of Primordial Germ Cells in Mice

CURO-BHSI Summer Research Fellow: Natalie Nesmith

Kit ligand (KITL) and its receptor KIT are required for the development and proliferation of germ cells, melanocytes, and hematopoietic cells in humans, mice and many other vertebrates. Of particular interest to our lab is the role of KITL in the differentiation and development of germ cells in mice.

Germ cell development is initiated when a certain amount of primordial germ cells (PGCs) are specified from somatic cells during gastrulation. PGCs first associate with the gut, then actively migrate toward the genital ridge where they lose their motility. Because of proliferation and suppression of apoptosis, PGC numbers increase rapidly during this time period and both processes are mediated by KITL. Recent studies from our lab have shown that proliferation of PGCs in the gut is partially dependent on KITL but PGC proliferation is completely dependent on KITL once these cells migrate from the gut. Still unknown, though, is whether KITL-mediated control of apoptosis also differs between premigratory and migratory PGCs.

This project will catalog the effects of different Kitl mutations on proliferation and apoptosis of PGCs at several stages of development. Observations that reveal preferential effects of specific Kitl mutations on either process will lead to a better understanding of the function of KITL. Since the KITL network is a prime example of cellular regulation and communication, more detailed understanding of its function has a number of clinical applications in multiple areas including reproductive health and the ability to manipulate and regulate the cellular signaling pathway.

Faculty Research Mentor: Dr. Mary Bedell, Genetics
 Unsung Hero: A Literary and Historical Study of Lautaro  

CURO Summer Research Fellow: Victor Orellana

In the ancient world, the tales of greatest struggle and triumph were captured and immortalized in the lines of epic verse. Distinguished from the rest, this genre of poetry reflects the grand scale of human interaction, stories of those who were greater than the common man and of the events that made them so. While this tradition is widely considered to have been at its peak in the Classical age, those epic works outside of this time period receive far less attention and credit for the stories they tell and the heroes they praise.

In the first work of literature to come from the New World, Don Alonso de Ercilla y Zúñiga captures the story of the battle between the Spanish conquistadors and the Mapuche people in his epic poem, 

La Araucana. Living in what is now Chile, the Mapuche were the only people that denied victory to the expanding Incan empire, and were renowned for their ferocity in war. When the Spanish attempted to take their lands, again the Mapuche showed their strength, and thus began the Arauco War. It should be noted, though, that while this project is designed to investigate the early years of the Arauco War, the Mapuche people never surrendered. To this day, they have still never recognized foreign rule, and while they live on reservations set aside by the Chilean government, they are still at odds with the descendants of the Spanish rulers.

During the mid-1500s, part of the Spanish custom in doing battle with the natives of the New World included the capture of locals, hoping to gain certain insight into either the new terrain or the enemy itself. One of the captured Mapuche was a young boy named Lautaro. He lived for several years with the Spanish and eventually became the servant of the Spanish commander, Pedro de Valdivia. Lautaro learned many things about these strange people, including their tactics, their weapons, and their horses, and after enough time in the presence of the enemy, he returned to his people to share this knowledge. Through his insight, the Mapuche became much more successful in defending against the conquistadors. Lautaro devised a military strategy combining the knowledge of his land and the vulnerabilities of the Spanish, and was able to destroy several cities before his ultimate death in a surprise attack, possibly due to a betrayal by one of his own.

In the midst of the many heavily worked epics of Western history, 

La Araucana is given much less attention, and in the study of the poem itself, the role of Lautaro is studied even less frequently. It is my goal to research and analyze his influences, especially his military tactics and contributions. I plan to accomplish this through a close reading of Lautaro’s appearances in the epic, in English translations and in the original Spanish text, as well as through in-depth reading of historical accounts and studies of the Mapuche people. Any attention given to specific military tactics will be assisted by referencing specific texts in that area of study.

Faculty Research Mentor: Dr. Ángel Nicolás Lucero, Spanish Literature
Developing a Biocontrol Agent for Chinese Privet, *Ligustrum sinense*

**CURO Summer Research Fellow: Tulsi Patel**

My research this summer will focus on initiating development of a biological control method for the exotic weed *Ligustrum sinense*. This proposal is based on the hypothesis that a host specific or modified broad host range fungal mutant that overproduces an amino acid that is toxic to *L. sinense* can be used to control the weed. I will be working under the guidance of Dr. Scott Gold in the Department of Plant Pathology at the University of Georgia. Dr. Gold's research focuses on the genetic interactions required for pathogenesis in fungi. In an effort to control Georgia’s #1 invasive plant, Dr. Gold and I started work this fall on this new *Ligustrum sinense* project, which I am pioneering.

*Ligustrum sinense*, commonly known as Chinese Privet is a rapidly growing invasive shrub that was introduced to the United States as an ornamental plant. Privet escaped cultivation in the 1930s and now invades millions of acres of land in the southeastern United States. Privet has the potential to alter ecosystems by forming dense thickets in the undergrowth of natural forests and reducing the amount of light, water, nutrition, and space available to native species. Because birds and small animals easily disperse Privet seeds, it has the potential to convert the diverse forests of the Southeast into a monoculture shrub-land. Moreover, the only effective control measure available is a costly combination of physical removal and herbicide application. The long-term goal of this project is therefore to identify a cost-effective bio-control agent for this exotic weed.

Our approach to develop a cost-effective biological control agent involves various steps. The first of these steps is to identify amino acids that are toxic to Privet. Amino acids regulate specific chemical pathways in living organisms—increasing the concentrations of certain amino acids can create an imbalance in the plant’s metabolic activities, which can eventually kill the plant. During my research last semester, I generated numerous rooted Privet plantlets from geographically diverse cuttings and treated them individually with 8 amino acids. After performing the preliminary experiment, I have concluded that lysine, methionine, and valine are three amino acids that appear most toxic to Privet. To verify the results from this initial experiment, I will run three identical trials during the summer so that the data can be statistically analyzed. I am currently working on determining the minimal effective concentration for each inhibitory amino acid. This experiment will also be repeated during the summer. The next step in the project will be to obtain a pathogenic fungus that could be mutated to secrete large amounts of toxic amino acid. Finding a potential host-specific pathogen involves literature surveys and personal communications. The University of Georgia has an international collaboration with Shanghai Academy of Agricultural Sciences and I will communicate with scientists there about possible control agents. Additional wild *Ligustrum* species are native to the western United States (*Ligustrum ovalifolium*); I will explore the possibility of identifying effective host specific pathogens through contacts with researchers there. This summer I will also contact a government regulatory agency, USDA-APHIS, to learn the restrictions placed on the importation and usage of pathogens either domestic or foreign.

However, before importing a host-specific pathogen, I will first test the experimental principle on *S. rolfsii*, a broad host range fungus. I will create a mutant of this fungus by exposing the fungus to ultraviolet rays or mutagenic chemicals. After identification of a high level secretor, I will inoculate Privet with this mutant to test its pathogenicity and verify the potential of the experimental procedure. If the experiment is successful for *S. rolfsii*, I will repeat it to create a host-specific mutant and test its pathogenicity and host specificity.

Additionally, during the course of the summer, I will use Chinese Privet to explore the current thinking of the ornamental industry with regards to the control of invasive species. I will conduct a survey to learn more about the Green industry’s attitudes and control mechanisms toward invasive plant release.

The success of this project will provide us with a fungal mutant that will secrete excess amounts of an amino acid that is detrimental to Chinese Privet but does not affect native species. The principle used in this project could then be used as a model to create efficient biocontrol agents for other exotic weeds like Kudzu.

*Faculty Research Mentor: Dr. Scott Gold, Plant Pathology*
Manner of Hammer Stone Use in Wild Capuchin Monkeys

CURO-OVPR Summer Research Fellow: Tomas Pickering

Background: Recently, in Piauí, Brazil, wild bearded capuchin monkeys (Cebus lipidinosus) have been documented using stone tools to crack open palm nuts. The stone hammers that the monkeys use typically weigh one kilogram, which is equivalent to 25-40% of an adult monkey’s body weight. Manipulation of these relatively heavy stones, that must be transported at least short distances to anvil sites and must be lifted in order to strike at the desired palm nut, has led to innovations in behavior made by the monkeys such as bipedalism during transportation.

Objectives: Under the guidance and direction of Dr. Dorothy Fragaszy, I will assist in a seven-week trip (June 25th to August 11th) to Brazil in order to study the kinematics of tool use by the capuchin monkeys. This will include an analysis of primate locomotion and positional behavior, for example, quadrupedalism versus bipedalism, forelimb mechanics, and posturing. An analysis of the movement through space and time (acceleration) of the hammer stone during use will also be of primary importance. The goal will be to collect the kinematic data in order to aid in the overall understanding of the importance of the nut cracking behavior and how it relates to the monkey’s natural history.

Methods: Preceding travels it will be necessary to learn and practice with technologies that will be used during field research and also acquire some basic knowledge of Portuguese. The collection of data on the kinematics of tool use will be done using cameras. At least two cameras will be established to record side and frontal views of the monkeys carrying hammer stones and striking palm nuts with the stones. Following, a frame by frame analysis of multiple joint movements will be done. Acceleration of the hammer stone will be determined by imbedding a wireless accelerometer into the stones that are placed into the field site where a group of habituated capuchins (N=15) frequent almost daily; data will be streamed into nearby laptops and stored. Analysis of accelerometer data will be done using the “LabView” computer software program. Any additional time will be used to help document other available food resources to the monkeys for purposes of aiding to the greater ecological significance of this behavior.

Significance: This project will improve understanding of the overall function of this unusual nut cracking behavior in wild capuchin monkeys. The reference point we are creating on hard-fruit feeding via tool use of a New World monkey is important to our understanding of tool use development in the phylogenetically distant hominid line.

Faculty Research Mentor: Dr. Dorothy M. Fragaszy, Biology

Creating a Culture of Undergraduate Inquiry
Hirano bodies are intracellular, paracrystalline, actin-rich structures that are most commonly found in the brains of humans suffering from neurodegenerative diseases. Their purpose and structure are not well understood, but their possible link to the prevention, cure, and further understanding of neurodegenerative diseases has made their study worthwhile. Previously, Dicytostelium (slime mold) was used to test if myosin II was essential for the formation of Hirano bodies in cells. Temperature-sensitive myosin II and mutated 34 kD protein were expressed constitutively in Dicytostelium cells. Hirano bodies formed in the cells at permissive temperatures while the cells at non-permissive temperatures died. Hirano bodies were counted and electron microscopy was performed. Myosin II was required for the formation of Hirano bodies, but the characterization was incomplete. Since expression was constitutive, it was impossible to determine how Hirano bodies contributed to cell death.

In order to complete the characterization of the molecular mechanism of Hirano body formation, I have been working with Drs. Marcus Fechheimer and Ruth Furukawa in creating an improved plasmid. Over the course of the year, I have worked on constructing a plasmid with an inducible promoter for the expression of the mutated 34 kD protein fused to red fluorescent protein. The inducible promoter will allow the expression of the 34kD protein to be turned on and off so I may observe how the Dicytostelium cells operate with the functional and nonfunctional myosin II. The vector I am creating will contain a blasticidin resistant cassette so that only the cells resistant to the blasticidin and expressing the red fluorescent protein will be studied.

By the end of this semester, the vector process should be completed or in its final stages. I will use this summer to perform experiments using the vector so that I may study Hirano bodies. My experiments will focus on how Hirano bodies form and observe how they contribute to cell death. Hirano bodies will be counted, and I will perform fluorescence and electron microscopy and western blotting on the Dicytostelium cells. Over the summer, I will further my understanding of cellular biology, improve my technique and efficiency in the lab, and learn several new techniques. These techniques include transforming Dicytostelium, manipulating protein expression in a cell, performing microscopy and western blots. Ultimately, this will lead me to better understand the research process and how Hirano bodies form.

*Faculty Research Mentor: Dr. Marcus Fechheimer, Cellular Biology*
Characterization of Mycobacterium shottsii

CURO Summer Research Fellow: Purvi Sheth

*Mycobacterium shottsii* is an acid-fast bacterium that was discovered in the spleens of several striped bass exhibiting ulcerative lesions in the Chesapeake Bay. This bacterium is of interest to investigators seeking to determine whether it causes the fish lesions. Vaccinologists are also interested in this bacterium. Its inability to grow above 30°C and relatedness to *Mycobacterium tuberculosis* suggests that it might be suitable for development as an intra-nasal tuberculosis vaccine. An initial characterization of *M. shottsii* was published by Rhodes and colleagues in 2003. The goal of the CURO summer research project will be to continue the characterization of this bacterium.

One emphasis of the project will be to investigate whether nutritional supplementation can enhance the growth rate of *M. shottsii*. This bacterium has a very slow doubling time in broth or on agar plates. Because growth on plates can take several weeks for colonies to be visible without a magnifying glass, the focus of this project will be growth in broth cultures. The bacterium grows in Middlebrook 7H9 broth supplemented with OADC (oleic acid, albumin, dextrose, and catalase) and Tween-80. Various nutritional supplements will be examined to determine if they allow *M. shottsii* to grow faster. A literature review of the growth requirements of other *Mycobacterium* species will be undertaken to help select candidate supplements to be tested. To be tested first will be ferric pyrophosphate, chicken egg, and pyruvate, as they have benefited the growth of other mycobacteria. Growth will be monitored in parallel supplemented and nonsupplemented cultures by measuring the optical densities at 600 nm.

This project will also examine antibiotic resistance in *M. shottsii*. This project will examine antibiotics that have been used for molecular cloning in other *Mycobacterium* species. In particular, the antibiotics kanamycin and hygromycin will be studied. A colorimetric assay using Alamar blue is used to determine the minimum inhibitory concentration (MIC) of drugs against *M. tuberculosis*. We will modify this assay for MIC determinations by *M. shottsii*. The assay will be performed in sterile 96-well dishes. Bacterial culture will be added to wells containing increasing amounts of each antibiotic. Sterile Alamar blue solution will be added to each well. Triplicate samples for each antibiotic concentration will be prepared. Cultures will be incubated at room temperature over several weeks and monitored for color change (from blue to pink). The drug concentration at which the color change is observed will indicate the MIC.

The final goal of this project will be to determine whether *M. shottsii* has a mycobacteriophage L5 attachment site on its chromosome. This site is used in other mycobacteria to integrate DNA into the chromosome, thereby allowing a gene to be present in single copy. Other researchers in the laboratory have successfully transformed *M. shottsii* with a multi-copy plasmid encoding a mycobacterial plasmid origin of replication, green fluorescent protein, and resistance to kanamycin. Therefore, a suicide plasmid encoding the mycobacteriophage L5 attachment site and integrase, and resistance to kanamycin will be electroporated into *M. shottsii* and plated onto 7H11 agar supplemented with OADC Tween-80 and 25 ug/ml kanamycin. If colonies appear, they will be screened by PCR for DNA specific to the suicide plasmid. If the DNA is present, then it will support the hypothesis that *M. shottsii* has an L5 attachment site.

*Faculty Research Mentor: Dr. Russell Karls, Microbiology*
I will use my CURO Summer Research Fellowship to fund research of Chinese-American relations under the guidance of Dr. Dawn Robinson. As globalization becomes an increasing force in contemporary society, progressively more Chinese businessmen are placed in business-oriented interactions with American businesswomen and vice versa. I wish to examine how differing cultural sentiments and expectations of gender roles between these two cultures affect workplace interactions.

Affect Control Theory provides a means of investigating these consequences as well as how such interactions are transforming cultural expectations. The cultural basis of the theory provides an opportunity to investigate cross-cultural interactions in a variety of contexts. However, few researchers have taken advantage of the opportunity to expand Affect Control Theory to this type of application, and these potentially far-reaching and significant implications have gone unexplored. Furthermore, as one of the few formalized, mathematical theories in Social Psychology, Affect Control Theory provides a precision and a depth that is rare in the contemporary study of social interaction.

A Clarke International Scholarship will be funding a two-week journey to Guangzhou, China to collect a Chinese dataset under the supervision of a renowned Affect Control Theorist at Sun Yat-sen University. I will combine this scholarship with a CURO Summer Research Fellowship. This research fellowship will provide the funding necessary for me to collect a corresponding American dataset, perform an in-depth analysis, and begin the working foundations of a thesis upon returning to the University of Georgia.

Faculty Research Mentor: Dr. Dawn T. Robinson, Sociology
Does Writing Ability Signal Academic Excellence?  
Evidence from the New Scholastic Aptitude Writing Section (SATW)  
CURO-UGA Alumni Association Summer Research Fellow: Jessica Van Parys

What Am I Studying? My research intends to determine if scores on the new writing section of the Scholastic Aptitude Test (SATW) are better able to predict collegiate academic success for incoming first-year students. I hope to answer several questions on this topic. First, does the SATW help predict student success in college more accurately than the old version of the SAT? Second, do scores on the new SAT disproportionately predict success for certain types of students (e.g. English majors versus Chemistry majors)? Finally, based on the research findings, what are the implications for students, admissions offices, and education policymakers?

Why Is This Study Important? Presumably, policymakers altered the SAT format to provide a test that better reflects important skills. It could also help admissions offices at colleges and universities better differentiate among candidates for admission. Universities admit students for a variety of reasons, but most commonly, they choose students who are most likely to succeed academically. Both students and the university suffer when dropout rates and academic probation rates are high. If a university can predict a student’s capacity for collegiate success, the student and the university are matched appropriately, and both parties benefit. Thus, it is important to evaluate how much predictive power measurement tools (e.g. the SATW) have in determining such success. Ceteris paribus, if the SATW does not better predict levels of student achievement, then the policy change was unproductive. In that case, high school students should spend less time on, and contribute fewer resources toward, preparing for the writing section. Similarly, universities should not use the SATW in their admissions decisions. Moreover, students, school districts, and universities may choose to emphasize alternative mechanisms to predict student achievement (e.g. high school end-of-course tests). Overall, it is important to understand the implications of new policies, as it is inefficient to promote policies that fail to provide helpful results.

Which Methods Will I Use? I will employ multi-variable regression analyses on student-level data from the University of Georgia Admissions, Financial Aid, and Registrar’s offices. I will limit my attention to the current first-year students because this is the first cohort of students who took the SATW. Professors Christopher Cornwell and David Mustard have permission to obtain and use these data to examine questions pertaining to student behavior and achievement in college. They will, however, need to update this data set at the end of this academic year.

My research will examine the determinants of a number of outcome variables, such as GPA, GPA in one’s intended major, the number of credit hours students complete, and the number of classes from which they withdraw. I will determine whether the new SATW exam helps explain these outcome variables while controlling for factors such as high school grade-point average (GPA), math and verbal SAT scores, gender, race, financial aid package offered (e.g. HOPE), and geographic region or school district.

Faculty Research Mentor: Dr. David B. Mustard, Economics
Through the summer research fellowship and in collaboration with the administrators of the Multicultural Archive of Georgia, I will conduct rigorous research, primarily through interviews, on the Civil Rights Movement in Georgia. The research will be based on the actions of the citizens from Atlanta, Athens, Albany, Savannah, Camilla, Americus, and other places in Georgia during the movement and will examine how the citizens were catalysts in desegregation and equal rights. The information compiled will be added to the online archive that the administrators have created specifically to aid teachers and students in their research of information on the Civil Rights Movement in Georgia. I also intend to personalize the process to include some research of my own.

A concept that I colorfully coin as “Beauty Imposed” is a controversial issue highly debated in the African American culture. This idea, in basic terms, explores the images of beauty held by members of the African American community and how much these images are influenced by the media, generations of cultural conditioning, and popular culture. Recent research has revealed that “color schemes,” or the different shades of skin, affect ideas of beauty for African Americans, especially in their consideration of the opposite sex within the culture. In addition, certain physical features are preferred over others, and varying stigmas, mostly negative, are attached to members of the culture based on the lack of particular physical features.

I will condense and reveal the results of recent research on these contemporary aesthetics in African American culture. In addition, I intend to compare the results with findings of my own. I want to uncover the images of beauty imposed on African Americans, particularly women, during the Civil Rights Movement. I will focus primarily on the concepts exposed in the arts and literature of the Black Aesthetic during the Black Arts Movement, which existed almost concurrently with the Civil Rights Movement. I will compare the concepts illustrated in the literature and arts from the movements with information given from the primary sources by incorporating questions from my personal research into the interviews. My findings will hopefully reveal the ideas of beauty in the African American culture prior and up to the Civil Rights Movement and the similarities the notions of beauty have to contemporary aesthetics.

The results of my research will provide a better understanding of the unique styles and different concepts of beauty within the African American culture and show how the different styles conform to or reject the standardized notion of beauty within the culture. In addition, I intend to simultaneously alleviate the negative perspectives that African American women may have of themselves when they do not conform to the standardized notions of beauty prevalent to the culture, by disrupting the imposed negativity of any conditioned thoughts and images of beauty.

*Faculty Research Mentor: Dr. Barbara McCaskill, African American Studies and English*
Since I currently do research under Dr. Whitford, we will utilize the summer as an in-depth extension of our current research. The three main goals for the summer are to complete the final revisions on our “Political and Social Foundations for Environmental Sustainability” paper, to finish our transfer pricing research, and to start a new project on social entrepreneurship.

Environmental sustainability is the long-term preservation of our environment for the future. The purpose of our essay is to quantitatively investigate several possible foundations for environmental sustainability, as measured across countries with varying geography, development patterns, social customs, and political arrangements. We first test two central hypotheses about the roles of democracy and federalism. Our study asks if democracy increases environmental sustainability and if federalism reduces sustainability. We also assess the roles of organized groups representing different kinds of environmental interests, development paths, and religious orientations. We find little evidence for variation in sustainability levels given variation in either democracy or federalism. However, we find that the effect of economic development (both current and historical) depends on the measurement of sustainability. Stress and vulnerability are affected by business practices and international environmental organizations (but environmental systems are not), and the effect of Protestant religious affiliations depends on our measurement of sustainability. Although these findings show no clear political foundation, they portray a complex and varied set of foundations for environmental sustainability.

Since we only have revisions left on the sustainability paper, the second thrust of our research will focus on the transfer pricing paper. The purposes of the transfer pricing project are to provide a broad overview of regulatory compliance in the international political economy, to consider the role and reasons for different regulatory policies, to see how these policies influence investment and productivity, and to model transfer pricing regimes (rules) across OECD countries, to consider evidence for how some countries depart from the norm, and to provide explanations for why those departures exist. Our main conceptual argument in this paper is that firms don’t like uncertainty and regulatory decisions can reduce this uncertainty. Since transfer pricing is very important to large firms crossing jurisdictions, we will narrow the scope of our research by focusing on regulatory decisions in the context of transfer pricing. To reduce the uncertainty inherent in transfer pricing, APAs (Advanced Pricing Agreements) help reduce uncertainty. In our paper, we ask why some nations allow APAs, while others do not. We assess the roles of broad regulatory regime quality, legal origins, political systems, corporate tax rates, and tax dependence of countries in their likelihood of adopting APAs. We will then formulate a model and explain deviations away from the norm such as Italy and Japan.

Lastly, we will start research on social entrepreneurship. Social entrepreneurship is business organizations or ventures that advance a social, philanthropic mission through business methods. We will study international social entrepreneurship in a comparative context.

Faculty Research Mentor: Dr. Andrew Whitford, Political Science
Appendix A

CURO 2006 Summer Research Fellows

Sarah Breevoort, CURO-BHSI Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
Construction of Three Reelp Mutant Plasmids to Aid in the Characterization of Reelp Enzymatic Activity

Lauren Coffey, CURO Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Susan Fang, CURO Summer Research Fellow
Prof. Christopher Hocking, Studio Foundations

Courtney Grant, CURO-BHSI Summer Research Fellow
Dr. Julie Coffield, Department of Physiology and Pharmacology
An Investigation of Botulinum Neurotoxin Interactions on RhoA Activity Using In Vitro Assays

Erica Hall, CURO-BHSI Summer Research Fellow
Dr. Jessie Kissinger, Department of Genetics

Adele Handy, CURO-UGA Alumni Association Summer Research Fellow
Dr. Greg Robinson, Department of Chemistry

Celan Hardman, CURO Summer Research Fellow
Prof. Joe Norman, Drawing and Painting

Sana Hashmi, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center
Alteration of Alpha-Dystroglycan and Cancer Progression

Matthew Haney, CURO Summer Research Fellow
Dr. Larry Nackerud, School of Social Work
Courrie – Not Email: Implications for Government Regulation of a Social Phenomenon. A Case Study of Language in France

Maggie Mills, CURO-NSF/SPIA Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Anna-Marieta Moise, CURO-BHSI Summer Research Fellow
Dr. Andrea Hohmann, Department of Psychology
Neurochemical Basis of Social Defeat in Syrian Hamsters: Role of Endogenous Cannabinoids

Lamar Moree, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center

Jesse Oakley, CURO Summer Research Fellow
Dr. Laurie Fowler, Department of Ecology
Economic Incentives for Private Land Conservation and Sustainable Development: Research into Environmental Policy in Costa Rica and Georgia
Katie Orlemanski, CURO-OVPR Summer Research Fellow  
Dr. Patricia Richards, Department of Sociology  
Reclaiming “Development” within the Context of Low-Income Neighborhoods

Danielle Pearl, CURO-OVPR Summer Research Fellow  
Dr. Keith Langston, Germanic and Slavic Languages  
Press Freedom, E.U. Accession, and Democracy in Croatia

Daniel Perry, CURO Summer Research Fellow  
Dr. David Landau, Department of Physics and Astronomy

Andrew Pierce, CURO Summer Research Fellow  
Dr. Thomas McNulty, Department of Sociology

Richard Piercy, CURO-OVPR Summer Research Fellow  
Dr. Cory Momany, Department of Pharmaceutical and Biomedical Sciences

Kurinji Pandiyan, CURO Summer Research Fellow  
Dr. Steven Holloway, Department of Geography  
Understanding Public Space in a New Urbanist Development

Mandy Redden, CURO-BHSI Summer Research Fellow  
Dr. Robert Arnold, Department of Pharmaceutical and Biomedical Sciences  
Towards a More Effective Delivery System for Anti-Cancer Drugs

Eva Bonney Reed, CURO-BHSI Summer Research Fellow  
Dr. Ronald Blount, Department of Psychology

Lisa Rivard, CURO-Toxicology Summer Research Fellow  
Dr. Jeff Fisher, Toxicology

Sonia Talathi, CURO-OVPR Summer Research Fellow  
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences  
Effectiveness of Ca2+-Independent Phospholipase A2 Inhibitors in the Induction of Chemotherapeutic-Induced Cancer Cell Death

Erika Vinson, CURO Summer Research Fellow  
Dr. Richard Siegesmund, Art Education

Joshua Watkins, CURO Summer Research Fellow  
Dr. Patricia Sullivan, Department of International Affairs  
The Price of Victory: When Leaders Underestimate the Cost of War

Daniel Weitz, CURO-OVPR Summer Research Fellow  
Dr. Gary Bertsch, Department of International Affairs  
The Impact of a European Union Nuclear Weapons Free Zone on the International Non-Proliferation Regime

Shannon Yu, CURO-BHSI Summer Research Fellow  
Dr. Nancy Manley, Department of Genetics
Appendix B

CURO 2005 Summer Research Fellows

Grace Anglin, CURO-OVPR Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
*Family Focused Emotion Communication Training*

Ashley Beebe, CURO Summer Research Fellow
Dr. James R. Holmes, Center for International Trade and Security
*The Influence of Media on Economic Policy in Brazil and Argentina*

Ingrid Bloom, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
*Differentiation of Human Embryonic Stem Cells into Endothelial Progenitors*

Ian Lewis Campbell, CURO Summer Research Fellow
Dr. Glenn Wallis, Department of Religion
*Theories of Mythology and the Way That Myths Have Affected Social and Political Formation*

Kimberly Coveney, CURO-CIT Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
*Role of iPLA2 in Phospholipid Metabolism in Chemotherapeutic-Induced Cancer Cell Death*

William Collier, CURO-OVPR Summer Research Fellow
Dr. Amy D. Rosemond, Institute of Ecology
*Analysis of an Exotic Species’ Interactions with Native Aquatic Trophic Dynamics: Quantifying the Effects of the North American Beaver (Castor canadensis) on Sub-Antarctic Stream Food Webs in the Cape Horn Archipelago, Chile*

John Crowe, CURO Summer Research Fellow
Prof. Mark Callahan, Ideas for Creative Exploration
*AUX Launch: Art, Representation, and Commerce on the Web*

Katie Griffith, CURO Summer Research Fellow
Dr. Diana Ranson, Department of Romance Languages
Dr. Judith Preissle, College of Education
*Assessing Cultural Values and Political Beliefs in a Nicaraguan Classroom: A Participant Observation*

Matthew Haney, CURO-CTEGD Summer Research Fellow
Dr. Rick Tarleton, Department of Cellular Biology
*Antibody Depletion of Highly Abundant Proteins in Trypanosoma cruzi for the Fine-Tuning of Proteomic Analysis*

Ned Hembree, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
*Rcl and Ste24 Inhibition by Dipeptidyl Acyloxyethyl Ketones: A Potential Target for Cancer Therapeutics*

Alicia Higginbotham, CURO Summer Research Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
*Christopher Logue’s Iliad: A Work in Translation*
Scott Jacques, CURO Summer Research Fellow
Dr. Mark Cooney, Department of Sociology
*The Social Reality of Young, Middle Class Drug Dealers*

Lisa Jordan, CURO Summer Research Fellow
Dr. Ruth Harris, Department of Food and Nutrition
*The Effect of Leptin on Sympathetic Nerve Activity in White Adipose Tissue*

Carey Kirk, CURO-OVPR Summer Research Fellow
Dr. David Z. Saltz, Department of Theatre and Film Studies
*The Effectiveness of Drama Techniques in Treating People Suffering from Trauma*

Andrew Leidner, CURO-CTEGD Summer Research Fellow
Dr. Pejman Rohani, Institute of Ecology
*Coevolutionary Behavior and Interference between Fatal Diseases*

Jon McGough, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
*The Role of Female Choice in Sexual Selection of Drosophila pseudoobscura*

Tatyana Nienow, CURO-BHSI Summer Research Fellow
Dr. Walter K. Schmidt, Department of Genetics
*Adapting Yeast for the Study of Pitrilysin and Other M16A Enzymes*

Erika Porter, CURO-BHSI Summer Research Fellow
Dr. Charles H. Keith, Department of Cellular Biology
*Intrinsic Fluorimetric Imaging of Neural Activation in Cultured Cells and Zebrafish*

Kurinji Pandiyan, CURO-CAES Summer Research Fellow
Dr. Raj Rao, Department of Animal and Dairy Science
Dr. Steven Stice, Department of Animal and Dairy Science
*Genomic Instability of Human Embryonic Stem Cells*

Kelly Proctor, CURO-OVPR Summer Research Fellow
Dr. Lee B. Becker, College of Journalism and Mass Communication
*Differences in Environmental Reporting: China and the United States*

Rebecca Trupe, CURO Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
*Family Focused Emotion Communication Training*

Russ Richardson, CURO Summer Research Fellow
Dr. Ron Carroll, Institute of Ecology
*Sugarcane Processing Waste as a Soil Amendment on Organic, Shade-Grown Coffee under Simulated Drought Conditions for Control of Plant-Parasitic Nematodes*

Dustin Williams, CURO-BHSI Summer Research Fellow
Dr. Scott T. Dougan, Department of Cellular Biology
*Development of Transgenic Zebrafish to Understand How Activation of Hyal-2 Leads to Tumor Formation*

Fei Yang, CURO Summer Research Fellow
Dr. Janet Westpheling, Department of Genetics
*Regulation of Branched-Chain Amino Acid Catabolism in Streptomyces coelicor: Applications for Metabolic Engineering of Polyketide Antibiotic Biosynthesis*
Stephanie Yarnell, CURO Summer Research Fellow
Dr. Carl Bergmann, Complex Carbohydrate Research Center
Appendix C

CURO 2004 Summer Research Fellows

Cara Altimus, CURO Summer Research Fellow
Dr. Jonathan Arnold, Department of Genetics
Isolation of a Light Receptor in the Biological Clock of N. crassa

Westin Amberge, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
Guided Differentiation of Human Embryonic Stem Cells into Endothelial Cells: Focusing on the Ulex Europaeus Agglutinin I Lectin

Namrata Asuri, CURO Summer Research Fellow
Dr. Sidney Kushner, Department of Genetics
Analysis of the Role of Ribosomal S1 in the Polyadenylation Pathway of Eschericia coli

Erin Bohan, CURO-OVPR Summer Research Fellow
Dr. Katarzyna Jerzak, Department of Comparative Literature
The Reconciliation of Selves: The Emigrant Experience in America

Rebecca Brantley, CURO-OVPR Summer Research Fellow
Ms. Ashley Callahan, Georgia Museum of Art
The Early Fashion Design of Mariska Karasz and the Influence of Her Native Hungary

Josef Broder, CURO Summer Research Fellow
Dr. Andrew Sornborger, Department of Mathematics
Techniques in High Noise Image Analysis

Beau Bryan, CURO-BHSI Summer Research Fellow
Dr. Michael Pierce, Department of Biochemistry and Molecular Biology
N-Cadherin Gl

Susannah Chapman, CURO Summer Research Fellow
Dr. Virginia Nazarea, Department of Anthropology
Designing Sui Generis Systems for Traditional Plants and Associated Local Knowledge

Clayton Griffith, CURO-OVPR Summer Research Fellow
Dr. Amy Rosemond, Institute of Ecology
The Effect of the North American Beaver (Castor Canadensis), an Exotic Herbivore, on the Composition, Structure, and Regeneration of the Riparian Vegetation of Sub-Antarctic Forested Streams in Chile

Christopher Hale, CURO-BHSI Summer Research Fellow
Dr. Thomas F. Murray, Department of Physiology and Pharmacology
Adolescence as a Distinct Period of Vulnerability to Nicotine Addiction

Catherine Hudson, CURO-BHSI Summer Research Fellow
Dr. Harry Dailey, Department of Microbiology and Biochemistry and Microbiology
Negatively Affecting the Heme Biosynthetic Pathway in “Escherichia coli”

Creating a Culture of Undergraduate Inquiry - 37 -
Douglas Jackson, CURO Summer Research Fellow
   Dr. Nigel Adams, Department of Chemistry
   Reactions of Protonated Carboxylic Acid Ions with Amines in the Interstellar Medium

Andrew Leidner, CURO-BHSI Summer Research Fellow
   Dr. Pejman Rohani, Institute of Ecology
   Parasitoid Behavior and Evolutionary Dynamics

Janel Long, CURO-OVPR Summer Research Fellow
   Dr. Jean Martin-Williams, School of Music
   The Partitas of Franz Krommer and Natural Horn Technique

John McWhorter, CURO-BHSI Summer Research Fellow
   Dr. Daniel Colley, Department of Microbiology
   Induction of the Regulatory Ligand PD-L2 and the Co-regulatory Receptor PD-1 on CD4 Lymphoctes
   During Early Experimental Schistosomiasis Mansoni

William Parker, CURO Summer Research Fellow
   Dr. Marly Eidsness, Department of Chemistry
   Trigger Factor

Gehres Paschal, CURO-OVPR Summer Research Fellow
   Dr. J. David Puett, Department of Biochemistry and Molecular Biology
   Activating Mutations of the Lutropin/Choriongonadotropin Receptor Associated with Familial Precocious
   Puberty, Male Psudohermaphorditism, Hypogonadism, Amenorrhea, Leydig cell Hyperplasia, and Metastatic
   Thyroid Carcinoma

Kevin Patrick, CURO Summer Research Fellow
   Dr. James Anderson, Department of Classics
   Cicero and the Foundations of a Legal Education at Rome

Katherine Price, CURO Summer Research Fellow
   Dr. Janet Westpheling, Department of Genetics
   Site Specific Chromosomal Integration Mediated by Bacteriophage Integrase

Matthew Rudy, CURO Summer Research Fellow
   Dr. Marly Eidsness, Department of Chemistry
   Analysis of Cotranslational Protein Folding in E-coli and Determination of the Role of the Trigger Factor Gene
   in the Folding Process

Desiree Smith, CURO Summer Research Fellow
   Dr. Roberta Fernandez, Department of Romance Languages
   Projecting a Positive Educational Experience for Latina/os in the South

Christopher Stokes, CURO-OVPR Summer Research Fellow
   Dr. Randy Kamphaus, School of Professional Studies
   Family Health and Classroom Behavior: A Pilot Study

Shana Strickland, CURO-BHSI Summer Research Fellow
   Dr. Kimberly Shipman, Department of Psychology
   Emotional Regulation and Coping Skills in Maltreated Children
Adam Stroupe, CURO Summer Research Fellow
  Dr. Boris Striepen, Department of Cellular Biology
  *Drug and Nutrient Trafficking in the Human Pathogen Cryptosporidium parvum*

Teerawit Supakorndej, CURO-BHSI Summer Research Fellow
  Dr. Michael Terns, Department of Biochemistry and Molecular Biology

Tendoh Timoh, CURO Summer Research Fellow
  Dr. Marly Eidsness, Department of Chemistry
  *Fluorophore-modified Nascent Polypeptides*

Jora Vaso, CURO-OVPR Summer Research Fellow
  Dr. Katarzyna Jerzak, Department of Comparative Literature
  *The Effect of Communism on the Works of Andric, Kadare, and Szymborska*

Leslie Wolcott, CURO-OVPR Summer Research Fellow
  Dr. Betty Jean Craige, Center for Humanities and Arts
  *The Environment in Georgia’s Literature, Past and Present*
Appendix D

CURO 2003 Summer Research Fellows

**Anthony Anfuso**, CURO Summer Research Fellow  
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology  
*Developing a Fast Plant Expression System to Identify Biosynthetic Genes Involved in Pectin Synthesis*

**Tiffany Beal**, CURO-BHSI Summer Research Fellow  
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology  
*Determining How Pectins Inhibit Cancer Growth and Metastasis*

**Robert Brady**, CURO Summer Research Fellow  
Dr. Nader Amir, Department of Psychology  
*Malleability of Interpretation Bias in Social Anxiety and General Anxiety*

**Josef Broder**, CURO Summer Research Fellow  
Dr. Chi N. Thai, Department of Biological and Agricultural Engineering  
*Operational Characteristics of a Mobile Spectral Imaging System for Plant Health Detection*

**Martha Rose Calamaras**, CURO Summer Research Fellow  
Dr. Kim Shipman, Department of Psychology  
*Emotional Understanding in Abused and Neglectful African-American Families*

**Daniel del Portal**, CURO-BHSI Summer Research Fellow  
Dr. Marcus Fechheimer, Department of Cellular Biology  
*The Physiological Role of Hirano Bodie*

**Dustin Dyer**, CURO Summer Research Fellow  
Dr. Guigen Zang, Department of Biological and Agricultural Engineering  
Dr. Michael Geller, Department of Physics and Astronomy  
*Energy Dissipation in Nanomechanical Resonators*

**Sarah Fritts**, CURO Summer Research Fellow  
Dr. John P. Carroll, School of Forest Resources  
*An Inventory and Assessment of Medicinal Plants and Animals Used by Makuleke Traditional Healers on the Northern Boundary of the Kruger National Park, South Africa*

**Betsy Goodwin**, CURO-BHSI Summer Research Fellow  
Dr. Ronald Blount, Department of Psychology  
*A Study of the Psychology of Pediatric Pain and Chronic Illness*

**Patrick Gosnell**, CURO Summer Research Fellow  
Prof. Ben Reynolds, Department of Photography  
*The Beautiful and the Absurd*

**Paulette Andrea Greene**, CURO-BHSI Summer Research Fellow  
Dr. Wyatt Anderson, Department of Genetics  
*Conspecific Sperm Precedence and Speciation in Drosophila pseudoobscura*
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Andrea Haltiner, CURO-BHSI Summer Research Fellow
Dr. Ruth Harris, Department of Foods and Nutrition
The Effects of Leptin on Leptin Receptor Expression in High-Fat Fed Mice

Luke Hoagland, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Medical Cellular Biology
The Role of Myosin II in Hirano Body Development and the Impact of Hirano Bodies on Cell Viability

Christopher “Kit” Hughes, CURO Summer Research Fellow
Prof. Mark Callahan, School of Art
Tagging

Steven Jocoy, CURO Summer Research Fellow
Dr. Michael Bender, Department of Genetics

Leena Kukkarni, CURO Summer Research Fellow
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
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Valerie Marshall
Dr. Ben Blount, Department of Anthropology

Ashley Neary
Dr. Susan Sanchez, Department of Medical Microbiology and Parasitology
Sensitive and Specific Detection of Fungal Keratitis in Horses

Ngozi Ogbuehi, CURO Summer Research Fellow
Dr. Mary Alice Smith, Department of Environmental Health Science
Comparing Apoptosis During Different Stages of Limb Development in Chick Embryos

Melissa Payton, CURO Summer Research Fellow
Dr. Lillian Eby, Department of Psychology
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John Drew Prosser, CURO Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
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Ryan Rhome, CURO Summer Research Fellow
Dr. Jan Westpheling, Department of Genetics
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Susan Ritger, CURO-BHSI Summer Research Fellow
Dr. Duncan C. Ferguson, Department of Physiology and Pharmacology
Immunoreactivity and Bioactivity of Recombinant Thyrotropins (TSH)

Ben Solomon, CURO Summer Research Fellow
Dr. Kevin McCully, Department of Exercise Science
Measuring Age Related Changes in Muscle Compliance Using Ultrasound

Creating a Culture of Undergraduate Inquiry
Mary Tolcher, CURO Summer Research Fellow
   Dr. Tim Hoover, Department of Microbiology
   Identification of Developmentally Regulated Proteins in the Budding Bacterium Hyphomonas neptunium

Meghan Wilson, CURO-BHSI Summer Research Fellow
   Dr. James Lauderdale, Department of Cellular Biology
   Pax 6b

Ryan Wilson, CURO Summer Research Fellow
   Roger Moore, Department of Landscape Architecture

Thomas Wood, CURO Summer Research Fellow
   Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
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Nadia Behizadeh
  Dr. Tricia Lootens, Department of English

Ashley D. Chadha
  Dr. Michael McEachern, Department of Genetics
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Emily DeCrescenzo
  Dr. Susan Sanchez, Department of Biochemistry and Molecular Biology
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Ivy Forkner
  Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
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Cory S. Gresham
  Dr. James B. Stanton, Department of Pathology
  Dr. Corrie C. Brown, Department of Pathology
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Nowell Hesse
  Dr. Maor Bar-Peled, Department of Plant Biology
  Identification of Nucleotide-Sugar Biosynthetic Genes Involved in Glycoconjugate Synthesis

Matt Hoffman
  Dr. Will York, Department of Biochemistry and Molecular Biology
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Parker Hudson III
  Dr. Mary Bedell, Department of Genetics

Britt Johnson
  Dr. Janet Westpheling, Department of Genetics
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LeeAnn Jones
  Dr. Massimo Palmarini, Department of Medical Microbiology
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Jenna Lee
  Dr. Andrew Herod, Department of Geography
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Judson A. Lewis  
Dr. John F. McDonald, Department of Genetics  
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Cheryl L. Maier  
Dr. Scott Pratt, Department of Animal and Dairy Science  
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Julie Orlemanski  
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Gautham Pandiyan  
Dr. Jacek Gaertig, Department of Cellular Biology  
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Katherine Williams  
Dr. Kojo Mensa-Wilmot, Department of Cellular Biology  
Dr. Anne Clark, Oxford University

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Dr. Debra Mohnen, Complex Carbohydrate Research Center
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David Cureton
Dr. Janet Westpheling, Department of Genetics
Development of an In Vitro Packaging System for a Streptomyces Bacteriophage

Jon E. Davis
Dr. Gary Bertsch, Department of Political Science
Identifying the Risks of China’s Nuclear Weapons Command-and-Control System in the Event of Political Crisis

Sayan De
Dr. Max Reinhart, Department of Germanic and Slavic Languages
The Progress and Modernization of Former East German Healthcare after Communism

Lawrence Dougherty
Dr. Daniel Promislow, Department of Genetics
Exploring Olfactory Response in Drosophila melanogaster and Evolutionary Theory of Aging

Matt Edwards
Dr. Gary Bertsch, Department of Political Science
Evaluating the Moscow Center for Export Control’s Role as a Non-Proliferation Epistemic Community Member

Ben Emanuel
Dr. Frances Teague, Department of English
Shakespeare on Screen: Henry in Hollywood

Jeff Halley
Dr. Sheng Cheng Wu, Department of Biochemistry and Molecular Biology
Cell Wall-Degrading Enzymes from the Fungus That Causes the Devastating Rice Blast Disease

Peter Harri
Dr. Kojo Mensa-Wilcot, Department of Cellular Biology
Gene Expression in Leishmania: Control of Protein Synthesis in Leishmania 5’ Untranslated Regions

Amanda Hudson
Dr. Michael Terns, Department of Biochemistry and Molecular Biology
Screening Mutant Yeast Strains for Abnormalities in the Localization of snoRNA

Kenneth Miller
Dr. Timothy Dore, Department of Chemistry
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Lorina Naci
Professor William Paul, Jr., School of Art
Each morning I get up with one word in mind: plastik...
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Dr. Mark Wheeler, Department of Dance  
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Cori Pelletier  
Dr. Roy Grant, Department of Music Therapy  
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Kate Smith  
Dr. Kenneth S. Latimer, Department of Pathology  
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Buudoan V. Tran  
Dr. Karl N. Kirschner, Complex Carbohydrate Research Center  
Dr. Robert J. Woods, Complex Carbohydrate Research Center  
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Dr. Harry Dailey, Department of Microbiology  
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2007 Summer Research Fellowships

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The University of Georgia Honors Program

CURO
Center for Undergraduate Research Opportunities

2008
Summer Research Fellowships

Creating a Culture of Undergraduate Inquiry
CURO Summer Research Fellowships

The Center for Undergraduate Research Opportunities (CURO) awards Summer Research Fellowships to academically talented undergraduates who participate in research during the summer term at the University of Georgia. The number of Summer Research Fellowships varies from year to year, based on funding. Successful applicants receive a financial award of $2,500 or $3000 and present their research at the CURO undergraduate research symposium. (Those students who receive $3000 must use $500 toward presenting their research at a regional or national conference.)

In order to be selected for a Summer Research Fellowship, interested students must have at least a 3.4 GPA, along with thirty hours of UGA credit, and must also be willing to commit to the following:

1. Enroll in two sequential Honors undergraduate research courses: HONS 4960H and HONS 4970H or HONS 4970H and HONS 4980H. (Students who wish to complete a thesis during the summer should check with Dr. Kleiber and their faculty research mentor. If approval is granted, the student will register for HONS 4980H and HONS 4990H.) Students who are awarded the fellowship must register for these classes for the regular summer session before they are eligible to receive fellowship monies. If, during the course of the fellowship, the student withdraws from these classes for any reason, the stipend must be returned in full. CURO Fellows must resign from any other UGA employment to be eligible for funding and may not be enrolled in any other courses. CURO will create 6 hours of Honors research courses for the student in OASIS.

2. Submit an abstract of the summer research to Dr. Pamela Kleiber by the last day of finals of the summer semester, for possible presentation at the annual CURO Symposium the following spring. Fellowship recipients are required to attend the upcoming Symposium, even if their abstract is not selected for presentation.

3. Participate in panel discussions with the Associate Director throughout the year to encourage an appreciation for undergraduate research at UGA.

Students who will be using human subjects in their research must be granted human subjects approval by the Institutional Review Board (IRB) at UGA in order to receive the fellowship. The human subjects application may be submitted to the IRB after the student is selected as a Summer Fellow, but the application must be approved before the student can receive the stipend.

Students who will be traveling internationally as part of their research must complete additional paperwork through CURO and the Office of International Education and are required to purchase travel insurance (approximately $1 per day) through the Office of International Education for their time abroad.
2008 Selection Committee

Dr. E. M. (Woody) Beck, Meigs Distinguished Teaching Professor, Sociology
Dr. Gaylen Edwards, Professor, Physiology & Pharmacology
Dr. Paul Schroeder, Professor, Geology
Dr. Regina A. Smith, Associate Vice President for Research
Dr. Fran Teague, Meigs Distinguished Teaching Professor, English
Dr. Brahm Verma, Professor, Biological & Agricultural Engineering
Chair: Dr. Pamela Kleiber, Associate Director, Honors Program

Special thanks to the sponsors of the 2008 Summer Research Fellowships

Honors Program
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Franklin College of Arts and Sciences
UGA Alumni Association
Jane and Bill Young Scholarship
June 10, 2008

Dear UGA Faculty and Students:

We are delighted and honored to name 33 CURO Summer Research Fellows for 2008, each of whom is featured in this handbook with a summary of his or her faculty-mentored research project. The goal of the CURO Summer Research Fellowships is to provide opportunities for intensive, immersive, faculty-guided research experiences for academically talented undergraduates. The program advances the students’ knowledge and abilities to think critically, solve problems, and contribute to greater understanding of the world.

The CURO 2008 Summer Research Fellowships are funded through the Honors Program, the Office of the Vice President for Research, the Biomedical and Health Sciences Institute, the Interdisciplinary Toxicology Program, the Franklin College of Arts and Sciences, the UGA Alumni Association, and the Jane & Bill Young Scholarship.

We are exceptionally proud of the quality of the contributions of present and past CURO Summer Fellows with the mentorship of faculty researchers and their graduate students. The summer fellowship program has contributed to building a culture of undergraduate inquiry at the University of Georgia, and the CURO Summer Fellows serve as ambassadors who share their enthusiasm and expertise in a variety of professional forums on campus as well as at regional, national, and international meetings.

Please join us in congratulating these young scholars on the occasion of being awarded these prestigious fellowships. Please join us also in thanking the faculty research mentors whose support and guidance are crucial to the CURO Summer Fellows’ success.

Sincerely yours,

David S. Williams
Director, Honors Program

Pamela B. Kleiber
Associate Director, Honors Program
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Multicultural Perspectives on Landscape Change
CURO Summer Research Fellow: Zachary Anderson

Over recent decades, social scientists have begun to research the causes and dynamics of landscape change and land use change. The concept of landscape varies widely among cultures, as do the aspects of landscape that are deemed important or valuable. Ideas about proper conservation practices, resource management, and land rights are all impacted by how local populations view their landscape. The biological environment exists independent of human understanding of it; nevertheless, by living in a place and giving it symbolic meaning, people actively create their landscape (Low and Lawrence-Zúñiga 2003). Because these human-centered processes create landscapes as cultural entities, studies of landscape change must take into account the perceptions and senses of place held by the residents. In addition, knowledge about how residents relate to places can inform land-use decisions and, in particular, restoration policy for environmentally degraded areas (Burley et al. 2007).

People's perception of their landscape is not only shaped by events currently taking place around them, but is a product of memory, stories, and their hopes for the future. The importance of local people's first-hand knowledge and understanding of their landscape has begun to be recognized as a valuable resource in planning for the future and understanding the past (Aswani and Lauer 2006). The goal of this study is to explore individual and community sense of place and perception of landscape change, eventually using this knowledge to work toward improved conservation practices and restoration ecology projects. Of particular interest are the memories of the past, thoughts about the present, and hopes for the future that inform these perspectives. In addition to the main focus of this research, this study will attempt to find out how local people feel about conservation and restoration, and how they would like to see their landscape change in the future.

This research will be undertaken as a multi-sited ethnography conducted in Fiji, New Zealand, and Brazil. In order to approach this research in a holistic way, this study will be theoretically interdisciplinary. Because the need to find and evaluate new methods of studying community’s sense of place in their landscape is a major issue facing social science, this study will use a number of different methods to analyze perceptions of landscape change. The data gathered will be qualitative in nature, focusing on my informants’ ideas and stories, my own reflections and impressions, participant observation, and document analysis. I will use the informal groups that I come into contact with during the course of daily activities as focus groups, and conduct semi-structured interviews. Interview questions will be designed to discover what aspects of the local landscape are salient to the participants and how participants see these aspects changing.

In addition, I have also chosen to use the Photovoice method of photo elicitation to assist in documenting participant’s perceptions of their landscape. The Photovoice concept, developed by Caroline C. Wang and Mary Ann Burris for use in the educational and medical research fields (1992), has only recently begun to be used by anthropologists. It involves giving a camera to someone and having them take pictures relating to the topic being studied. Once the camera is returned, and the photographs are developed, they are asked to explain what is in each picture, and why it is important to them. As interest in landscape and land use change has grown, researchers have also become interested in adopting research methods deemed more participatory (Russell and Harshbarger 2003), Photovoice provides a way for participants to take an empowered position in a study by choosing the topics and places they wish to discuss; which are important to them. Finally, in addition to Photovoice, I will also use satellite imagery, historical photographs, and participatory GIS to assist in focusing conversation on specific topics or areas, and as a method of “ground truthing” (Vajjhala 2006) to compare local perceptions of landscape change with those held by outsiders. In Fiji, a major component of my research will be a participatory GIS project designed to assist local fishermen and landholders in mapping the recently created locally-managed conservation zone and working with them to decided how to best market these maps to “eco-tourists.”

Faculty Research Mentor: Dr. Peter Brosius, Anthropology
Determinants in the Localization of Telomerase to Telomeres

CURO-BHSI Summer Research Fellow: Matthew Belcher

Due to the unidirectional nature of DNA polymerase, linear eukaryotic chromosomes become shorter with each round of DNA replication and cell division. The protective sequences at the ends of the chromosomes, known as telomeres, eventually reach a critically short length causing the cell to go into crisis or senescence. This limits the replicative ability of cells and is thought to be directly linked to aging. In humans, telomeres are synthesized by telomerase, a ribonucleoprotein enzyme with two main subunits, telomerase reverse transcriptase (hTERT) and telomerase RNA (hTR). hTERT uses hTR as a template to add telomeric repeats (TTAGGG) to the ends of chromosomes. In addition to providing a buffer against the loss of important genetic material, the telomeres prevent chromosome ends from being recognized as double strand breaks by the DNA repair machinery.

In humans, telomerase synthesizes telomeres during prenatal development and is inactive in adult somatic cells. However, telomerase is reactivated in over 90% of cancers, immortalizing cancer cells and conferring unlimited capacity to divide. The essential role of telomerase in tumor maintenance has made it a prominent target for the development of cancer treatments. It has been demonstrated that inhibition of telomerase can prevent the proliferation of cancer cells in culture. Thus, understanding essential aspects of the activity of telomerase provides new potential means of telomerase inhibition and cancer treatment. In the work proposed here, we hope to better understand a critical step in the regulation of telomerase activity in cancer cells – localization of the enzyme to telomeres.

In cancer cells, we have found that the activity of telomerase is restricted to S phase of the cell cycle through regulated trafficking of hTR and hTERT. These two subunits are sequestered at sites separate from telomeres throughout most of the cell cycle, and mobilized to telomeres during S phase. The goal of my current research is to understand the mechanism of recruitment of telomerase to telomeres (a process that could be disrupted to inhibit telomerase). Our preliminary studies have revealed that hTR depends on hTERT, and hTERT requires hTR for transport to telomeres (i.e. a co-dependence of the two components). These findings suggest that the two subunits are recruited to telomeres as an assembled complex. In further experiments, we will investigate the domains of hTERT as well as hTR that are necessary for recruitment to telomeres. We will use fluorescence microscopy to assess localization patterns of hTR and hTERT in cellular models transfected with hTR and hTERT mutants. The observed localization phenotypes will help us to determine what portions of hTR and hTERT are necessary for recruitment to telomeres, and better understand essential aspects of the mechanism of this important step in telomerase function. This information may allow development of novel inhibitors to prevent telomerase assembly or recruitment, providing a means to fight a wide variety of cancers.

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Faculty Research Mentor: Dr. Michael Terns, Biochemistry & Molecular Biology
Dr. Rebecca Terns, Biochemistry & Molecular Biology
Uncovering Traditions of the Gothic Style in the Architectural Plans of Saint Germain-des-Prés and Saint Martin-des-Champ in Paris

CURO-OVPR Summer Research Fellow: Mary Elizabeth Blume

Subject of Research: As a recipient of the CURO summer fellowship research grant, I will be enabled to participate in a survey and study of two structures in Paris, France that are of monumental significance to the history of Gothic architecture: the abbey churches of Saint-Martin-des-Champs and Saint-Germain-des-Prés. Though these two structures contain a wealth of information that would undoubtedly enhance the field of art history and particularly contribute to the study and comprehension of Gothic architecture, little information of the churches’ original plans exist, nor has accurate data of their plans been collected to date. My research will focus on collecting such data by means of taking precise measurements of the structures and then converting those measurements into accurate architectural plans using a sophisticated rendering program. Once created, these plans will facilitate further analysis of the monuments that has so far been impossible. The grand scale goal of this project is to utilize the accumulated measurement data and architectural plans to discover in what ways the designs of Saint-Martin-des-Champs and Saint-Germain-des-Prés fill the missing links in the evolution of Gothic architecture. The primary product of my research will be a comparative analysis of the two plans which I will perform in effort to note the similarities and differences of the two churches as well as to uncover trends, conventions, and developments of early-Gothic architectural design.

Significance of Research: Gothic architecture developed in a evolutionary manner, each building being literally built upon the blueprints of past buildings; thus, understanding the designs of early-Gothic structures not only bolsters but forms the very foundation for studying the plans of later structures. The methods and designs of medieval and Gothic architects were largely experiments that often needed revising but occasionally produced innovations that revolutionized Gothic style and architecture at large forever. The knowledge and experience gained by the architects of Saint-Martin-des-Champs and Saint-Germain-des-Prés during their experiments provided the scaffolding for later Gothic masterpieces such as the renowned Cathedral of Notre-Dame, also in Paris. As foundational examples of the Gothic style, access to and apprehension of the two early-Gothic churches’ plans is absolutely essential for a more complete appreciation of their legacy.

Method of Research: My research will begin with a two week field study of the two early-Gothic monuments in Paris, France. During this time I will assist my faculty mentor, Dr. Stefaan Van Liefferinge, in surveying the structures using a Leica TPS800 totalstation to acquire accurate measurements. Upon my return to the United States at the end of May, I will use the retrieved measurements to draw accurate plans to scale with Autocad, a Computer Aided Design software. In addition, I will analyze the plans to determine the evidence each contains about the evolution and conventions of Gothic architecture and to compose a written comparison that will form the framework of a thesis to be written during the subsequent semesters.

Faculty Research Mentor: Dr. Stefaan Van Liefferinge, Art History
Interactions of Bees and Hummingbirds with *Hamelia patens*

CURO-OVPR Summer Research Fellow: Melissa Brody

Coffee, a worldwide commodity for centuries, is to this day a fundamental cash crop of many nations around the world, particularly in Latin America. Traditionally, coffee is grown under a canopy of shade-providing plants that create a beneficial microclimate for coffee plants to grow. Today, these traditional shade-grown coffee plantations maintain high levels of biodiversity of not only plants, but also of migratory birds, arthropods, amphibians, and many other organisms. This high incidence of biodiversity promotes other notable ecological benefits, such as natural pest and insect control, nutrient-rich soil from leaf litter, and a reduction of water runoff. All of these benefits are invaluable to the long-term sustainability of the ecosystem. Furthermore, the increase in productivity of the shade-grown coffee plantations due to their long-term sustainability has strong positive economic implications for small local farmers who depend on coffee as a major cash crop.

In the San Luis Valley of northwestern Costa Rica, where UGA has established a field station, shade-grown coffee plantations are very common, as coffee is one of the top five exports of Costa Rica. Farmers in the area promote biodiversity in their shade-grown coffee plantations by planting *Hamelia patens*, an aesthetically pleasing plant of the family Rubiaceae. This plant attracts bees and hummingbirds with its showy, terminal clusters of bright red flowers. Although the mechanism is poorly understood, bees have been shown to promote greater productivity of the coffee plants through cross-pollination. However, the hummingbirds attracted to large densities of *H. patens* for nectar can create a major problem for the bees. Hummingbirds, famous among birds for their aggressive territoriality, defend large clumps of these plants, supposedly because their nectar is a valuable food resource. My hypothesis is that the aggressive territorial behavior of the hummingbirds reduces bee abundance and diversity, with concomitant reduction in coffee productivity. Conversely, lower densities of *H. patens* may fail to attract bees or hummingbirds, also limiting coffee production.

My overall research purpose is to analyze how the presence of *H. patens* impacts coffee production. My ultimate goal for this study period is to identify the optimal density of *H. patens* that attracts the largest number of bees without eliciting territorial behavior by hummingbirds.

I will conduct my study at the shade-grown coffee plantations adjacent to the UGA Costa Rica campus in northwestern Costa Rica. I will examine the attraction of bees and hummingbirds to *H. patens* plants across a range of densities. Because I will not be in the field during coffee production, I will not be able to directly relate coffee bean production to bee and hummingbird visitation rates. I will however conduct interviews with local farmers to obtain information concerning crop yields as influenced by the presence of *H. patens*.

I will record the number of bee visits at pre-selected flower clusters during the early morning and early afternoon. I plan to identify farms that are within walking distance and that have high, medium or low densities of *H. patens*. Visits by hummingbirds and interactions with bees will also be recorded. In order to experimentally test the dynamics of hummingbird-bee interactions, I will set up a series of hummingbird feeders with sugar water of different dilutions to investigate the idea that hummingbirds will exclude bees from the richest food sources.

Faculty Research Mentor: Dr. Ron Carroll, Ecology
Journalists rarely see poverty as news and very rarely cover it specifically. However, it affects every aspect of life – health, education, crime, business and government. Now that’s news! If journalists knew how to cover poverty, not as an exclusive “vertical” beat but as a “horizontal” and inclusive aspect of separate health, education and crime stories, it may make a difference in the community.

In a research grant supported by the Office of the Vice President of Public Service and Outreach, Grady College of Journalism and Mass Communication faculty John Greenman and Diane Murray will create a training program to increase the coverage of poverty in news, particularly at 14 daily newspapers in Georgia, including the Athens-Banner Herald, located in “persistently poor counties,” as defined by a previous University of Georgia study. Journalists often distort coverage of poverty with bias and don’t illuminate its causes, which can influence public opinion and public policy, according to the research.

I have been invited as an undergraduate research assistant to join the project. I will discover how journalists can relate to the surroundings around them and incorporate it effectively in their stories. My section of the project is, in part, a literature search of sense of place in the community, journalism, and poverty. Currently, there is no recognized connection between these three, and my goal is to identify a realistic connection. I will also interview University faculty with specific knowledge of these areas. Essentially, my hypothesis is determining in counties with persistent poverty whether poverty is an essential element of journalistic sense of place.

The reach of this research is profound. It will establish how Greenman and Murray create a training program to teach journalists at 14 newspapers in the state. Once the program is tested at the 14 sites, the idea is to widen the reach to 30 daily newspapers in North Carolina, South Carolina, Florida, Alabama, and Mississippi through efforts with Auburn University, Florida A&M University, University of Florida, and University of Southern Mississippi.

I have established relationships with the University of Georgia chapter of the Roosevelt Institute, and we have agreed to share literature, research and public reactions to poverty in order to enrich both journalistic coverage of poverty and policymaking efforts within the institute. I have also made connections with Margaret Holt of the Kettering Foundation, which also expresses interest in public journalism and issues of poverty in culture. Both programs support National Issues Forums in order to encourage and collect public opinions on issues such as immigration, education and poverty. Holt has already begun providing me with various articles about poverty, different ideas of community in America, and Webcasts about homelessness and poor lifestyles. By linking a national foundation, a journalism college and a student-run policy organization, the implications of poverty research span far beyond a training program and into the original concerns that poverty coverage affects public opinion and public policy.

I will also be able to work with OneAthens, a local organization committed to change for poverty in Athens-Clarke County, a county with a 28 percent poverty rate – the eighth highest rate in the state and more than double the state’s rate of 13 percent poverty. Because Athens-Clarke County is one of the 14 counties with a newspaper to be used as a training site following this research, the 26,000 residents of the county living in poverty could directly benefit.

Faculty Research Mentors: Prof. John Greenman, Journalism Diane Murray, Public Service & Outreach, Grady College of Journalism & Mass Communication
Long-Range Retrograde Transduction of Trophic And Survival Signals
in Mouse Sympathetic Neurons

CURO-BHSI Summer Research Fellow: M. Logan Davis

Developing vertebrate neurons depend on target-derived growth factors for survival and the proper execution of many physiological functions. The neurotrophic factor hypothesis posits that peripheral tissues produce limited concentrations of growth factors for which neurons must compete. Neurons that fail to acquire enough growth factor die by programmed cell death (PCD), also known as apoptosis, a type of death analogous to that in many neuropathological conditions. The neurotrophins are the best characterized growth factors, typified by nerve growth factor (NGF). Neurotrophins bind to transmembrane receptor tyrosine kinase (Trk) receptors and activate downstream intracellular pathways that result in modulation of gene expression and ultimately survival and growth. Yet, despite decades of research, the precise molecular mechanisms that underlie long-range retrograde signal transduction of survival signals remain unknown.

A well established model, in the sympathetic nervous system, assumes that NGF binds to TrkA receptors on axon terminals followed by the dimerization of ligand-receptor complexes which are endocytosed and retrogradely transported via the microtubule network where they produce survival signals at the cell body. However, studies by Robert Campenot and others give strong evidence in support of a faster signal that does not require internalization of NGF. This argument was facilitated by the advent of a novel culture method that separates the fluid environment of neuron cell bodies from their distal axons. Due to advances in microscience, however, we now have a more useful device which can be used to study long-range transduction of survival signals.

The Jeon laboratory at the University of California at Irvine has developed a unique microfluidic multicompartment device that delivers precise control over the length and direction of axon growth plus the ability to manipulate the microfluid environments of distal axons and neuron soma. This device is also compatible with live cell imaging technology. I will take advantage of this device to work toward elucidating the precise mechanisms of long-range retrograde transduction of survival signals. In this effort, I will focus on current understandings of neuronal PCD to clarify the interaction of pro-survival and death signals.

When neurotrophins are withdrawn from neurons in vitro, they follow a complex series of PCD events that ultimately lead to caspase mediated cell death. A dramatic increase in reactive oxygen species (ROS) takes place soon after onset of apoptosis. However, cells can be rescued by late re-addition of NGF which rapidly suppresses ROS production, evidence of a rapid survival signal. I will begin by plating mouse superior cervical ganglia (SCG) neurons in devices from UCI. Axonal growth will be controlled by micropatterned poly-L-lysine. Cells will be deprived of NGF and exposed to anti-NGF antibody in both somal and distal axon compartments. ROS will be visualized using confocal microscopy and the fluorescent dye DCFDA after 2 h. I expect to see an immediate decrease in ROS production after re-addition of NGF to the distal axon compartment. Controls will be conducted without deprivation of NGF. Based on the lengths of axons and the time of ROS suppression, the rate of movement of the signal can be deduced, which may provide clues as to which molecules are involved in the mechanism. This work will be an extension of my current work which focuses on measuring relative rates of mitochondrial movement in neurons exposed to free NGF and deprived of NGF and could eventually have important clinical ramifications.

Faculty Research Mentor: Dr. James Franklin, Pharmaceutical & Biomedical Sciences
Decision-Making Strategies of Wild Capuchin Monkeys

CURO-OVPR Summer Research Fellow: Rebecca Greenberg

Background: Wild bearded capuchin monkeys (*Cebus libidinosus*) use stone tools (weighing up to one-half their body weight) to crack open hard palm nuts to ingest the kernel. We know that: 1) Individual capuchins differ in proficiency; larger and older animals are more proficient nut-crackers. 2) Nuts of different species differ in their resistance to cracking and that whole nuts are harder to crack than partial nuts. 3) Monkeys prefer heavy stones, which are more effective for cracking tough nuts. 4) Monkeys transport nuts and stones to anvil sites. These findings suggest that the monkeys are faced with decisions about which nuts to crack and which stones to use. I propose to accompany Dr. Dorothy Fragaszy on a six to eight week trip to Piauí, Brazil to study this phenomenon.

Objectives: The primary objective of my study is to gain insight into the decision-making strategies of wild capuchin monkeys cracking nuts. Optimal foraging theory recognizes alternative strategies that individuals adopt in complex foraging circumstances: the animals can maximize payoff, minimize effort, or maximize the reliability of payoff. These different strategies predict different patterns of choice. For example, to minimize effort, individuals should choose lighter stones when cracking partial nuts; to maximize the probability of cracking open the nut they should always choose the heavier stone. My design will evaluate the effects of type of palm nut and weight of hammer stones on choice and proficiency.

Methods: Two 2x2 designs will give the capuchins a choice of two nuts (Experiment 1: whole or partial, Experiment 2: two different nut species) and two stones of same volumes but different masses (800 gm, 1500 gm) at a site where the monkeys come reliably to crack nuts. There are about ten individuals of different ages and sexes whose cracking behavior has been well-documented in the field site, and the primary focus will be gathering data on their choices of nut and stone, and their cracking activity. Data will be coded from video using ethological methods.

Significance: This study will provide insight into the capuchins’ sensitivity to properties of the stones and nuts, as reflected in their choice of materials for cracking nuts. These factors will contribute to understanding these monkeys’ behavior in this special context, and in particular the relation between proficiency and choice.

Faculty Research Mentor: Dr. Dorothy Fragaszy, Psychology
Analyzing the Function of O-GlcNAc in Drosophila

CURO-BHSI Summer Research Fellow: Marcus Hines

My research this summer will focus on analyzing how post-translational modifications of proteins modulate their functions. The specific post-translational modification that I will be studying is the addition of N-acetylglucosamine to serine and threonine residues on nuclear and cytoplasmic proteins. The addition of O-GlcNAc is dynamic in cells and tissues during normal development and in various disease states. For instance, it has been shown that over-expression of O-GlcNAc can lead to such diseases as cancer and type II diabetes. It is difficult to study the functions of O-GlcNAc in whole animals, like mice, because of the severe complications that occur with an absence of it. However, Drosophila provides us with biological tools that we can use to examine the turning on or off of O-GlcNAc. Therefore, we will be using genetic, molecular, and chemical techniques in Drosophila systems to investigate the influence of O-GlcNAc on the development of the nervous system. The long-term goal of this project is to use glycomic and proteomic technologies to analyze the glycans and glycoproteins of Drosophila with altered O-GlcNAc and observe how this alteration affects the nervous system of Drosophila.

We will be using O-GlcNAc transferase (OGT) and N-acetylglucosaminidase (OGA) enzymes to alter the O-GlcNAc present in Drosophila. OGT and OGA are nucleocytoplasmic enzymes that catalyze the addition of GlcNAc moieties to Ser/Thr residues of proteins. Using tissue-specific genetic regulators, we will selectively turn-on and turn-off the expression of these enzymes. We can follow the O-GlcNAc status of the embryo using antibodies that recognize the glycan and the OGT or OGA enzyme. We will use specific markers of neuronal development to assess the state of the nervous system. Various genetic crosses will be set-up to analyze phenotypes that result from altered O-GlcNAc dynamics. Eventually, we will be using glycan analysis and mass spectroscopy to analyze our findings.

The success of this project will provide us with a deeper understanding of O-GlcNAc. This understanding, in turn, will help in the fight to cure diseases like cancer and type II diabetes.

Faculty Research Mentors: Dr. Michael Tiemeyer, Complex Carbohydrate Research Center
Dr. Lance Wells, Complex Carbohydrate Research Center
Scientists have been working for years trying to solve the puzzle of Alzheimer’s disease. Experts say that over 4.5 million people today suffer from Alzheimer’s, and by 2050 there will be over 14 million diagnosed (King 2003). New and exciting findings have opened doors to explore uncharted territories to discover what ultimately causes the neurodegenerative disease of Alzheimer’s.

In a recent study, it was discovered that Alzheimer’s disease in a mouse model can be reversed by a simple mutation (Galvan 2006). The mutation occurs in β-amyloid precursor protein (APP), a large glycoprotein that is often found in neurons. APP is cleaved by γ-secretase to form Aß, which is found in many senile plaques, and AICD (Kinoshita 2002). Alzheimer’s has traditionally been linked to an accumulation of senile plaques. Scientists have long believed that Aß and the plaques were responsible for Alzheimer’s disease, but Galvan’s results modified many of their views. Galvan showed that the second part of the APP might play an essential role in the progression of Alzheimer’s. Expression of AICD in cultured cells induces apoptosis, programmed cell death (Kinoshita, 2002). The Alzheimer’s model mice expressed a form of human APP that causes accumulation of Aß, deposition of plaques, loss of synapses, and loss of memory (Galvan, 2006). In Galvan’s new mouse model, a mutation prevented the APP from being cleaved within the AICD region. The mice that had this mutation did not experience synaptic loss, abnormal behaviors, or memory loss, even though plaques were still present in their brains. The results conclude that in addition to Aß, AICD-dependent processes may also be crucial to understanding the progression of Alzheimer’s.

Galvan’s discoveries have caused scientists to highlight AICD and its functions. AICD’s function in cell death fueled searches for its interactions with other proteins and cellular functions. Fe65 has been found to bind to AICD, and it has also been found to be essential for AICD to function in transcription and apoptosis (Tesco 2005; Cao and Südhof 2001). Cao’s tests showed that transcription dramatically increased when both Fe65 and AICD were present. In tests where AICD was mutated to prevent binding Fe65, transcription was not enhanced. King confirmed that Fe65 actually binds not only to AICD, but also to full length APP. Thus, Fe65 can function to affect release of AICD from APP to cause transcription in the nucleus (King 2003). Since Fe 65 was connected to Alzheimer’s search, the components that interact with Fe65 were then analyzed.

One of the major things that interact with Fe65 is Mena. Mena was found to bind to Fe 65 (Ermeckova 1997). Mena in turn interacts with F-actin, a major component in Hirano bodies. As explained in detail below, my project will explore the interactions of AICD, Fe65, Mena, and Hirano bodies. I will test the hypothesis that Hirano bodies can reduce AICD dependent cell death by using Mena to sequester Fe65 and AICD.
Hirano bodies have been linked to Alzheimer’s disease because they are often found in increased numbers in autopsies of patients with the disease. Hirano originally found the complexes in patients that did not even have senile plaques, yet exhibited neurodegenerative diseases. The Hirano complexes are in cell processes that make synaptic contacts with other neurons. Hirano bodies have been found in the parts of the brain used to make new memories, and they are also found in Pick’s disease, Creutzfeldt-Jakob, and normal aging. They represent alterations in the cytoskeleton and contain F-actin (Hirano 1994). Even though Hirano bodies have been found to be involved in many disorders and in many animals, they have not been extensively studied since they could usually only be observed in autopsy tissue samples.

Other scientists have explored Hirano bodies, but much of their function still remains a mystery. Recent studies have established cultured cell models that allow studies of Hirano bodies in growing cells (Maselli 2003; Davis 2007). These experiments on Hirano bodies have proved that they are not deleterious to cell growth. In fact, they seemed to rescue phenotypes given a mutation in assays under different stresses (Maselli 2003). Mammalian cells with Hirano bodies can crawl on a substrate and grow as well as cells without the Hirano bodies (Davis 2007). The model allows scientists to study Hirano bodies in live cells. Many more experiments are needed to determine functions and purposes of the Hirano bodies.

It is intriguing that AICD is sequestered in Hirano bodies in the hippocampus in autopsy samples of the Alzheimer’s patients (Munoz 1993). This report has largely been ignored until recent discoveries have refocused scientists on the actions of AICD and Fe65.

Imperative to my question, Ha discovered that Hirano bodies serve to protect cells from AICD-induced apoptosis (Ha 2007). Ha looked for AICD and Fe65, and discovered that they were co-localized in Hirano bodies. Further tests showed that Hirano bodies actually hinder AICD-dependent apoptosis and transcriptional activity. Hirano bodies must function in some way to recruit the AICD and Fe65, and they prevent the AICD and Fe65 movement to the nucleus where AICD and Fe65 turn on transcription and induce apoptosis (Ha 2007).

The central goal of my project is to discover how AICD and Fe65 are recruited to the Hirano bodies, and whether this recruitment is required to protect cells from AICD-dependent apoptosis. I hypothesize that Mena is responsible for recruitment of AICD and Fe65 to Hirano bodies, since, as noted above, Mena binds to actin and also to Fe65. First I will try to discover if Mena is present in the Hirano bodies. By using a plasmid that drives expression of Mena-GFP, the sample will show fluorescence in regions where Mena is present. I will then stain the Hirano bodies with rhodamine-labeled phalloidin, and will look for co-localization of Mena-GFP and Hirano bodies. I predict that Mena will be present in the Hirano bodies. To confirm this result, I will use an antibody to Mena. If it is present, I hope to determine that Mena is used to recruit AICD and Fe65 to Hirano bodies. I will use control cells or Mena knock-out cells (Bear 2000, Bear 2002) in which Mena and its relatives have been removed (Bear 2002). Each of these will be made to contain or not contain Hirano bodies by expression of actin binding protein named CT-GFP (Maselli 2003). AICD will be expressed (or not) in each of the four cell types, and the localization of AICD and AICD-dependent cell death will be measured. The design of this experiment and the predicted results are show in Table I. The most important predictions are highlighted in red. This experiment will show if Mena is needed to bring AICD and FE65 to the Hirano bodies. I predict that AICD will not be recruited to the Hirano bodies in cells lacking Mena. Further, I predict that the cells containing both the Mena and the Hirano bodies will survive the best due to Mena bringing the AICD to the Hirano body, which sequesters the AICD and thus protects the cell.

Faculty Research Mentors: Dr. Marcus Fechheimer, Cellular Biology
Dr. Ruth Furukawa, Cellular Biology
Identification and Characterization of a Nuclease that Functions in an RNA-Mediated Viral Defense Pathway (RNAi) in Prokaryotes

CURO Summer Research Fellow: Lindsay Jones

In eukaryotes, a system known as RNA interference (RNAi) provides defense against genome invaders such as viruses. In the eukaryotic RNAi pathway, an RNA nuclease termed Dicer cleaves double-stranded RNAs derived from an invading virus into short (20-25 nucleotide) interfering (si)RNAs. One of the siRNA strands is integrated into an RNA-induced silencing complex (RISC) and through its complementarity to viral sequences, guides the RISC complex to viral target RNAs. An integral RISC nuclease termed Slicer cleaves the viral RNA to prevent expression and limit viral infection.

The eukaryotic RNAi pathway is being intensively investigated not only for its innate biological importance but also for its tremendous potential in biotechnology and medicine. Identification of an analogous pathway in prokaryotes would similarly revolutionize our understanding of prokaryotic biology and open new avenues for development of experimental and anti-microbial tools.

Recent work indicates that an RNA-mediated system for viral defense exists in most prokaryotes\(^1\). The goal of my project is to identify and characterize nucleases involved in this pathway. The results of our initial experiments indicate that a candidate nuclease that we have identified functions analogously to Dicer in generation of siRNAs in the archaean Pyrococcus furiosus. One important aspect of the function of this nuclease is the specificity of the enzyme for cleavage of substrate RNAs, whose sequences differ significantly among species. In order to investigate and understand the recognition of the substrate RNA by this nuclease, I plan to take advantage of the distinct extant enzymes and substrates present in various species. In work that I have begun this semester and will continue through the summer, I will characterize a series of nuclease homologs and RNA substrates from prokaryotic organisms in order to analyze substrate recognition. Homologs of the candidate nuclease from other organisms will be identified bioinformatically. Gene-specific primers will be used in PCR (polymerase chain reaction) to amplify the protein coding sequences. The PCR products will be inserted into an Escherichia coli expression vector that encodes an N-terminal tag. The proteins will be expressed in E. coli and purified using affinity chromatography. The nuclease activity of the purified proteins toward various RNA substrates will be tested using assay conditions developed for the P. furiosus protein and optimized as necessary. Based on our results and sequence comparisons of the proteins and RNA substrates, we will formulate hypotheses about the amino acids and nucleotides involved in recognition, which we will test by site-directed mutagenesis. Ultimately we also hope to obtain structural information on select RNA-nuclease complexes (in collaboration with Dr. Hong Li at Florida State University) that together with my studies will provide a detailed molecular understanding of the recognition of RNA substrates by the nuclease that generates siRNAs in prokaryotes.


Faculty Research Mentors: Dr. Michael Terns, Biochemistry & Molecular Biology
Dr. Rebecca Terns, Biochemistry & Molecular Biology
During my study of algebraic geometry, I have been intrigued by the concept of the Grassmannian, \( \mathcal{G}(k, n) \). This is the set of \( k \)-dimensional planes in an \( n \)-dimensional projective space, \( \mathbb{P}^n \). Gino Fano studied the variety of lines on cubic hypersurfaces, which gave rise to the notion of the Fano variety (Izadi 535). If we let \( X \) be a variety in complex projective \( n \)-space, \( \mathbb{P}^n \), we then define the Fano variety associated to \( X \), \( F_k(X) \), as the variety of \( k \)-dimensional linear spaces contained in \( X \). The Fano variety notion was created as a generalization of ruled surfaces, surfaces through each point of which there passes a line (ruling).

It can be seen that the Grassmannian \( \mathcal{G}(k, n) \) is covered by open sets isomorphic to \( \mathbb{P}^{(k+1)(n-k)} \) (Harris 200). This shows that the Grassmannian is smooth, so its tangent bundle is well-defined. I presented the tangent bundle of the Grassmannian and of a Fano variety for specific examples. The dimension of the Fano variety \( F_k(X) \) is not always known, specifically for some values of \( k \) (Harris 154). We do have an expected dimension for the Fano variety, but this expected dimension is just a lower bound for the dimension.

In the VIGRE Algebraic Geometry Seminar, I presented the notion of the Fano variety. It can be seen that the Grassmannian \( \mathcal{G}(k, n) \) is covered by open sets isomorphic to \( \mathbb{P}^{(k+1)(n-k)} \) (Harris 200). This shows that the Grassmannian is smooth, so its tangent bundle is well-defined. While reading literature for my talk, I discovered that the dimension of the Fano variety \( F_k(X) \) was not always known (Harris 154). We do have an expected dimension for the Fano variety, but this expected dimension is just a lower bound. For example, if we take the Fermat quartic in \( \mathbb{P}^5 \), \( \{(x_0, x_1, x_2, x_3, x_4, x_5) \in \mathbb{P}^5 | x_0^4 + x_1^4 + x_2^4 + x_3^4 + x_4^4 + x_5^4 = 0\} \), the expected dimension is one while the dimension is two. So, as we can see from fairly simple examples that this expected dimension has flaws.

When we classify varieties, the first thing we want to know about a variety is its dimension, so the dimension of the Fano variety is important. That it is sometimes unknown is unsettling. Many other properties are unknown in general, such as whether the variety is irreducible, connected, smooth, or singular. If the expected dimension does not agree with the actual dimension, then the degree is not known. To start to understand these properties, we start with low dimensions and calculate. This may give us a better intuition to generalize to higher dimension. It is an amazing fact that any cubic surface \( C \) in \( \mathbb{P}^3 \) contains exactly 27 lines, making the Fano variety \( F_1(C) \) have dimension 0 and degree 27. Olivier Debarre and Laurent Manivel calculate many of these low dimensional results in their work (11-12). The dimension of the Fano variety of a quadric is known (Harris 293).
A type of machinery that may help us with these properties is stratifications. We start with a hypersurface $V$ in $\mathbb{P}^n$, which is defined by an irreducible homogeneous polynomial $f$ of degree $d$. We can define the dual map $\partial_x V \rightarrow \mathbb{P}^{n-1}$ that maps a point $x$ of $V$ to the partials of $f$ at $x$ (Clemens, Griffiths 302). So $\partial_x(x)$ is the tangent hyperplane to $V$ at $x$. If we add the condition that $V$ is either nonsingular or has at most one ordinary double point, then we may prove that if the Hessian of $f$ is nonsingular at a point $x$ in $V$, then the tangent hyperplane to $V$ at $x$ when restricted to $V$ has an ordinary double point at $x$. Moreover, if we let $L$ be a line in $\mathbb{P}^3$ and further restrict $f$ to be a cubic polynomial, then we can classify the line into three types. Clemens and Griffiths noted that the image of the dual map must either be a nonsingular quadric curve, a projective line and the map is two-to-one, or an isomorphism to a projective line in the smallest linear subspace containing the ordinary double point of $V$ and the map is one-to-one (307). This classification is mutually exclusive and exhaustive. This technique has proven fruitful in other cases, such as planes in cubics (Izadi 542), but has not yet been used to its full potential. I have started an attempt to classify the types of lines in quartic hypersurfaces in order to find a way to look at tangent bundle of Fano varieties.

Using this approach to Fano varieties, I will investigate their unknown properties, as part of the motivating classification problem of varieties. This discipline is important to me as a mathematician because algebraic geometry gives me a lens to comprehend and explore many dimensions, and lets me see mathematics from a new point of view. Bertrand Russell said, “Mathematics, rightly viewed, possesses not only truth, but supreme beauty – a beauty cold and austere, like that of sculpture.” This beauty has captivated me, making me do mathematics, and I feel that this problem has as much beauty as meaning.

References
- Debarre, Olivier and Manivel, Laurent. *Schémas de Fano*, arXiv math-AG/9611033
- Harris, Joe. *Algebraic geometry, a first course* (Springer, Berlin, 1992)

*Faculty Research Mentor: Dr. Elham Izadi, Mathematics*
Imaging of Endogenous Ca\textsuperscript{2+} Waves in Developing Zebrafish

CURO Summer Research Fellow: Jung Woong Kim

The zebrafish has become a model organism for biological sciences due to its large transparent body and fast growth from eggs to larvae during embryonic development. Transgenic forms of zebrafish expressing the cameron fluorescent resonant energy transfer (FRET) calcium indicator are utilized in measuring changes in Ca\textsuperscript{2+} levels to study neural activity in vertebrates. The collaborative laboratory of Dr. Sornborger and Dr. Lauderdale has recently characterized developmentally related calcium waves propagating in the zebrafish hindbrain at 5 days post fertilization (dpf). Calcium waves have also been observed at 1 dpf; however, the spatiotemporal characteristics are different in these early waves.

This summer, I will test how calcium waves in the zebrafish brain change over time as a function of developmental stage. I will perform a series of imaging experiments using the existing transgenic line of zebrafish that express cameron under the HuC promoter (and therefore in all neurons) used in Dr. Sornborger and Dr. Lauderdale’s laboratory. Zebrafish will be imaged daily from 1 through 10 dpf. As part of this project, I will learn imaging and data analysis methodologies such as real-time acquisition of calcium imaging data using a confocal microscope and multivariate statistical analysis techniques. This project should result in a clearer understanding of how these waves behave during development and give potential clues as to their functions.

Faculty Research Mentors: Dr. Andrew Sornborger, Mathematics, Engineering
Dr. James Lauderdale, Cellular Biology

Creating a Culture of Undergraduate Inquiry
My research concerns the investigation of the biopsychosocial variables involved in the etiology, maintenance, and severity of noncardiac chest pain (NCCP) in adolescents. Chest pain occurs in about 1 in 10 school-age children (Garber, Walker, & Zeman, 1991). It is the second most common reason for referral to pediatric cardiologists (Selbest et al., 1988). Of those children evaluated for chest pain, 95% have been found to have chest pain of noncardiac origin (Lam & Tobias, 2001). Currently, the true origin of this pain is unknown in the majority of these cases. However, the contribution of psychological factors has been indicated in anecdotal clinical observations. In addition, there is a small body of empirical research suggesting that psychosocial factors play a prominent role in the etiology, severity, and maintenance of this condition.

In one of the few investigations of the association between psychological factors and chest pain, Lipsitz et al. (2004) compared patients who had been diagnosed by cardiologists 1-3.5 years earlier with either NCCP or innocent murmurs (IM). Neither condition has significant physical health implications. They found current heightened levels of anxiety and anxiety sensitivity in pediatric patients who had been diagnosed with NCCP when compared to patients who had been diagnosed with IM. Further, 62% of those who had been evaluated for chest pain reported that they often or sometimes have current chest pain. In related research, Campo and Fritzsch (1994) found that the most frequent presentation of psychological problems within the pediatric setting may be somatic complaints with no apparent physical etiology, of which chest pain is an example. These patients often interpret and communicate their symptoms as a physical illness and seek medical help (Lipowski, 1988). Familial factors are implicated in the children’s display subjective health complaints, like NCCP. Craig et al. (2002, 2004) studied the children of three groups of mothers including those who had been diagnosed with somatization disorder, had a physical illness, or were healthy. They found that the children of mothers who were somatisers had many more visits to the general practitioner and reported more physical symptoms. It is possible that parental factors also influence chest pain severity and health care utilization for children with these symptoms.

The purpose of the current investigation is to determine the contribution of various child, parent, and familial psychosocial factors to the severity of chest pain symptoms and health care utilization. Two groups of 8-18 year old patients seeking diagnostic services at Sibley Heart Center’s clinics for either chest pain or murmurs will serve as participants. Forty-six patients with each disorder are being recruited. Participants complete the assessment measures used in this study prior to receiving diagnostic feedback. Measures of children’s anxiety, depression, somatization, functional disability, behavioral difficulties, and adaptive behaviors are collected; parental anxiety, depression and somatization; and family history of health conditions will also be collected. Only patients diagnosed with NCCP or IM will be retained in the study.

It is hypothesized that patients with NCCP will show more psychological distress, fewer adaptive behaviors, more parental psychological distress, have more family members with health conditions, and use more health care resources than patients with murmurs. Also, these same psychosocial factors will correlate with chest pain severity and amount of health care usage.

Faculty Research Mentor: Dr. Ronald Blount, Psychology
Since the 2000 census, the Spanish speaking population within Georgia has increased by over 300 percent, resulting in the creation and continued growth of a unique bilingual environment within the state. The project I am currently working on and wish to continue during the summer, examines the linguistic and social results of this developing language setting within Georgia. To conduct this research, I have been gathering data through questionnaires that examine the use and perceptions of the Spanish language in Athens, Georgia. In addition, I have been working on the local level to collect information regarding social factors, such as age, amount of time spent in the United States, country of origin, and social networks, that affect the use and perceptions of Spanish held by native Spanish speakers within Georgia. I also helped design a questionnaire that is currently being distributed among Spanish speaking populations within the city of Athens, Georgia such as the Hispanic Student Association (HSA), the Athens Catholic Social Services, and various English to Speakers of Other Languages (ESOL) groups. The questionnaire first asks respondents to rate their perceptions of Spanish by evaluating the Spanish spoken by their elders, peers, and by themselves on scales of “correctness” and “pleasantness”. The questionnaire also asks respondents to provide information regarding their use of the language in comparison to their use of English in specific social situations, such as the home, church, work, or school.

To conclude my work on the project for this semester, I will statistically tabulate and analyze the results of the distributed questionnaires. With my results, I hope to prove my hypothesis that the most influential factors on the bilingual environment in Georgia are the age and community networks of respondents followed closely by their duration of stay in the United States.

In order to further understand the bilingual climate within Georgia, I propose an expansion of the data collection of this project during the summer to include a larger number of respondents across the state of Georgia. To begin, I will increase the sample size within the city of Athens by targeting not only well-known Hispanic organizations, but also local community centers such as restaurants, neighborhoods, and churches. Furthermore, I will broaden the sample by contacting established Hispanic organizations within the cities of Roswell, Augusta, and Atlanta in order to distribute the questionnaire to members of their populations. I have chosen these sites for their accessibility, large Hispanic populations, and for the opportunity they present to examine the bilingual situation within Georgia from varying degrees of urbanization. Through this extension of target respondents, I will have the opportunity to not only compare results between cities, but also to search for any overlying correlations in an attempt to better understand and document the growing bilingual environment within the state of Georgia. This part of my research will be concluded by a statistical evaluation of the data collected from the questionnaires; through such analysis, I will be able to quantitatively verify the validity of my previous hypothesis.

The ultimate goal of this project is to understand the developing interaction between English and Spanish within the state of Georgia. This is of particular importance since there has been very little research conducted regarding the emerging bilingual situation in the Southeastern region of the United States, specifically within Georgia. However, through continued research, I hope to create a model through which future studies can obtain a broader and deeper understanding of how perceptions and social variables of the emerging Spanish-English language context in the Southeast are affecting not only the speakers, but also the languages themselves.

Faculty Research Mentor: Dr. Chad Howe, Romance Languages
Glycan Interactions and the Development and Spread of Cancer Cells

CURO-Jane & Bill Young Scholarship Summer Research Fellow: Katherine McGlamry

Over the past year and a half, I have worked in Dr. Michael Tiemeyer’s lab at the Complex Carbohydrate Research Center. I have learned the skills of glycan analysis and fly genetics and have been applying these skills to answer important questions related to normal and abnormal cell function. Our analysis is designed to learn how glycan interactions relate to the development and spread of cancer cells. Recently, I have focused on the study of glycoproteins bearing O-linked glycans. This class of glycans is found covalently attached to specific amino acid residues along polypeptide chains and have been shown to be important for many cell-cell interactions. For example, the Notch protein carries a specific O-linked glycan that begins with a Fucose residue. Cell signaling through the Notch protein initiates cell-cell interactions that allow one cell to determine the differentiated state of other cells. This is significant because in cancer cells, Notch interactions are disrupted and cell differentiation is altered. The defective cell then replicates in an uncontrolled manner and the cancer spreads.

My research thus far has focused on working with Drosophila to get a better idea of how glycans influence Notch signaling. Appropriate O-linked glycans are important for the modulation of Notch signaling in both Drosophila and vertebrate cells, connecting the study of Notch signaling in Drosophila to human health. Inappropriate Notch signaling contributes to the pathophysiology of many cancers, so it is imperative to determine what causes the disturbance in the signal. It is known that loss of O-fucosylation of Notch is one way in which Notch signaling can be disrupted. Over the past few months, I have been looking at the O-linked glycans of Drosophila embryos and have discovered novel O-fucose structures that are relevant to Notch signaling. We need to understand how these structures may modulate Notch and have an effect on its function and therefore play a role in cancer production. I have worked with fly genetics to isolate fly embryos that have a mutation in the enzyme that adds Fucose to the Notch protein and will soon be analyzing these proteins to determine how the defect in the pathway effects cell-cell signaling.

With all of the skills I have gained from my past research experiences, I have high hopes for what I would like to accomplish this summer. I wish to conduct highly specific glycan analysis on materials harvested from pancreatic cancer patients to find early markers of the disease. Based on the research I have done on cell-cell interactions, I believe that if I can find indicators of abnormal cell-cell signaling in cancerous cells, this can be used as an early marker of cancer in live human cells. Using my knowledge of O- and N-linked glycan analysis and Notch signaling, I would like to use my time this summer to study the impact of aberrant glycosylation on the interactions between cancerous cells and hopefully help uncover a marker for early stages of cancer.

Faculty Research Mentor: Dr. Michael Tiemeyer, Complex Carbohydrate Research Center
The world is in desperate need of an efficient, clean-burning fuel for sustainability of our society and preservation of the environment. Hydrogen is an ideal alternative fuel because its only combustion byproduct is water. Hydrogen can be biologically produced in a carbon neutral reaction, and it has approximately three times the amount of stored energy per unit mass as gasoline. Although hydrogen is the cleanest and most promising fuel option for the future, the renewable synthesis of hydrogen is not yet well developed nor is it efficient.

Currently, the most common methods of hydrogen production are steam reforming of natural gas and the electrolysis of water, which are nonrenewable and energy intensive, respectively. Enzymatic hydrogen production is preferable to chemical synthesis because an enzyme does not require extreme reaction conditions. Nature has already evolved enzymes that can produce hydrogen. The hyperthermophilic Archaea, *Pyrococcus furiosus*, produces a soluble four-subunit hydrogenase enzyme that metabolizes hydrogen reversibly. To further explore the structure and function of *P. furiosus* soluble hydrogenase I, it was necessary to express the recombinant enzyme in the model proteobacterium *E. coli*. Dr. Michael Adams’ research group at University of Georgia wanted to express an active recombinant hydrogenase for the purpose of engineering modified forms with tailored catalytic activity and electron donor specificity. One obstacle in making an active hydrogenase is the complex processing that occurs in *vivo* to fully assemble the heterotetrameric metalloenzyme. Dr. Adams’ group has recently expressed an active form of recombinant soluble hydrogenase I from *P. furiosus* in *E. coli* (USA patent 61/005,383). This hydrogenase is stable, but oxygen sensitive, so it must be expressed anaerobically. This semester, I compared the specific activities of the native and recombinant forms of this enzyme and found that our recombinant hydrogenase had less than ten percent of the specific activity of native *P. furiosus* hydrogenase.

The future commercial production of hydrogen depends upon our ability to synthesize recombinant hydrogenase more efficiently. Throughout this semester and this summer, I intend to investigate methods for increasing the specific activity of recombinant hydrogenase. The current model system of *P. furiosus* hydrogenase is based entirely on homology to the hydrogenase processing systems in *E. coli*, which may not truly reflect what is happening in *P. furiosus*. It is possible that the activity of recombinant tetrameric hydrogenase is significantly limited due to a difference between the enzymatic processing steps occurring in the native organism versus those occurring in the recombinant bacteria. I plan to examine various processing reactions that may be limiting. Also, although this enzyme has at least one catalytic subunit that is essential for activity, it is suspected that not all four subunits are necessary for the hydrogenase reaction. I will experiment with the expression of different combinations of subunits to determine the simplest configuration necessary for detection of hydrogenase activity. In summary, while in Dr. Adams’ laboratory, I hope to provide a better understanding of the biochemical mechanisms necessary for heterologous expression of active soluble hydrogenase I from *P. furiosus*. This information will allow me to optimize the specific activity of this recombinant hydrogenase through an investigation of various multimeric and monomeric forms of the enzyme and an improvement in the enzymatic processing steps.

*Faculty Research Mentor: Dr. Michael Adams, Biochemistry & Molecular Biology*
Behavioral and Neural Plasticity Following Daily Practice of Saccade Tasks in Schizophrenia

CURO-BHSI Summer Research Fellow: Madison Moore

During my time as a Summer Research Fellow, I would continue my role as an undergraduate research assistant in the lab of Dr. Jennifer McDowell, but I would be taking on several more advanced projects. The main project I would be working on would be an ongoing study whose primary aim is to understand the changes in behavioral performance and brain activity between normal and schizophrenia subjects following practice of an eye movement task. Based on previous data, there is evidence to suggest that while practice may make all subjects better at the task, it may differentially impact brain activity in the two groups. Specifically, I would be analyzing data produced by subjects who participate in a two-week regimen of saccadic eye movement tasks. The eye movements of interest in this study are of two types: 1) prosaccades, or rapid redirections of a subject’s gaze from a center fixation to a peripheral stimulus; and 2) antisaccades, redirections of gaze to mirror image location (same distance, opposite side) of a stimulus, without looking at the stimulus first. The brain substrates supporting performance on these two tasks are similar, but the additional inhibitory component during antisaccades presumably requires recruitment of prefrontal cortex. Previous research from Dr. McDowell’s laboratory has demonstrated that while practicing the same task improves subject performance on that task (i.e. antisaccade performance improves antisaccade performance), practicing the opposite task hurts subject performance on the task in question (i.e. prosaccade practice worsens antisaccade practice). This finding allows for the examination of whether and how the areas of the brain mediating performance on these tasks change over time in both normal and schizophrenia subjects.

In this study, subjects complete a two-week trial during which their prosaccade and antisaccade performance are evaluated three times using fMRI (at baseline, after one week of practice, and after two weeks of practice). Between the fMRI tests, subjects come to the lab daily to practice either prosaccade or antisaccade tasks. I will devote much of my time to collecting, scoring and analyzing the eye movement data from practice sessions, as well as potentially contributing to analysis of the fMRI data. Because inhibitory processes are expected to improve with practice on the antisaccades task, other related measures of inhibition will be measured with an ocular motor version of a spatial delayed-response task (ODRT) and by the Wisconsin Card Sorting Task (WCST). Analysis of this data will also be a focus of my project.

What excites me most about this project is the opportunity to evaluate the data for potential therapeutic benefits to patients with schizophrenia. It has been well documented that schizophrenia patients show significant dysfunction in prefrontal cortex activity during antisaccades. If the hypothesized improvement in antisaccade performance in these patients is seen, it will raise the question of whether this improvement could represent a reversal of this hypofrontality. Such a reversal may extend to other aspects of daily life which require executive functioning and raises the possibility of developing new treatment options for individuals with schizophrenia.

Finally, I will also be helping to pilot a novel antisaccade paradigm. I will have a chance to contribute to designing the study and will have ample opportunity to develop strong independent working skills as I will be largely responsible for running, scheduling, assigning credit to, and scoring data for the participants we recruit from the undergraduate research pool over the summer. This project would also likely continue into my work in fall 2008. Overall, this summer experience would be highly beneficial to my education. Not only would I contribute to projects with worthwhile implications, but I would get to read many relevant research articles and gain valuable exposure to many advanced research techniques.

Faculty Research Mentor: Dr. Jennifer McDowell, Psychology
The Advantage of Weakness: How Weak States Can Overcome Military Might of Strong States

CURO-OVPR Summer Research Fellow: Emily Myers

Since the origins of the first human civilizations, leaders of dominant villages, city-states, and states have employed military conflict as a policy tool in attempts to manipulate their weaker neighbors and adversaries. Sometimes these ventures were successful and the strong state achieved its goals, but sometimes the weaker state managed to thwart its attacker. Data collected by Dr. Patricia Sullivan shows that since 1945, major power states have failed to attain their primary political objective in almost 40% of their military operations against weak states. Dr. Sullivan has primarily focused on the political objectives strong states pursue and the manner in which they use military force in an attempt to attain those objectives. I plan to focus on the weak states that have been the targets of military operations by major power states and those weak states who initiated the use of military force against a stronger opponent. I find this topic to be especially relevant today, in light of the United States’ current conflict in Iraq. Undoubtedly the United States is much stronger than the Iraqi government, or any of the insurgent and terrorist groups within Iraq, yet our occupation there has been long and bloody and some American citizens and politicians are loudly calling for withdrawal. It fascinates me that such an economically and militarily disadvantaged country such as Iraq has been able to halt the progress of a hegemon like the United States, and I am eager to research how this is possible and how it relates to or differs from examples from the past.

Research Questions:

- For what type of political objective do militarily strong states use military force against weaker states? What were the political objectives and motivations of the weaker state?
- Why did the weaker state choose to fight back or even initiate armed conflict against much stronger states? What do weak states think they can achieve by engaging strong states militarily?
- What military and political strategies do weak states employ in an effort to counter the overwhelming material power of strong states?
- What can the leaders of weak states achieve when they fight strong states?

Research Design:

Dr. Sullivan has created an original data set of major power military operations against both state and non-state targets since the termination of World War II. The Military Intervention by Powerful States (MIPS) dataset contains extensive data on all 127 foreign military interventions conducted by China, France, Russia/USSR, the United Kingdom, and the United States between 1946 and 2003. However, the focus of her data collection and analysis has been on the motivations for, conduct, and outcomes of those military operations from the perspective of the strong states. I will use the methodology she has developed to collect data on the motivations, perceptions, and actions of the weak states in the dataset using a range of sources including scholarly studies, newspapers, chronologies of international events, and government and military records. After collecting the data, I will work with Professor Sullivan to conduct statistical analyses and I will write case studies for three or four of the armed conflicts that weak states engaged in against major powers. I hope that this research will reveal any dominant trends or commonalities between resilient or aggressive weak states and shed light on their objectives and motivations.

Faculty Research Mentor: Dr. Patricia Sullivan, International Affairs
As a cast member of the University Theatre production *The Misadventures of Uncle McBuck*, I became exposed to the work of playwright and theatre innovator Augusto Boal. Boal is responsible for an extremely influential set of theatre techniques known as Theatre of the Oppressed, comprised of image theatre, invisible theatre, and forum theatre. Boal began developing these techniques in the 1960s and 70s during times of political turmoil in Brazil and Argentina, intending to bring awareness and dialogue to those oppressed by the socio-political institutions and people in power at that time. Based on his development of these techniques, Boal believes that all people are capable of creating theatre. He also believes that dismantling the barriers between audience and actor is essential to changing the observer to an active participant. For example, in forum theatre, if an audience member feels a character is being oppressed, they can stop the scene and take the place of the character, showing how they would handle the situation.

In invisible theatre, however, separation between actor and spectator is dismantled even further. Boal developed this technique while living in Argentina under a regime that forbid the performance of activist theatre. In order to continue his work, Boal and his colleagues moved their performances to public spaces. Those observing the “scene” did not know that what they were observing was planned beforehand. One classic example of invisible theatre focused on the issue of sexual harassment. One woman (an actor) boards a train, and soon after is verbally harassed by a man (another actor). None of the other passengers on the train intervened in the situation. Over the next few train stops, the harassing man leaves, and another man and two women enter. The women (actors) begin verbally harassing the man (also an actor). This engenders a notable response from regular passengers. Other actors posing as passengers begin to direct the discussion towards this double standard. While the scene may not present a solution to such a problem, it does evoke discussion, and have a strong impact on those observing.

This summer I plan to conduct intensive independent study of Boal’s work, focusing particularly on the invisible theatre technique. I will read several of Boal’s books, including *Theatre of the Oppressed*, *Games for Actors and Non-Actors*, and *The Aesthetics of the Oppressed*. I also intend to research how invisible theatre has been utilized throughout the world and what other scholars have found in working with this performance style. I will then draw on this intensive study in order to organize, rehearse, and perform an invisible theatre piece of my own creation.

This research is very important to developing a better understanding of how theatre can bring focus to social and political issues. The distinctiveness of invisible theatre resides in its public setting. While many theatrical productions center on social change, these are often attended by those who already agree with change that the playwright may be arguing. Invisible theatre brings the performance to a broader audience, instead of waiting for people to come to it. Better understanding of this theatrical technique will provide more opportunities for theatre to address issues and spark an environment of dialogue among everyday citizens of the world.

*Faculty Research Mentor: Prof. George Contini, Theatre & Film Studies*
Worldwide, multiple sclerosis (MS) is estimated to affect 2.5 million people, and in the United States approximately 400,000 people live with MS.\textsuperscript{1} With such a large population of patients who suffer from MS, research dedicated to the development of therapeutic programs that improve the quality of life for MS individuals (MS-I) is both meaningful and worthwhile.

MS is a chronic inflammatory and degenerative disorder that adversely affects the central nervous system (CNS). MS onset is thought to be a genetically influenced autoimmune response, however, the exact origin and early mechanisms of MS development remain unclear.\textsuperscript{2} The principal pathological consequence of MS is the development of demyelinated plaques and subsequent areas of scar tissue (sclerosis) in the CNS white matter.\textsuperscript{2} The damage to axons and support cells in the CNS causes a delay or complete obstruction of neural conduction.\textsuperscript{3} The symptoms of MS stem from the impaired conduction, thus the symptoms of MS are widespread depending on the origin and destination of the affected axons, and the course of the disease in any given individual is fairly unpredictable.\textsuperscript{2}

CNS axonal degeneration alters conduction to muscle tissue creating physical limitations.\textsuperscript{3} MS-I present with numerous physically limiting symptoms, which, in terms of physical function, include muscle fatigue and weakness as well as irregular walking mechanics and poor balance.\textsuperscript{3} Therefore, improving the physical capacities of MS-I remains a crucial area of research. Muscle strength of MS-I can be improved, thereby enhancing daily functional task capabilities.\textsuperscript{2} Although strength gains can occur through neural and/or physiological adaptations, increased strength can be due solely to neurological adaptations.\textsuperscript{4} Flexibility training has been shown improve muscle strength.\textsuperscript{3} For individuals who have physical limitations, e.g., MS-I, this type of training could be more practical than traditional resistance training while still providing functional benefits.

Therefore, this study will be a portion of a much larger multifaceted research project that will determine the effects of a flexibility-training program on the improvement of functional task ability of MS-I through neuromuscular adaptations. To adequately evaluate the outcomes of flexibility training for MS-I, the comparison of neurological function in the muscle tissue between MS-I and non-MS-I must be determined.

The sit-to-stand movement (STS) is a task that is performed many times each day (e.g., standing after using the bathroom.) STS movement has been classified as the most mechanically demanding daily task.\textsuperscript{7} The STS movement is one of the tasks of interest for the overall research project; however, neuromuscular activation and movement mechanics displayed during a STS task is the focus of this study. The purpose of my study will be to compare the pre-therapeutic measurements of neuromuscular activation and movement mechanics exhibited during the STS by MS-I to those displayed by matched controls. It is thought that the MS-I will display lower magnitudes of neuromuscular activation, differing activation frequencies, and decreased functional task ability compared to matched control participants.
Methods: A sample of 5 to 10 MS-I and an equal number of non-MS-I matched control individuals will participate in this study. The controls will be matched to MS-I for gender, age, height, mass, and physical activity. The STS functional task will be performed by each participant for 3 trials. Electrical activation of 7 major muscles of each leg and 1 of the lower back will be obtained using bipolar surface electromyography (EMG). Isometric strength of the legs and back will also be measured. Spatial locations of the lower extremity and lower spine will be recorded using an electromagnetic system.

The root mean square (RMS) and power of frequency content will be generated for the EMG measurements for both the STS and isometric strength test. STS RMS data will be scaled to isometric RMS data. For determining if compensatory movements are performed by MS-I, the peak joint angles and angular velocities of the legs and trunk will be compared to control participant values.


Faculty Research Mentor: **Dr. Kathy Simpson, Kinesiology**
Military Interventions by Powerful States

CURO Summer Research Fellow: Julie Patel

Why are militarily strong states frequently unable to attain their political objectives when they use force against much weaker adversaries?

Dr. Patricia Sullivan, an assistant professor in the Department of International Affairs, has been working on a project that draws on the historical record of major power military interventions to identify the conditions under which militarily strong states are able to attain their political objectives through the use of military force and the factors that limit the utility of force as an instrument of statecraft. I am intrigued by Dr. Sullivan’s project, and I would like to be involved in researching the conditions that are required for a state to achieve its objectives in an armed conflict with another state or a non-state actor like an insurgent or a terrorist group. Over the past five years, she has developed a dataset with extensive data on American, British, Chinese, French, and Russian uses of military force between 1946 and 2003. I would like to work with her this summer to expand the dataset to include military operations by other powerful states like Israel and India.

After identifying the military operations conducted by a given state since 1945, I will gather both qualitative and quantitative data from government and military records, historical case studies, and newspaper reports. I will write synopses of each conflict as well as comparative case studies. In addition, I will work with Professor Sullivan to use the data to test hypotheses about which variables have the greatest effect on a state’s ability to reach its objectives in an asymmetric conflict. One of the explanatory variables that I am most interested in is the resolve that each side has to fight and bear costs for the objective at stake in the conflict. According to Sullivan, “the more vital the interests at stake, whether to the security and prosperity of a nation-state, or to the survival of a political leader, the higher the human and material costs an actor will be willing to bear to secure those interests” (501).

The research data that I collect will help test Sullivan’s theory of asymmetric war outcomes, but I also plan to use the data I gather and the case studies I write to develop an Honors thesis. I hope to learn more about coding qualitative data and using quantitative data to test hypotheses. I am also excited about exploring historical records to learn more about particular uses of military force by powerful countries. Moreover, this research topic has important real world implications. After a careful study and analysis of the military interventions in the past, state leaders and policy makers can look to this information when determining whether or not their state will engage another state militarily.


Faculty Research Mentor: Dr. Patricia Sullivan, International Affairs
Prokaryotic RNA interference (pRNAi) is the term given to a heritable genome defense system involved in protection of prokaryotes from genome invaders, such as phages.¹ The pRNAi system arises from the CRISPR and Cas genes, which are present in forty percent of bacteria and ninety percent of archaea, and is hypothesized to function analogously to eukaryotic RNAi. Non-coding RNAs transcribed from CRISPR operons are thought to function with protein products of Cas genes as part of several distinct ribonucleoprotein (RNP) complexes. As in eukaryotic RNAi, effector complexes guided by component RNAs are thought to recognize and silence foreign nucleic acid. Additional distinct CRISPR-Cas complexes likely function in biogenesis of the CRISPR RNAs and in integration of new RNA-encoding elements into the genome, a novel feature of the prokaryotic system. It is believed that pRNAi has significant potential to be developed for the production of novel nucleic acid-based antibiotics targeting drug resistant bacteria, as well as for experimental manipulation of bacterial gene expression. In addition, the system is being pursued as a means to combat phage infections in industrially important microorganisms. However, the proposed pRNAi pathway is largely based on bioinformatic predictions, and little is known about the hypothetical complexes that comprise the system.

For the past eleven months, I have been intensively involved in a research project to characterize the CRISPR RNA-Cas protein complexes involved in pRNAi in *Pyrococcus furiosus*. The goal of my research project is to identify the RNA-protein and protein-protein interactions that are critical for the organization and function of the complexes. Toward this end, I have recently cloned genes encoding Cas proteins into bacterial expression vectors, expressed the proteins in *Escherichia coli*, and purified the proteins. In the coming months, I plan to perform gel mobility shift and affinity co-purification assays to identify potential RNA-protein and protein-protein interactions, respectively. The proteins that I plan to assay have been identified as components of complexes with other Cas proteins and with specific CRISPR RNA species in *P. furiosus* by other members of our group. I will assay for the ability of a protein to interact with the proteins and RNAs found associated in vivo. I plan to further investigate the molecular basis of any identified interactions by site directed mutagenesis of proteins and RNAs. The proposed studies will provide our first insight into the interactions that are essential to bring together Cas proteins and CRISPR RNAs in the complexes that comprise the prokaryotic RNA interference system.


**Faculty Research Mentors:** *Dr. Michael Terns, Biochemistry & Molecular Biology*
*Dr. Rebecca Terns, Biochemistry & Molecular Biology*
Architecture supplies a physical embodiment of the culture in which it was constructed. When built as a function of an imperial government, architecture visually represents the ideological goals of the state. The location, size, and design of a building or complex reflect the overall goals of a state or particular ruler. Particularly in the Byzantine and Islamic empires, in which architecture was considered a form of propaganda for the state, the construction of new buildings provided an opportunity to communicate a message to one’s subjects. Because construction techniques were not as convenient and efficient during the medieval period as in the modern period, carrying out large-scale projects required time, energy and wealth to sustain the project’s completion. Therefore, constructing monumental buildings and complexes became a symbol of imperial stability, power, and resource availability.

The city of Constantinople, later named Istanbul after Muslim conquest, offered an example of a location in which rulers were forced to design their architectural constructions based on an existing and unchangeable urban plan. The city’s position on the Golden Horn, a peninsula jutting into the Bosporus, prevented outward growth on three sides of the city. Therefore, the amount of available space, particularly on the peninsula, was determined by the construction of previous governments. The practice of constructing buildings on existing foundations was a common one with a long tradition. Both Byzantine and Islamic rulers built on sites of earlier constructions, either out of necessity or to imply dominance over or succession of the previous state.

The construction of churches and mosques in Constantinople/Istanbul by imperial governments also shows the cultural intertwining of secular and religious authority in both Byzantine and Islamic cultures. The use of religious architecture to assert state ideology evidences hazy boundaries between sources of authority. The erection of particular imperial houses of worship regarding specific architectural and spatial design elements that appear in each building reveals not only how a building’s execution fulfills the purpose of the state, but also how the different cultures understood the roles of church and government within the state.

Using primary and secondary sources, I will research and write a paper for presentation at the 2009 CURO Symposium and possible publication in an undergraduate research journal. My paper will explore the explicit connection between ideology and design at Hagia Sophia (built 562), the complex of Sultan Mehmed II (1463-1470), the Bayezid II mosque (1501-1506), the Suleymaniye complex (1550-1557) and the Sultan Ahmed mosque (1609-1616). These houses of worship will serve as examples of how rulers both Byzantine and Islamic manipulated the urban plan of the city of Constantinople to construct buildings that enhance state ideology and eminence. These particular constructions provide especially valuable examples: Hagia Sophia was built as the imperial church during the height of the Byzantine Empire under Emperor Justinian I and remained such until the fall of Constantinople, and the imperial mosques were built in the two centuries following the Islamic conquest of Constantinople in 1453. Therefore, studying these five houses of worship show the changing landscape of Constantinople during years in which imperial control of the city shifted from a Christian to an Islamic state.

Faculty Research Mentor: Dr. Asen Kirin, Art History
Refugees and Internally Displaced People:
How Effective Are the United Nations, Nongovernmental Organizations, and Subsequent Initiatives in Pacifying This Complex Humanitarian Crisis?

CURO Summer Research Fellow: Katie Pyne

Refugees are one of the world’s most vulnerable groups. They are torn from their land by conflict and disaster and many times can never return home. Whether they are outcasts in their own countries or are considered undesirables in foreign lands, these individuals, mostly women and children, face a very uncertain future. The United Nations (UN) estimates that there are over 15 million refugees who crossed international borders to seek safety, and another 22 million internally displaced people in the world.

The number of Iraqi refugees is already over 4 million, and is rapidly increasing every day due to the war. This growing problem needs to be addressed immediately in order to stop this crisis from getting substantially worse, and most importantly, to save those who already find themselves without shelter, family, food or any assurance of legal or personal safety. The aim of this project is to figure out the most directly effective way to address this painfully important issue.

Since the Geneva Refugee Convention and the establishment of the United Nations High Commissioner for Refugees (UNHCR) in 1951, there has been significant institutional development focused on the concern for displaced people. Some argue that these institutions have developed strong ties with policymakers, but it is questionable how successfully these have translated into significant policy impacts, and more importantly into effective relief.

United Nations agencies are constantly creating appeals for funding from governments, initiating talks with prominent state leaders or launching entire operations to help specific countries. In most complex emergencies, host governments either do not exist or are completely ineffectual, so nongovernmental organizations (NGOs) at all levels are a vital component in the UN’s ability to extend relief to those in need. But how effective is this pairing of the UN and NGOs in controlling the number of displaced people in a perilous country, or providing relief for those who already bare the refugee status? What other factors are at work either for or against this humanitarian progress?

We will explore this issue by taking a look at past and current refugee crises, and analyzing the cause-effect relationship between UN and NGO initiatives and the conditions of the particular refugee problem. The four problem areas we will focus on are Palestine, Sudan, Somalia and Burma. Palestinians are the world's oldest and largest refugee population, and make up more than one fourth of all refugees. The Palestinian refugee situation has experienced many different types of approaches to aid, and thus will be an extremely valuable example. According to the UNHCR, the struggle to protect internally displaced people in Darfur, Sudan has proven to be one of the most difficult efforts in the past few years, so analyzing these attempts will be very enlightening. Somalia’s chaotic state and almost complete lack of government presence makes it an area of great interest. Finally, Burma or Myanmar’s unique position and attractiveness to China and other Asian countries also makes it a highly worthy case.

Qualitatively, we will explore the details of many facets of the refugee issue, including policy implementation, area conditions during certain time periods, and aid disbursement. This will be done by a comprehensive analysis of a myriad of sources, such as official UN and government documents, scholarly journals, and reports from international organizations. Quantitative research will be done by using a time-series technique. We will examine the statistical trends of population dispersion and migration in each country, and identify interruptions in the trend. The interruptions will then be connected to the socio-political climate in the given country at that time, and specifically to organizational intervention. The overall goal in employing the combination of both research techniques is to achieve a full understanding of all the factors that affected the trends, and thus arrive at well-founded conclusions that could serve to advise on effective policy for the Iraqi refugee crisis and other emergency humanitarian situations.

Faculty Research Mentor: Dr. Jerome Legge, International Affairs
RSV, respiratory syncytial virus, is the greatest cause of lower respiratory tract disease in young children and infants and is also a major cause of lower respiratory tract illness in all people, especially the elderly and the immunocompromised (Handforth, Ogra, Tripp). RSV mainly causes bronchiolitis in young children and infants but can also cause a wide span of respiratory ailments including pneumonia, bronchitis, upper respiratory tract disease, and several other illnesses (Ogra). No effective or safe vaccine has been developed for combating RSV and few successful treatments exist.

RSV is a single-stranded, negative sense RNA virus in the Paramyxovirus family. The most significant components of the virus are two of its virally encoded surface trans-membrane proteins, the F and G protein. The F protein allows for viral fusion to host membranes and effectively produces protective immunity and neutralizing antibodies to guard the virus from a foreign attack. The G protein also induces some protective immunity and creates some neutralizing antibodies but seems to play a pivotal role in the pathogenesis of RSV disease (Stott, Olmsted, Bembridge).

The central conserved region of the G protein contains a CX3 cell receptor 1 chemokine motif, allowing the G protein to bind to the CX3 cell receptor 1. The G protein is the main attachment protein and binds to cells through heparin binding domains and also to a lesser extent through its CX3CR1 chemokine motif (Teng, Tripp). Several studies have concluded that G protein expression is connected to abnormal inflammatory responses in animal models (Tripp). In several studies, BALB/c mice sensitized with G protein and challenged with RSV develop enhanced pulmonary disease coupled with an increased cellular inflammatory response and pulmonary eosinophilia. In addition, results from other studies of mice infected with wild type or RSV mutant viruses lacking the G genes reveal that the G protein causes enhanced pulmonary inflammation, pulmonary eosinophilia, skewed Th2-type cytokine responses, altered chemokine mRNA expression by pulmonary leukocytes, and higher amounts of pulmonary expression of the pro-inflammatory tachykinin, substance P (Johnson, Tripp, Varga). Many studies infer that the immune deviation caused by the G protein is linked to the central conserved region of the G protein (Hancock, Sparer, Varga).

The specific aims of this research project with Dr. Tripp are to 1) transfet Chinese hamster ovary (CHO) cells with plasmid DNA expressing CX3CR1 under neomycin/G418 selection, 2) confirm high levels of CX3CR1 expression in transfected cells by flow cytometry and western blots, 3) confirm that the G protein and fractalkine, the native ligand, bind to CX3CR1-transfected cells by flow cytometry, 4) determine the strength of the interaction between the G protein and the CX3CR1 cell receptor, and 5) test antibodies to see if they can prevent the interaction between the G protein and the CX3CR1 cell receptor. In this effort, the following reagents will be used: commercially available transfection reagents, such as Lipofectamine®, for transfecting the plasmid DNA, previously developed monoclonal antibodies with known specificities along regions of the G protein, FPLC-purified G protein, and flow cytometry reagents. This project will enormously aid Dr. Tripp’s own studies on developing anti-viral drugs and vaccines. If the G protein can be prevented from binding to the CX3CR1 cell receptor, the body will thus have a much stronger immune response to the virus.

Faculty Research Mentor: Dr. Ralph Tripp, Infectious Diseases
Hirano Bodies, aggregates of actin, have been found in many neurodegenerative diseases, such as Alzheimer’s, Parkinson’s, and Pick’s disease. Actin is a protein that aids in numerous cellular processes. In general actin can be used to aid the microtubule skeleton which provides support to the cell, or it can also be used in locomotion. Originally Hirano bodies could not be studied in vivo, meaning that the function of Hirano Bodies in a living cell could not be observed. However, when Dr. Fechheimer’s lab discovered Hirano Bodies in Dictyostelium, cellular slime mold, an entirely new branch of study became possible. My research has focused on the Effects of Hirano Bodies on the Tau Protein. This research is based on the belief that Hirano bodies will mediate mutated forms of Tau Proteins. However, the point of this research is to search for the truth and one must take into account the possibility that Hirano bodies may not have any effect on the functionality of the mutated tau protein. I have been working under the guidance of Drs. Marcus Fechheimer, and Ruth Furukawa who are affiliated with the University of Georgia Cellular Biology department. Dr. Fechheimer’s lab investigates basic cellular biology questions. Currently the lab is working toward discovering the basic questions that are still unanswered in relation to Hirano Bodies, mainly what is their structure and function.

Dr. Fechheimer, Dr. Furukawa, and I have planned a systematic approach to solving my research problem: Do Hirano bodies mediate the functionality of the mutated tau protein? The first step to this experiment is isolating a control plasmid, β-galactadoise. β-gal will be used to test the transfection rate in the H4 cells that will be used in this experiment. Basically, transfection is the process of inserting a plasmid into a cell, which causes the cell to express the characteristics that the plasmid (circular DNA) codes for. It is important to have a control for the transfection rate because it is necessary to demonstrate that the experimental plasmid’s transfection rate is valid. The experimental plasmid will be obtained from researchers that have already done research with the particular mutations that I am looking to test, R406W and P301L. Currently the plasmids have been obtained from Dr. Brandt from the University of Osnabrück in Germany. Currently the plasmids are being isolated from E. coli in order to transfected them into cells. After isolating the plasmids from the E. coli cells, the experimental plasmid that will express mutated tau will be transfected into two different H4 cell cultures. Since two different experimental plasmids were given, there are a total of four H4 cell cultures. The experimental plasmids will be transfected into cells that are destined to make Hirano bodies as well as cells that are not destined to make Hirano bodies. All four cell lines will be observed for any disparity in behavior. If the cells without the Hirano bodies perform a cellular action but the cells with the Hirano bodies don’t then we will know that the Hirano bodies are in fact mediating the processes of mutated tau. Various methods will be used to test the presence of Hirano bodies in the cells including staining of the Hirano bodies. However, the next question that we must ask is whether the action being mediated will be beneficial or detrimental to the cell. This question may be answered with the very function that the Hirano may or may not mediate. A process that mutated tau has been known to hinder is microtubule binding. If the cells with Hirano bodies do not have any problems with microtubule binding, and cell without Hirano Bodies have many instances of incorrectly, or less efficiently bound microtubules, it would be logical to point out that Hirano bodies were beneficial in that particular case.

The completion of this project will provide us with an answer. Either way, whether the Hirano bodies mediate or do not mediate the tau protein, the experiment will demonstrate what significance the Hirano bodies have on mutated Tau, a protein that is thought to be instrumental in Alzheimer’s disease.

Faculty Research Mentors: Dr. Marcus Fechheimer, Cellular Biology
Dr. Ruth Furukawa, Cellular Biology
Solving the World’s Energy Crisis – Not One Sugar at a Time

CURO Summer Research Fellow: Neeraj Sriram

With the inevitable depletion of the world’s energy supply, there has been an increasing worldwide interest in developing alternative sources of energy. In the recent years, growing attention has been devoted to the conversion of biomass (plant materials and animal waste) into fuel ethanol, considered the cleanest liquid fuel alternative to fossil fuels. According to the article, *Fueling the future of bioenergy* [UGA Research Magazine, fall 2007], “The future of growth of biofuels won’t be in corn ethanol.” Instead, “the consensus opinion is cellulosic ethanol – from wood debris, switch grass, and other abundant sources of cellulose, which is the most plentiful biological material on Earth.” This research project focuses squarely on the conversion of lignocellulosic biomass (a plant biomass composed of cellulose and lignin) to ethanol, thereby diversifying the current fossil-energy based systems for fuel.

The conversion of lignocellulosic biomass to ethanol involves hydrolysis, a chemical reaction where a compound is broken down by reacting with water, leading to a mixture of sugars such as glucose, xylose, arabinose, galactose and mannose. The economic viability of converting biomass to ethanol depends on the yield (quantity of product formed per mass of material input) and productivity (rate at which the product is generated) of the process. In order to achieve high yield and productivity, all the sugars must be fully utilized. Current technology for creation of ethanol neither adequately nor efficiently consumes sugar mixtures.

During fermentation, bacterial strains, specifically *Escherichia coli* (*E. coli*), generally consume the sugars (glucose, xylose, arabinose, galactose, and mannose) in a sequential manner to create ethanol. In an effort to increase the rate of ethanol production, this project will focus on simultaneous consumption of biomass sugars by the *E. coli* rather than on a sequential nature of consumption. To this end, we will focus our efforts on a mixture containing glucose, xylose, and arabinose, because these sugars are found at high concentrations in the biomass. Our reasons for selecting this specific mixture are 1) these sugars are the primary components of decomposed biomass, and 2) sugars such as glucose, xylose and arabinose epitomize the problem of sequential sugar metabolism. The technology we plan to develop relies on the concept of creating strains, where one strain handles each component of the mixture. Our overall goal is to generate three strains, the first of which only consumes glucose, the second strain only consumes xylose, and the third strain uses only arabinose. A glucose-selective strain, for example, will only consume glucose and leave the other components unconsumed.

The construction of any substrate-selective strain requires knocking out or mutating specific genes within the *E. coli* bacteria. For example, a glucose-selective strain would have mutations in *araA* and *xylA* genes, preventing it from consuming xylose and arabinose. Similarly, a xylose-selective strain and an arabinose-selective strain would have mutations in *ptsG manZ glk araA* genes and *ptsG manZ glk xylA* genes, respectively. My plan is to carry out some of the gene knockouts during this spring semester and then have the strains available to run a variety of experiments during the summer. Thus, when all the three substrate-selective strains are placed simultaneously in a fermenter containing the three sugars, each strain will act optimally on their respective sugar and be unaffected by the presence of other sugars or the other strains. With the appropriate process sequence, a hydrolysate of the biomass containing these sugars would have the glucose, xylose, and arabinose consumed simultaneously and effectively to create ethanol.

Therefore, the overall objective of this project is to construct a series of appropriate strains and then demonstrate the fermentation process on simulated and actual hydrolyzed biomass. This process of creating of ethanol from lignocellulosic biomass can be used as a relatively simple solution to address the widespread lack of modern energy around the world.

Faculty Research Mentor: Dr. Mark Eiteman, Biological & Agricultural Engineering
India and China are two countries that are constantly referred to as emerging economies. These two countries are gaining a stronger economy and can potentially become world powers. Both China and India are countries that border each other and are regional powers in Southeast Asia. India’s primary sphere of influence is within South Asia, which is composed of India, Pakistan, Bangladesh, Bhutan, Maldives, Sri Lanka, Nepal, and Afghanistan. China’s primary sphere of influence, on the other hand, is within East Asia, which contains China, Taiwan, Japan, North Korea, South Korea, Vietnam, and Mongolia. As India and China start to expand politically, militarily, and economically, both have begun to exert their influence over Southeast Asia. Southeast Asia consists of Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, East Timor, and Vietnam.

This study seeks to determine how power—economic and political—is used to create influence over other countries in order to establish dominance over a region. The countries that will be used in this study are India, China, United States and the countries of Southeast Asia. India, China, and the United States will, hereafter, be known as the power countries. Southeast Asia was chosen because it is not the primary sphere of influence for any of the power countries. Since China and India are more regional than global, a geographic region close to India and China had to be chosen. The independent variables for the project are the ratio of military power between a power country and a Southeast Asian country, regime type, recent disputes, whether the countries are members of the same intergovernmental organizations (IGOs), the percentage of a power country’s GDP that comes from exports, the percentage of GDP that comes from the production of defense goods, and the percentage of GDP resulting from the production of vital goods. The dependent variables are economic dependence and political dependence. Economic dependence is measured as the percentage of a Southeast Asian country’s GDP that comes from imports that is equal to the amount of trade it conducts with a power country, and the percentage of imports that is equal to vital goods and defense goods. Political dependence, on the other hand, is measured through the number of joint exercises conducted between a power country and a Southeast Asian country, events data, arms transfers from a power country, and similarity in UN voting between these countries.

An understanding of the global and regional power structure will enable influential countries to maintain peace around the world and lower the number of conflicts, current and future. It will also let policymakers consider diplomatic negotiations with a country that has influence over a belligerent nation in order to prevent a crisis or conflict rather than direct confrontation.

Faculty Research Mentor: Dr. Brock Tessman, International Affairs
Can humans act truly randomly? In philosophical debates, a determinist believes that all events are the result of causes, including human actions. For example, when someone is asked to choose a random number from 1 to 10, do they in fact randomly choose, or is there a reason that they choose a particular number based on psychological reasons inherent in the person or certain notions they hold about ‘randomness?’ Philosophical arguments on this matter are often inconclusive given their theoretical foundations. I propose to ultimately study this human notion of randomness, but must first look at what makes something random before conducting experiments with human subjects.

Many computer programs contain pseudorandom number generators. These programs use mathematical algorithms to generate sequences of ‘random’ numbers. These programs generally are based on initial seed values so that given the same initial seed value, the program will produce the same sequence of ‘random’ numbers. This notion of the same random sequence is contradictory, and consequently these sequences are not truly random, but pseudorandom. Platforms and applications that use forms of pseudorandom number generators range from Java and C++ to the more familiar shuffle feature on iTunes.

Numerous different algorithms and techniques exist to produce these seemingly random sequences, and equally many tests exist to verify that these sequences are random, or random enough. Some techniques to generate random numbers include shuffle randomizers, lagged Fibonacci randomizers, or the Mersenne prime twister; some tests to verify the randomness of these sequences include the gap test, the serial test, or the equidistant test. Each algorithm has its own advantages and disadvantages making it better or less suited to certain applications. Through research I will analyze a few of these different algorithms and tests such as those described by Donald Knuth in *The Art of Computer Programming*. To further my understanding of what makes a sequence random or how a random sequence can be produced, I will conduct experimentation with Java’s pseudorandom number generator as well as iTunes’s shuffle feature. I will generate samples of random numbers of varying sizes using these various algorithms and, with the help of Dr. Lazar, compare the results to those expected in statistical distributions of random variables. Further research in following semesters will integrate techniques learned here in analyzing ‘random’ sequences given by human subjects in future experimentation.

*Faculty Research Mentor: Dr. Nicole Lazar, Statistics*
Comparison of RGS Regulation of LPA Signaling in Prostate Cancer and Ovarian Cancer

CURO Summer Research Fellow: Kathryn Turner

Prostate cancer is one of the most fatal types of cancer, and, in the United States, it is the one of the most common types diagnosed among men, where it is estimated that one in 35 will die of prostate cancer. Lysophosphatidic Acid (LPA), a type of phospholipid, is a signaling molecule that induces metastasis, proliferation, migration, and overall survival of the cells by initiating signaling cascades in prostate cancer cells.

LPA affects the cells by directly activating G-protein coupled receptors (GPCRs), a type of transmembrane protein that activates heterotrimeric guanine nucleotide-binding proteins (G-proteins). G-proteins change from their inactive form (GDP) to their active form (GTP) to produce the downstream signal. When the G-proteins stay in the active form, it increases the amount of signal. This is only the start of a long cascade that eventually leads to the activities for which cancer is recognized. The bulk of this pathway is largely unknown, but it is possible that a target for preventing cancerous effects can be found here. Therefore, more about the specifics of the downstream signals should be discovered in order to determine the best way to prevent this outcome.

Regulators of G-Protein Signaling (RGS) proteins act as regulatory devices that deactivate the G-proteins, changing them back from GTP to GDP. We have discovered much about this signaling cascade in ovarian cancer cells, so this project will compare and contrast the pathways in ovarian and prostate cancer cells. Specifically, I will determine the role of RGS function in regulating LPA activation of G-protein signaling pathways in prostate cancer cells. Multiple aims will be used to reach a conclusion.

Aim 1: Demonstrate that LPA signaling in prostate cancer cells is sensitive to RGS regulation. RGS proteins’ sensitivity to LPA will be found by over-expressing the RGS proteins, and looking for a decrease in the pathway signal. Also, we will determine if RGS-insensitive G-proteins increase the signaling cascade. The amount of signal change will be tested by looking at the production of second messengers, specifically cyclic adenosine monophosphate (cAMP), an intermediate in the cascade which has been found to decrease with increasing amounts of LPA signaling. It will also be tested in a similar fashion using inositol phosphates (IPs), a second messenger of the cascade which has been found to increase with increasing amounts of LPA signaling. Proliferation and migration assays will also be used to determine specifics about LPA sensitivity.

Aim 2: Determine if RGS transcripts are endogenously expressed in prostate cancer cells. There are over 30 different isoforms of RGS proteins; therefore, it is necessary to determine which types are endogenously present in the cell. Using reverse-transcription polymerase chain reaction (RT-PCR), it is possible to test which isoforms of RGS proteins are present in the cell as mRNA. It is beneficial to narrow down what types of RGS proteins are active in order to better understand the specifics of how the cascade works and identify potential therapeutic targets.

The results of this experiment will be used to determine efficient ways to prevent the cancerous effect of this LPA signaling pathway. Also, the similarities and differences of the prostate and ovarian cancer cells can be used to provide insight into how diverse this pathway is and if it can be used to learn about other types of cancer as well.

Faculty Research Mentor: Dr. Shelley Hooks, Pharmaceutical & Biomedical Sciences
Among subcategories of schizophrenia, there is evidence that people with the deficit syndrome have a more severe form of the illness. Patients with the deficit syndrome have primary and enduring negative symptoms such as apathy, restricted affect, diminished emotional range, poverty of speech, curbing of interests, diminished sense of purpose, and diminished social drive. They demonstrate more anhedonia (little pleasure) in the absence of depression. Epidemiological studies have demonstrated a higher occurrence of summer births in deficit patients versus winter births in nondeficit patients. Deficit patients show more physical maladies, such as high blood pressure and diabetes, have greater social and occupational dysfunction, and show less response to treatment with antipsychotic medication. There are specific neurological and neuropsychological impairments associated with the deficit syndrome, which suggests a higher degree of disruption of brain function in this group.

One simple and accessible model of functioning in prefrontal cortex circuitry is known as the antisaccade task. Antisaccade eye movements require participants to inhibit a reflexive glance towards a peripheral stimulus in favor of a voluntary glance to the mirror image location of the stimulus (same distance, opposite direction). While people with schizophrenia make many more antisaccade errors with longer reaction times towards the peripheral stimulus, it appears that people with the deficit form of the illness may make the most antisaccade errors.

The purpose of the proposed study is to explore any relationship between poor antisaccade performance and deficit-like symptoms in an undergraduate sample. Antisaccade performance will be measured in undergraduate participants with no previous personal or family psychiatric history. Several measures will be used to assess deficit and negative symptoms. The first is a self-report Schizotypal Personality Questionnaire, which is a 74-item scale corresponding to nine specific subscales of odd and unusual behavior. The second measurement is the Chapman Ratings Scale which is used for the identification of several subcategories of psychosis-like symptoms. The third is the Beck Depression Inventory to assess the presence of depressive symptoms. Blood pressure measurements and birth date information will also be collected. It is hypothesized that people with poor antisaccade performance will show more of the deficit-like characteristics: more negative symptoms (primarily anhedonia), less depression, more summer births, and higher blood pressure.

Between group differences will be evaluated using ANOVAs to compare groups of good and bad antisaccade performance (as defined by the highest and lowest quartiles of the antisaccade performance distribution). Between group comparisons using correlation methods will be conducted between antisaccade performance and the different deficit and negative symptom measures.

Any statistically significant association between higher occurrence of antisaccade error rates and high occurrence of deficit symptoms will be an interesting demonstration of similar psychophysiological characteristics found in a normal population of no psychiatric family history. Such a result would be an invaluable aid in future research in schizophrenia because it would suggest that schizophrenia-risk studies could be done using undergraduate subject pools. Typically, schizophrenia-risk studies identify children with a parent of someone with schizophrenia and they follow the children through the age of risk (a low-yield, time consuming and resource intensive enterprise). Studying schizophrenia-risk in normal subjects who have distinct patterns of scores on critical measures would greatly enhance our ability to research related issues in an unimpaired group.

Faculty Research Mentor: Dr. Jennifer McDowell, Psychology
The field of photochemistry offers the scientific community a fresh new method of studying biological structure and function. Photoremovable protecting groups (PPGs) can be readily applied to biological systems because they can quickly and efficiently release a biological effector with a simple flash of light, enabling the researcher to study how the timing and location of events triggered by messengers, such as nucleotides, neurotransmitters, peptides, drugs, etc., affect cellular function. PPGs that are efficiently cleaved by two-photon excitation (2PE) offer exquisite control over both the space and timing of effector release because 2PE limits release to the precise focal volume of a focused laser. With 2PE, the three-dimensional volume of photorelease can be limited to one fL, roughly the size of a bacterial cell. Conventional single-photon excitation (1PE) requires harmful UV wavelengths, but 2PE utilizes light in the near-IR region of the spectrum. Near-IR light does not cause damage to biological systems and penetrates biological media more deeply. PPGs with sensitivity to 2PE are powerful tools for exploring cellular function.

A number of PPGs have been created to regulate the activity of biological effectors with light, but few possess sufficient sensitivity to 2PE for biological use. Among these compounds, photolabile groups based on hydroxyquinoline (HQ) have shown good 2PE properties (Figure 1). Consequently, others in the Dore laboratory have investigated the photochemistry of a series of 8-substituted HQ analogs (Figure 1: X = Br, NO$_2$, CN). Over the summer, I will work to expand our understanding of how various electron-withdrawing groups affect the properties of HQ by synthesizing the compound ClHQ (Figure 1, X = Cl). The chloride substituent has been chosen in particular because of its electron-withdrawing abilities. By exchanging the bromide in the 8-position of BHQ (Figure 1: X = Br) with the chloride group of ClHQ, the $pK_a$ of the hydroxyl group will be lowered and a larger proportion of phenolate will be present at physiological pH, which is hypothesized to increase the sensitivity to light. Sensitivity is a measure of how effective a compound is at absorbing photons and directing their action to effector cleavage. After ClHQ has been synthesized, its photochemical and photophysical properties will be measured. The characterization of ClHQ will complete the study of HQ analogues and enrich our understanding of how electron-withdrawing groups at the 8-position of HQ-based PPGs impact photochemical parameters.

I plan to synthesize ClHQ by chlorinating the 8-position of a known hydroxyquinoline and building this intermediate to ClHQ-OAc. The acetyl group on ClHQ will simulate a biological effector, and the rate of its photorelease can be compared to other analogues (Figure 1). To characterize ClHQ, I will use MS, IR, $^{13}$C and $^1$H NMR spectroscopy. The photophysical and photochemical properties of ClHQ will be determined by investigating UV-vis and fluorescence spectra, and the values for the uncaging action cross-section ($d_u$) and quantum efficiency ($Q_u$) of ClHQ will be obtained with a Ti:Sapphire laser. The resulting ClHQ data will be compared with other analogous HQ chromophores to gauge how electron-withdrawing groups affect the photochemistry of this class of compounds.


Faculty Research Mentor: Dr. Timothy Dore, Chemistry
Issues in Current Turkish-German Literature

CURO-OVPR Summer Research Fellow: Laura Wynn

My research will focus on literature by Turkish-German authors since the reunification of Germany. I will examine the writings of Zafer Senocak, Feridun Zaimoglu, Emine Sevgi Özdamar and Dilek Güngör and analyze how they address the issues of identity and cultural heritage as Turkish-Germans. I have already examined the works of Dilek Güngör, a Turkish-German journalist and author, and have studied many articles concerning Turkish-German literature by Leslie Adelson, a leading scholar in the field of Turkish-German literature. This year while working under Dr. Kagel as his research assistant, I began researching the issues presented in recent Turkish-German literature, and my work has prepared me to execute this research thoroughly. Based on my previous examinations of this literature, in my research I expect to find that the Turkish-German authors explore the issues of identity and the struggles they face to balance their heritage with their new homeland. Ultimately the outcome of my research will be a presentation at the CURO symposium in the following year, and I ultimately hope to turn this research into a thesis at some point in the future.

Turkish-German issues of identity initiated with the institution of the Gastarbeiter program in 1961, which allowed Turkish workers to assist in the rebuilding of Germany during the post-war economic boom, in which there was a shortage of labor. Although most workers left after a few years, many stayed in Germany, which has caused much political controversy about what rights should be afforded these “Fremder,” or foreigners. During the 1980’s, literature by Turkish-German authors began emerging, and their literature began to attain attention when Emine Sevgi Özdamar won the Ingeborg Bachmann prize in 1991. Since the reunification of Germany, there has been much more literature written by Turkish-German authors, especially as the second generation of Turkish-Germans has come of age. In 2000 Germany broadened its views of citizenship after a long battle fought mainly by the Turkish-German population, and this enfranchisement has led to greater societal acceptance for the group as a whole. The literature written by Turkish-German authors typically involves the ordinary struggles and pleasures of the Turkish-German experience. Through examining recent Turkish-German literature I will be able to attain a sense of the place politically and socially of the Turkish-Germans, especially as depicted through literature, one of the most vibrant forms of expression for a group of people.

When researching the issues in current Turkish-German literature, it is key to have access to as many primary sources so as to obtain the most precise and recent opinions of the authors. While some of these sources are available to me in the United States, it would also be beneficial for me to go to Berlin and be able to find more primary sources in the libraries there, as well as possibly attain an interview with one or more of the authors I intend to study. I hope to be able to speak with Dilek Güngör about her personal experience growing up as a second generation Turkish person living in Germany who has since gained German citizenship.

Examining the issues addressed in Turkish-German literature has become extraordinarily important as the topic of transnationalism has come to the forefront of political and social discussions today, especially in Europe. In my research I intend to look at the Turkish-German literature as a part of this broader transnationalism.

Faculty Research Mentor: Dr. Martin Kagel, Germanic & Slavic Languages
Appendix A

CURO 2007 Summer Research Fellows

Caroline M. Anderson, CURO-OVPR Summer Research Fellow
Dr. John Turci-Escobar, Department of Music Theory
Dr. Max Reinhart, Department of German
A Psychoanalytical Examination of Wolf and Mörike’s Peregrina Songs

Joseph Burch, CURO Summer Research Fellow
Dr. Harry Dailey, Department of Microbiology and Biochemistry & Molecular Biology
Converting Ferrochelatase into a Cytochrome c Like Protein

Amy Burrell, CURO-BHSI Summer Research Fellow
Dr. Debra Mohsen, Department of Biochemistry & Molecular Biology
Analysis of the Transcriptional Expression of Arabidopsis GAUT Genes: 15 Proven and Putative Plant Cell Wall Biosynthetic Galacturonosyltransferases

Lee Ellen Carter, CURO-OVPR Summer Research Fellow
Dr. Fausto Sarmiento, Department of Geography
Ecoregional Conservation Among Indigenous Communities in Cotacachi, Ecuador

Kimberly DeLisi, CURO-BHSI Summer Research Fellow
Dr. Ray Kaplan, Department of Infectious Diseases
Parameters Affecting Fecal Egg Count Data for Determining Drug Resistance in Nematode Parasites of Horses

Joshua Dunn, CURO-OVPR Summer Research Fellow
Dr. William Kretzschmar, Departments of Linguistics and English
The Youth of Roswell Voices: A Linguistic Analysis

Katie Flake, CURO-BHSI Summer Research Fellow
Dr. Maor Bar-Peled, Complex Carbohydrate Research Center
The Arabinose Kinase Project

James Gordy, CURO Summer Research Fellow
Dr. Michael Adams, Department of Biochemistry & Molecular Biology
Developing Methodologies for the Study of Small ORFs in P. furiosus

Jana Hanchett, CURO Summer Research Fellow
Dr. David Schiller, Department of Musicology/Ethnomusicology
Latino and Hispanic Musical Influences on Athens-Clarke County

Laura Harrison, CURO-BHSI Summer Research Fellow
Dr. Corrie Brown, Department of Pathology
Campylobacter in the Crypts

Clare Hatfield, CURO-OVPR Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs
Democracy and the Choice of Law: The Intersections of Shari’ā, Domestic and International Law
CURO 2008 Summer Research Fellowships

Anna Hudson, CURO Summer Research Fellow
Dr. Richard Dluhy, Department of Chemistry
Using Surface Enhanced Raman Spectroscopy for the Detection of Pathogens

Andy Kragor, CURO-Jane & Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center
Dr. Carl Bergmann, Complex Carbohydrate Research Center
Unbiased Isolation and Carbohydrate Mapping of Alpha-Dystroglycan

Brian Laughlin, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center
Functional Analysis of the Magnaporthe grisea Secretome

James MacNamara, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Biochemistry & Molecular Biology
Synthesis of Quinolinol-Based Inhibitors of Rce1p

Prashant Monian, CURO-Interdisciplinary Toxicology Program Summer Research Fellow
Dr. Brian Cummings, Pharmaceutical & Biomedical Sciences
Molecular Inhibition of Independent Phospholipase A2 and its Effect on Prostate Cancer Growth

Neil Naik, CURO-OVPR Summer Research Fellow
Dr. Ruth Harris, Department of Food & Nutrition
The Effect of Antagonizing Stress Receptors in Rats During Repeated Exposure to Restraint Stress

Natalie Nesmith, CURO-BHSI Summer Research Fellow
Dr. Mary Bedell, Department of Genetics
Genetic Studies on the Roles of KITL in Regulating the Proliferation and Apoptosis of Primordial Germ Cells in Mice

Victor Orellana, CURO Summer Research Fellow
Dr. Nicolás Lucero, Department of Romance Languages
Unsung Hero: A Literary and Historical Study of Lautaro

Tulsi Patel, CURO Summer Research Fellow
Dr. Scott Gold, Department of Plant Pathology
Developing a Biocontrol Agent for Chinese Privet, Ligustrum sinense

Tomas Pickering, CURO-OVPR Summer Research Fellow
Dr. Dorothy M. Fragaszy, Department of Psychology
Manner of Hammer Stone Use in Wild Capuchin Monkeys

Cleveland Piggott, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
The Formation of Hirano Bodies

Purvi Sheth, CURO Summer Research Fellow
Dr. Russell Karls, Department of Microbiology
Characterization of Mycobacterium shottsii

Traci Tucker, CURO Summer Research Fellow
Dr. Dawn Robinson, Department of Sociology
Gender and Role Meanings: A Cross-Cultural Comparison
Jessica Van Parys, CURO-UGA Alumni Association Summer Research Fellow  
Dr. David Mustard, Department of Economics  
*Does Writing Ability Signal Academic Excellence?: Evidence from the New Scholastic Aptitude Writing Section (SATW)*

Delila Wilburn, CURO Summer Research Fellow  
Dr. Barbara McCaskill, Departments of African American Studies and English  
*Beauty Imposed*

Karen Wong, CURO Summer Research Fellow  
Dr. Andrew Whitford, Department of Political Science
Appendix B

CURO 2006 Summer Research Fellows

Sarah Breevoort, CURO-BHSI Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
Construction of Three Recpl Mutant Plasmids to Aid in the Characterization of Recpl Enzymatic Activity

Lauren Coffey, CURO Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Susan Fang, CURO Summer Research Fellow
Prof. Christopher Hocking, Studio Foundations

Courtney Grant, CURO-BHSI Summer Research Fellow
Dr. Julie Coffield, Department of Physiology and Pharmacology
An Investigation of Botulinum Neurotoxin Interactions on RhoA Activity Using In Vitro Assays

Erica Hall, CURO-BHSI Summer Research Fellow
Dr. Jessie Kissinger, Department of Genetics

Adele Handy, CURO-UGA Alumni Association Summer Research Fellow
Dr. Greg Robinson, Department of Chemistry

Celan Hardman, CURO Summer Research Fellow
Prof. Joe Norman, Drawing and Painting

Sana Hashmi, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center
Alteration of Alpha-Dystroglycan and Cancer Progression

Brian Levy, CURO Summer Research Fellow
Dr. Larry Nackerud, School of Social Work
Courrie – Not Email: Implications for Government Regulation of a Social Phenomenon. A Case Study of Language in France

Maggie Mills, CURO-NSF/SPIA Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Anna-Marieta Moise, CURO-BHSI Summer Research Fellow
Dr. Andrea Hohmann, Department of Psychology
Neurochemical Basis of Social Defeat in Syrian Hamsters: Role of Endogenous Cannabinoids

Lamar Moree, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center

Jesse Oakley, CURO Summer Research Fellow
Dr. Laurie Fowler, Department of Ecology
Economic Incentives for Private Land Conservation and Sustainable Development: Research into Environmental Policy in Costa Rica and Georgia
Katie Orlemanski, CURO-OVPR Summer Research Fellow
Dr. Patricia Richards, Department of Sociology
Reclaiming “Development” within the Context of Low-Income Neighborhoods

Danielle Pearl, CURO-OVPR Summer Research Fellow
Dr. Keith Langston, Germanic and Slavic Languages
Press Freedom, E.U. Accession, and Democracy in Croatia

Daniel Perry, CURO Summer Research Fellow
Dr. David Landau, Department of Physics and Astronomy

Andrew Pierce, CURO Summer Research Fellow
Dr. Thomas McNulty, Department of Sociology

Richard Piercy, CURO-OVPR Summer Research Fellow
Dr. Cory Momany, Department of Pharmaceutical and Biomedical Sciences

Kurinji Pandian, CURO Summer Research Fellow
Dr. Steven Holloway, Department of Geography
Understanding Public Space in a New Urbanist Development

Mandy Redden, CURO-BHSI Summer Research Fellow
Dr. Robert Arnold, Department of Pharmaceutical and Biomedical Sciences
Towards a More Effective Delivery System for Anti-Cancer Drugs

Eva Bonney Reed, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology

Lisa Rivard, CURO-Toxicology Summer Research Fellow
Dr. Jeff Fisher, Toxicology

Sonia Talathi, CURO-OVPR Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
Effectiveness of Ca2+-Independent Phospholipase A2 Inhibitors in the Induction of Chemotherapeutic-Induced Cancer Cell Death

Erika Vinson, CURO Summer Research Fellow
Dr. Richard Siegesmund, Art Education

Joshua Watkins, CURO Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
The Price of Victory: When Leaders Underestimate the Cost of War

Daniel Weitz, CURO-OVPR Summer Research Fellow
Dr. Gary Bertsch, Department of International Affairs
The Impact of a European Union Nuclear Weapons Free Zone on the International Non-Proliferation Regime

Shannon Yu, CURO-BHSI Summer Research Fellow
Dr. Nancy Manley, Department of Genetics
Appendix C

CURO 2005 Summer Research Fellows

Grace Anglin, CURO-OVPR Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Family Focused Emotion Communication Training

Ashley Beebe, CURO Summer Research Fellow
Dr. James R. Holmes, Center for International Trade and Security
The Influence of Media on Economic Policy in Brazil and Argentina

Ingrid Bloom, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
Differentiation of Human Embryonic Stem Cells into Endothelial Progenitors

Ian Lewis Campbell, CURO Summer Research Fellow
Dr. Glenn Wallis, Department of Religion
Theories of Mythology and the Way That Myths Have Affected Social and Political Formation

Kimberly Coveney, CURO-CIT Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
Role of iPLA2 in Phospholipid Metabolism in Chemotherapeutic-Induced Cancer Cell Death

William Collier, CURO-OVPR Summer Research Fellow
Dr. Amy D. Rosemond, Institute of Ecology
Analysis of an Exotic Species’ Interactions with Native Aquatic Trophic Dynamics: Quantifying the Effects of the North American Beaver (Castor canadensis) on Sub-Antarctic Stream Food Webs in the Cape Horn Archipelago, Chile

John Crowe, CURO Summer Research Fellow
Prof. Mark Callahan, Ideas for Creative Exploration
AUX Launch: Art, Representation, and Commerce on the Web

Katie Griffith, CURO Summer Research Fellow
Dr. Diana Ranson, Department of Romance Languages
Dr. Judith Preissle, College of Education
Assessing Cultural Values and Political Beliefs in a Nicaraguan Classroom: A Participant Observation

Matthew Haney, CURO-CTEGD Summer Research Fellow
Dr. Rick Tarleton, Department of Cellular Biology
Antibody Depletion of Highly Abundant Proteins in Trypanosoma cruzi for the Fine-Tuning of Proteomic Analysis

Ned Hembree, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
Rce1and Ste24 Inhibition by Dipeptidyl Acyloxymethyl Ketones: A Potential Target for Cancer Therapeutics

Alicia Higginbotham, CURO Summer Research Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
Christopher Logue’s Iliad: A Work in Translation
Scott Jacques, CURO Summer Research Fellow
Dr. Mark Cooney, Department of Sociology
The Social Reality of Young, Middle Class Drug Dealers

Lisa Jordan, CURO Summer Research Fellow
Dr. Ruth Harris, Department of Food and Nutrition
The Effect of Leptin on Sympathetic Nerve Activity in White Adipose Tissue

Carey Kirk, CURO-OVPR Summer Research Fellow
Dr. David Z. Saltz, Department of Theatre and Film Studies
The Effectiveness of Drama Techniques in Treating People Suffering from Trauma

Andrew Leidner, CURO-CTEGD Summer Research Fellow
Dr. Pejman Rohani, Institute of Ecology
Coevolutionary Behavior and Interference between Fatal Diseases

Jon McGough, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
The Role of Female Choice in Sexual Selection of Drosophila pseudoobscura

Tatyana Nienow, CURO-BHSI Summer Research Fellow
Dr. Walter K. Schmidt, Department of Genetics
Adapting Yeast for the Study of Pitrilysin and Other M16A Enzymes

Erika Porter, CURO-BHSI Summer Research Fellow
Dr. Charles H. Keith, Department of Cellular Biology
Intrinsic Fluorimetric Imaging of Neural Activation in Cultured Cells and Zebrafish

Kurinji Pandiyan, CURO-CAES Summer Research Fellow
Dr. Raj Rao, Department of Animal and Dairy Science
Dr. Steven Stice, Department of Animal and Dairy Science
Genomic Instability of Human Embryonic Stem Cells

Kelly Proctor, CURO-OVPR Summer Research Fellow
Dr. Lee B. Becker, College of Journalism and Mass Communication
Differences in Environmental Reporting: China and the United States

Rebecca Trupe, CURO Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Family Focused Emotion Communication Training

Russ Richardson, CURO Summer Research Fellow
Dr. Ron Carroll, Institute of Ecology
Sugarcane Processing Waste as a Soil Amendment on Organic, Shade-Grown Coffee under Simulated Drought Conditions for Control of Plant-Parasitic Nematodes

Dustin Williams, CURO-BHSI Summer Research Fellow
Dr. Scott T. Dougan, Department of Cellular Biology
Development of Transgenic Zebrafish to Understand How Activation of Hyal-2 Leads to Tumor Formation

Fei Yang, CURO Summer Research Fellow
Dr. Janet Westpheling, Department of Genetics
Regulation of Branched-Chain Amino Acid Catabolism in Streptomyces coelicor: Applications for Metabolic Engineering of Polyketide Antibiotic Biosynthesis
Stephanie Yarnell, CURO Summer Research Fellow
Dr. Carl Bergmann, Complex Carbohydrate Research Center
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Cara Altimus, CURO Summer Research Fellow
Dr. Jonathan Arnold, Department of Genetics
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Westin Amberge, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
Guided Differentiation of Human Embryonic Stem Cells into Endothelial Cells: Focusing on the Ulex Europaeus Agglutin I Lectin

Namrata Asuri, CURO Summer Research Fellow
Dr. Sidney Kushner, Department of Genetics
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Erin Bohan, CURO-OVPR Summer Research Fellow
Dr. Katarzyna Jerzak, Department of Comparative Literature
The Reconciliation of Selves: The Emigrant Experience in America

Rebecca Brantley, CURO-OVPR Summer Research Fellow
Ms. Ashley Callahan, Georgia Museum of Art
The Early Fashion Design of Mariska Karasz and the Influence of Her Native Hungary

Josef Broder, CURO Summer Research Fellow
Dr. Andrew Sornborger, Department of Mathematics
Techniques in High Noise Image Analysis

Beau Bryan, CURO-BHSI Summer Research Fellow
Dr. Michael Pierce, Department of Biochemistry and Molecular Biology
N-Cadherin Gl

Susannah Chapman, CURO Summer Research Fellow
Dr. Virginia Nazarea, Department of Anthropology
Designing Sui Generis Systems for Traditional Plants and Associated Local Knowledge

Clayton Griffith, CURO-OVPR Summer Research Fellow
Dr. Amy Rosemond, Institute of Ecology
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Christopher Hale, CURO-BHSI Summer Research Fellow
Dr. Thomas F. Murray, Department of Physiology and Pharmacology
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Catherine Hudson, CURO-BHSI Summer Research Fellow
Dr. Harry Dailey, Department of Microbiology and Biochemistry and Microbiology
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Douglas Jackson, CURO Summer Research Fellow  
Dr. Nigel Adams, Department of Chemistry  
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Andrew Leidner, CURO-BHSI Summer Research Fellow  
Dr. Pejman Rohani, Institute of Ecology  
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Janel Long, CURO-OVPR Summer Research Fellow  
Dr. Jean Martin-Williams, School of Music  
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John McWhorter, CURO-BHSI Summer Research Fellow  
Dr. Daniel Colley, Department of Microbiology  
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Gehres Paschal, CURO-OVPR Summer Research Fellow  
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Katherine Price, CURO Summer Research Fellow  
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Shana Strickland, CURO-BHSI Summer Research Fellow  
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Teerawit Supakorndej, CURO-BHSI Summer Research Fellow  
Dr. Michael Terns, Department of Biochemistry and Molecular Biology  

Tendoh Timoh, CURO Summer Research Fellow  
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Dr. Katarzyna Jerzak, Department of Comparative Literature  
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Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
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Tiffany Beal, CURO-BHSI Summer Research Fellow
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
*Determining How Pectins Inhibit Cancer Growth and Metastasis*

Robert Brady, CURO Summer Research Fellow
Dr. Nader Amir, Department of Psychology
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Josef Broder, CURO Summer Research Fellow
Dr. Chi N. Thai, Department of Biological and Agricultural Engineering
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Martha Rose Calamaras, CURO Summer Research Fellow
Dr. Kim Shipman, Department of Psychology
*Emotional Understanding in Abused and Neglectful African-American Families*

Daniel del Portal, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
*The Physiological Role of Hirano Bodies*

Dustin Dyer, CURO Summer Research Fellow
Dr. Guigen Zang, Department of Biological and Agricultural Engineering
Dr. Michael Geller, Department of Physics and Astronomy
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Sarah Fritts, CURO Summer Research Fellow
Dr. John P. Carroll, School of Forest Resources
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Betsy Goodwin, CURO-BHSI Summer Research Fellow
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Patrick Gosnell, CURO Summer Research Fellow
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Luke Hoagland, CURO-BHSI Summer Research Fellow
   Dr. Marcus Fechheimer, Department of Medical Cellular Biology
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Christopher “Kit” Hughes, CURO Summer Research Fellow
   Prof. Mark Callahan, School of Art
   Tagging

Steven Jocoy, CURO Summer Research Fellow
   Dr. Michael Bender, Department of Genetics

Leena Kukkarni, CURO Summer Research Fellow
   Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
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Ashley Neary
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Ngozi Ogbuehi, CURO Summer Research Fellow
   Dr. Mary Alice Smith, Department of Environmental Health Science
   Comparing Apoptosis During Different Stages of Limb Development in Chick Embryos

Melissa Payton, CURO Summer Research Fellow
   Dr. Lillian Eby, Department of Psychology
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John Drew Prosser, CURO Summer Research Fellow
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Ryan Rhome, CURO Summer Research Fellow
   Dr. Jan Westpheling, Department of Genetics
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Susan Ritger, CURO-BHSI Summer Research Fellow
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Dr. Tricia Lootens, Department of English

Ashley D. Chadha
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Emily DeCrescenzo
Dr. Susan Sanchez, Department of Biochemistry and Molecular Biology
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Ivy Forkner
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
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Cory S. Gresham
Dr. James B. Stanton, Department of Pathology
Dr. Corrie C. Brown, Department of Pathology
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Nowell Hesse
Dr. Maor Bar-Peled, Department of Plant Biology
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Dr. Frances Teague, Department of English
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Jeff Halley
Dr. Sheng Cheng Wu, Department of Biochemistry and Molecular Biology
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Peter Harri
Dr. Kojo Mensa-Wilcot, Department of Cellular Biology
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Dr. Robert J. Woods, Complex Carbohydrate Research Center
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2008 Summer Research Fellowships

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CURO Summer Research Fellowships

The Center for Undergraduate Research Opportunities (CURO) awards Summer Research Fellowships to academically talented undergraduates who participate in research during the summer term at the University of Georgia. The number of Summer Research Fellowships varies from year to year, based on funding. Successful applicants receive a financial award of $3,000 and present their research at the CURO undergraduate research symposium. (Those students who receive $3,000 must use $500 toward presenting their research at a regional or national conference.)

In order to be selected for a Summer Research Fellowship, interested students must have at least a 3.4 GPA, thirty hours of UGA credit, and must commit to the following:

1. Enrolling in two sequential Honors undergraduate research courses: HONS 4960H and HONS 4970H or HONS 4970H and HONS 4980H. Students who wish to complete a thesis during the summer should check with Dr. Kleiber and their faculty research mentor. If approval is granted, the student will register for HONS 4980H and HONS 4990H. Students who are awarded the fellowship must register for these classes for the regular summer session before they are eligible to receive fellowship monies. If, during the course of the fellowship, the student withdraws from these classes for any reason, the stipend must be returned in full. CURO Fellows must resign from any other UGA employment to be eligible for funding and may not be enrolled in any other courses. CURO will create 6 hours of Honors research courses for the student in OASIS.

2. Submitting an abstract of the summer research to Dr. Pamela Kleiber by the last day of finals of the summer semester, for possible presentation at the annual CURO Symposium the following spring. Fellowship recipients are required to attend the upcoming Symposium, even if their abstract is not selected for presentation.

3. Participating in panel discussions with the Associate Director throughout the year to encourage an appreciation for undergraduate research at UGA.

Students who will be traveling internationally as part of their research must complete additional paperwork through CURO and the Office of International Education and are required to purchase travel insurance (approximately $1 per day) through the Office of International Education for their time abroad.
2009 Selection Committee

Dr. Wyatt Anderson  Alumni Foundation Distinguished Research Professor, Genetics
Dr. E. M. Beck  Meigs Professor, Sociology
Dr. Katarzyna Jerzak  Associate Professor, Comparative Literature
Dr. Michael Roden  Professor and Department Head, Geology
Dr. Regina Smith  Associate Vice President, Office of Vice President for Research
Dr. Frances Teague  Meigs Professor, English
Dr. Juergen Weigel  Professor, Microbiology
Chair: Dr. Pamela Kleiber  Associate Director, Honors Program

Special thanks to the sponsors of the 2009 Summer Research Fellowships

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UGA Alumni Association
The Jane and Bill Young Scholarship
May 4, 2009

Dear UGA Faculty and Students:

We are delighted and honored to name 26 CURO Summer Research Fellows for 2009, each of whom is featured in this handbook with a summary of his or her faculty-mentored research project. The goal of the CURO Summer Research Fellowships is to provide opportunities for intensive, immersive, faculty-guided research experiences for academically talented undergraduates. The program advances the students’ knowledge and abilities to think critically, solve problems, and contribute to greater understanding of the world.

The CURO 2009 Summer Research Fellowships are funded through the Honors Program, the Office of the Vice President for Research, the Biomedical and Health Sciences Institute, the Interdisciplinary Toxicology Program, the Franklin College of Arts and Sciences, the UGA Alumni Association, and the Jane & Bill Young Scholarship. In addition, a Howard Hughes Medical Institute’s Exceptional Research Opportunities Program (EXROP) participant will join the CURO Summer Fellowship this year.

We are exceptionally proud of the quality of the contributions of present and past CURO Summer Fellows and with the mentorship of faculty researchers and their graduate students. The Summer Fellowship program has contributed to building a culture of undergraduate inquiry at the University of Georgia, and the CURO Summer Fellows serve as ambassadors, sharing their enthusiasm and expertise in a variety of professional forums on campus as well as at regional, national, and international meetings.

Please join us in congratulating these young scholars on the occasion of being awarded these prestigious fellowships. Please join us also in thanking the faculty research mentors whose support and guidance are crucial to the CURO Summer Fellows’ success.

Sincerely yours,

David S. Williams
Director, Honors Program

Pamela B. Kleiber
Associate Director, Honors Program
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Effect of Mono and Divalent Cations On Biofilm Formation In a Prolific Biofilm Forming Strain of *Listeria monocytogenes* Cultured In a Chemically Defined Medium

**CURO-OVPR Summer Research Fellow: Christine C. Akoh**

**Introduction**

Background: *Listeria monocytogenes* is a pathogen of extreme importance to both public health and the food industry. *L. monocytogenes* causes human listeriosis and generally affects pregnant women, the elderly, infants and the immunocompromised (Cohen et al, 1983 and Ostolaza et al, 1995). *L. monocytogenes* forms biofilms on surfaces commonly found in food processing plants (Beresford et al, 2001). Biofilms are surface-associated microbial communities surrounded by an extracellular matrix that consists of polysaccharides, nucleic acids and proteins (Whitchurch et al, 2002). Microorganisms within biofilms are protected from sanitizers and antimicrobials thus increasing the likelihood of survival and the subsequent contamination of food. Cations are thought to be required for bacterial growth and stability (Ordal, 1976); however, there is conflicting information on the effect of cations on bacterial biofilm formation (Phan-Thanh et al, 1997 and Turakhia et al, 1983). Previous studies have suggested that the presence of cations may contribute to effective biofilm formation in some bacteria strains (Turakhia et al, 1983). To date, the role of cations in *L. monocytogenes* attachment and biofilm formation has not been studied.

**Objectives:** The objectives of this study will be to: 1) determine the mono and divalent cation requirements of a prolific biofilm forming strain of *L. monocytogenes* (strain 311) and 2) determine the effect of metal chelators as well as mono and divalent cations on biofilm formation *L. monocytogenes* strain 311.

**Methods:** Biofilms of *L. monocytogenes* strain 311 will be grown on stainless steel chips in a full strength tryptic soy broth (TSB) versus a dilute TSB (1:10). Metal chelators and cations will be added to the media at varying concentrations. Biofilms will be grown overnight at 25°C. Biofilm growth of *L. monocytogenes* strain 311 in the presence of metal chelators and metal cations will be assessed by fluorescent microscopy and the bacterial spread plate method.

**Significance:** This study proposes that cations play a major role in biofilm formation in *L. monocytogenes* and likely will improve the biofilm forming ability of this pathogen. The information obtained from this study will provide insight into the external factors that enable effective and efficient biofilm formation in *L. monocytogenes*. This information can then be used as a tool to formulate effective intervention strategies against this pathogen of extreme importance.

Research Faculty Mentor, Dr. Joseph Frank, Department of Foods and Nutrition
Protein-linked Glycoconjugates as Biomarkers for Cancer or Other Physiological Processes

CURO-Jane and Bill Young Scholarship Summer Fellow: **Sambita Basu**

The objective of the research undertaken is to identify protein-linked glycoconjugates as biomarkers for cancer or other physiological processes such as cell development. The identification of these glycobiomarkers will allow for a better understanding of the role of protein glycosylation in disease progression. The techniques that are currently employed by the student will be continued; optimization of these techniques will be attempted.

Biological samples that consist of cell pellets or organ tissues that are diseased or non-diseased will be obtained from collaborators at the Medical College of Georgia. These colon cancer tissue samples will undergo testing; glycoproteins will be extracted after lipid removal with organic solvents. Two strategies will be followed for the glycomic analysis:

1) Solubilized glycoproteins will be mixed with biotinylated carbohydrate binding molecules (lectins or antibodies) and the bound glycoconjugates will be precipitated with avidin-conjugated beads. Bound glycoproteins will be eluted, then digested with trypsin and subjected to proteomic analysis by LC-MS/MS. Bioinformatic tools such as those developed at the Center for Biological Sequence Analysis (Denmark) or BioInquire Inc (Athens, GA) will be used to identify disease-specific glycobiomarkers.

2) Solubilized glycoproteins will be proteolyzed with trypsin; then the glycopeptides will be subjected to lectin affinity chromatography and the lectin bound glycopeptides will be treated with N-glycanase (for N-linked glycopeptides) or β-elimination coupled to Michael addition (BEMAD) for the analysis of O-linked glycopeptides. The resulting deglycosylated peptides will be analyzed by LC-MS/MS in order to identify the glycosylation sites.

**Faculty Research Mentor:** Dr. Gerardo Alvarez-Manilla, Biochemistry and Molecular Biology, Complex Carbohydrate Research Center
Harry Eugene Crews was born to sharecroppers in Bacon County, Georgia in 1935. He has since become one of the South’s most influential writers, having published 18 novels, an autobiography, numerous essays, and several short stories.

In his introduction to Classic Crews, he wrote, “My compulsive need to look for the edge and live on it has marked me in more ways than I would want to know or try to explain.” Usually styled as the South’s answer to such hard-living authors as Hunter S. Thompson, Charles Bukowski, or Jack Kerouac, Crews has lived on the edge in more senses than one. As an undergraduate, he left the University of Florida after two years, “choking and gasping from Truth and Beauty,” thus inaugurating his uneasy relationship with higher education. Though he would return to complete his bachelor’s degree, earn a master’s in creative writing, and finally to teach, his work initially received little attention from literary scholars. Only in the past two decades has his writing begun to accumulate a significant body of criticism.

Fortunately, the Main Library at the University of Georgia not only houses multiple copies of his books, but the Hargrett Rare Book and Manuscript Library purchased, in 2006, his complete archive of manuscripts, correspondence, interview transcripts, business and legal records, audio/visual media, and other miscellany.

This summer, I plan to read nearly all of Crews’s work and to conduct intensive research in the Harry Crews Collection. I will also read a selection of both his predecessors and contemporaries, focusing, on one hand, upon the authors of the Southern Renaissance, and on the other, upon those producing so-called “grit lit,” fiction that centers upon the daily lives of the poor in the rural and small-town South. My goal will be to put Crews in conversation (literally, in some cases, via his correspondence) with these authors in order to gauge their impact upon his writing as well as the impact of his writing upon a new generation of Southern writers.

I am particularly interested in Crews’s relationship to the Agrarian tradition of Southern literature, specifically the Vanderbilt Agrarians or Fugitives. Crews studied creative writing under Andrew Lytle at Florida, and the Collection contains extensive correspondence between the two. William Faulkner, whom I am currently studying, provides another point of departure. Other potentially influential authors I will read include Robert Penn Warren, Flannery O’Conner, Erskine Caldwell, Carson McCullers, and Eudora Welty. Of Crews’s contemporaries, I plan to read James Agee, Fred Chappell, James Dickey, Larry Brown, Walker Percy, Dorothy Allison, Barry Hannah, and Randall Kenan, though these names may change as I intend to allow my research to guide my reading. By exploring both ends of Crews’s timeline, I hope to better understand his role in the transition of Southern fiction from Agrarian and Modern to Postcolonial, Postmodern, even “Postsouthern.”

In addition to participating in CURO forums and the symposium, I plan to explore in detail one aspect of my study through a thesis to be written this coming fall.

Southern literature takes as its inspiration the gritty and beautiful, backward and progressive, disturbing and serene milieu beneath the Mason Dixon, but its concerns are universal and its innovations remarkable. I hope to contribute to this ever-expanding discourse and to the scholarship that seeks to elucidate the work of one of its foremost practitioners.

Faculty Research mentor: Dr. Hugh Ruppersburg, English
CURO 2009 Summer Research Fellowships

Imaging Masculinity in Contemporary Fashion Photography
CURO Summer Fellow: Corbin Busby

“Fashion photography has made an indispensable contribution to the vitality of modern photographic tradition.” -- Glenn D. Lowry, Director, Museum of Modern Art

In 2004, the Museum of Modern Art mounted an exhibition of photographs with arguably humble origins: editorials in fashion magazines or mass marketed advertisement campaigns. Entitled Fashioning Fiction in Photography since 1990, the exhibit was comprised of over ninety photographs taken by thirteen different photographers. About half of these photographers are typically identified as fine artists, whereas the other are generally described as “commercial professionals.” Provocatively, the visual evidence mounted in the exhibition failed to bear out this distinction. (Kismaric 12)

Curators Susan Kismaric and Eva Respini of the Museum of Modern Art explain that 1990 was the right moment for this exhibit because “the saturation of imagery in contemporary life has become a preoccupation of art. Contemporary commercial imagery is ubiquitous, and the visual strategies used by every kind of photographer have been nurtured by images from countless magazines and newspapers” (Kismaric 12). As many newspaper articles and reviews attested at the time, Fashioning Fiction was a groundbreaking exhibition in the recognition of fashion photography as art. Indeed, in the aftermath of this exhibition, the difference between high and low art, between artistic and commercial is negligible, or even nonexistent. As a result, fashion photography is now being subjected to the kinds of analysis previously reserved for high art, with increasing but still limited numbers of books and articles published on the subject of fashion photographers and their work.

My research will focus on furthering this discussion by focusing on the photography of menswear in both fashion spreads and advertisements. I plan on focusing on designers such as Dolce and Gabbana, John Galliano, and Diesel. These designers are representative of the wide spectrum of men’s fashion including luxury fashion, avant-garde fashion, and street fashion. They consistently develop narratives in their work, and frequently they are daring, controversial, and shocking. The fashion spreads and advertisements created by photographers such as Steve Meisel and Steven Klein regularly question, satirize, and critique traditional values of masculine virility. Androgyny, sadism, and masochism are all tropes that male fashion photography seems to foreground. I plan on focusing on advertisements and editorial spreads that cast male models in effeminate, inhuman, or victimized roles. Ultimately, I will write a paper that discusses the photographer’s challenge of objectifying males and why using tropes that are contrary to mainstream perceptions of masculinity aid the photographer in his/her goal of provoking lust for both the lifestyle and the clothing of men.

With the recognition that this is an emerging area of study with few resources devoted to the topic of fashion photography, and even fewer that focus specifically on menswear. I plan on embarking upon an interdisciplinary study that draws on the fields of queer studies, gender studies, and the history of sexuality. I will, however, always maintain focus on the theories and philosophies of contemporary art history. I will also be able to simultaneously reflect upon the art of an earlier generation of fashion photographers such as Irving Penn, Helmut Newton, Guy Bourdin, and Cindy Sherman. By incorporating a wide variety of studies, I hope to gain an understanding of the objectification and materiality of male in an art form that is based upon selling a lifestyle.


Faculty Research Mentor: Dr. Isabelle Loring Wallace
Canine distemper virus (CDV) causes multisystemic disease in dogs, as well as other carnivorous mammals, worldwide. Canine distemper virus is a member of the genus Morbillivirus in the Paramyxoviridae family; it is closely related to the measles virus in humans and renderpest virus in cattle. Similar to these other morbilliviruses, CDV is highly infectious and is associated with high morbidity and mortality, particularly in young dogs. Viral transmission occurs through inhalation of aerosolized viral particles or through contact with infected nasal and ocular secretions, feces and urine. Initially the virus replicates in lymphoid tissue of the upper respiratory tract followed by spread to the respiratory, alimentary, urogenital, and central nervous systems (CNS). Central nervous system infection leads to inflammation of the brain and spinal cord and demyelination is often a prominent feature. Encephalomyelitis is a common cause of death in naturally occurring CDV infections (Summers and Appel 1994). The introduction of modified live vaccines in the 1960’s significantly decreased the incidence of CDV; however, several cases of vaccine-associated encephalomyelitis have been reported. From 1968 to 1970, two separate episodes of encephalomyelitis occurred in fourteen dogs of varying breeds after administration of CDV/hepatitis virus combined vaccines (Hartley 1974). Although histopathological evidence for CDV existed in those cases, accelerated onset of clinical disease and a unique lesion distribution were suggestive of post-vaccinal versus wild-type disease. Suspected cases of post-vaccinal disease seemingly are associated with minimal viral replication in lymphoid and epithelial tissue, an absence of visceral viral inclusion bodies, and a unique brainstem tropism with a marked number of CNS viral inclusions compared to the typical wild-type infections (Hartley 1974; Cornwell, Thompson et al. 1988). Suspected post-vaccinal infections also have been shown to be limited to the affected host without spread to other susceptible animals in close proximity (Cornwell, Thompson et al. 1988; McCandlish, Cornwell et al. 1992). Although evidence exists for vaccine-induced CDV, it remains impossible to definitively rule out a natural infection acquired in temporal proximity to vaccination. Moreover, molecular evidence that post-vaccinal CDV is a true clinical entity has not been demonstrated conclusively.

Definitive differentiation between vaccine-induced and wild-type CDV infection is important for vaccine development, management of future outbreaks and therapeutic intervention. My research will utilize genetic differences between the wild-type and vaccinal distemper virus to determine the origin of disease in previous cases of CDV infection. Phylogenetic analysis of the hemagglutinin (H), fusion (F) and phosphoprotein (P) genes of CDV typically is utilized to identify and characterize genetically distinct strains of CDV and to differentiate them from vaccine strains (Maes, Wise et al. 2003; Pardo, Johnson et al. 2005). Such analyses have been utilized to distinguish several wild-type strains from the three most common vaccine strains of CDV (Onderstepoort, Rockborn and Snyder Hill), but they have not been utilized to confirm the presence of vaccinal nucleic acids in clinical cases of CDV. In this study, reverse transcriptase (RT) PCR will be used to amplify several small fragments (<150 base pairs) from each of the H, F and P genes from seven commercially available vaccines and culture isolates of wild-type and vaccine strains of CDV.

At the University of Georgia College of Veterinary Medicine, formalin fixed, paraffin embedded brain and spinal cord tissues are available from cases of suspected wild-type (> 30 cases) and vaccine-associated CDV encephalomyelitis (15 cases). RNA will be extracted from these neural tissues and the developed RT PCR assays for the H, F, and P gene fragments will be applied. Sequence alignment and phylogenetic analysis will be used to compare the amplified gene segments, which also will be compared to known published sequences. These analyses should identify regions of genetic variability between wild and vaccinal CDV strains that should allow for definitive discrimination between natural and post-vaccinal CDV encephalomyelitis.


Faculty Research Mentor: Dr. Scott Schatzberg, Veterinary Medicine
Charting the Oppression of Minority Groups through Southern Gothic Literature

CURO Summer Fellow: Charles Ginn

The southern gothic movement in American literature is a movement characterized by its heightened sense of reality and grotesque characters, who are subjected to the stifling atmosphere of life in the south. The crumbling landscape of the post Civil War era provides the setting for readers to vicariously experience horrifying realities. However, at its core, the genre contains progressive social commentary that explores the injustices that minorities such as African Americans, women, and homosexuals fell victim to during this period. The portrayal of such marginalized groups illustrates the intense struggle that these minorities experienced during a time of racial and social prejudice. Therefore, this project will endeavor to determine the role that southern gothic literature had on exploring and exposing the oppression of African Americans, women, and homosexuals in the south. Furthermore, this research will investigate how reactions to these fictional works are manifested, throughout the south, in relation to these minority groups. As a result, this research will provide further knowledge of the role that literature of the southern gothic movement had in exposing the struggles that African Americans, women, and homosexuals experienced, respectively.

Throughout this research, the significance of oppression in southern gothic literature will be the central focus. Early southern gothic fiction provides us with rich insight because it presents illustrations of oppression prior to revolutionary civil rights movements. This research will draw on diverse reactions to authors of the southern gothic movement, and to the marginalized groups portrayed in their works. In *The Heart is a Lonely Hunter* by Carson McCullers, Dr. Copeland, Mick, and John Singer represent three characters whose ambitions and desires are crushed by societal implications. Their experiences of oppression typify the struggles that African Americans, women, and homosexuals experienced throughout the south. In turn, this research will charter the correlation between fiction and actual historical accounts. Consequently, this research will provide for a greater understanding in regards to how southern gothic literature highlighted the inequitable treatment that minority groups in the south received.

This research project will take a literary and historical approach in order to become well versed with the works of southern gothic fiction, and to possess a thorough understanding of the societal implications during the early twentieth century. This research will involve an exhaustive examination of southern gothic fiction by a wide variety of authors who comprise the genre. The works of Carson McCullers, Flannery O’Connor, William Faulkner, and Tennessee Williams, as well as others, will be the focus of a thorough survey of the southern gothic movement. In addition, this research will conduct an analysis of both primary and secondary sources in order to determine the reactions to these works. Through this process, the research will view the southern gothic movement through different perspectives in order to ascertain a greater comprehension of the realities of oppressed groups in the south.

Faculty Research mentor: Dr. Hugh Ruppersburg, English
Patients with schizophrenia often have difficulty with behaviors requiring executive functioning, such as inhibition, planning, and certain types of memory. These symptoms are thought to be due to the fact that schizophrenics have decreased prefrontal cortex activity (hypofrontality). The goal of the project that I would be working on in Dr. Jennifer McDowell’s laboratory in the Department of Psychology is to understand the changes in behavioral performance and brain activity in schizophrenic and normal subjects alter practice of eye movement tasks. In this study, subjects will be performing two types of eye movement tasks: prosaccades (rapid redirections of gaze from a center fixation to a peripheral stimulus) and antisaccades (rapid redirections of gaze from a center fixation to a mirror image location of a peripheral stimulus after inhibition of a glance to the cue itself). Similar brain areas are activated during these tasks, but prefrontal cortex activity is greatly increased during antisaccades. This increase is likely due to the fact that the prefrontal cortex is required for participants to be able to inhibit glancing towards the stimulus.

During the study, the participants’ eye movement performance will be tested in the fMRI three different times (at the beginning of the trial, after one week of practice, and after two weeks of practice). Between brain scan sessions, participants will be assigned to practice either prosaccades or antisaccades daily. Previous research has shown that practicing a task improves performance on that task (i.e. practicing prosaccades improves prosaccade performance), but practicing the opposite task worsens performance (i.e. practicing antisaccades worsens prosaccade performance). These changes in performance also coincide with changes in neuronal circuitry. This study will examine these changes and compare them across the two groups.

One hypothesis of this study is that the participants who practice antisaccades should show improvement on the antisaccade task itself and on related measures of inhibition as assessed by an eye movement version of a spatial delayed-response task (ODRT) and by the Wisconsin Card Sorting Task (WCST). These participants should also show increased prefrontal cortex activity. Another hypothesis is that if the participants with schizophrenia show an increase in prefrontal cortex activity, then some of the symptoms associated with hypofrontality should decrease. If the data supports these hypotheses, then the results could be used to develop new treatment options for patients with schizophrenia.

As a Summer Research Fellow, I would continue to collect, score, and analyze eye movement data for the study, as well as analyze the results of the ODRT and WCST. In addition, since the project is nearing its completion, I will help with the statistical analyses of the pre-, mid-, and post-test behavioral data. Importantly, the uninterrupted time that I could allot during the summer would allow me to learn how to work with the fMRI data. Although I have been trained to help with data collection in the fMRI environment, working with the analysis of that data requires a commitment at a different level than can be met by the 12 hours that I expend during my 4960H. The Summer Research Fellowship would allow me to concentrate my efforts on this process for an extended period, thus providing one of the few ways possible to gain this interesting experience.

Faculty Research Mentor: Dr. Jennifer E. McDowell, Psychology
The Development and Implications of Predictive Modes of Thought from the Renaissance to Modernity

CURO-OVPI Summer Fellow: Dillon Horne

In high school, I was involved in a debate as to whether certain words act as “gate-keepers” to an esoteric body of knowledge, and at what point could entry to this field be granted. Extrinsic factors showed me that knowledge is ambiguous and there is a limit to the faith that can be placed in its convictions. Furthermore, debate revolves around causal relations. I was constantly presented with a series of predictions grounded in different epistemological backgrounds. In a world so guided by these numbers, what is their credibility? This project stems from the skepticism resulting from my experience with debate. I seek to examine the history of mathematics and philosophy behind modern probability theory.

The human obsession with planning, and hence, order, has driven the development of predictive modes of thought. The demand for coherence and subsequent refusal of a non-causal universe implies that human beings find necessity in space free of chance. From the introduction of astrology, in which the positions of the stars dictated daily fortunes to what day death’s shadow will be cast, to modern day statisticians, in which numbers guide recommendations, individuals have used these systems to structure an otherwise random existence. The institutionalization of these methods, backed by figures of authority, has added reinforcement to these ideologies.

I shall focus on the development of predictive modes of thought, from the astrology of the Renaissance to modern probability theory, and the implications of these two schools of thought. I will begin with a focus on the 16th century figures of Gerolamo Cardano and Giordano Bruno and their respective contributions to scientific knowledge. Cardano in particular holds special significance in this dialogue due to his early dealings with game theory, giving rise to key precursors of modern concepts of probability. Moreover, the esoteric nature of the topic at hand demands an introspective analysis into what constitutes ‘secret’ information and how the dichotomy between esoteric and exoteric knowledge can be bridged. For this question, I will turn again to Cardano and his attempt to solve the ‘cubed-problem.’ His perspective concerning knowledge arose from an inter-disciplinary focus, in particular with game theory, medicine, philosophy, and astrology, thus giving him the necessary language to disseminate knowledge on a large-scale. Concerning Bruno, I intend to highlight his involvement with the hermetic tradition and how that involvement led to his death sentence by the Catholic Church. Essentially, it was due to the esoteric society he was a part of that placed renewed interest on Gnosticism and mysticism. This story shows the sharp divide between the esoteric and exoteric world, and how the two can violently come into contact with each other.

From there I shall move on to a brief overview of the correspondence between Fermat and Pascal, but with a larger emphasis on Ian Hacking’s concept of probability as an emergent concept rather than an epochal shift. The importance of this correspondence is that it made possible the idea of statistically predicting the future. The two scholars deal with the ‘problem of the points,’ that is, how to determine the most likely outcome of a chance game. This ties back into Cardano’s earlier work with game theory. With Hacking, I will focus on his work concerning the ‘signs’ of the low sciences that served to make predictions reliable, shifting from there to Pascal’s wager and how that signaled the introduction of probability-based decision making. This leads into modern studies of economics, governmental policy, etc.

This project will build upon other works of history of philosophy and mathematics by providing a more comprehensive focus on what exactly is probability and how it came to be. In a world so caught up in numbers, the significance of an encompassing study on the development of probability will serve to provide a basis of credibility for acting on predictions.

Faculty Research Mentor: Dr. Thomas Cerbu, Comparative Literature
Re-examine Alternative Editing and Understanding the Protein Diversity in *T. brucei*

**CURO Summer Fellow: Tiffany Hu**

*Trypanosoma brucei* (*T. brucei*) is the causative agent of African trypanosomiasis, a tropical disease that affects humans (Human African trypanosomiasis) and non-primate mammals (Nangana). This disease is spread by a bite from the insect vector tsetse fly (*Glossina sp.*). Human African trypanosomiasis, also known as African sleeping sickness, develops in two stages. The parasite crosses the blood-brain barrier into the central nervous system in the second stage, with symptoms involving confusion, poor coordination, and the characterizing disturbance of the sleep cycle, for which the disease is named. Trypanocidal drugs have been developed to combat the disease, but most are becoming less effective, outdated, highly toxic and scarce. Efforts toward understanding trypanosome biology and developing new drugs must be made to fight this disease.

The *T. brucei* life cycle alternates between mammalian and insect hosts. Energy metabolism is developmentally regulated to cope with the demands of the two drastically different environments. Cytochrome-mediated respiration occurs in the insect (procyclic) developmental stage while the mammalian-form (bloodstream) is restricted to glycolysis [1]. Some components of the electron transport chain are encoded by the kinetoplast, which is housed in the organism’s mitochondria. This highly ordered structure is a catenated network of DNA maxi- and minicircles [2]. The coding information for the maxicircle genes is often incomplete and mostly undergoes post-transcriptional modification to produce functional mRNAs [3]. *T. brucei* mitochondrial RNA editing, which is guided by the minicircle encoded guide RNAs (gRNAs), is a process where the cryptic mRNAs are made functional by uridine insertion and deletion [4]. A prime example of this is the cytochrome oxidase subunit III (COXIII) mRNAs. These transcripts are abundant and extensively edited in both forms and suggest an alternative function of COXIII mRNA editing in *T. brucei* [5]. More recently, the Hajduk lab has identified an alternatively edited transcript from this diverse pool of COXIII mRNAs which contained a long reading frame and coded for a protein that contained a unique hydrophilic amino-terminal domain and a carboxyl terminus that is identical to COXIII [6]. Alternatively edited protein-1 (AEP-1) is a 49kDa protein that localizes to the mitochondria of bloodstream-form *T. brucei*. Immunofluorescence microscopy reveals that AEP-1 also stably associates with the tripartite attachment complex (TAC), which is a structural linkage between flagellum basal bodies and the kinetoplast [7]. Dominant negative mutation of the protein results in abnormalities in kinetoplast segregation and structure and also a decrease in cell growth. Based on this data, RNA editing not only allows for the translation of conventional mitochondrial proteins, but also generates diverse mRNA sequences that code for proteins with novel functions in trypanosomes.

Further analysis of this COXIII mRNA transcript revealed another alternatively edited region that codes for alternatively edited protein-2 (AEP-2). Antibodies were raised against N-terminal region of the protein. The goal of my research is to identify the function of AEP-2 in *T. brucei* mitochondria. To assess if AEP-2 localizes in a similar fashion as AEP-1 in *T. brucei*, mitochondria will be hypotonically isolated and the membrane proteins will be extracted using a tandem nonionic detergent treatment. These proteins will be fractionated by SDS-PAGE and further analyzed by Western Blot. Immunofluorescence will be also be used to analyze the distribution of AEP-2 in the cell. Blue Native PAGE (BN-PAGE) fractionation and Western Blot analysis of mitochondrial membrane proteins will be used to determine if AEP-2 assembles into an integral membrane complex. The proteins run on SDS- and BN-PAGE will be further analyzed by tandem mass spectrometry for the identification of AEP-2 and interacting members of the complex. The overall goal of this project is to re-examine alternative editing and to bring us closer to understanding the protein diversity in *T. brucei*. Dr. Hajduk’s lab is currently researching various basic molecular pathways in African trypanosomes and my work would contribute to the larger investigation of RNA editing. Understanding the function of novel proteins may eventually lead to the discovery of new drug targets that will aid in the fight of African sleeping sickness.


**Faculty Research Mentor: Dr. Stephen L. Hajduk, Biochemistry and Molecular Biology**

**Creating a Culture of Undergraduate Inquiry**

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Optimization and Analysis of Titanium Dioxide Nanorod Photodegradation

CURO-OVPI Summer Fellow: Whitney Ingram

As our world becomes more populated and technologically savvy, people tend to underestimate the impact of waste and pollutants produced from factories, cars, and other people. Pollutants known as Volatile Organic Compounds (VOCs) pose an inevitable hazard for human health and for the environment (Ma et al, 2009). However, recent developments in photocatalytic technologies provide hope in irradiating VOCs in an efficient manner. The materials known as photocatalysts are proving to be more than just an effective material for water-electrolysis. Photocatalysts are materials that accelerate photo-chemical reactions in the presence of light. One of the most intriguing applications of photocatalysts is its capability to decompose most organic compounds. Ideally, any pollutant could be decomposed by photocatalyst with light as the only energy source. Some of the feasible applications of photocatalysts are the self-purification of water and air (Smith & Zhao, 2008). Previous research indicates titanium dioxide (TiO$_2$) as one of the most effective and promising photocatalyst due to its high effectiveness and chemical stability.

(Syounan & Nakashima, 2007). TiO$_2$, which reacts under wavelengths of UV light at or below 388nm, champions in photocatalytic activity when compared to most other photocatalysts. However, the photodegradation of the semiconductor lacks the speed necessary to decompose VOCs in considerable timing. Alone this semiconductor can only reach a certain level of efficiency due to the quick recombination of the photogenerated electron-hole pairs (Smith & Zhao, 2008). There are several different avenues for increasing the photocatalytic activity of TiO$_2$. By heating TiO$_2$ above 200°C, defects in the crystallized structure of TiO$_2$ are reduced significantly and photocatalytic behavior is increased. Because reactions take place on the surface of the material, structural composition can also affect photocatalytic abilities. Another means to increase photodegradation capacity is by doping TiO$_2$ with another semiconductor or metal with a similar band gap as TiO$_2$. During the process of photodegradation, electrons become excited leaving behind a highly oxidative positively charged hole. The positively charged hole creates oxidative radicals from water that can break down VOCs; however, this process mitigates as the electron and positive hole recombine. Adding a semiconductor or metal with a similar band gap as TiO$_2$ lengthens the charge separation time in TiO$_2$, increasing the degradation ability of TiO$_2$. Since the summer of 2008, I have been working with Dr. Yiping Zhao and graduate student Wilson Smith in their pioneering research to increase the photocatalytic efficiency of TiO$_2$. Their innovative approach to the fabrication of TiO$_2$ nanostructures have produced some of the highest levels of efficiency seen in the field of TiO$_2$ photodegradation. These structures called nanorods are fabricated by a custom built electron deposition machine using a procedure known as the Oblique Angle Deposition (OAD) method. This method proves more efficient than other nanostructure fabrication, such as ball-milling, hydrothermal synthesis, and sol-gel, which produce a random nature in the structure of the nanoparticles. The OAD method gives control on the height and thickness of the nanorods by simply adjusting the angle of the substrates. Accompanying these new nanostructures are a variety of questions. During the summer I will undertake several projects to investigate the degradation characteristics of the nanorods created by the OAD method. These projects include a height dependent study on the photocatalytic degradation of TiO$_2$ nanorods, the effect of Ag-coatings on nanorods on photocatalytic degradation, and the height dependent study of TiO$_2$/WO$_3$(Titanium Dioxide/Tungsten Oxide), which from previous research proves to be ten times more effective than TiO$_2$ alone, dual layer structure fabricated by OAD and their photo catalytic ability. The goal of this research is to gain an understanding of how TiO$_2$’s photocatalytic abilities can be optimized via TiO$_2$ nanorod structures. I am ecstatic to be part of a project that is paving the way for other physicists to follow and expand upon the experience that I have gained and contributed while working under Dr. Zhao and Mr. Smith.


Faculty Research Mentor: Dr. Yiping Zhao, Physics
As hyped and far-reaching as notions such as environmental friendliness, sustainability, local food, and “going green” are, each manifests a central value: resource stewardship.

Resource stewardship movements have been in effect since the advent of recycling at the latest, but only recently have they shifted from espousing a worldwide “save our planet” sentiment to a local or community-based one, especially in the way of agriculture. The past decade or so has seen the boom of local food movements, such as the phenomenon of community supported agriculture (CSA), whereby a farmer opens his crop to local “subscribers” who pay each season to receive a basket of produce every week. According to localharvest.org, “the number of CSAs in the United States was estimated at 50 in 1990, and has since grown to over 2200.” Time captured this sentiment with a March 2007 cover: “Forget Organic. Eat Local.”

Of the many strands of local/sustainable agriculture, one of the most prominent is biodynamics, conceived in the 20’s and 30’s by Austrain philosopher Rudolph Steiner. In addition to being in practice on individual farms, Steiner’s ideas have laid groundwork for institutions as well, such as Demeter, an international certification agent for biodynamic farms. Given that Germany has the largest organic food market in the European Union, the subject matter of my study will be bilingual German farmers who show awareness of this ideal of resource stewardship, whether Demeter-certified or not. Because the crucial element of practicing resource stewardship is attention to the input and output of a system, my subjects should give this attention, even if only implicitly, to their own private eco-systems.

Just as any cultural movement does in its infant stages, the local/sustainable food movement currently relies on slogans, pamphlets, small-time periodicals, and feature stories in mass media for the dissemination of its knowledge into the public sphere of the U.S. I intend to approach the movement from a different angle: through organizations such as Worldwide Opportunities on Organic Farms and Help Exchange, as well as through personal connections, I will stay with four farmers in south Germany who are looking for temporary farmhands and who would consent to being my subject matter. As a participant observer within their lives, I will employ ethnographic methods as I observe, talk, write, photograph, plant, plow, sweat, and eat.

The end product of this project will be a book of writing and color photographs written for any reasonably intelligent reader. I like to think that what I give the reader in writing will be what the farmer gives those who eat his food: instead of condensed, dehydrated, simplified material whose nutrition can be summarized and digested quickly, I aim to provide an organic, holistic compilation that portrays the material life of its object, a kind of synchronic biography. The role of photography in this project should not be underestimated. I believe that one appeal of resource stewardship is an aesthetic one found in the life of this farmer, a kind of harmony with innate sensibilities that sustainable living supplies through a return to nature. This sensibility accounts for, for example, why we find landscapes beautiful. Experience tells me that photography appeals to this sensibility more effectively than writing does.

My task will be to manifest the ideal of resource stewardship by giving it faces (and dirty fingernails, bronzed forearms, and fresh wheelbarrows full of carrots). If these farmers are who they say they are, then this ideal should make itself apparent in that which I aim to portray: their everyday material lives.
Human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS) continue to be the leading infectious cause of death worldwide and constitute a major global health emergency. In 2006 the World Health Organization (WHO) estimated that 39.5 million adults and children are living with HIV worldwide, with close to 3 million deaths due to AIDS\(^1\). Although the implementation of Highly Active Antiretroviral Therapy (HAART) has led to a significant decline in AIDS-related morbidity and mortality, an associated higher risk of cardiovascular disease (CVD) in HIV patients taking HAART has been documented. In particular, one class of antiretroviral drugs called protease inhibitors (PIs) has been implicated in contributing to the development of several adverse effects related to the metabolic syndrome, including insulin resistance, hyperglycemia, hyperlipidemia, and lipodystrophy. In fact, a 26% relative increase in the myocardial infarction rate per year of exposure with combination antiretrovirals was reported in HIV patients\(^2\). Since people with HIV are generally living longer as a result of effective viral suppression, the intersection of an increased CVD risk due to antiretroviral treatment with the risk of developing AIDS in these patients represents a serious issue concerning the long term management for HIV infection.

One strategy employed to treat elevated lipid levels in patients currently taking PIs is to co-administer lipid lowering drugs such as HMG-CoA reductase inhibitors, also known as statins. Co-administration of statins with PIs can result in increased blood levels and reduced clearance of statins, potentially leading to toxicity. In fact, several case reports have been described which link the co-administration of PIs with statins, resulting in severe toxicity and even death. This significant drug interaction has led to several statins being contraindicated with PI-containing HAART regimens. However, the increased risk of CVD necessitates the use of lipid-lowering drugs in these patients. The leading hypothesis behind this potentially life-threatening drug-drug interaction (DDI) is via the shared hepatic metabolism of both compounds by the cytoplasmic isoenzyme cytochrome P450 3A4 (CYP3A4), leading to increased plasma levels of statins\(^3\). Recently, statins have been characterized to undergo transporter-mediated uptake by members of the solute carrier (SLC) superfamily into hepatocytes prior to CYP3A4-mediated metabolism. In addition, there is growing evidence to suggest that PIs are substrates for SLC transporters found in hepatocytes, such as OATP1B3 and OATP2B1. Therefore, we hypothesize that DDIs between statins and PIs are in part mediated through drug transporters expressed in hepatocytes. Understanding the mechanisms involved in antiretroviral DDIs at the site of cellular membrane transport will not only help indentify interactions of therapeutic or toxic importance, but will also provide useful guidelines on optimal combinations of antiretroviral drugs and co-administered medications. This knowledge will be of benefit to all clinicians and people living with HIV.

Substrate and inhibitor properties of the PIs atazanavir, nelfinavir, and ritonavir will be assessed using OATP2B1 and OATP1B3 overexpressing cell systems. Comparison between the PIs’ cellular accumulation using an overexpressing system with the wild type cell line will allow for direct assessment of substrate properties. Additionally, PI interactions with OATP2B1 and OATP1B3 will be evaluated using estrone-3-sulfate, a known ligand for both transporters. Similarly, the transport of pravastatin and simvastatin will be determined using the transporter overexpressing cell systems. Combinations of PIs and statins will then be evaluated for effects on the cellular accumulation of each other.

1. UNAIDS/WHO  
The proposed research for this summer fellowship will entail the generation of additional zebrafish models for lysosomal disorders. We aim to first characterize the expression and activity of several lysosomal enzymes that are associated with human diseases across a developmental timeline in zebrafish. To do so, we will monitor the activity of these enzymes in embryo lysates and also localize the expression of enzyme transcripts using in situ hybridization techniques. These experiments, currently underway in the lab, will help to better understand how these enzymes are regulated in this organism (something that is currently not known) and guide our selection of candidates for new disease models. Based on preliminary findings, we will also aim to target the knockdown of the lysosomal enzyme aspartylglucosaminidase (AGA), which is essential in the final steps of asparagine-linked oligosaccharide breakdown. AGA is specifically responsible for cleaving a N-acetylglucosamine from asparagine residues on glycoproteins and mutations in this enzyme caused aspartylglucosaminuria (AGU). Clinically, AGU is very similar to ML-II. Therefore, investigation of an AGU zebrafish model has the potential to yield new insight into the pathogenesis of both disorders. Towards the proposed aims, I have already successfully measured AGA enzyme activity in zebrafish embryos and demonstrated that no AGA activity is deposited in the eggs. Our plan is to knockdown the expression of AGA using antisense morpholinos, modified oligonucleotides that can inhibit translation of AGA in the developing embryo. We will undertake a biochemical and phenotypical analysis of the mutant embryos that is highly parallel to the approach the lab has used successfully to characterize the ML-II zebrafish model. With the lack of economical animal models for such LSDs as aspartylglucosaminuria, there is an inherent barrier to developing new therapies; however, creating an effective AGA knockdown zebrafish model will be a groundbreaking step in opening many doors for therapeutic possibility.


Seizure disorders, including epilepsy, affect over 3 million people in the United States, and more than 10% of the population will experience a seizure in their lifetime. Seizures are a symptom of abnormal, excessive or synchronous neuronal activity in the brain that can last for only a few seconds or, in some cases, indefinitely. The mechanisms underlying seizure generation and propagation remain poorly understood despite intensive study. Because seizures are often a systems-level phenomenon, our understanding of seizure mechanisms would benefit greatly if seizure-related changes in neuronal activity could be imaged throughout the brain. In my summer research project, I plan to study seizure mechanisms by optically imaging seizure-induced changes in neural activity in the zebrafish.

This semester I have been using confocal laser scanning microscopy to image brain activity in larval zebrafish induced to seize with pentylenetetrazol (PTZ), a GABA-A receptor antagonist. Brain activity is monitored by imaging the emitted fluorescence from a genetically encoded calcium indicator called *cameleon*. At the neuronal level, electrical activity is known to result in a rapid transient increase in the concentration of intracellular calcium. The *cameleon* fluorescence "signature" changes depending on intracellular calcium concentration. This allows me to map seizure-induced changes in neural activity over large regions of the developing zebrafish brain. In zebrafish, the larval period begins at 3 days post fertilization (dpf), when the fish are nearly free-swimming, and extends until about 27 dpf. Larval fish ranging from 3 dpf to 10 dpf exhibit significantly different seizure patterns indicating that mechanisms involved in seizure induction and propagation change as a function of neural development.

Seizures in adult zebrafish have not yet been imaged. The adult stage serves as an important fiducial point for comparison to larval seizures. This summer I plan to expand my imaging to adult zebrafish. We recently found that adult fish are much more susceptible to PTZ. In a behavior assay, adult fish lost consciousness within a few minutes of exposure to PTZ at a dose that minimally affected larvae. I will test the hypothesis that seizures in adult zebrafish brains are qualitatively different from those in larval brains. I will test this by imaging the pattern of PTZ-induced seizure activity in the adult brain and compare to the pattern observed in larvae. As part of this study, I will also test other chemoconvulsants that act on different receptors in the brain. Because this project involves quantitative imaging methods to address a neurobiological problem, I will conduct my summer research under the direction of Drs. Andrew Sornborger (Dept. Mathematics and Faculty of Engineering) and Jim Lauderdale (Dept. Cellular Biology).

Faculty Research Mentors: **Dr. Jim Lauderdale, Cellular Biology** and **Dr. Andrew Sornborger, Mathematics and Engineering**
The ICC and the US: How have the Actions of the US Affected the ICC in the Past and how will they Affect the ICC in the Future?

CURO Summer Fellow: Bridget Mailley

Through this research project, I will examine the motives and resulting effects of one of the greatest obstacles to the International Criminal Court (ICC) – the United States. I want to determine whether the United States will help or continue to impede this Court and this channel for justice; what the United States’ actions should be; and how that could affect the ICC. First of all, why does the US seem to support regional courts such as the ICTY and the ICTR, but rejects a truly international court such as the ICC? I am also interested in whether or not the Obama Administration has any plans to alter or reverse the Bush Administration’s policies toward the ICC. Some of these policies include the American Service Members’ Protection Act and the unorthodox “un-signing” of the Rome Statute. This is a particularly interesting point considering Vice President Joseph Biden’s adamant support of the United States in its rejection of the Rome Statute. If the Obama Administration does indeed intend to change US policy toward the ICC, how will this affect the ICC? Finally, I would conclude with recommendations as to how the current administration should proceed with their treatment of the ICC in such a way that is beneficial, not only for the US, but for the future of international humanitarian law and for the rest of the world.

In order to get sufficient answers to all of my questions, I will use a few different methods of information gathering. First of all, I will utilize the published research that is already available concerning why the US has behaved as it has, and I would take into account the opinions of authors who have been following this field since the ICC became an issue. Second of all, I will interview people who are currently working with the ICC and the Coalition of the International Criminal Court (a coalition of NGOs that work for and monitor the ICC) about what they know concerning the situation between the US and the ICC, and how they think the US should act toward the ICC. I will also interview people from the US State Department to learn the United States’ current position, and how they view the United States’ position with regard to the ICC, and whether or not they think it should or will change. By conducting interviews with people who are currently involved with the ICC, CICC, and State Department I will be able to rectify the gap between published information and what is currently happening.

Along with my personal interest in the topic, there will be several benefits of this project. First of all, with this project, I would take a subject that is usually the concern of professionals and offer a well-founded, solidly researched addition to the undergraduate catalog. Second of all, the issues surrounding the ICC are current and important issues and this research project would offer a fresh viewpoint on evolving field of study that affects the United States and the rest of the world, especially those areas in conflict. Lastly, this project could be the primary step in developing a set of scholarly recommendations for the actions of the United States concerning the ICC. The ICC is still young and growing, and the actions of countries now will heavily determine whether or not this court will be able to act independently in the future or if this court will be another puppet of the powerful.

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3 Ibid. 27.
5 Ibid., 90.

Faculty Mentor: Dr. Amy Ross, Geography
Ferrofluids are colloidal mixtures of nano-size magnetic particles (either single domain or superparamagnetic), covered by a surfactant and suspended in a compatible liquid medium [1]. A non-magnetic object placed inside a ferrofluid acts as a “magnetic hole”, in a manner analogous to an electronic hole in a semiconductor. An applied magnetic field gradient attracts magnetic nanoparticles, which end up displacing and effectively pushing the magnetic hole away. As such, any non-magnetic object inside a ferrofluid can potentially be manipulated and directed towards a given direction. Researchers have applied this principle to move and separate non-magnetic micro-beads within ferrofluids in microfluidic channels [2, 3].

Specific shape of a “magnetic hole” matters. An elongated particle in a ferrofluid turns to align its long axis with the applied magnetic field. For instance, the swimming direction of live Escherichia coli bacteria in bio-compatible ferrofluids can be controlled easily via external magnetic fields. Interestingly, magnetic holes act “magnetic” as well – attracting each other and forming clusters and chains in the presence of a field. Particle manipulation within ferrofluids works as long as what is being manipulated is much larger than the magnetic nanoparticles and the average spacing between them.

This proposal presents a truly universal, versatile, cost-effective and label-free particle and cellular manipulation scheme within bio-compatible ferrofluids, directly impacting health industry, biomedical research and homeland security. We have experimentally observed that larger microbeads can be moved faster under traveling magnetic field excitation within ferro-microfluidic devices. This is expected, since magnetic forces scale with the volume of the beads, whereas hydrodynamic drag (as approximated through Stokes flow around a sphere) scales with the bead radius. We will design, fabricate and test a microbead sorting device based on this observation. Separation efficiency will be characterized as a function of bead size and excitation parameters. Non-spherical micro-particles (available from Sigma Aldrich, St. Louis, MO) will also be studied. It is expected that elongated particles will orient their long axes parallel to the excitation electrodes and move by “log rolling” along their shorter axes. Once fully characterized, the particle sorter will be tested with live cells in bio-compatible ferrofluids. We will demonstrate bacterial sorting with both motile (K-12) and non-motile (YK4116 fla- and YK4183 mot-) strains of fluorescently-labeled Escherichia coli.

The same field gradients that help move cells inside ferrofluids would end up stretching them. If the device is not optimized, the stretching forces may severely and permanently damage the cell being manipulated in the long run. Therefore, even though the eventual goal is to demonstrate a cellular sorting and separation scheme valid for animal and human cells in general, these cells are left out of the scope of this proposal. Sorting and manipulation capabilities will be demonstrated with microbeads and live E. coli – these gram-negative cells possess a cell wall, and structurally, they are more rigid than most mammalian cells. The physics of particle manipulation will be clearly understood during the course of this work before specific animal and human cell protocols are developed for the next phase.

References:

Research Faculty Mentor: Dr. Leidong Mao, Engineering
A Computational Study of the Crystalline Structure of Tyrosine Kinase Mutants

CURO Research Fellow: Amar Miraz

Today researchers predominantly use genome sequencing technologies to identify cancer causing mutations in tyrosine kinases. However, to design novel drugs for these mutated kinases, a clear understanding of how these mutations alter the structure and function of the protein is necessary. Despite the availability of many tyrosine kinase structures, there is no clear understanding of how cancer mutations alter tyrosine kinase structure and function. This is due, in large part, to the complex network of atomic interactions observed in their crystal structures and our inability to pinpoint key interactions that contribute to tyrosine kinase function.

My research this past semester has focused on using powerful visualization tools such as PyMol to understand the combinatorial complexity of atomic interactions observed in tyrosine kinase structures. Three-dimensional protein visualization has become a powerful new tool in the field of bioinformatics which promises to revolutionize the way we study proteins. The strength of visually analyzing proteins is that it uses computer processing power to overcome the obstacles of protein complexity which plague other forms of study. Using these tools, I have been able to pinpoint key residues in tyrosine kinases that contribute to their function. This analysis has lead to several interesting hypotheses, which our lab is currently following up experimentally.

Since I have gained the experience in using computational tools to study tyrosine kinase structures, my goal this summer is to understand how mutations in tyrosine kinases alter their function. For this, I will first catalogue all the known somatic mutations identified in tyrosine kinases through genome sequencing studies. Then, I will map and analyze these mutations in the context of available structures to understand how these mutations alter tyrosine kinase structure and function. For this, I will primarily be using the visualization tools that I used in my previous semester as well as other computational tools that our lab is currently developing. The information gained from this study will directly contribute to our understanding of human cancers and provide clues for designing novel therapeutic strategies.

Faculty Research Mentor: Dr. Natraj Kanan, BCMB
Empirical Examination of Child Emotion Assessments: A Comparison of Child, Parent, and Behavioral Observation Methods

CURO-OVPR Research Fellow: Cody Nichol

Since emotion may be comprised of both physiological and bodily indicators, multiple methods of assessment should be employed. Adrian and Zeman (2007) reported that 44% of children emotion regulation (ER) research relied on only one method of inquiry while 31.5% used two methods of inquiry. This study will empirically examine three methods of emotion assessment in youth ages 7-12 years: self-report, other-report, and observation. In self-report, children are often administered a questionnaire and asked to account subjective and internal emotional experiences. In other-report, an individual who knows the child well, such as a parent, is asked to account the child’s ER capabilities. In observation, a trained researcher or research assistant objectively codes particular aspects of the child’s emotional experience. A criticism of observation is that it does not take into consideration the reasoning that motivates a particular behavior. In an effort to bring together the different ways of assessing emotion, one theory suggest that these methods each contribute to understanding a particular aspect of child emotion (Hubbard & Dearing, in press). There are advantages and disadvantages of each method, so in this context, one of the most argued questions in child psychology revolves around who is the best reporter of child ER: parents, children, or observers. In this research project, I will examine correlations among each assessment method and relate the reports to other indices of the child’s emotional functioning. Such knowledge has various implications in the context of clinical diagnosis, treatment evaluation, and research methods. An enhancement in diagnosis capabilities could result in improved treatment outcomes. In the context of scientific inquiry, researchers will be more aware of which emotion assessment methods to use so that erroneous and misleading data is not collected. In this research initiative, I will examine a community sample of 42 children (21 male and 21 female) and their mother and fathers. For the child self report data, I will analyze the Children’s Emotion Management Scale (CEMS; Zeman et al., 2001) and Positive and Negative Effect Scale for Children (PANAS-C, Laurent et al., 1999). For the parent report data I will analyze the Emotion Regulation Checklist (ERC, Shields & Cicchetti, 1997). For the observation data, I will code a behavioral interaction task in which the parents and child discussed emotions. Indices of the child’s emotional functioning will also be related to symptoms of psychopathology. Data will be analyzed using SPSS, one of the most prevalent programs for statistical analysis in social science. Analyses will allow me to identify any significant relationships among variables in the self-report, observation, and other report data sets. I hypothesize that there will be a significant relationship between the behavioral observations and the child self-report measures, indicating that children in the specified age group are reliable reporters of emotion regulation processes.


Faculty Research Mentor: Dr. Cynthia Suveg, Psychology
Carotenoids, a group of natural pigments, are found in a variety of bacteria, plants, animals, and fungi. These pigments create coloration ranging from yellow to red. Carotenoids not only provide characteristic colors to certain organisms, but some are also important in the human diet as precursors of vitamin A or as powerful antioxidants. Additionally, they are used in a number of different industries, including pharmaceuticals and cosmetics.

Moreover, carotenoids are an important component in animal feed. Unlike photosynthetic organisms and some bacteria and fungi, animals cannot independently synthesize carotenoids, and thus they must obtain these compounds from dietary sources. Because animals raised for commercial use do not have access to the same diet that they would have in the wild, it is important that these pigments be added to their feed. For example, carotenoids are responsible for the characteristic pink color of salmon and shrimp. In the natural environment of salmon, astaxanthin, a specific carotenoid, is produced by marine bacteria and algae and then passed on to the salmon that consume these organisms. Astaxanthin is therefore added to the feed of salmon grown in aquaculture in order to give them the color that consumers desire and expect (Mann et al. 2000). The cost of producing astaxanthin and incorporating it in animal feed is rather high, and accounts for about fifteen to twenty percent of food costs (Rajasingh et al. 2006). Carotenoids are also used to give desirable colors to chicken egg yolks (Karadas et al. 2006).

My proposed research for the CURO summer research fellowship, which would be a continuation of research from the spring of 2009, would involve the genetic alteration of soybean plants in order to incorporate genes that would promote the production of astaxanthin. Soybean is an important ingredient in animal feed due to its high protein content and its relatively low price (Sørensen et al. 2009). Soybean that already contains astaxanthin would eliminate the cost of having to add carotenoids to animal feed.

Two genes, \textit{crtW} and \textit{crtZ}, are involved in the conversion of \(\beta\)-carotene to astaxanthin through a two-step process with a canthaxanthin intermediate. It may also be possible that a single gene, \textit{crtS}, has the ability to convert \(\beta\)-carotene to astaxanthin in a single step. For this project, both pathways will be attempted in order to determine which is the most efficient in the production of astaxanthin in soybean. The first step in this project was the creation of a synthetic \textit{crtS} gene which has been optimized for expression in soybean. Once a vector has been created, the plasmid will undergo enzymatic digestion and analysis using gel electrophoresis as well as DNA sequencing in order to ensure that the vector was correctly assembled and that the desired components are present. Once the plasmid is ready, soybean somatic embryos will be shot with the plasmid using a gene gun. The transformed embryos will be allowed to recover and will then undergo selection and maintenance in selection medium.

DNA can then be extracted from the embryos in order to perform a polymerase chain reaction and Southern blot analysis to make sure that the plasmid was integrated into the genome of the plant tissue.

Once the soybean somatic embryos have been transformed, they will need to be regenerated into plants. After undergoing differentiation and maturation in liquid medium, they will be allowed to desiccate and then returned to solid medium for their germination into plants. The goal of this project is to eventually create a transformed plant that will possess the necessary gene or genes for the production of astaxanthin in its seed. This would be a valuable product for use in aquaculture and other industries, and would be extremely marketable as a component of animal feed. A sufficient amount of work has been done to engineer the production of carotenoids in other plants to suggest that there are no obvious impediments to this work.


Research Faculty Mentor: Dr. Wayne Parrot, Crop and Soil Sciences
Develop an Efficient Method to Create Marked and Unmarked Mutations in the Human Genome

CURO Research Fellow: Akanksha Rajeurs

My summer project will be to develop an efficient method to create marked and unmarked mutations in the human pathogen Mycobacterium tuberculosis. This bacterium is the causative agent of tuberculosis which kills almost 2 million people each year. To create a vaccine, the bacterium must be attenuated. This can be accomplished by deleting multiple chromosomally-located genes that are important for survival of the bacteria inside the host. To delete specific genes, systems have been developed that take advantage of homologous recombination.

Currently, two homologous recombination approaches exist to delete genes from the M. tuberculosis chromosome. The first employs a plasmid system (1, 3). Because transformation of plasmid DNA into M. tuberculosis is inefficient, separate genetic selections must be performed sequentially to isolate bacteria in which the targeted chromosomal gene is replaced. The second method uses a specialized transducing phage (2). In this case, regions of homology flanking the gene to be replaced are cloned onto a cosmid (a plasmid containing the cosA bacteriophage packaging site) such that they instead flank an antibiotic resistance gene. The cosmid is ultimately packaged into phages. As infection of M. tuberculosis by the specialized transducing phage is extremely efficient, bacteria having undergone separate recombination events in each of the flanking regions can be obtained by selecting for antibiotic resistance. The problem with the latter method is that a different antibiotic resistance gene would be required to replace another targeted chromosomal gene.

The goal of my CURO summer research project will be to combine features of the two recombination systems. Basically, I will be creating two types of cosmids. Each will have convenient cloning sites. In one of the cosmids, cosmid A, the cloning sites will flank a cassette of genes: a hygromycin resistance gene (hyg), a gene encoding green fluorescent protein (gfp), and a sucrose counter-selectable gene (sacB). The second cosmid, cosmid B, will not flank any genes. To delete a specific chromosomal gene, 500-1000 base pair regions of DNA flanking the targeted gene will be cloned into both of these cosmids. This will allow two different specialized transducing phages to be created. Transducing phages derived from cosmid A will allow for replacement of the targeted chromosomal gene with the gene cassette by selecting for resistance to hygromycin. The gfp gene on the cassette will facilitate study of the mutant as the bacteria should fluoresce green. Transducing phages derived from cosmid B can then be used on the cassette-containing mutants to select for only those bacteria that have lost the cassette. This is accomplished by plating the bacteria on medium containing sucrose. Sucrose is toxic to M. tuberculosis if the sacB gene is present.

Creation of the modified recombination system requires several steps. Since starting in Dr. Karls’s lab, I have made a couple of plasmids. The first one replaced the kanamycin resistance gene with the hyg gene on a plasmid that also contains an origin for replication in E. coli (oriE), the element for packaging DNA into bacteriophage lambda (cosA), and a unique PacI restriction enzyme site (for joining with mycobacteriophage DNA). This plasmid has been designated cosmid B. I have also removed a polylinker sequence from a plasmid that contains the gfp gene. Additional steps will involve introducing a restriction enzyme linker and the sacB gene into my gfp-containing plasmid. From the resulting plasmid, I will excise a fragment containing the sacB and gfp genes and transfer it into cosmid B to create cosmid A. I plan to complete cosmid B by the end of the summer. If I finish earlier, I will test the system by targeting a gene in the nonpathogenic species Mycobacterium smegmatis.


Research Faculty Mentor: Dr. Russell Karls, Veterinary Medicine
Salmonella outbreaks of unknown origin have plagued both humans and non-domestic bird species in the Southeastern United States. These outbreaks have devastating environmental and public health implications. Although we know about the epidemiology of salmonella in avian species, we have not isolated possible locations where the disease may be transmitted from bird to bird. There may also be some relationship between the current occurrences of salmonella outbreaks in humans and non-domestic birds via cross-species infection by contaminated peanut butter. Earlier research has found a correlation between the high incidences of infection of the strain *Salmonella enterica* serovar Typhimurium DT104 and the congregation of birds around bird feeders. The goal of this research is to observe non-domestic bird populations plagued with Salmonella and determine if the transmission of the Salmonella occurs at bird feeders. I would also like to determine if the Salmonella outbreak in the peanut butter may have any relation to the Salmonella strain, *Salmonella enterica* serovar Typhimurium DT104, in the nondomestic bird population. Furthermore, I want to determine if the *Salmonella enterica* serovar Typhimurium DT104 can be introduced into the human population and cause infection.

Bird feeders will be observed and studied to locate any possible transmittance of salmonella between feeding birds and, if infection does occur at bird feeders, salmonella isolates will be harvested from infected birds for further testing. I will be using polymerase chain reaction (PCR) and Pulse-field gel electrophoresis (PFGE) to amplify and compare the Salmonella isolates. *S. enteric* serovar Typhimurium SR11 and *Escherichia coli* HB101 will be used in PCR as positive and negative controls. Salmonella isolates from human populations and avian populations will be compared and analyzed to determine if they reside in the same family of bacterium. Upon determining the strain of salmonella in each population and comparing them, I will be able to tell whether cross-contamination via peanut butter introduced into the bird population could be the connection between the two salmonella epidemics. The completion of this project will help to better understand the origins and implications of the Salmonella epidemic and the extent to which the two concurrent plague of infections, of birds and humans, are related. If so, it will also help determine what precautions should be taken to minimize cross-species infection.


*Faculty Mentor: Susan Sanchez, Small Animal Veterinary Medicine*
Within my proposed research, I intend to analyze the nature of the individual and the notion of his happiness, as put forth by several traditions. I shall take an inter-disciplinary approach, using the work of Plato as a comparison point, in examining the traditions of Neo-Platonism, early and medieval Christianity, Tibetan Buddhism, and Psychology. Working to identify underlying similarities, I shall emphasize similar notions within each tradition, with the hope that a thorough analysis may highlight specific principles that, if taken to heart by the individual, shall help to elevate his happiness, and thus his well-being. Characterizing the individual and describing both what happiness is and how to arrive at it has been a key focus for past historical writers, and the proposed research intends to build on these understandings. Rather than simply defining the individual and happiness within each culture, this research shall emphasize how each tradition suggests the individual should behave and live. Happiness is essential to living well, therefore, serious consideration must be given to how the individual can and should act in order to increase his well-being.

Rather than directly comparing ideas of happiness within each tradition, I intend to emphasize the way the individual is represented and, specifically, highlight how the individual is suggested to live and develop himself, hence the emphasis and continual comparison with the Platonic notion of education. By approaching the research in this manner, a definition of happiness may be arrived at, and instead of merely providing an ending definition, reasons why this happiness is achieved shall be provided, as well as methods for obtaining it. Thus, I shall initially begin my research with Plato’s definition of the individual, and argue for his conception of happiness being directly related to his notion of education. This definition of the individual and idea of education shall then be compared to the remaining traditions mentioned above, and similarities and differences shall be noted.

The significance of this proposed research lies in providing the individual with practical suggestions on how to live and behave, suggestions that are aimed to increase his happiness and overall well-being. Rather than comparing the traditions simply for noting fundamental differences, emphasis shall be placed on understanding how these differences actually surface in the suggested behavior of the individual, and in this manner the research is unique. Although a great deal of work has already been completed on happiness, the importance of my research lies in the comparison and culmination of different traditions, and this would not have been possible if I had not already completed previous research within each tradition.

Furthermore, in tracing the thought of Plato throughout history, the proposed research will highlight the modern day importance of the Platonic notion of education, as well as its relevance to Christian, Buddhist, and current thought in Psychology. Most notably, those ideas dealing with man’s relationship to God, fundamental concepts within Tibetan Buddhism, and current Psychological work on the individual and his well-being shall be stressed. The research shall act as a connection between the traditions. While there are limits on the proposed research, and no secret combination of words or principle shall ever bring about true happiness, the goal of the proposed research is to emphasize at least a few principles that, if taken to heart, can and hopefully will make a positive change in the life of the individual.

Faculty Research Mentor: Dr. Frank R. Harrison, III, Philoshophy
Finding God in the Poetry of Robert Penn Warren

CURO Research Fellow: Matthew Sellers

With a body of poetry devoted to the human struggle with spiritual transcendence, Robert Penn Warren’s metaphysical confusion deserves attention for its variety and depth and for its pertinence to understanding the poet’s struggle. If awarded a CURO Summer Fellowship, I propose an interdisciplinary study which includes an intense reading of Warren’s later poetry (circa 1965 onward) and evaluates it in terms of psychology, contemporary history, biography, religion, and literary analysis to catalogue and describe the spiritual struggle and comment on its importance to the development of the poet, to the poet’s commentary on his society, and to understanding the moral system Warren creates. In addition, key critical pieces on selected poems will be studied to comprehend the critical response to Warren’s spirituality.

Associated most often with *All the King’s Men*, literary giant Robert Penn Warren contributed far more to American literature than a single novel. In fact, he produced countless poems, essays, short stories and textbooks, a literary oeuvre of which great authors would be envious. Called by R.W.B. Lewis “the most complete man of letters in our time,” Warren’s life spans the Great Depression, two World Wars and the civil rights movement; his work grapples with Southern identity, human consciousness, and the inevitability of spirituality. Particularly in his later pieces, Warren vacillates between confident acceptance of spirituality and fretful anxiety about such blind faith. In *Can I See Arcturus From Where I Stand* (1975), for example, “Evening Hawk” describes a spiritual experience that must inevitably end, whereas in “Youth Stares at a Minoan Sunset” from *Now and Then: Poems* (1976-1978) the tone tends toward the melancholy. The speaker’s nostalgia for innocence goes beyond a mere remembrance of youth, it communicates a longing for the same spiritual connection the young man embraces even as the speaker’s bitterness questions the validity of such openness to a transcendental moment. The two poems were written in close temporal proximity, yet they offer very different outlooks on transcendence. Warren’s inability to settle this spiritual crisis in his poetry captures a personal struggle that raises many fundamental yet very pertinent questions about the nature of spirituality and humanity’s definition of its place in the world. In the proposed study, the emotional response of the reader and speaker to such questions will be explored to delineate Warren’s take on the nature of modern spirituality.

Though acknowledging its spiritual nature, the majority of criticism directed at Warren’s poetry focuses on the American consciousness and Southern morality communicated in the work. Yet, outside the context of moral democracy or traditional virtue, the spirituality that Warren’s speakers seek or experience suggests the need for some sort of defining morality beyond simply devotion to the ideology of the state. A.L. Clements argues in his essay “Sacramental Vision: The Poetry of Robert Penn Warren” for the growth of Warren’s poetry, that it begins “in pain, makes its progress through to darkness and death, and then…ends in rebirth, truth, selfhood, even joy.” This outlook is a positive one, yet the element of pain Clements claims vanishes never disappears entirely from the poetry, rather it lingers in the form of doubt. Biography would be an easy way to evaluate Warren’s spirituality, yet to say that his Southern heritage creates the struggle between rural faith and world-class education would be an oversimplification of a complex internal debate. More, to suggest that an old man would be more willing than a young man to accept some form of belief insults the carefully constructed narrative. Therefore, I suggest a compilation of the critical body of writing on Warren’s poetry to compare the analytical takes on his spirituality. Only then, by juxtaposing the critical works and the insight gained into Warren’s spiritual world, can the sublime nature of the poetry be contextualized in terms of Warren’s American consciousness and Southern heritage.

Faculty Research Mentor: Dr. Hugh Ruppersburg, English
Implicit System of Rational Thought Analogous to Modern First-Order and Modal Logics in Plato’s Late Dialogues

CURO Research Fellow: Michael Slade

Through this study, I hope to find in Plato’s late dialogues an implicit system of rational thought analogous to modern first-order and modal logics. If a working “rules of inference” can be found, the second stage of my project will be finding the axiomatic assumptions lying at the heart of Plato’s philosophy. Though the importance of Plato’s writings to western thought has become a bit of an axiom in the history of ideas, the exact manner in which he was revolutionary is a topic of disagreement. Some cite his “doctrine of the forms,” while others speak vaguely of his literary genius or mythological power. Historically, however, it was his concern for developing a philosophical methodology that established him as truly innovative. This concern for the rational process motivated Plato’s definition of philosophy not as a set of propositions or doctrines to be believed, but instead a practice to be engaged in. He called this practice διαλεκτική, the dialectic.

Unfortunately, the concept of “dialectic” has been abused by modern scholars. If one were to read, for example, Gustav Mueller’s Plato, The Founder of Philosophy as Dialectic, one gains the distinct impression that dialectic is mainly a literary device, where two distinct forces create a tension towards a single goal. While such attempts provide legitimate scholarly insight, they do not capture Plato’s intention of dialectic for two reasons. First, by leaping into the metaphorical abyss they bypass the very obvious relation of διαλεκτική to διαλέγομαι, a straightforward Greek verb meaning “to converse with (a person).” The dialectic is a conversation, not a process of formal witticism. Second, to characterize the fundamental philosophical activity as something pertaining to either reading or writing is clearly misguided in light of Plato’s critique of the written word in Phaedrus and The Seventh Letter. Far closer to Plato is Christopher Gill’s definition of dialectic as “philosophical dialogue conducted through systematic, one-to-one, question and answer.” This still leads, however, to a very obvious question: “What is methodological system underlying Plato’s dialectic?”

My research will attempt to address this question through an intensive study of logical form in a considerable segment of Plato’s “late” dialogues: Theaetetus, Statesman, Sophist and Parmenides. While relevant passages on the dialectical process appear in many of Plato’s other works (The Republic, Gorgias and Meno, for example), Plato’s “trilogy” (Theaetetus, Sophist and Statesman) plus Parmenides are attractive as the focus of my study for several reasons. First, they are far more self-conscious about the dialectical process than most of Plato’s other dialogues, providing detailed analysis of the methods they are employing to address a particular question. Second, while every Platonic dialogue is an instance of dialectic, flawed interlocutors often interfere with the smooth workings of the philosophical process. In Parmenides and the trilogy, the speakers tend to be both cooperative and intelligent, producing ideal circumstances for the study of the dialectic. Third, these dialogues tend to be neglected, especially at the undergraduate level, because of their notorious difficulty. It is, however, precisely the highly technical, dialectical machinery of the dialogues that make them both difficult and fertile for study.

If the formalization I’m proposing is possible, it will revitalize the argumentative framework which many contemporary philosophers consider an artifact of only historical interest and motivate a reevaluation of Plato in terms of his fundamental assumptions. Judgments can then be made concerning Plato’s presuppositions and the rigor of his entailments, instead of simply rejecting the conclusions of arguments solely because they are unattractive. Any such system would also contribute meaningfully to the ongoing debate over the “periodization” of Plato by attempting to provide an objective standard to measure the level of philosophical disparity between the “early,” “middle” and “late” dialogues.

6 “Afterword: Dialectic and the Dialogue Form in Late Plato” in Form and Argument in Late Plato ed. Christopher Gill and Margaret McCabe (New York: Oxford University Press 1996), 285

Faculty Research Mentor: Dr. Frank R. Harrison, III, Philosophy
Designing Teaching Modules for Genome Analysis
Howard Hughes Medical Institute Exceptional Research Opportunities Program (EXROP)
Valeriya Spektor

This EXROP project is designed for students who are interested in a career in academics that combines both research and innovative teaching. It is an offshoot of Dr. Wessler’s HHMI Professor Program (see http://www.hhmi.org/research/professors/wessler.html for more details) entitled: The Dynamic Genome: Introducing Evolution to Undergraduates.

At the heart of Dr. Wessler’s HHMI program is a laboratory classroom that was designed to replicate the Wessler research laboratory with both computational and experimental facilities. Courses are taught year-round in this facility. In addition, a unique feature of course content is the focus on transposable elements (TEs), mobile genetic elements that comprise a staggering 50% of the human genome and over 90% of some plant genomes. As such, one outcome of the courses taught as part of the larger program is that students experience the excitement of scientific discovery, as they are often the first to analyze significant portions of a genome. In doing so, students learn that the genome is more than an instruction manual for making an organism; it is also an historical record of how species evolve.

The summer experience will begin with a short training period with personnel from the research laboratory with a focus on genome analysis including both computational and experimental protocols. These skills will then be applied in two ways. These experiences occur first, by working with lab personnel to teach a short genome analysis “boot camp” for incoming college freshman; and, second, by working independently to design a laboratory module or assessment tool(s) for future courses.

Faculty Research Mentor: Dr. Sue Wessler, Plant Biology
Synthesis of BHQ-dithiol as a Photoremovable Protecting Group for Mifepristone

CURO-OVPR Research Fellow: Alexandra M. Walker

Photoactivation of gene expression is an invaluable technology that enables the study of intracellular physiology.\textsuperscript{1-3} Using light to activate or inactivate specific genes enables precise control of cell mechanisms in an endeavor to further understand biological systems. One reason to induce gene expression is to explore the establishment of neural circuits in the central nervous system (CNS) of developing vertebrates. Specifically, the role of \textit{Pax6}, a highly conserved transcription factor in vertebrates pertinent to the development of the CNS, can be investigated in zebrafish.\textsuperscript{4-7} Experiments utilizing high-resolution optical imaging allow the functional study of neural activity, but are inadequate for studying the timing of expression in single cells.\textsuperscript{8-10} Photoactivation of a small-molecule inducer gene expression can alleviate these spatiotemporal limitations. Eventually, target genes like \textit{Pax6} can be manipulated in other vertebrates, including humans, to avoid various genetic disorders.

I will synthesize and test the photochemical properties of a photoactivatable activator of gene expression, BHQ-dithiol-MFP, which is comprised of 8-bromo-7-hydroxyquinolinyl-dithiol (BHQ-dithiol), a photoremovable protecting group (PPG) that is hydrolytically robust and sensitive to two-photon excitation (2PE) conjugated to mifepristone (MFP), which activates gene expression through Invitrogen’s GeneSwitch\textsuperscript{TM}.\textsuperscript{11}


Faculty Research Mentor: Dr. Timothy Dore, Chemistry
Development of Consensus-Degenerate Hybrid Oligonucleotide Primers (CODEHOPs) for Retroviral Discovery

CURO Research Fellow: Shuyan Wei

Despite the importance of discovering retroviral diseases such as human immunodeficiency virus and human T-lymphotropic virus (HTLV), techniques for retroviral discovery remain limited. Currently, there are no available techniques to identify all members of the retroviral family. We propose to develop a sensitive, broadly reactive PCR assay using CODEHOPs for the identification of retroviral genomes present in all members of the family Retroviridae. The gag, pro, pol and env genes are present in all infectious retroviruses. These genes and the proteins they encode will be used to identify non-redundant amino acid sequences from all known unique retroviral species. Consensus-degenerate hybrid oligonucleotide primers will be developed from the alignment of these sequences. Highly conserved domains of 8-10 amino acids will be back-translated into degenerate nucleotide sequences that will be designed to represent all possible codons for the resultant amino acid. Once developed, the degeneracy and sensitivity of the primer pairs will be tested via reverse transcriptase PCR on retroviruses that infect a wide variety of species. The most sensitive and broadly reactive primers will be used to screen clinical specimens that may be associated with retroviral infection.

To date, retroviruses have not been identified in dogs, although several canine diseases have similarities to known retroviral disorders in other species. Degenerative myelopathy (DM) is a progressive, idiopathic neurodegenerative disorder that primarily affects the spinal cord of dogs. Several clinical and histopathological similarities exist between canine DM and retrovirus-induced myelopathies. In particular, canine DM has striking similarities to HTLV type-1 myelopathy/tropical spastic paraparesis. Both disorders have nearly identical cervical and thoracic spinal cord pathology, and interestingly both conditions typically spare the thoracic limbs until late in the disease processes. The broadly reactive pan-retroviral PCR assays (developed via the CODEHOP strategy) will be used to evaluate cerebrospinal fluid and spinal cord tissue of dogs with histopathologically confirmed DM for the presence of retroviruses.

Development of a broadly reactive PCR assay for the retroviral genome should prove useful in determining whether or not canine DM is associated with retroviral infection. Moreover, pan-retroviral PCR will be a powerful tool for retrovirus detection in numerous diseases of unknown etiology in dogs and other species including humans.

Faculty Research Mentor: Dr. Scott Schatzberg, Veterinary Medicine

Appendix A
CURO 2008 Summer Research Fellows

Zachary Anderson, CURO Summer Research Fellow
Dr. Peter Brosius, Department of Anthropology
Multicultural Perspectives on Landscape Change

Matthew Belcher, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry and Molecular Biology
Dr. Rebecca Terns, Department of Biochemistry and Molecular Biology
Determinants in the Localization of Telomerase to Telomeres

Mary Elizabeth Blume, CURO-OVPR Summer Research Fellow
Dr. Stefaan Van Liefferinge, Department of Art History
Uncovering Traditions of the Gothic Style in the Architectural Plans of Saint Germain-des-Pres and Saint Martin-des-Champ in Paris

Milissa Brody, CURO-OVPR Summer Research Fellow
Dr. Ron Carroll, Odum School of Ecology
Interactions of Bees and Hummingbirds with Hamelia patens

Carolyn Crist, CURO-UGA Summer Research Fellow
Dr. John Greenman, Journalism
News in the Black Belt: Teaching Journalists how to Cover Poverty in Persistently Poor Counties

M. Logan Davis, CURO-BHSI Summer Fellow
Dr. James Franklin, Department of Pharmaceutical and Biomedical Sciences
Long-Range Retrograde Transduction of Trophic and Survival Signals in Mouse Sympathetic Neurons

Caroline M. Anderson, CURO-OVPR Summer Research Fellow
Dr. Dorothy Fragaszy, Department of Psychology
Decision-Making Strategies of Wild Capuchin Monkeys

Marcus Hines, CURO-BHSI Summer Research Fellow
Dr. Michael Tiemeyer, Complex Carbohydrate Research Center
Dr. Lance Wells, Complex Carbohydrate Research Center
Analyzing the Function of O-GlcNAc in Drosophila

Haylee Humes, CURO Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
How AICD and Fe65 are Recruited to Hirano Bodies

Lindsay Jones, CURO Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry and Molecular Biology
Dr. Rebecca Terns, Department of Biochemistry and Molecular Biology
Identification and Characterization of a Nuclease that Functions in an RNA-Mediated Viral Defense Pathway (RNAi) in Prokaryotes

Tyler Kelly, CURO Summer Research Fellow
Dr. Elham Izadi, Department of Mathematics
Usage of Linear Subspaces with Varieties
Former CURO Summer Research Fellows

**Jung Woong Kim**, CURO Summer Research Fellow
Dr. Andrew Sorenborger, Department of Mathematics, Engineering
Dr. James Lauderdale, Department of Cellular Biology
*Imaging of Endogenous Ca2+ Waves in Developing Zebrafish*

**Jennifer Lee**, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology
*Understanding Pediatric Symptoms*

**Sharon McCoy**, CURO-OVPR Summer Research Fellow
Dr. Chad Howe, Department of Romance Languages
*Dialect Perceptions of Spanish Speakers in Georgia*

**Katherine McGlamry**, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Michael Tiemeyer, Complex Carbohydrate Research Center
*Glycan Interactions and the Development and Spread of Cancer Cells*

**Alice Meagher**, CURO-BHSI Summer Research Fellow
Dr. Michael Adams, Department of Biochemistry and Molecular Biology
*Expression and Characterization of the Heterologously Expressed Soluble Hydrogenase I from Pyrococcus furiosus*

**Madison Moore**, CURO-BHSI Summer Research Fellow
Dr. Jennifer McDowell, Department of Psychology
*Behavioral and Neural Plasticity Following Daily Practice of Saccade Tasks in Schizophrenia*

**Emily Meyers**, CURO-OVPR Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
*The Advantage of Weakness: How Weak States can Overcome Military Might of Strong States*

**Kelly Nielsen**, CURO-OVPR Summer Research Fellow
Prof. George Contini, Department of Theatre and Film Studies
*Augusto Boal’s Invisible Theatre: Political Play with an Unassuming Audience*

**Sean O’Rourke**, CURO Summer Research Fellow
Dr. Kathy Simpson, Department of Kinesiology
*Neuromuscular Activation and Movement Kinematics Exhibited During the Sit-to-Stand by Multiple Sclerosis Individuals*

**Julie Patel**, CURO Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
*Military Interventions by Powerful States*

**Neil Pfister**, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry and Molecular Biology
Dr. Rebecca Terns, Department of Biochemistry and Molecular Biology
*Interactions that Define the Organization of RNA-Protein Complexes Involved in Prokaryotic RNA Interference*

**Stefann Plishka**, CURO-Franklin College of Arts and Sciences Summer Research Fellow
Dr. Asen Kirin, Department of Art History
*Imagining Constantinople: Imperial Houses of Worship as Symbols of State Ideology*
Katie Pyne, CURO Summer Research Fellow  
Dr. Jerome Legge, Department of International Affairs  
Refugees and Internally Displaced People: How Effective are the United Nations, Nongovernmental Organizations, and Subsequent Initiatives in Pacifying this Complex Humanitarian Crisis?

Joseph Rimanddo, CURO-Interdisciplinary Toxicology Program Summer Research Fellow  
Dr. Ralph Tripp, Department of Infectious Diseases  
Understanding and Preventing the Interaction between RSV’s G Protein and the CX3CR1 Cell Receptor

Aalok Sanjanwala, CURO Summer Research Fellow  
Dr. Marcus Fechheimer, Department of Cellular Biology  
Dr. Ruth Furukawa, Department of Cellular Biology  
The Effect of Hirano Bodies on Mutated Tau Protein

Neeraj Sriram, CURO Summer Research Fellow  
Dr. Mark Eiteman, Department of Biological and Agricultural Engineering  
Solving the World’s Energy Crisis – Not One Sugar at a Time

Giridhar Subramanian, CURO Summer Research Fellow  
Dr. Brock Tessman, Department of International Affairs  
Power and Influence in Southeast Asia: A Study of the Methods Used by India, China, and the United States

Aileen Thomas, CURO Summer Research Fellow  
Dr. Nicole Lazar, Department of Statistics  
How Random is Pseudorandom

Kathryn Turner, CURO Summer Research Fellow  
Dr. Shelley Hooks, Department of Pharmaceutical and Biomedical Sciences  
Comparison of RGS Regulation of LPA Signaling in Prostate Cancer and Ovarian Cancer

Manouela Valtcheva, CURO Summer Research Fellow  
Dr. Jennifer McDowell, Department of Psychology  
Antisaccade Performance and Deficit Characteristics in a Normal Population

Hunter Wilson, CURO Summer Research Fellow  
Dr. Timothy Dore, Department of Chemistry  
8-Chloro-7-hydroxyquinoline as a Biologically Useful Photoremovable Protecting Group

Laura Wynn, CURO-OVPR Summer Research Fellow  
Dr. Martin Kagel, Department of Germanic and Slavic Languages  
Issues in Current Turkish-German Literature
Appendix B
CURO 2007 Summer Research Fellows

Caroline M. Anderson, CURO-OVPR Summer Research Fellow
  Dr. John Turci-Escobar, Department of Music Theory
  Dr. Max Reinhart, Department of German
  *A Psychoanalytical Examination of Wolf and Mörike's Peregrina Songs*

Joseph Burch, CURO Summer Research Fellow
  Dr. Harry Dailey, Department of Microbiology and Biochemistry & Molecular Biology
  *Converting Ferrochelatase into a Cytochrome c Like Protein*

Amy Burrell, CURO-BHSI Summer Research Fellow
  Dr. Debra Mohnen, Department of Biochemistry & Molecular Biology
  *Analysis of the Transcriptional Expression of Arabidopsis GAUT Genes: 15 Proven and Putative Plant Cell Wall Biosynthetic Galacturonosyltransferases*

Lee Ellen Carter, CURO-OVPR Summer Research Fellow
  Dr. Fausto Sarmiento, Department of Geography
  *Ecoregional Conservation Among Indigenous Communities in Cotacachi, Ecuador*

Kimberly DeLisi, CURO-BHSI Summer Research Fellow
  Dr. Ray Kaplan, Department of Infectious Diseases
  *Parameters Affecting Fecal Egg Count Data for Determining Drug Resistance in Nematode Parasites of Horses*

Joshua Dunn, CURO-OVPR Summer Research Fellow
  Dr. William Kretzschmar, Departments of Linguistics and English
  *The Youth of Roswell Voices: A Linguistic Analysis*

Katie Flake, CURO-BHSI Summer Research Fellow
  Dr. Maor Bar-Peled, Complex Carbohydrate Research Center
  *The Arabinose Kinase Project*

James Gordy, CURO Summer Research Fellow
  Dr. Michael Adams, Department of Biochemistry & Molecular Biology
  *Developing Methodologies for the Study of Small ORFs in P. furiosus*

Jana Hanchett, CURO Summer Research Fellow
  Dr. David Schiller, Department of Musicology/Ethnomusicology
  *Latino and Hispanic Musical Influences on Athens-Clarke County*

Laura Harrison, CURO-BHSI Summer Research Fellow
  Dr. Corrie Brown, Department of Pathology
  Campylobacter in the Crypts

Clare Hatfield, CURO-OVPR Summer Research Fellow
  Dr. Stephen Shellman, Department of International Affairs
  *Democracy and the Choice of Law: The Intersections of Shari’a, Domestic and International Law*

Anna Hudson, CURO Summer Research Fellow
  Dr. Richard Dluhy, Department of Chemistry
  *Using Surface Enhanced Raman Spectroscopy for the Detection of Pathogens*
Former CURO Summer Research Fellows

Andy Kragor, CURO-Jane & Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center
Dr. Carl Bergmann, Complex Carbohydrate Research Center
*Unbiased Isolation and Carbohydrate Mapping of Alpha-Dystroglycan*

Brian Laughlin, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center
*Functional Analysis of the Magnaporthe grisea Secretome*

James MacNamara, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Biochemistry & Molecular Biology
*Synthesis of Quinolinol-Based Inhibitors of RecIp*

Prashant Monian, CURO-Interdisciplinary Toxicology Program Summer Research Fellow
Dr. Brian Cummings, Pharmaceutical & Biomedical Sciences
*Molecular Inhibition of Independent Phospholipase A2 and its Effect on Prostate Cancer Growth*

Neil Naik, CURO-OVPR Summer Research Fellow
Dr. Ruth Harris, Department of Food & Nutrition
*The Effect of Antagonizing Stress Receptors in Rats During Repeated Exposure to Restraint Stress*

Natalie Nesmith, CURO-BHSI Summer Research Fellow
Dr. Mary Bedell, Department of Genetics
*Genetic Studies on the Roles of KITL in Regulating the Proliferation and Apoptosis of Primordial Germ Cells in Mice*

Victor Orellana, CURO Summer Research Fellow
Dr. Nicolás Lucero, Department of Romance Languages
*Unsung Hero: A Literary and Historical Study of Lautaro*

Tulsi Patel, CURO Summer Research Fellow
Dr. Scott Gold, Department of Plant Pathology
*Developing a Biocontrol Agent for Chinese Privet, Ligustrum sinense*

Tomas Pickering, CURO-OVPR Summer Research Fellow
Dr. Dorothy M. Fragaszy, Department of Psychology
*Manner of Hammer Stone Use in Wild Capuchin Monkeys*

Cleveland Piggott, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
*The Formation of Hirano Bodies*

Purvi Sheth, CURO Summer Research Fellow
Dr. Russell Karls, Department of Microbiology
*Characterization of Mycobacterium shottsii*

Traci Tucker, CURO Summer Research Fellow
Dr. Dawn Robinson, Department of Sociology
*Gender and Role Meanings: A Cross-Cultural Comparison*

Jessica Van Parys, CURO-UGA Alumni Association Summer Research Fellow
Dr. David Mustard, Department of Economics
*Does Writing Ability Signal Academic Excellence?: Evidence from the New Scholastic Aptitude Writing Section (SATW)*

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Former CURO Summer Research Fellows

Delila Wilburn, CURO Summer Research Fellow
  Dr. Barbara McCaskill, Departments of African American Studies and English
  Beauty Imposed

Karen Wong, CURO Summer Research Fellow
  Dr. Andrew Whitford, Department of Political Science
Appendix C
CURO 2006 Summer Research Fellows

Sarah Breevoort, CURO-BHSI Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
*Construction of Three Rcelp Mutant Plasmids to Aid in the Characterization of Rcelp Enzymatic Activity*

Lauren Coffey, CURO Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Susan Fang, CURO Summer Research Fellow
Prof. Christopher Hocking, Studio Foundations

Courtney Grant, CURO-BHSI Summer Research Fellow
Dr. Julie Coffield, Department of Physiology and Pharmacology
*An Investigation of Botulinum Neurotoxin Interactions on RhoA Activity Using In Vitro Assays*

Erica Hall, CURO-BHSI Summer Research Fellow
Dr. Jessie Kissinger, Department of Genetics

Adele Handy, CURO-UGA Alumni Association Summer Research Fellow
Dr. Greg Robinson, Department of Chemistry

Celan Hardman, CURO Summer Research Fellow
Prof. Joe Norman, Drawing and Painting

Sana Hashmi, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center
*Alteration of Alpha-Dystroglycan and Cancer Progression*

Brian Levy, CURO Summer Research Fellow
Dr. Larry Nackerud, School of Social Work
*Courrie – Not Email: Implications for Government Regulation of a Social Phenomenon. A Case Study of Language in France*

Maggie Mills, CURO-NSF/SPIA Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Anna-Marieta Moise, CURO-BHSI Summer Research Fellow
Dr. Andrea Hohmann, Department of Psychology
*Neurochemical Basis of Social Defeat in Syrian Hamsters: Role of Endogenous Cannabinoids*

Lamar Moree, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center

Jesse Oakley, CURO Summer Research Fellow
Dr. Laurie Fowler, Department of Ecology
*Economic Incentives for Private Land Conservation and Sustainable Development: Research into Environmental Policy in Costa Rica and Georgia*

Katie Orlemanski, CURO-OVPR Summer Research Fellow
Dr. Patricia Richards, Department of Sociology
*Reclaiming “Development” within the Context of Low-Income Neighborhoods*
Former CURO Summer Research Fellows

Danielle Pearl, CURO-OVPR Summer Research Fellow
   Dr. Keith Langston, Germanic and Slavic Languages
   Press Freedom, E.U. Accession, and Democracy in Croatia

Daniel Perry, CURO Summer Research Fellow
   Dr. David Landau, Department of Physics and Astronomy

Andrew Pierce, CURO Summer Research Fellow
   Dr. Thomas McNulty, Department of Sociology

Richard Piercy, CURO-OVPR Summer Research Fellow
   Dr. Cory Momany, Department of Pharmaceutical and Biomedical Sciences

Kurinji Pandiyan, CURO Summer Research Fellow
   Dr. Steven Holloway, Department of Geography
   Understanding Public Space in a New Urbanist Development

Mandy Redden, CURO-BHSI Summer Research Fellow
   Dr. Robert Arnold, Department of Pharmaceutical and Biomedical Sciences
   Towards a More Effective Delivery System for Anti-Cancer Drugs

Eva Bonney Reed, CURO-BHSI Summer Research Fellow
   Dr. Ronald Blount, Department of Psychology

Lisa Rivard, CURO-Toxicology Summer Research Fellow
   Dr. Jeff Fisher, Toxicology

Sonia Talathi, CURO-OVPR Summer Research Fellow
   Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
   Effectiveness of Ca2+-Independent Phospholipase A2 Inhibitors in the Induction of Cheomtherapeutic-Induced Cancer Cell Death

Erika Vinson, CURO Summer Research Fellow
   Dr. Richard Siegesmund, Art Education

Joshua Watkins, CURO Summer Research Fellow
   Dr. Patricia Sullivan, Department of International Affairs
   The Price of Victory: When Leaders Underestimate the Cost of War

Daniel Weitz, CURO-OVPR Summer Research Fellow
   Dr. Gary Bertsch, Department of International Affairs
   The Impact of a European Union Nuclear Weapons Free Zone on the International Non-Proliferation Regime

Shannon Yu, CURO-BHSI Summer Research Fellow
   Dr. Nancy Manley, Department of Genetics

Creating a Culture of Undergraduate Inquiry
Appendix D
CURO 2005 Summer Research Fellows

Grace Anglin, CURO-OVPR Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
*Family Focused Emotion Communication Training*

Ashley Beebe, CURO Summer Research Fellow
Dr. James R. Holmes, Center for International Trade and Security
*The Influence of Media on Economic Policy in Brazil and Argentina*

Ingrid Bloom, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
*Differentiation of Human Embryonic Stem Cells into Endothelial Progenitors*

Ian Lewis Campbell, CURO Summer Research Fellow
Dr. Glenn Wallis, Department of Religion
*Theories of Mythology and the Way That Myths Have Affected Social and Political Formation*

Kimberly Coveney, CURO-CIT Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
*Role of iPLA2 in Phospholipid Metabolism in Chemotherapeutic-Induced Cancer Cell Death*

William Collier, CURO-OVPR Summer Research Fellow
Dr. Amy D. Rosemond, Institute of Ecology
*Analysis of an Exotic Species’ Interactions with Native Aquatic Trophic Dynamics: Quantifying the Effects of the North American Beaver (Castor canadensis) on Sub-Antarctic Stream Food Webs in the Cape Horn Archipelago, Chile*

John Crowe, CURO Summer Research Fellow
Prof. Mark Callahan, Ideas for Creative Exploration
*AUX Launch: Art, Representation, and Commerce on the Web*

Katie Griffith, CURO Summer Research Fellow
Dr. Diana Ranson, Department of Romance Languages
Dr. Judith Preissle, College of Education
*Assessing Cultural Values and Political Beliefs in a Nicaraguan Classroom: A Participant Observation*

Matthew Haney, CURO-CTEGD Summer Research Fellow
Dr. Rick Tarleton, Department of Cellular Biology
*Antibody Depletion of Highly Abundant Proteins in Trypanosoma cruzi for the Fine-Tuning of Proteomic Analysis*

Ned Hembree, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
*Rcl and Ste24 Inhibition by Dipeptidyl Acyloxyxymethyl Ketones: A Potential Target for Cancer Therapeutics*

Alicia Higginbotham, CURO Summer Research Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
*Christopher Logue’s Iliad: A Work in Translation*

Scott Jacques, CURO Summer Research Fellow
Dr. Mark Cooney, Department of Sociology
*The Social Reality of Young, Middle Class Drug Dealers*
Lisa Jordan, CURO Summer Research Fellow  
Dr. Ruth Harris, Department of Food and Nutrition  
The Effect of Leptin on Sympathetic Nerve Activity in White Adipose Tissue

Carey Kirk, CURO-OVPR Summer Research Fellow  
Dr. David Z. Saltz, Department of Theatre and Film Studies  
The Effectiveness of Drama Techniques in Treating People Suffering from Trauma

Andrew Leidner, CURO-CTEGD Summer Research Fellow  
Dr. Pejman Rohani, Institute of Ecology  
Coevolutionary Behavior and Interference between Fatal Diseases

Jon McGough, CURO-BHSI Summer Research Fellow  
Dr. Wyatt Anderson, Department of Genetics  
The Role of Female Choice in Sexual Selection of Drosophila pseudoobscura

Tatyana Nienow, CURO-BHSI Summer Research Fellow  
Dr. Walter K. Schmidt, Department of Genetics  
Adapting Yeast for the Study of Pitrilysin and Other M16A Enzymes

Erika Porter, CURO-BHSI Summer Research Fellow  
Dr. Charles H. Keith, Department of Cellular Biology  
Intrinsic Fluorimetric Imaging of Neural Activation in Cultured Cells and Zebrafish

Kurinji Pandiyan, CURO-CAES Summer Research Fellow  
Dr. Raj Rao, Department of Animal and Dairy Science  
Dr. Steven Stice, Department of Animal and Dairy Science  
Genomic Instability of Human Embryonic Stem Cells

Kelly Proctor, CURO-OVPR Summer Research Fellow  
Dr. Lee B. Becker, College of Journalism and Mass Communication  
Differences in Environmental Reporting: China and the United States

Rebecca Trupe, CURO Summer Research Fellow  
Dr. Kimberly Shipman, Department of Psychology  
Family Focused Emotion Communication Training

Russ Richardson, CURO Summer Research Fellow  
Dr. Ron Carroll, Institute of Ecology  
Sugarcane Processing Waste as a Soil Amendment on Organic, Shade-Grown Coffee under Simulated Drought Conditions for Control of Plant-Parasitic Nematodes

Dustin Williams, CURO-BHSI Summer Research Fellow  
Dr. Scott T. Dougan, Department of Cellular Biology  
Development of Transgenic Zebrafish to Understand How Activation of Hyal-2 Leads to Tumor Formation

Fei Yang, CURO Summer Research Fellow  
Dr. Janet Westpheling, Department of Genetics  
Regulation of Branched-Chain Amino Acid Catabolism in Streptomyces coelicor: Applications for Metabolic Engineering of Polyketide Antibiotic Biosynthesis

Stephanie Yarnell, CURO Summer Research Fellow  
Dr. Carl Bergmann, Complex Carbohydrate Research Center
Appendix E
CURO 2004 Summer Research Fellows

Cara Altimus, CURO Summer Research Fellow
Dr. Jonathan Arnold, Department of Genetics
*Isolation of a Light Receptor in the Biological Clock of N. crassa*

Westin Amberge, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
*Guided Differentiation of Human Embryonic Stem Cells into Endothelial Cells: Focusing on the Ulex Europaeus Agglutin I Lectin*

Namrata Asuri, CURO Summer Research Fellow
Dr. Sidney Kushner, Department of Genetics
*Analysis of the Role of Ribosomal S1 in the Polyadenylation Pathway of Escherichia coli*

Erin Bohan, CURO-OVPR Summer Research Fellow
Dr. Katarzyna Jerzak, Department of Comparative Literature
*The Reconciliation of Selves: The Emigrant Experience in America*

Rebecca Brantley, CURO-OVPR Summer Research Fellow
Ms. Ashley Callahan, Georgia Museum of Art
*The Early Fashion Design of Mariska Karasz and the Influence of Her Native Hungary*

Josef Broder, CURO Summer Research Fellow
Dr. Andrew Sornborger, Department of Mathematics
*Techniques in High Noise Image Analysis*

Beau Bryan, CURO-BHSI Summer Research Fellow
Dr. Michael Pierce, Department of Biochemistry and Molecular Biology
*N-Cadherin Gl*

Susannah Chapman, CURO Summer Research Fellow
Dr. Virginia Nazarea, Department of Anthropology
*Designing Sui Generis Systems for Traditional Plants and Associated Local Knowledge*

Clayton Griffith, CURO-OVPR Summer Research Fellow
Dr. Amy Rosemond, Institute of Ecology
*The Effect of the North American Beaver (Castor Canadensis), an Exotic Herbivore, on the Composition, Structure, and Regeneration of the Riparian Vegetation of Sub-Antarctic Forested Streams in Chile*

Christopher Hale, CURO-BHSI Summer Research Fellow
Dr. Thomas F. Murray, Department of Physiology and Pharmacology
*Adolescence as a Distinct Period of Vulnerability to Nicotine Addiction*

Catherine Hudson, CURO-BHSI Summer Research Fellow
Dr. Harry Dailey, Department of Microbiology and Biochemistry and Microbiology
*Negatively Affecting the Heme Biosynthetic Pathway in “Escherichia coli”*

Douglas Jackson, CURO Summer Research Fellow
Dr. Nigel Adams, Department of Chemistry
*Reactions of Protonated Carboxylic Acid Ions with Amines in the Interstellar Medium*
**Former CURO Summer Research Fellows**

Andrew Leidner, CURO-BHSI Summer Research Fellow  
Dr. Pejman Rohani, Institute of Ecology  
*Parasitoid Behavior and Evolutionary Dynamics*

Janel Long, CURO-OVPR Summer Research Fellow  
Dr. Jean Martin-Williams, School of Music  
*The Partitas of Franz Krommer and Natural Horn Technique*

John McWhorter, CURO-BHSI Summer Research Fellow  
Dr. Daniel Colley, Department of Microbiology  
*Induction of the Regulatory Ligand PD-L2 and the Co-regulatory Receptor PD-1 on CD4 Lymphoctes During Early Experimental Schistosomiasis Mansoni*

William Parker, CURO Summer Research Fellow  
Dr. Marly Eidsness, Department of Chemistry  
*Trigger Factor*

Gehres Paschal, CURO-OVPR Summer Research Fellow  
Dr. J. David Puett, Department of Biochemistry and Molecular Biology  
*Activating Mutations of the Lutropin/Choriogonadotropin Receptor Associated with Familial Precocious Puberty, Male Pseudohermaphroditism, Hypogonadism, Amenorrhea, Leydig cell Hyperplasia, and Metastatic Thyroid Carcinoma*

Kevin Patrick, CURO Summer Research Fellow  
Dr. James Anderson, Department of Classics  
*Cicero and the Foundations of a Legal Education at Rome*

Katherine Price, CURO Summer Research Fellow  
Dr. Janet Westpheling, Department of Genetics  
*Site Specific Chromosomal Integration Mediated by Bacteriophage Integrase*

Matthew Rudy, CURO Summer Research Fellow  
Dr. Marly Eidsness, Department of Chemistry  
*Analysis of Cotranslational Protein Folding in E-coli and Determination of the Role of the Trigger Factor Gene in the Folding Process*

Desiree Smith, CURO Summer Research Fellow  
Dr. Roberta Fernandez, Department of Romance Languages  
*Projecting a Positive Educational Experience for Latina/os in the South*

Christopher Stokes, CURO-OVPR Summer Research Fellow  
Dr. Randy Kamphaus, School of Professional Studies  
*Family Health and Classroom Behavior: A Pilot Study*

Shana Strickland, CURO-BHSI Summer Research Fellow  
Dr. Kimberly Shipman, Department of Psychology  
*Emotional Regulation and Coping Skills in Maltreated Children*

Adam Stroupe, CURO Summer Research Fellow  
Dr. Boris Striepen, Department of Cellular Biology  
*Drug and Nutrient Trafficking in the Human Pathogen Cryptosporidium parvum*
Former CURO Summer Research Fellows

Teerawit Supakornnej, CURO-BHSI Summer Research Fellow
  Dr. Michael Terns, Department of Biochemistry and Molecular Biology

Tendoh Timoh, CURO Summer Research Fellow
  Dr. Marly Eidsness, Department of Chemistry
  Fluorophore-modified Nascent Polypeptides

Jora Vaso, CURO-OVPR Summer Research Fellow
  Dr. Katarzyna Jerzak, Department of Comparative Literature
  The Effect of Communism on the Works of Andric, Kadare, and Szymborska

Leslie Wolcott, CURO-OVPR Summer Research Fellow
  Dr. Betty Jean Craige, Center for Humanities and Arts
  The Environment in Georgia’s Literature, Past and Present

Creating a Culture of Undergraduate Inquiry
Appendix F
CURO 2003 Summer Research Fellows

Anthony Anfuso, CURO Summer Research Fellow
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
Developing a Fast Plant Expression System to Identify Biosynthetic Genes Involved in Pectin Synthesis

Tiffany Beal, CURO-BHSI Summer Research Fellow
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
Determining How Pectins Inhibit Cancer Growth and Metastasis

Robert Brady, CURO Summer Research Fellow
Dr. Nader Amir, Department of Psychology
Malleability of Interpretation Bias in Social Anxiety and General Anxiety

Josef Broder, CURO Summer Research Fellow
Dr. Chi N. Thai, Department of Biological and Agricultural Engineering
Operational Characteristics of a Mobile Spectral Imaging System for Plant Health Detection

Martha Rose Calamaras, CURO Summer Research Fellow
Dr. Kim Shipman, Department of Psychology
Emotional Understanding in Abused and Neglectful African-American Families

Daniel del Portal, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
The Physiological Role of Hirano Bodies

Dustin Dyer, CURO Summer Research Fellow
Dr. Guigen Zang, Department of Biological and Agricultural Engineering
Dr. Michael Geller, Department of Physics and Astronomy
Energy Dissipation in Nanomechanical Resonators

Sarah Fritts, CURO Summer Research Fellow
Dr. John P. Carroll, School of Forest Resources
An Inventory and Assessment of Medicinal Plants and Animals Used by Makuleke Traditional Healers on the Northern Boundary of the Kruger National Park, South Africa

Betsy Goodwin, CURO-BHSI Summer Research Fellow
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Patrick Gosnell, CURO Summer Research Fellow
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Paulette Andrea Greene, CURO-BHSI Summer Research Fellow
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Andrea Haltiner, CURO-BHSI Summer Research Fellow
Dr. Ruth Harris, Department of Foods and Nutrition
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Luke Hoagland, CURO-BHSI Summer Research Fellow  
Dr. Marcus Fechheimer, Department of Medical Cellular Biology  
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Christopher “Kit” Hughes, CURO Summer Research Fellow  
Prof. Mark Callahan, School of Art  
*Tagging*

Steven Jocoy, CURO Summer Research Fellow  
Dr. Michael Bender, Department of Genetics

Leena Kukkarni, CURO Summer Research Fellow  
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Ryan Rhome, CURO Summer Research Fellow  
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Susan Ritger, CURO-BHSI Summer Research Fellow  
Dr. Duncan C. Ferguson, Department of Physiology and Pharmacology  
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Ben Solomon, CURO Summer Research Fellow  
Dr. Kevin McCully, Department of Exercise Science  
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Mary Tolcher, CURO Summer Research Fellow  
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Meghan Wilson, CURO-BHSI Summer Research Fellow  
Dr. James Lauderdale, Department of Cellular Biology  
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Ryan Wilson, CURO Summer Research Fellow
Roger Moore, Department of Landscape Architecture

Thomas Wood, CURO Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology

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Ashley D. Chadha
Dr. Michael McEachern, Department of Genetics
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Emily DeCrescenzo
Dr. Susan Sanchez, Department of Biochemistry and Molecular Biology
Development of a Detection Method for TSST-1 exotoxin from Staphylococcus aureus Associated with Toxic Shock Syndrome in Horses Directly from Clinical Samples

Ivy Forkner
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
Functional Expression of Putative Biosynthetic Genes for Pectin: A Plant Polysaccharide with Anti-Cancer Activity

Cory S. Gresham
Dr. James B. Stanton, Department of Pathology
Dr. Corrie C. Brown, Department of Pathology
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Nowell Hesse
Dr. Maor Bar-Peled, Department of Plant Biology
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Dr. Will York, Department of Biochemistry and Molecular Biology
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Parker Hudson III
Dr. Mary Bedell, Department of Genetics

Britt Johnson
Dr. Janet Westpheling, Department of Genetics
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LeeAnn Jones
Dr. Massimo Palmarini, Department of Medical Microbiology
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Judson A. Lewis
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Cheryl L. Maier
Dr. Scott Pratt, Department of Animal and Dairy Science
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Lauren Watson
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Katherine Williams
Dr. Kojo Mensa-Wilmot, Department of Cellular Biology
Dr. Anne Clark, Oxford University

Brad Wright
Dr. Larry Nackerud, School of Social Work
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Dr. Debra Mohnen, Complex Carbohydrate Research Center
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Dr. Janet Westpheling, Department of Genetics
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Jon E. Davis
Dr. Gary Bertsch, Department of Political Science
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Dr. Max Reinhart, Department of Germanic and Slavic Languages
The Progress and Modernization of Former East German Healthcare after Communism

Lawrence Dougherty
Dr. Daniel Promislow, Department of Genetics
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Matt Edwards
Dr. Gary Bertsch, Department of Political Science
Evaluating the Moscow Center for Export Control’s Role as a Non-Proliferation Epistemic Community Member

Ben Emanuel
Dr. Frances Teague, Department of English
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Jeff Halley
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Amanda Hudson
Dr. Michael Terns, Department of Biochemistry and Molecular Biology
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Kenneth Miller
Dr. Timothy Dore, Department of Chemistry
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Lorina Naci
Professor William Paul, Jr., School of Art
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Creating a Culture of Undergraduate Inquiry
Former CURO Summer Research Fellows

Lynn Nguyen
   Dr. Mark Wheeler, Department of Dance
   Chinese Classical Dance

Cori Pelletier
   Dr. Roy Grant, Department of Music Therapy
   Music Therapy with Premature Infants

Kate Smith
   Dr. Kenneth S. Latimer, Department of Pathology
   Immunohistochemical (IHC) Detection of Natural Killer Cells in Fish

Buudoan V. Tran
   Dr. Karl N. Kirschner, Complex Carbohydrate Research Center
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   Parameter Development and Application of the Glycam Force Field for Sialic Acid Derivatives

John Woodruff
   Dr. Harry Dailey, Department of Microbiology
   The Generation of Mutations in the n-Terminal Region of the Protoporphyrinogen Oxidase of Bacillus subtilis
   to Create a Protein Capable of Mitochondrial Targeting in Mammalian Cells
CURO Summer Research Fellowships

The Center for Undergraduate Research Opportunities (CURO) awards Summer Research Fellowships to academically talented undergraduates who participate in research during the summer term at the University of Georgia. The number of Summer Research Fellowships varies from year to year, based on funding. Successful applicants receive a financial award of $3,000 and present their research at the CURO undergraduate research symposium. (Those students who receive $3,000 must use $500 toward presenting their research at a regional or national conference.)

In order to be selected for a Summer Research Fellowship, interested students must have at least a 3.4 GPA, thirty hours of UGA credit, and must commit to the following:

1. Enrolling in two sequential Honors undergraduate research courses: HONS 4960H and HONS 4970H or HONS 4970H and HONS 4980H. Students who wish to complete a thesis during the summer should check with Dr. Kleiber and their faculty research mentor. If approval is granted, the student will register for HONS 4980H and HONS 4990H. Students who are awarded the fellowship must register for these classes for the regular summer session before they are eligible to receive fellowship monies. If, during the course of the fellowship, the student withdraws from these classes for any reason, the stipend must be returned in full. CURO Fellows must resign from any other UGA employment to be eligible for funding and may not be enrolled in any other courses. CURO will create 6 hours of Honors research courses for the student in OASIS.

2. Submitting an abstract of the summer research to Dr. Pamela Kleiber by the last day of finals of the summer semester, for possible presentation at the annual CURO Symposium the following spring. Fellowship recipients are required to attend the upcoming Symposium, even if their abstract is not selected for presentation.

3. Participating in panel discussions with the Associate Director throughout the year to encourage an appreciation for undergraduate research at UGA.

Students who will be traveling internationally as part of their research must complete additional paperwork through CURO and the Office of International Education and are required to purchase travel insurance (approximately $1 per day) through the Office of International Education for their time abroad.
2010 Selection Committee

Dr. Patricia Hunt-Hurst  Professor and Head, Textiles, Merchandizing and Interiors
Dr. John Maerz  Assistant Professor, Vertebrate Ecology
Dr. David Saltz  Professor and Head, Theater and Film Studies
Dr. Paul Schroeder  Professor, Geography
Dr. Michael Tiemeyer  Associate Professor, Biochemistry and Molecular Biology
Dr. Karen Webber  Associate Professor, Institute of Higher Education
Chair: Dr. Pamela Kleiber  Associate Director, Honors Program

Special thanks to the sponsors of the 2010 Summer Research Fellowships

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The Office of the Senior Vice President for Academic Affairs and Provost
The Office of the Vice President for Instruction
The Office of the Vice President for Research
The UGA Alumni Association
The Athletic Association
The Jane and Bill Young Scholarship
April 12, 2010

Dear UGA Faculty and Students:

We are delighted and honored to name 25 CURO Summer Research Fellows for 2010, each of whom is featured in this handbook with a summary of his or her faculty-mentored research project. The goal of the CURO Summer Research Fellowships is to provide opportunities for intensive, immersive, faculty-guided research experiences for academically talented undergraduates. The program advances the students’ knowledge and abilities to think critically, solve problems, and contribute to greater understanding of the world.

The CURO 2010 Summer Research Fellowships are funded through the Honors Program, the President’s Office, the Office of the Senior Vice President for Academic Affairs and Provost, the Office of the Vice President for Instruction, the Office of the Vice President for Research, the Alumni Association, the Athletic Association, and the Jane and Bill Young Scholarship.

We are exceptionally proud of the quality of the contributions of present and past CURO Summer Fellows and with the mentorship of faculty researchers and their graduate students. The Summer Fellowship program has contributed to building a culture of undergraduate inquiry at the University of Georgia, and the CURO Summer Fellows serve as ambassadors, sharing their enthusiasm and expertise in a variety of professional forums on campus as well as at regional, national, and international meetings.

Please join us in congratulating these young scholars on the occasion of being awarded these prestigious fellowships. Please join us also in thanking the faculty research mentors whose support and guidance are crucial to the CURO Summer Fellows’ success.

Sincerely yours,

David S. Williams                                           Pamela B. Kleiber
Director, Honors Program                                     Associate Director, Honors Program
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During its dominance, television news was viewed as a relatively homogenous product, catering and marketing to a rather large audience. However, as new forms of media challenged broadcast, primarily satellite and cable, and the major networks fought to retain their audience level, observers noted that “news” was changing. Simply the introduction of greater competition, competition that seemed to target a particular slice of the market, changed the nature of news. Many scholars began to discuss news as filtered through a prism, rather than a “fair and balanced” representation of “all you need to know”. I will attempt to test this theory of niche news by analyzing the coverage of a rather politically charged event, the Tea Party Convention.

If this theory is true, the expectation is that coverage among the major news outlets (ABC, CBS, NBC, FOXNews, MSNBC, and CNN) will differ significantly in their presentation. In the end, I expect variation in 1. How the Convention is framed, 2. How much attention is given to the event, and 3. The positive and negative connotations found in the words used to describe the event. I will conduct a content analysis of news transcripts from the days immediately surrounding the convention according to particular variables, such as sources, ideological bias, and attention. Most of the data analysis will be descriptive, with quantitative support from correlation and cross-tabulation analysis. My expectation is a confirmation of the niche theory. News no longer represents reality, but rather reality through a particular market perspective.

Research Faculty Mentor, Dr. Audrey Haynes, Department of Political Science
Healthy Teens: A Longitudinal study of ‘at risk’ secondary students

Amarachi Anukam

Healthy Teens is a project to examine the developmental pathways that students follow from 6th to 12th grade, especially in regards to dating violence, relationships with peers, academic success or failure, drug use, depression & suicidal thoughts, and dropping out of school. Although this list includes a broad range of behaviors, the main goal of this research is to prevent violence and aggression in youth by working with kids, families, and schools. This project has followed over 700 northeast Georgian students from 6th to 12th grade.

In middle school, students were recruited into the project in two ways. Most of the students were randomly selected, and these students make up the “random” group of participants. In addition, some students were nominated by their teachers for being more aggressive towards their peers. These nominated students make up the “high-risk” group of participants, as they already show more aggressive and violent behavior than their peers. The students were surveyed every spring from 6th to 12th grade, but received slightly different surveys based on what group they were in. Surveys evaluated a wide variety of violence-related behaviors (aggression towards peers, delinquency, weapon carrying, drug & alcohol use), as well as a large number of risk factors and protective factors at multiple levels of the ecological framework.

The ecological model states that there are different levels of interaction that influence behaviors of individuals. These levels are: child (the individual in question), family, peers, school, community, and society. At each level of the ecological model, protective factors promote healthy, nonviolent behaviors and risk factors enhance the likelihood of violence and aggression. For example, a protective factor at the family level is having a positive relationship with parents. In contrast, a risk factor at the family level is lack of parental supervision.

This summer, I will observe and analyze risk and protective factors of research participants at the neighborhood level. Under the guidance of a graduate assistant, I will be conducting neighborhood observations using an adapted version of The Neighborhood Observational Checklist (NOC) (Zenk, Schulz, House, Benjamin, & Kannan, 2005b). The Neighborhood Observational Checklist adapted for the study comprises 36 items that cover land use; street, sidewalk, and building conditions; alcohol, tobacco, and fast-food advertisements; residential housing; noise; and resident activity. I will use a handheld computer (Palm m125) to collect NOC data programmed in Experience Sampling Program (ESP) version 4.0 software, a system well suited for field-based observational research (Gravlee, Zenk, Woods, Rowe, & Schulz, 2006). All travel costs to and from the neighborhoods will be covered by the lab. After collecting data, I will use SPSS (a computer program used for statistical analysis) to examine disparities between the neighborhood environments of the students and compare self-reports of delinquency by neighborhood characteristics.

Faculty Research Mentor: Dr. Pamela Orpinas, Department of Health Promotion and Behavior
A number of characteristics have been traditionally attributed to Japanese discourse by qualitative research. While this qualitative approach is not itself a problem, it is the responsibility of scholars to verify previous findings. To this end, I seek to quantitatively evaluate such attributions, while also developing a concrete understanding of such discourse features.

To this end, I will analyze six large collections of text (“corpora”) using three methods: comparing which words are found near each other (and how often), examining rates of appearance for certain words and fixed phrases, and directly examining context through the use of concordancing software.

Three of the corpora I use will be in English: the EMU corpus was created by myself and was taken from freely available online interviews with English-speaking musicians. The EJI corpus was also created by myself, and followed the same sampling procedure as the EMU corpus, though I sampled from interviews with Japanese musicians that had been translated into English. The third is the FROWN reference corpus, which is a million-word collection drawing from a large range of written sources and genres.

Three of the corpora will be in Japanese: the Corpus of Spontaneous Japanese and the Balanced Corpus of Contemporary Written Japanese are, like FROWN, reference corpora and were created by the National Institute for Japanese Language. The third will be a personally-constructed Japanese-language corpus designed similarly to the EJI and EMU corpora.

The reference corpora (FROWN, CSJ, BCCWJ) will permit me to compare general language use against my specialized interview corpora in order to account for the impact of genre, and the three interview corpora will be compared to yield insight into Japanese discourse features.

This research will prove significant because it seeks to assess accepted beliefs about Japanese speech, which impact wider attitudes towards the Japanese themselves. Furthermore, understanding of Japanese communicative patterns has major implications for international business. In inter-company relations where miscommunications are disastrous and costly, a thorough understanding of Japanese communicative practices is invaluable.

*Faculty Research mentor: Dr. William Kretzschmar, Departments of English and Linguistics*
Genetic analysis of pigmentation in Drosophila tennebrosa

Michael Bray

The primary goal of this project is to identify the genes that underlie the dark diffuse pigmentation in D. tennebrosa. In the quinaria group of Drosophila, most species are yellow in body color, with distinct dark spots spaced around the abdomen. D. tennebrosa is the only member of this subgenus group that is melanic, in that it has a completely black abdomen. Because the majority of the quinaria group's coloration is yellow, the lighter trait is thought to be the ancestral trait. Thus, the dark abdomen of D. tennebrosa is thought to be the derived trait. I will make reciprocal crosses between male D. tennebrosa and female D. suboccidentalis and between male D. suboccidentalis and female D. tennebrosa. Since the male offspring will be sterile from the reciprocal cross, I will take the female offspring and backcross the hybrids to either male D. suboccidentalis or male D. tennebrosa for two generations. Because the dark diffuse abdomen is thought to be associated with the X chromosome from previous crosses, I will use genetic markers on the X chromosome from each species and test each marker for an association for the dark diffuse abdomen. I will use two genes known to be involved in pigmentation on the X chromosome, yellow and omb (Wittkopp et al., 2003). To narrow down the candidate genetic region, we will also use eight markers that are not associated with pigmentation. If there is a statistical association between a marker and the dark abdomen, this suggests that this gene or a gene physically linked to it causes the derived trait to be expressed.

The effects of the dark pigmentation will be also studied by breeding the D. tennebrosa pigmentation gene into the D. suboccidentalis genome. This is important because pigmentation genes affect many phenotypes or traits. We will look at different traits previously thought to be associated with pigmentation. One trait that is correlated to pigmentation includes heat tolerance. Dark pigmentation of some Drosophila species tends to associate with higher altitudes where the coloration helps the flies absorb heat from the solar rays (Pool and Aquadro, 2007). Other traits that have been correlated with pigmentation that can be examined for this experiment are desiccation resistance, UV resistance, and behavior such as mating preference (Wittkopp and Beldade, 2009).

"Pigmentation is a rapidly evolving trait" (Ng et al., 2008), and a new mutation could significantly change not just one but many. Understanding the genetic basis of pigmentation will help advance the scientific community to comprehend complex traits with more than one chemical pathway. It will hopefully enable us to understand how traits change and appreciate the remarkable diversity of the animal kingdom.


Faculty Research Mentor: Dr. Kelly Dyer, Department of Genetics
Influences on the outlook of the post-college educational opportunities and choices of undergraduate science majors

Ebony Caldwell

Women and members of some racial and ethnic groups are under-represented in the fields of science, medicine, and public health. This disparity is even more present at the faculty level, where minority representation in only 5%, despite the US population of minority groups being over 30%. However, before these faculty members even enter the workforce, they are influenced by a myriad of influences as undergraduate students that influence their future employment and educational decisions. How undergraduate students reason through their post-college educational opportunities and choices is the focus of this study. Ten UGA undergraduate science majors will be recruited through snowball sampling, and through a semi-structured interview protocol, the students will be asked how they think about their academic and professional futures. This data will then serve as basis for qualitative analytic work exploring how gender, race, and ethnicity may affect perceptions of opportunities and likelihood of success for students at the undergraduate level.

Faculty Research Mentor: Dr. Monica Gaughan, Department of Health Policy and Management
The field of linguistics is one that is not often explored within the context of marketing and business management. Rather, its study is most often confined to analysis of historical languages and language acquisition, leaving little room for discoveries in the art of modern communication. Roswell Voices, a program designed to create a partnership between the Roswell Convention and Visitors Bureau (CVB) and academic researchers at the University of Georgia, began in 2002 as a means of associating community development efforts with the historical and contemporary language of the area. Under the direction of Dr. William Kretzschmar, the project is currently in the application process (attached) to become a member of the European Network of Living Labs (ENoLL, www.openlivinglabs.eu), a program under the umbrella of the European Union, designed to “develop and offer a gradually growing set of networked services to support the ‘Innovation Lifecycle’ for all actors in the system: end-users, SME’s, corporations, public sector and academia.” Roswell would be the first U.S. member of EnoLL, and membership would add a more commercial aspect to ongoing “service learning” and research cooperation between Roswell and the University. My research will not only strengthen the partnership created between the city of Roswell and the University, but will also open doors to discoveries in the field of sociolinguistics, with regard to how speech can be used as a business strategy.

The primary objective of this research is the identification of patterns in communication that characterize new members of the business community and allow for their success in the free market. I will look for characteristics that help to establish credibility as an entrepreneur and as a provider of goods and services. The process will begin with recorded, personal interviews of six volunteers from the Roswell community, recruited through the Roswell CVB who have come to Roswell from abroad and started businesses. As part of the recruitment process, I will research the different immigrant communities that have come to Roswell and now do business there. Included in the survey (attached) are questions related to personal information, observations of the history and daily life of Roswell, pronunciation of common words, and various regional terms. I will transcribe each of the interviews, and then review them to discover specific themes in the speakers’ process of integration with the Roswell community and conducting business there. In particular, I will be counting the occurrence of certain phrases or sounds already being studied in Roswell, especially aspects of southern speech historically present in Roswell, and comparing the speech of the subjects with what is known about other Roswell residents. I believe that a new understanding of the integration of new international residents and their businesses will emerge and give the community of Roswell a means of improving communication between buyers and sellers, ultimately helping the local economy to continue grow and prosper.


Faculty Research mentor: Dr. Bill Kretzschmar, Department of English
Mechanism of plant biomass conversion without pre-treatment by anaerobic thermophilic bacterium
Caldicellulosiruptor bescii
Meagan Cauble

Converting plant biomass into ethanol and other fuels shows great promise for minimizing the consumption of gasoline and decreasing pollution to the environment. Caldicellulosiruptor bescii is an anaerobic thermophile that can grow on untreated plant biomass at high cell densities and can degrade plant biomass to release hydrogen, which is an alternative energy source. However, the mechanism for this process is not clear. C. bescii has optimal activity and growth at 75°C. The utilization of this organism for the production of biofuels would decrease contamination by other microorganisms because of the high temperature. Furthermore, the enzymatic reactions required for the degradation of plant biomass can be done at high speeds because the rate of cellulose degradation increases with temperature.

In this project, I will study the mechanism that C. bescii uses to degrade cellulose and polysaccharides. I will grow the organism on various types and combinations of plant biomass, such as switchgrass, poplar, and peanut shells, among others. The cell density of C. bescii in cells per milliliter will be calculated on various patterns of plant biomass. I will estimate the amount of substrate conversion by the organism and evaluate the chemical and structural composition of plant biomass both before and after the organism was grown on the substrate. Furthermore, I will determine what metabolites accumulated on plant biomass of different compositions after the organism was grown. Also, I will compare the efficiency of polysaccharide and plant biomass conversion by C. bescii intact cells and by isolated extracellular enzymes produced by the growth of C. bescii on different substrates. I will do this by isolating the extracellular proteins by protein SDS electrophoresis and measure the hydrolytic activity of these enzymes in comparison to the activity of C. bescii cells. This data will give insight into the mechanism of plant biomass conversion by C. bescii and demonstrate what types of plant biomass the organism most efficiently uses.

Faculty Research mentor: Dr. Mike Adams, Department of Biochemistry and Molecular Biology
Applications of Molecular Dynamics Simulations to Models of Gas-Grain Interactions in the Interstellar Medium

Daniel Cellucci

In Astrophysical simulations involving the early formation of stars and solar systems, much of the behavior of the system is dependent upon the interactions between gas molecules and larger, amorphous conglomerates of ice and dust. Though these interactions are integral to the understanding of the system as a whole, the details regarding the interchange between the gas and the larger particles have been treated mainly with over-simplified models that neglect important physical behaviors only accessible through atomistic simulations of realistic systems. The proposed research seeks to provide far more accurate and richly detailed information about gas-grain interactions by examining the systems at the molecular level. In particular, this research will predict the sticking coefficient for various gas-grain combinations. The sticking coefficient measures the probability that a gas atom or molecule incident on an ice or dust grain will stick to the surface rather than scatter back into the gas phase. This parameter is a function of both the grain temperature and the kinetic energy of the incident gas molecule. Since many important chemical and physical reactions in the interstellar medium are catalyzed by ice and dust grains, a detailed understanding of the capture probability for reactants by the grains is essential for accurate, predictive models of interstellar environments and star-forming regions.

The objectives of this research are twofold. Initially, the goal will be to create an effective simulational framework involving the test case of atomic hydrogen interacting with amorphous water ice and to be able to calculate the sticking coefficient for this system. After these preliminary computer experiments have been successfully performed and compared to previously published results, the framework that will have been developed by the initial tests will be expanded to include grains other than amorphous water ice, and other gas species such as carbon, oxygen, nitrogen, sulfur, methyl, hydrogen cyanide and formaldehyde.

In order to accomplish these objectives, multiple programming and simulational tools will be employed. Namely, the scripting language Ruby will be used to generate the atomistic model of the amorphous ice grain to be used in the gas-grain scattering simulation. Using this information, a series of randomized trajectories for the possible collisions between the gas molecule and the solid will be calculated using the LAMMPS Molecular Dynamics Simulator. These trajectories will then be averaged over multiple separate simulations involving different initial conditions to allow for a precise estimation of the sticking coefficient for a given grain temperature $T$ and gas kinetic energy $K$. The full $T$-$K$ dependence of the sticking coefficient will be mapped out by repeatedly following the above procedure for various $(T, K)$ pairs.

Research of this kind will significantly improve the way gas-grain interactions are treated in models of cool astrophysical environments. Additionally, the frameworks and the scripts being generated for this project will be capable of being applied in a variety of contexts, not the least of which includes a further exploration into different specific gas-grain combinations. Although the research in question will seek to provide the sticking coefficients for many elements common in the interstellar medium, there are a multitude of different combinations that will not be explored in this project that could, nevertheless, be readily computed by later research students who have been trained to use the tools resulting from this research project.

Faculty Research Mentor: Dr. Steven Lewis, Department of Physics
At the University of Georgia, the organic chemistry students are repeatedly given the same unknowns every year per each laboratory experiment. After having decided to take action to reverse this, the chemistry department is determined to work toward a direction of providing multiple, yet similar, unknowns. The inclusion of several unknowns within an experiment allows for each group in a class to be given different reagents for a reaction. This pushes them to be held accountable for truly learning more about the chemistry behind their experiment.

To begin this change, the implementation of a Luche reduction experiment should take place. Currently, there is an experiment that is performed using the reagent isoamyl acetate. This is the infamous “banana lab” that causes a nauseating aroma of bananas that lingers for days in the halls of the chemistry building. It is presently on the drawing board to perform the Luche reduction with a chemical that is called carvone. Carvone naturally forms two enantiomers, or mirror images. The first, \(S\)-(+)\-carvone gives off the aroma of dillweed. Its mirror image, \(R\)-(−)-carvone, smells of spearmint (McMurry 24). The idea is to isolate the \(R\)-(−)-carvone enantiomer, which is then to be reduced using sodium borohydride and cerium chloride to make two diasteriomers via the Luche reduction. Diasteromers are stereoisomers (molecules with the same chemical formula that vary electronically, often giving them different properties) that are not superimposable mirror images, enantiomers (McMurry 302). Since carvone has three double bonds that are capable of being reduced, the sodium borohydride and cerium chloride allow for the reduction to be regiospecific in choosing the explicit point desired for the reduction (Gemal and Luche 1981).

The basics of the experiment are not the changing factor of the laboratory design. However, a notable laboratory experiment involving the finding of optical activity of a reduction reaction has yet to be found. The products of the Luche reduction contain chiral centers which simply means that on at least one carbon, the four substituents are all different. Optical activity is a property that is seen in a chiral species when it rotates the plane of a transmitted beam of polarized light. (McMurry 295). The use of an instrument called a polarimeter allows the investigator to determine the optical activity of his product. This, in turn, if knowledge of the optical rotation of each pure individual diasteromer is known, allows the experimenter to calculate the percentage of each diasteromer contained within his product.

If the students are given different concentrations of the starting reagent, they will then have the results of varying optical rotations. After performing the optical rotation with the polarimeter, they will then be able to back calculate to determine the concentration of the starting reactants that they had been given initially. These concentrations will be known only to the instructor who will then be able to verify the results of each lab group individually.

This experiment proves to be important in multiple ways. First, it changes the original reaction used in the Luche reduction. Next, it implements the uncommon finding of optical activity of reduction reactions and is able to include several unknowns to keep the results among laboratory groups varied. Finally, it moves away from the intense aroma of the bananas toward the scent of spearmint, as long as the \(R\) enantiomer is the one isolated!


Faculty Research Mentor: Dr. Richard Hubbard, Department of Chemistry
As a CURO Apprentice for the 2009-10 academic year, I have had the opportunity to research how the Civil Rights Movement shaped the United States socially, politically, and psychologically during the twentieth century. This summer, I would like to step back one hundred years and delve into the world of American slavery. If I receive the Summer Research Fellowship, I will independently research the life of one extraordinary slave and pianist named Thomas Bethune, otherwise known as “Blind Tom” (1848-1908). Now recognized by scholars as autistic, Blind Tom was a musical prodigy born into slavery in Columbus, Georgia. Exhibited as a freak and a genius, he performed throughout the United States, Europe, and South America. I will write a scholarly essay examining what his life tells us about attitudes towards race, intelligence, gender, and disability during the nineteenth century. Within my paper, I will also compare his experiences with other nineteenth century humans who were showcased for their bizarre physical characteristics, including Saartjie Baartman (the “Venus Hottentot”), Ota Benga the pygmy, and the Siamese twins Chang and Eng Bunker.

Studying Blind Tom will be a particularly enriching experience because he is from Columbus, Georgia, which is the city that I have been researching this year for the Civil Rights Digital Library. Also, I played the piano for nine years, and my musical background will help me to interpret his repertoire and compositions as clues into his life. I plan to use the Thomas Bethune/Thomas Wiggins/Blind Tom Collection which includes multiple pages of sheet music and nineteenth century news articles. I will trace notices and reviews of Blind Tom’s concerts from the Georgia Historic Newspapers microfilm and use periodicals from the Hargrett Rare Book and Manuscript Library such as Harper’s Magazine and Frank-Leslie’s Magazine. I will also utilize biographical information in both archival and modern books published about Blind Tom that are available in the main library. Finally, to think about Blind Tom in the context of nineteenth-century race relations and science, I will research the scientific claims of superior/inferior races made by early eugenicists such as Louis Agassiz and Samuel Morton in Types of Mankind (1855), as well as theories of race and disability by contemporary scholars such as Rosemarie Garland Thomson.

In addition to conducting my independent research project, I will assist Dr. Barbara McCaskill with her single-authored book entitled A Thousand Miles for Freedom: William and Ellen Craft in the Transatlantic World. Her work depicting the lives of two fugitive slaves from Georgia will expose me to research methods for studying American slavery. My assistance with Dr. McCaskill’s book will help me to further understand my work on Blind Tom and introduce me to the steps necessary for developing a scholarly book. To help move Dr. McCaskill’s book towards publication, I will check factual information and research appropriate illustrations for the book using scholarly articles, maps, photographs, and images from contemporaneous newspapers and magazines.

The CURO Summer Research Fellowship will provide me with the opportunity to investigate and study an individual’s life story within the context of larger cultural, social, and intellectual forces affecting it. My work both on Blind Tom and on Dr. McCaskill’s subjects William and Ellen Craft will give me a comprehensive understanding of what it meant to be an African American during nineteenth-century American slavery.

Faculty Research Mentor: Dr. Barbara McCaskill, English
Ethanol is a possible replacement for gasoline as the major transportation fuel. Switching to biofuels would lessen the human contribution to greenhouse gases since the emissions produced when the fuel is burned is offset by the carbon sequestered in growing new feedstock. Since this fuel could be made locally, it would help the United States possibly gain more energy independence by reducing our dependence on foreign oil for transportation fuel. Ethanol is produced by fermenting organisms such as the yeast strain S. cerevisiae, which use the sugars in their surrounding environment for cellular processes. The two major sources for ethanol production in the world are corn in the United States and sugar cane in Brazil (1). Using these sources as feedstocks could create a slight competition between ethanol production and food supply, increasing food prices world-wide. One possible solution to this problem would be to use a feedstock that is not fit for human consumption, such as lignocellulosic biomass.

Pine wood is an inviting source of biomass from which ethanol can be created since it can grow in different environments making it a possible feedstock for many parts of the world. It also would not compete with food sources meaning food prices would be unaffected. Finding or creating a yeast strain which specializes in fermenting pine wood could help ethanol fermentations using pine as feedstock. One such strain has been produced by our lab, AJP50, by exposing its parent strain, ADY, to pretreated pine wood.

Ethanol production from biomass is impeded by inhibitory compounds released from biomass that is pretreated. The three main classes of inhibitors are: aromatics, weak acids, and furan derivatives; they can slow the growth rate of the yeast, inhibit cellular metabolism, and possibly cause cell death (3). Removing these toxins before fermentation is an undesirable solution since it would only add to the cost of ethanol production (2). AJP50 is possibly more resilient in surviving these inhibitors, and may even be able to convert them into less toxic forms faster than its parent strain ADY. Currently it remains unknown what genetic changes may have caused this difference in fermentation ability, however if they were known this knowledge would be useful in further engineering the strain to be even better at converting pine wood into ethanol. If I receive the summer fellowship my experiments would involve using methods to determine the differences in phenotype of different strains derived from AJP50. I would also assist in the creation of these derivative strains. Experiments using a Bioscreen C machine have already been done to generate growth comparisons between ADY and AJP50 in a variety of conditions. The growth and ethanol production data collected thus far indicate that AJP50 is able to outperform ADY at the equal cell level. Development of improved protocols for Bioscreen C experiments would allow for rapid characterization of future strains. It would also allow for rapid testing of a variety of conditions related to biomass fermentations. Successfully engineering derivative strains of AJP50 to ferment pine wood efficiently may significantly contribute to a move from a fossil fuel based economy and help the United States gain greater energy independence.

References:


Faculty Research Mentor: Dr. Joy Doran-Peterson, Department of Microbiology
Creating a transgenic mouse to study the physiological role of Hirano bodies in the progression of Alzheimer’s disease
Camille Gregory

Since their discovery in 1968, Hirano bodies have been found in a multitude of neurodegenerative diseases and conditions including Alzheimer’s disease, amyotrophic lateral sclerosis, Pick’s Disease, Parkinson’s Disease, and chronic alcoholism. These structures develop in the brain due to normal aging as well, but their incidence in Alzheimer’s Disease is much higher.

Although Hirano bodies were discovered decades ago, their function in the brain remains unclear since previous research has been limited to postmortem brain samples. Dr. Fechheimer and Dr. Furukawa’s laboratory have created a model system in which to study Hirano bodies in living cells. It is believed that Hirano Bodies are not detrimental to neuronal function and in fact may play a protective role in the body’s response to Alzheimer’s Disease.

My role this summer will be to create a transgenic mouse that has Hirano Bodies and Alzheimer’s Disease in order to study the physiological role of Hirano bodies in the disease. The protein CT-GFP (CT-carboxy terminal amino acids 124-295 of the 34 kD actin binding protein fused to green fluorescent protein (GFP)), when expressed in sufficient quantities, has been shown to induce Hirano Bodies in mice. Previously, the Rosa-26 promoter, a weak promoter that is expressed throughout the body, was used to drive CT-GFP expression in mice. However, this mouse had beta galactosidase with flanking loxP sites upstream of CT-GFP. The beta galactosidase had to be excised from the DNA for the CT-GFP to be expressed. To this end, the Ros-26 mouse was mated with a mouse expressing cre recombinase using the Thy1.2 promoter. Cre recombinase cleaves the beta galactosidase at the loxP sites, and the Thy1.2 promoter is neuron specific in mice. This allowed for CT-GFP expression in the brain alone. The resulting mice formed Hirano bodies after about six months, simulating an aging mouse.

Due to the complicated genetics of this process, it would be simpler to design a mouse that forms Hirano Bodies without the extra cleavage step from cre recombinase. I will be designing DNA with the Thy 1.2 promoter directly driving CT-GFP expression in the neurons. This DNA will be injected into the pronucleus to produce several founder lines of mice. From a portion of the tails, I will prepare genomic DNA in which to conduct polymerase chain reaction and southern blot tests to determine which founder mouse contain Thy1.2- CT-GFP DNA. I will also carry out western blot analyses on brain samples to select the best founder mouse for the transgenic lineage. The mouse that expresses the most CT-GFP will be ideal because it should form the most Hirano bodies.

To determine the physiological role Hirano bodies play in Alzheimer’s disease, the chosen founder will be crossed with an Alzheimer’s disease model mouse. This mating will produce mice that create Hirano bodies and develop Alzheimer’s disease in a time dependent fashion. The resulting transgenic mice will be characterized through tests of learning, neuropathology, and electrophysiology using the Alzheimer’s Model mice, the Hirano Body mice without Alzheimer’s, and wild type mice as controls.


Faculty Research Mentor: Drs. Marcus Fechheimer & Ruth Furukawa, Department of Cellular Biology
Breast cancer is the second leading cause of women for cancer deaths in the United States. Although there are over 200,000 new cases of breast cancer each year, currently there is still not a serum based markers approved for the screening and diagnosis of breast cancer. The discovery of new biomarkers for breast cancer would enhance the current methods used for diagnostics and monitoring the course of the disease, such as mammography and physical examination. In addition, new markers could allow for better prediction of the disease that may reoccur in patients. Lastly, the detection of biomarkers in breast cancer may possibly lead to new therapeutic inventions to prevent the disease from spreading in patients.

Glycosylphosphatidylinositol-anchored proteins (GPIP) are a posttranslational modification that anchors a modified protein onto the surface of the cell membrane. The synthesis of GPI anchored proteins goes through approximately 20 enzymes, with one of them being GPI transamidase (GPIT), which adds the GPI anchor to the C-terminus of the protein. Preliminary studies have shown GPIT is over expressed significantly in breast cancer. In addition GPI-PLD, another enzyme discovered for the responsibility of cleaving GPIP, was found at high levels in human serums and shown to be expressed at elevated levels in several cancer cell lines. Prior studies have shown a new methodology of alpha toxin can be used as an effective method for identifying some of the GPIP released into the serum. Hence, this summer we plan to utilize new methodologies and technologies to exercise glycoproteomics analyses on breast tissue for the discovery of new markers. We want to use a siRNA sequence to knock down the expression level of GPI-PLD to cause an increase in GPIP on the cell membrane. With the relative number of GPIP identified as potential biomarker implies these elevated levels or the increased release of GPIP from cell surface into the serum insinuates their function is relevant to tumor cell survival. Isolating the GPIP released from breast cancers into sera will hopefully allow for identification of specific GPIP and their examination as a potential biomarker for breast cancer.

*Faculty Research Mentor: Dr. Michael Pierce, Complex Carbohydrate Research Center*
Bufo marinus Pathogen and Parasite Analysis as a Model for Ecosystem Change

Georgianna Mann

There is evidence that populations of *Bufo marinus* have been declining simultaneously with a rise in the alteration of their natural wetland habitats. It is very possible that this decrease in population is a direct result of environmental change and pollutant inputs. As part of a larger study by Master’s student Kristy Segal in the Odum School of Ecology, I will assess the impact of land use changes on *Bufo marinus*, or the cane toad, by using pathogen and parasite burden as an indicator of population health. Amphibians in rice fields are exposed to several stressors they would not ordinarily encounter, such as agrochemical use. These stressors may translate to an important difference in habitat quality. By studying the pathogen and parasite burden of cane toads along a gradient of anthropogenic influence (natural wetlands, organic rice fields and conventional rice fields), I will be able to determine: 1) if rice fields can be a long term surrogate habitat for cane toads, and, 2) if cane toads can serve as an appropriate sentinel species for land use changes in the Rio Tempisque Basin. The following data will be collected: 1) morphometric measurements, 2) body mass, 3) gender, 4) biological samples (blood and feces). The primary pathogens and parasites of interest are: *Batrachochytrium dendrobatidis* (Bd), ranavirus, *Rhabdias spp.* and intestinal helminths. Microscopic analysis of blood and fecal smears will determine presence and identification of hemo- and endo-parasites, and polymerase chain reaction (PCR) skin swabs will detect Bd and ranavirus tissue samples. I predict that the *Bufo marinus* inhabiting anthropogenically altered habitats will harbor a higher prevalence and diversity of selected pathogens and parasites. Thus, I further predict that I will see a positive correlation between the use of pesticides and this effect.

If *Bufo marinus* proves to be an appropriate sentinel species, other research activities associated with the Rio Tempisque Project will be able to use parasite and pathogen abundance as indicators of environmental change. This would provide a relatively simple, yet sensitive, method to monitor ecosystem health. In addition, this data will directly inform researchers and land managers of the wellbeing of cane toads in the Rio Tempisque Basin, which may be extrapolated to other amphibian species that also rely on wetlands for part of their life cycle. This could have important management implications for land use regulations and rice farming practices.


Epigenetic Effects of Bromate on p21 and Histone-2AX Expression in HEK293 Cells

Krelin Naidu

The epigenetic effects of bromate (BrO3-) exposure in human embryonic kidney 293 (HEK293) cells were investigated. BrO3- is a byproduct of ground water disinfection procedures (ozonation). It has been designated a possible human carcinogen by the International Agency for Research on Cancer. BrO3- treatment (10 – 200 ppm) causes damage to HEK293 cells based on cell death assays and significant increases in specific regulatory proteins (p53, p53, cdc2, etc.) in HEK 293 cells over 72 hours. Additionally, bromate induced epigenetic changes were assessed by increased expression of phosphorylated histone-2AX (H2AX), a histone correlated with DNA damage that facilitates DNA repair. BrO3- exposure also led to a G2/M cell cycle arrest that correlated to increased expression of tumor suppressor gene, p-p53, and other regulatory genes p-p38, p21, cyclin B1 and p-cdc2. Treatment of cells for 48 hour low concentrations (1 – 100 ppm) showed similar trends in protein expression levels. This suggests that bromate’s toxicity may lead to epigenetic alterations. To confirm the epigenetic changes, methylation specific PCR after bisulfite conversion will be conducted to assess the suspected methylation of specific cell cycle regulation proteins such as p21. Preliminary studies demonstrate that bromate treatment of human embryonic kidney 293 cells alters the methylation status of p21 and increases in the phosphorylation of H2AX. These modifications in DNA methylation and histone expression levels support the hypothesis that bromate, at low levels, induces epigenetic changes in both in vivo and in vitro models of toxicity.

Faculty Research Mentor: Dr. Brian S. Cummings, Department of Pharmaceutical and Biomedical Sciences
Effects on Blood Flow Velocity and Arterial Diameter Produced by Compression Therapy in SCI Individuals

Rebecca Parker

Introduction
Exercise is essential for human health. Chronic conditions like diabetes, obesity, hypertension and other cardiovascular risk factors are counteracted by exercise. However, some individuals are unable to exercise due to injury or disease, and their vascular health declines (4, 2). Cardiovascular disease is the leading cause of death in spinal cord injury (SCI) populations (5). Hence, the target population for this study is individuals with SCI. Compression therapy improves discomfort in limbs which suffer from edema (1). Compression therapy may also improve vascular health by increasing venous blood flow. By increasing blood velocity, people may be able to attain health benefits similar to moderate exercise such as walking (3).

Findings from my previous research in able-bodied subjects suggest that "muscle pump" compression with pressures of 90mmHg applied every 5 seconds produces a beneficial vascular response. Increases in diameter observed after compression therapy measure within the expected magnitude for changes in flow-mediated dilation (FMD) in the femoral artery. FMD is a measure of a healthy vascular response, which is often due to increased blood flow and/or release of nitric oxide (6).

Intent
The purpose of the study is to continue my previous research that investigates the effects of compression therapy on arterial blood flow. This study also involves the investigation of arterial diameter change, which may be an effect of compression therapy.

Significance
As a summer research fellow, I will spend the first few weeks in preparation at the Vascular Biology lab at UGA. The heart of the study will be completed at Shepherd Center in Atlanta. This will allow me to have greater access to my target population of individuals with SCI. Working at the Shepard Center will also allow me to extend the partnership of the University of Georgia with the rehabilitation center.

In the fall, I hope to combine my findings at the Shepherd Center with my previously completed research and develop an Honors Thesis. If Compression Therapy appears to produce significant vascular benefits, then we can look toward the production of our device as a portable unit for outpatient therapy.

References

Faculty Research Mentors: Dr. Kevin McCully, Department of Kinesiology
Charaterization of Striated Fiber Assemblin Proteins in *T. gondii*

Jay Patel

Toxoplasmosis is an infection caused by *Toxoplasma gondii*, an obligate intracellular parasite known to infect humans and other animals. Infection in humans commonly occurs by consumption of undercooked meat containing tissue cysts of *T. gondii* or by taking in oocysts, the resistant stage of the parasite that can travel through various environments. Luckily, many cases of Toxoplasmosis are asymptomatic regardless of what stage infects the host. However, infection in immunocompromised people presents severe symptoms that can lead to death. From 1999-2004 the National Health and Examination Nutrition Study (NHANES) national probability sample found that approximately 11% of men and women in the United States were infected by *T. gondii* [1]. Most carriers of the parasite do not undergo treatment, but the patients that acquire critical symptoms require medical attention. Current treatments for toxoplasmosis include an anti-malarial drug and antibiotics. In order to better treat this infection scientists have taken an interest in discovering more about *T. gondii*.

Dr. Striepen’s lab is attempting to gain a better understanding of Striated Fiber Assemblins (SFAs), microtubule associated proteins, found in *T. gondii*. SFAs, and SFA-like proteins have already been characterized in several organisms including *Chlamydamonas reinhardtii*, and *Giardia lamblia*. In *Chlamydamonas*, SFA is thought to play a role in cell division based on fluorescent microscopy of the protein. Use of a green fluorescent protein (GFP) tag on the SFA gene to image *Chlamydamonas* revealed movement and conformational changes. During interphase the SFA produces a cross-like structure that eventually forms dots near the spindle poles when mitosis begins. Before the SFA reverts back to the cross-like structure, the SFA takes the shape of a line during telophase [2]. Furthermore, beta-giardin, an SFA homolog, is thought to play a role in nuclear division of *Giardia lamblia* based on its presence within the adhesive disk of the parasite [3]. The predicted roles of SFAs in other organisms support the hypothesis that SFA plays a role in the division process of *T. gondii*.

In order to characterize SFAs in *T. gondii*, Dr. Striepen’s lab has made expression vectors for the three SFA genes (SFA2, SFA3, and SFA4) present in the tachyzoite stage of the parasite. The expression vectors, however, use very strong tubulin promoters that can cause over expression artifacts when imaging parasites. My research project that began in the fall of 2009 entails cloning expression vectors that use the endogenous promoters of the respective SFA genes. Over the summer, I hope to collect qualitative data by visualizing parasites that have been transfected with the native promoter expression vectors. Time-lapse imaging with an epifluorescent microscope will play a critical role in determining the actual structure of the SFA proteins during various stages of the cell cycle. In addition, I will also be doing co-immunoprecipitation experiments to determine what other proteins interact with the different SFA proteins. By compiling the qualitative data from microscopy and the results of my co-immunoprecipitation experiments, I will be able to understand the role SFAs play in *T. gondii’s* divisionary mechanism.

*Faculty Research Mentor: Dr. Boris Striepen, Department of Cellular Biology*
Oil Palm Proliferation in Peru  
Rachel Perez

I propose to investigate the detrimental environmental, social, and economic effects of palm oil cultivation in Peru. I will conduct this research for eight weeks in Loreto, Peru in cooperation with members of the Peruvian Society for Environmental Law (la Sociedad Peruana de Derecho Ambiental, SPDA). SPDA provides the Peruvian government with valuable information about the effects of oil palm production on the people and landscapes of Peru. SPDA plans to propose and implement guidelines to minimize the harmful social and ecological effects of these plantations and to raise awareness about this serious issue on a local, national, and global level.

To combat oil shortages and carbon emissions, the Peruvian government passed a law requiring a 5% blend of biodiesel with all standard diesels by 2011. Many investors have subsequently turned to biofuel production as a quick source of income. One of the more lucrative biofuel crops is the oil palm (Elaeis guineensis); palm oil is also a highly sought commodity on a global level for its versatility in other industries (food, beauty, and health products, and the metal and textile industries).

Large-scale oil palm plantations require vast tracts of land, which leads to extensive deforestation of rainforests with high conservation value. More companies are encroaching on protected forests and national parks, and the burning associated with creation of new oil palm plantations creates smog, carbon emissions, fires spreading to neighbor forests, and greater risk of future fires.

Besides threatening the habitats of many endangered, threatened, and protected species, deforestation also affects indigenous groups in Peru, who in many cases were guaranteed ancestral land rights and rely on forest products for their own sustenance as well as for commerce. Non-indigenous Peruvians are also affected by oil palm production because the monopoly of many agricultural plots by plantations results in less high-quality land available for food crops, which leads to a cycle of decreased supply of food and higher food prices.

The CURO Summer Fellowship will allow me to travel to Loreto, Peru, and work directly with SPDA for eight weeks. At SPDA, I will continue my research on this issue by studying a model oil palm farm set up in Loreto by the UN, translating oil palm-related documents from Spanish into English and from English into Spanish for wider distribution, interviewing local people and government officials about oil palm production, following the upcoming Peruvian local elections (which will affect oil palm production in the area), helping SPDA create more reports on this issue, and collecting references on Malaysian oil palm companies’ expansion into Peru.

I have been conducting research on oil palm proliferation in Peru, Indonesia, and Malaysia in collaboration with CICR and SPDA since August 2009. I have also been corresponding via email and telephone with SPDA members Juan Luis Dammert, Pablo Peña, and Bruno Monteferri, and they have helped me to develop my research plan. At CICR, I have created a database of references pertaining to oil palm and have written outlines that will serve as the framework for my research in Peru. I am now taking an upper level Spanish course (SPAN 4010- Advanced Conversation and Composition) and reading articles in Spanish sent to me from SPDA.

Degradation caused by the oil palm industry is a very real and very urgent issue. My research will help relevant actors make informed decisions about oil palm production in Peru. My research will also help to strengthen the institutional ties between CICR and SPDA, leading to further research collaborations in the future.

Research Faculty Mentor: Dr. Peter Brosium, Department of Anthropology
In his book Hot, Flat, and Crowded, Thomas Friedman discusses how in traditional South African societies, those with chronic illness who sought treatment from healers were not instructed to take elixirs or remedies, but were instead instructed to cook a meal for the entire village. The idea was that patients could help themselves by helping others. These societies realized that chronic illnesses were often the result of problems of the heart, and successfully managed them in ways that might confuse the traditional Western medical establishment.

As American politicians debate the merits of a new healthcare system, and as the world embraces a newly globalized order, many are realizing that the health problems that plague us worst and cost insurance providers the most money are chronic illnesses, illnesses that Western medicine has a spotty track record at treating. Many of the common sense, non-partisan health reform measures (like preventative care and fewer costly invasive procedures) that President Barack Obama has encouraged legislators to consider have their root most recently in innovations the Mayo Clinic and other cutting-edge hospitals have introduced. But these innovations have been introduced to America from much older healing traditions, traditions we would be wise to consider as we progress into the increasingly technology-oriented world of the 21st Century.

Most people today think of medicine in terms of pills, surgery, and needles, but a survey of various civilizations’ health traditions reveals highly sophisticated and surprisingly accurate ideas about how the human body works and how it can be treated that range from yogic meditation to herbal tea remedies. Like Western medicine, Chinese Traditional Medicine and Indian Ayurvedic medicine have developed over thousands of years, however practitioners of these systems glean their insights not so much with CAT scans and T-cell counts as they do by examining the color and shape of a patient’s tongue.

The Western medical tradition has its roots in the materialistic scientific rationalism that Greeks like Hippocrates espoused and scientists like Leonardo da Vinci re-discovered in the Renaissance. Likewise, Chinese medicine today is a direct descendent from Lao-Tzu, the chief shaper of Taoism, and the impression of yin-yang balance of the “chi” energy flow provides the major foundation for Chinese anatomical thought. Likewise, Ayurvedic medicine finds its foundations in the Bhagavad Gita.

The goal of this project will be to explore how the major medical systems of the world derive their guiding beliefs from the major philosophical, literary, and spiritual works that permeate a given culture. This anthropological eye that seeks to examine the idea of health from a psychological, physiological, and philosophical approach to the arts and sciences may seem a bit unfocused. But many civilizations don’t draw artificial lines between disciplines as Western academia does, instead uniting their ideas in holistic systems of thought. Thus this project will utilize the full extent of the “liberal arts,” from history and literature to sociology and religion, to help us gain a fuller understanding of what public health has meant across the world and through the centuries, and more importantly, what public health will look like in the globalized world.

Research Faculty Mentor: Dr. Katarzyna Jerzak, Department of Comparative Literature
Monarch butterflies (*Danaus plexippus*), a species best known for migrating between the eastern U.S. and Mexico annually, are commonly infected by a debilitating protozoan *Ophryocystis elektroschirra*. This study will examine the effect of parasite infection on mate choice and mating success in the monarch butterfly. Monarchs have a unique mating behavior (called ‘forced copulation’) whereby males chase and force themselves onto passing females. Although female monarchs do not actively choose their mating partners, females can struggle to avoid mating with certain males, and males may give up faster on certain females. Because infected monarchs are often in poorer condition than healthy butterflies, and because mating with an infected partner poses the risk of spore transmission to offspring, it is expected that infected male and female monarchs will mate less often than healthy butterflies. This study will be initiated using both healthy and experimentally infected monarchs raised under standard laboratory conditions. I will examine the number and duration of mating contests for healthy vs. infected males and females. I predict that healthy males will initiate more mating attempts, but that contest duration will be longer for infected males due to female avoidance behaviors. I also predict that healthy males will initiate more mating attempts with healthy (as opposed to infected) females, whereas infected males may be less choosy in selecting mating partners. A behavioral study of this nature has not yet been done with the monarch butterfly and could provide insight into the broader role of parasite infection on mating behavior.

*Faculty Research Mentor: Dr. Sonia Altizer, Odum School of Ecology*
J.R.R. Tolkien is best known as the author of the popular fantasy novels *The Hobbit* and *The Lord of the Rings*. However, he also wrote an elaborate history for his created world, along with many other short stories and essays, many of which are published in *The Silmarillion* and the twelve-volume *History of Middle-Earth*. In these writings, he creates a world rich with diversity, peopled with various races, from Men and Hobbits to Elves and Ents. These races are further subdivided into ethnicities and cultures, often differing as much as the races themselves. Far from being simple stereotypes, each is replete with its own language or dialect, history, cultural practices, and ethnic or racial interests, together rivaling the modern world in its ethnic diversity.

Although much criticism has discussed race and culture in Tolkien’s works, almost all of it has failed to recognize that Tolkien’s races play different roles in his philosophy. Much critical analysis deals with Tolkien’s races narrowly, for example interpreting his works strictly in theological terms. Other analysis, in trying to apply all aspects of Tolkien’s ethnic perspective to the real world, has suggested that Tolkien’s work includes latent elements of racism. Such accusations are especially prevalent in discussions of the Orcs, an irredeemably evil race, which is presented as darker-skinned than the other races. In fact, Tolkien’s races variously have theological, ideological, medieval or mythic, and socio-cultural roots, and discussions that attempt to apply only one perspective to all of Tolkien’s races misses many of their subtleties. For example, the much-criticized Orcs can be seen in theological terms as a relatively pure representation of evil and not as an allegory of a particular real-world race, and thus any superficial comparison between them and real-world races leads inappropriately to conclusions of racism. This research will examine when Tolkien’s conceptions of race and culture can be applied fruitfully to the real world based on modern ideas about race and when they cannot, and on this basis will seek a more accurate understanding about what he is saying about race, issues surrounding it, and possible solutions relevant to our own world.

No comprehensive study of these applications has yet been undertaken. Throughout Tolkien’s works, his races and cultures are shown interacting and working together to face the challenges and evils of their times, while simultaneously dealing with conflicts stemming from colonization, expansionism, assimilation, and cultural loss. Parallels to the real world, especially globalization after the World Wars, are clear, and Tolkien provides valuable insights into contemporary global issues. This includes possible solutions to racial conflicts through successful interracial relationships. For example, Legolas and Gimli, whose ethnic identities predispose them to be enemies, manage to form a genuine friendship within the Fellowship of the Ring. In fact, the Fellowship as a whole, which is made up of Men, Hobbits, an Elf, a Dwarf, and a Wizard, may be seen as an example of racial reconciliation and collaboration at multiple levels.

After establishing a background of modern critical ideas concerning race, culture, and ethnicity, this project will distinguish between the theological, mythic, and socio-cultural features of Tolkien’s races. This will involve an exhaustive study of his complete *legendarium*, his letters and essays, and key critical pieces and will then identify insights into racial issues in the modern world.

*Faculty Research Mentor: Dr. Jonathan Evans, Department of English*
African trypanosomes are parasitic protozoa found in sub-Saharan Africa that cause disease in both humans and large mammals. In humans, the subspecies Trypanosoma brucei gambiense and Trypanosoma brucei rhodesiense cause African sleeping sickness, a neurological and fatal disease endemic to sub-Saharan Africa. In animals, Trypanosoma brucei brucei causes the wasting disease Nagana, which affects thousands of livestock each year. The difference in host specificity of these three subspecies of T. brucei is due to the activity of a minor subclass of human serum high-density lipoprotein called Trypanosome Lytic Factor (TLF), which is cytotoxic to T. b. brucei (Rifkin, 1978).

The goal of my summer research will be to elucidate the distinct phenotypes of human serum killing and to identify the specific proteins involved with each distinctive phenotype. We will continue both fixed and live cell imaging of the cellular morphologies associated with each lytic TLF component, as well as, determine the specific activities through short-term and extended lysis assays. Analysis of the morphological phenotypes of killing of the individual protein components of TLF through these studies may lead to a better understanding of the mechanisms underlying trypanosome killing by human serum.

Previous studies have reported that trafficking of TLF to the lysosome and acidification of the organelle is critical for lytic activity of the particle and the proposed mechanism of lysis (Shimamura, Hager, and Hajduk, 2001). The localization of the large vacuole has been reported to be lysosomal (Vanhollebeke et al., 2007), however, in our studies of cells treated with low activity serum we have observed a nonlysosomal localization of the vacuole. Further analysis using immunofluorescence microscopy of live cells. Trypanosomes treated with freshly collected human serum were found to change rapidly in morphology from long, slender cells to swollen and “kite-shaped” prior to lysis at two hours. Treatment with low activity serum produced by prolonged storage at 4°C or heat inactivation for 30 minutes at 62°C, resulted in the gradual formation of a large cytoplasmic vacuole and a delay in trypanosome killing (approximately 16 hrs compared with 2 hrs with lytic serum). This large vacuole was also observed when cells were treated with highly purified, lipid free, apoL-I, one of the two lytic TLF proteins. The difference in lysis phenotypes support the hypothesis that the lytic mechanism is likely due to multiple TLF proteins and associated killing activities. One of these proteins may be selectively inactivated by heat treatment or prolonged storage resulting in the distinct morphologies observed.

The toxicity of human serum to T.b. brucei is well-documented; however, the molecular mechanism of killing is yet to be completely defined. The reported cellular morphology of human serum treated trypanosomes suggests two distinct phenotypes associated with cell death - swollen, “kite-shaped” cells and cells exhibiting a large cytoplasmic vacuole. In previous experiments, the morphological changes associated with serum killing were examined using both fixed cell imaging and time-lapse microscopy of live cells. Trypanosomes treated with freshly collected human serum were found to change rapidly in morphology from long, slender cells to swollen and “kite-shaped” prior to lysis at two hours. Treatment with low activity serum produced by prolonged storage at 4°C or heat inactivation for 30 minutes at 62°C, resulted in the gradual formation of a large cytoplasmic vacuole and a delay in trypanosome killing (approximately 16 hrs compared with 2 hrs with lytic serum). This large vacuole was also observed when cells were treated with highly purified, lipid free, apoL-I, one of the two lytic TLF proteins. The difference in lysis phenotypes support the hypothesis that the lytic mechanism is likely due to multiple TLF proteins and associated killing activities. One of these proteins may be selectively inactivated by heat treatment or prolonged storage resulting in the distinct morphologies observed.

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The goal of my summer research will be to elucidate the distinct phenotypes of human serum killing and to identify the specific proteins involved with each distinctive phenotype. We will continue both fixed and live cell imaging of the cellular morphologies associated with each lytic TLF component, as well as, determine the specific activities through short-term and extended lysis assays. Analysis of the morphological phenotypes of killing of the individual protein components of TLF through these studies may lead to a better understanding of the mechanisms underlying trypanosome killing by human serum. Previous studies have reported that trafficking of TLF to the lysosome and acidification of the organelle is critical for lytic activity of the particle and the proposed mechanism of lysis (Shimamura, Hager, and Hajduk, 2001). The localization of the large vacuole has been reported to be lysosomal (Vanhollebeke et al., 2007), however, in our studies of cells treated with low activity serum we have observed a nonlysosomal localization of the vacuole. Further analysis using immunofluorescence microscopy, as well as, electron microscopy will be used to determine the localization of the cytoplasmic vacuole. Elucidating the mechanism of killing of T.b. brucei through these studies will enable us to better understand human innate immunity to these parasites, and, possibly, identify model mechanisms for potential drug therapies.


Research Faculty Mentor: Dr. Stephen Hajduk, Biochemistry and Molecular Biology
Borderline personality disorder (BPD), as defined by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Ed. Text Revision (DSM-IV-TR; American Psychiatric Association, 2000), is described as “a pervasive pattern of instability of interpersonal relationships, self-image, and affects” (p. 706). In non-clinical samples it has a prevalence rate of 1-2% (Torgeson, Kringlen & Cramer, 2001). The proposed project would add to the literature on BPD’s most widely used treatment, Dialectical Behavior Therapy (DBT). DBT utilizes four modules that directly address the symptoms of BPD. For instance, when under extreme stress, patients with BPD will dissociate, or become detached from reality, become paranoid, injure themselves or even attempt suicide. The distress tolerance module’s goal is to teach patients with BPD to tolerate and survive crises without resorting to these potentially harmful tactics and teaches him/her more effective coping mechanisms (Linehan, 1993). One such coping mechanism taught by the distress tolerance module is distraction. The literature on distraction indicates that it is an effective strategy for tolerating distress (see Kuehner, Huggiziger, & Liebsch, 2009; Priem, & Solomon, 2009; Jain et. al., 2007). This study would test the efficacy of distraction by utilizing the Cold Pressor Test (CPT). The CPT has been used in a number of studies and is an empirically validated method for inducing stress in the laboratory (Lovallo, 1975). It involves submerging the participant’s non-dominant hand in 0-1°C water for three minutes in order to produce physiological arousal. The current study would use blood pressure and pulse readings in order the gauge the participant’s stress level after undergoing the Cold Pressor. Half of the participants would be randomly assigned to the experimental group which would be taught how to utilize distraction as a coping mechanism for the stress of the Cold Pressor. After the data is collected, it will be analyzed to determine if the participants who distracted themselves during the CPT show a significantly less change in physiological arousal from the baseline as compared with the control group. If the hypothesis is correct it will prove that the distress tolerance skill, distraction, is an effective method of preventing increases in blood pressure and heart rate. The study would be the first to examine the effects of distraction on these indicators of stress using the CPT and would have significant implications on the use of DBT as a therapy.

Research Faculty Mentor: Dr. Rheeda Walker-Obasi, Department of Psychology
Silyl-substituted arenes promote meta-directed electrophilic aromatic substitution (cyclialkylation) by Lewis acid activation of conjugated dienones, forming tricyclic compounds composed of a central cycloheptane ring. The following is a three part synthetic scheme for the creation of the silyl-substituted tricycle: first, synthesis of the C-ring; second, synthesis of the A-ring followed by the coupling of the A and C-rings to create an arene-dienone; and third, the formation of the heptane B-ring to complete the target tricycle.

Scheme 1: C-ring Synthesis

Scheme 2: A-ring Synthesis, Coupling, and Dienone Formation

Scheme 3: Target Annulation

In organic synthesis, six-membered cyclic systems are easily and readily formed, while seven-membered carbon rings are more difficult to synthesize. Functionalization of the arene with activating groups will promote cyclialkylation, which is governed by the directing nature of the activating groups as well as the molecule’s geometric restraints. The introduction of the silyl functionality on the arene would potentially allow a handle for further transformations, leading to more diverse tricycles.

*Faculty Mentor: Dr. George Majetich, Department of Chemistry*
A Study Of The Psycho-Physical Performance Technique Of Michael Chekhov

Jake Young

It is important to note that, even though humans have been engaging in performance of some kind ever since they inhabited this world, the “grammar” of performance is a relatively new concept. In the late 19th century Konstantin Stanislavski introduced the first techniques for actors to better approach the craft of performance. When an actor describes his “technique”, what does he mean? An actor’s technique is his method. It is the process he undergoes in order to physically and psychologically prepare himself to take the stage and to commit to believing in his actions while he is onstage. One of Stanislavski’s students, Michael Chekhov studied the work of his teacher, which was focused on an actor exploring the psychology and emotions of their characters leading them to action. But Chekhov also experimented directly with the actor’s physicality, using external qualities to lead to emotion. His theories of the connection between an actor’s physicality and his psychological impulses were considered so radical that before his studies could come to fruition he was exiled from his native Russia. Ironically, his works have only recently been published in his homeland, a country that is now relearning what he had explored in depth a century ago. The purpose of this research is two fold; 1) to have the opportunity to study with the few remaining students who actually studied under Chekhov, and become more familiar with his groundbreaking work, and 2) to bring to life the actual development of Michael Chekhov’s acting technique through the creation of a solo performance that will not only elaborate upon Chekhov’s life and the discovery of these techniques but present these findings in a performance that will make it accessible to the non-actor.

Faculty Research Mentor: Dr. George Contini, Department of Drama
Appendix A
CURO 2009 Summer Research Fellows

**Christine Akoh**, CURO-OVPR Summer Research Fellow  
Dr. Joseph Frank, Department of Foods and Nutrition  
*Effect of Mono and Divalent Cations on Biofilm Formation in a Prolific Biofilm Forming Strain of Listeria Monocytogenes Cultured in a Chemically Defined Medium*

**Sambita Basu**, CURO-Jane and Bill Young Scholarship Summer Fellow  
Dr. Gerardo Alvarez-Manilla, Department of Biochemistry and Molecular Biology, Complex Carbohydrate Research Center  
*Protein-linked Glycoconjugates as Biomarkers for Cancer or Other Physiological Processes*

**Chip Blackburn**, CURO-OVPI Summer Fellow  
Dr. Hugh Ruppersburg, Department of English  
*Harry Crews and the Tradition of Southern Fiction-Writing*

**Corbin Busby**, CURO Research Fellow  
Dr. Isabelle Loring Wallace, Lamar Dodd School of Art  
*Imaging masculinity in Contemporary Fashion Photography*

**Kelly Cummings**, CURO-OVPR Summer Fellow  
Dr. Scott Schatzberg, Department of Veterinary Medicine  
*Differentiation of Natural and Post-vaccinal Canine Distemper Virus Encephalomyelitis*

**Charles Ginn**, CURO Research Fellow  
Dr. Hugh Ruppersburg, Department of English  
*Charting the Oppression of Minority Groups through Southern Gothic Literature*

**Erin Hansen**, CURO Research Fellow  
Dr. Jennifer McDowell, Department of Psychology  
*Effects of Daily Saccade Practice on Behavioral and Neural Plasticity in Schizophrenics*

**Dillon Horne**, CURO-OVPI Summer Fellow  
Dr. Thomas Cerbu, Department of Comparative Literature  
*The Development and Implications of Predictive Modes of Thought from the Renaissance to Modernity*

**Tiffany Hu**, CURO Research Fellow  
Dr. Stephen Hajduk, Department of Biochemistry and Molecular Biology  
*Re-examine Alternative Editing and Understanding the Protein Diversity in T. brucei*

**Whitney Ingram**, CURO-OVPI Summer Fellow  
Dr. Yiping Zhao, Department of Physics  
*Optimization and Analysis of Titanium Dioxide Nanorod Photodegradation*

**Daniel Jordan**, CURO Research Fellow  
Dr. Betty Jean Craigie, Department of Comparative Literature  
*German Sustainable Farming as a Model for Resource Stewardship*

**Fahad Khan**, CURO-ITP Summer Fellow  
Dr. Jason Zastre, Department of Pharmacy  
*Highly Active Antiretroviral Therapy*
Former CURO Summer Research Fellows

Max Klein, CURO-UGA Alumni Association Summer Fellow
  Dr. Richard Steet, Department of Biochemistry and Molecular Biology
  Gauging the Developmental Impact of Impaired Glycoprotein Breakdown in Zebrafish

Susan Klodnicki, CURO-OVPR Summer Fellow
  Dr. Jim Lauderdale, Department of Cellular Biology
  Dr. Andrew Sornborger, Department of Mathematics and Engineering
  PTZ and Other Chemoconvulsant Effects on Adult Zebrafish

Bridget Mailey, CURO Research Fellow
  Dr. Amy Ross, Department of Geography
  The ICC and the US: How have the Actions of the US Affected the ICC in the Past and how will they Affect the ICC in the Future?

Francisco Marrero, CURO Research Fellow
  Dr. Leidong Mao, Department of Engineering
  Development of Ferrofluid Based Platform for Particles and Cellular Manipulation

Amar Mirza, CURO Research Fellow
  Dr. Natrajan Kannan, Department of Biochemistry and Molecular Biology
  A Computational Study of the Crystalline Structure of Tyrosine Kinase Mutants

Cody Nichol, OVPR Research Fellow
  Dr. Cynthia Suveg, Department of Psychology
  Empirical Examination of Child Emotion Assessments: A Comparison of Child, Parent and Behavioral Observation Methods

Emily Pierce, CURO Summer Fellow
  Dr. Wayne Parrot, Department of Crop and Soil Sciences
  Genetic Alteration of the Soybean to Promote Astaxanthin Production

Akanksha Rajeurs, CURO Research Fellow
  Dr. Russell Karls, Department of Veterinary Medicine
  Develop an Efficient Method to Create Marked and Unmarked Mutations in the Human Genome

Al Ray, III, OVPI Research Fellow
  Dr. Susan Sanchez, Department of Small Animal Veterinary Medicine
  Relationship between Epidemiology of Salmonella in Non-Domestic Avian Species and Humans in the Southeastern United States

Joe Reynolds, CURO Research Fellow
  Dr. Frank Harrison, Department of Philosophy
  Analysis of the Nature of the Individual and the Notion of his Happiness

Matthew Sellers, CURO Research Fellow
  Dr. Hugh Ruppersburg, Department of English
  Finding God in the Poetry of Robert Penn Warren

Michael Slade, CURO Research Fellow
  Dr. Frank Harrison, Department of Philosophy
  Implicit System of Rational Thought Analogous to Modern First-Order and Modal Logics in Plato’s Late Dialogues
Alex Walker, OVPR Research Fellow
   Dr. Timothy Dore, Department of Chemistry
   Synthesis of BHQ-dithiol as a Photoremovable Protecting Group for Mifepristone

Shuyan Wei
   Dr. Scott Schatzberg, Department of Veterinary Medicine
   Development of Consensus-Degenerate Hybrid Oligonucleotide Primers (CODEHOPs) for Retroviral Discovery

2009 Howard Hughes Medical Institute EXORP Student

Valeriya Spektor
   Dr. Sue Wessler, Department of Plant Biology
   Designing Teaching Modules for Genome Analysis
Appendix B
CURO 2008 Summer Research Fellows

Zachary Anderson, CURO Summer Research Fellow
Dr. Peter Brosius, Department of Anthropology
*Multicultural Perspectives on Landscape Change*

Matthew Belcher, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry and Molecular Biology
Dr. Rebecca Terns, Department of Biochemistry and Molecular Biology
*Determinants in the Localization of Telomerase to Telomeres*

Mary Elizabeth Blume, CURO-OVPR Summer Research Fellow
Dr. Stefaan Van Liefferinge, Department of Art History
*Uncovering Traditions of the Gothic Style in the Architectural Plans of Saint Germain-des-Paris and Saint Martin-des-Champs in Paris*

Milissa Brody, CURO-OVPR Summer Research Fellow
Dr. Ron Carroll, Odum School of Ecology
*Interactions of Bees and Hummingbirds with Hamelia patens*

Carolyn Crist, CURO-UGA Summer Research Fellow
Dr. John Greenman, Journalism
*News in the Black Belt: Teaching Journalists how to Cover Poverty in Persistently Poor Counties*

M. Logan Davis, CURO-BHSI Summer Fellow
Dr. James Franklin, Department of Pharmaceutical and Biomedical Sciences
*Long-Range Retrograde Transduction of Trophic and Survival Signals in Mouse Sympathetic Neurons*

Marcus Hines, CURO-BHSI Summer Research Fellow
Dr. Michael Tiemeyer, Complex Carbohydrate Research Center
Dr. Lance Wells, Complex Carbohydrate Research Center
*Analyzing the Function of O-GlcNAc in Drosophila*

Haylee Humes, CURO Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
*How AICD and Fe65 are Recruited to Hirano Bodies*

Lindsay Jones, CURO Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry and Molecular Biology
Dr. Rebecca Terns, Department of Biochemistry and Molecular Biology
*Identification and Characterization of a Nuclease that Functions in an RNA-Mediated Viral Defense Pathway (RNAi) in Prokaryotes*

Tyler Kelly, CURO Summer Research Fellow
Dr. Elham Izadi, Department of Mathematics
*Usage of Linear Subspaces with Varieties*

Jung Woong Kim, CURO Summer Research Fellow
Dr. Andrew Sorensen, Department of Mathematics, Engineering
Dr. James Lauderdale, Department of Cellular Biology
*Imaging of Endogenous Ca2+ Waves in Developing Zebrafish*

Jennifer Lee, CURO-BHSI Summer Research Fellow
Former CURO Summer Research Fellows

Dr. Ronald Blount, Department of Psychology
*Understanding Pediatric Symptoms*

Sharon McCoy, CURO-OVPR Summer Research Fellow
Dr. Chad Howe, Department of Romance Languages
*Dialect Perceptions of Spanish Speakers in Georgia*

Katherine McGlamry, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Michael Tiemeyer, Complex Carbohydrate Research Center
*Glycan Interactions and the Development and Spread of Cancer Cells*

Alice Meagher, CURO-BHSI Summer Research Fellow
Dr. Michael Adams, Department of Biochemistry and Molecular Biology
*Expression and Characterization of the Heterologously Expressed Soluble Hydrogenase I from Pyrococcus furiosis*

Madison Moore, CURO-BHSI Summer Research Fellow
Dr. Jennifer McDowell, Department of Psychology
*Behavioral and Neural Plasticity Following Daily Practice of Saccade Tasks in Schizophrenia*

Emily Meyers, CURO-OVPR Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
*The Advantage of Weakness: How Weak States can Overcome Military Might of Strong States*

Kelly Nielsen, CURO-OVPR Summer Research Fellow
Prof. George Contini, Department of Theatre and Film Studies
*Augusto Boal’s Invisible Theatre: Political Play with an Unassuming Audience*

Sean O’Rourke, CURO Summer Research Fellow
Dr. Kathy Simpson, Department of Kinesiology
*Neuromuscular Activation and Movement Kinematics Exhibited During the Sit-to-Stand by Multiple Sclerosis Individuals*

Julie Patel, CURO Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
*Military Interventions by Powerful States*

Neil Pfister, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry and Molecular Biology
Dr. Rebecca Terns, Department of Biochemistry and Molecular Biology
*Interactions that Define the Organization of RNA-Protein Complexes Involved in Prokaryotic RNA Interference*

Stefann Plishka, CURO-Franklin College of Arts and Sciences Summer Research Fellow
Dr. Asen Kirin, Department of Art History
*Imagining Constantinople: Imperial Houses of Worship as Symbols of State Ideology*

Katie Pyne, CURO Summer Research Fellow
Dr. Jerome Legge, Department of International Affairs
*Refugees and Internally Displaced People: How Effective are the United Nations, Nongovernmental Organizations, and Subsequent Initiatives in Pacifying this Complex Humanitarian Crisis?*

Joseph Rimanddo, CURO-Interdisciplinary Toxicology Program Summer Research Fellow
Dr. Ralph Tripp, Department of Infectious Diseases
*Understanding and Preventing the Interaction between RSV’s G Protein and the CX3CRI Cell Receptor*
Aalok Sanjanwala, CURO Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
Dr. Ruth Furukawa, Department of Cellular Biology
The Effect of Hirano Bodies on Mutated Tau Protein

Neeraj Sriram, CURO Summer Research Fellow
Dr. Mark Eiteman, Department of Biological and Agricultural Engineering
Solving the World’s Energy Crisis – Not One Sugar at a Time

Giridhar Subramanian, CURO Summer Research Fellow
Dr. Brock Tessman, Department of International Affairs
Power and Influence in Southeast Asia: A Study of the Methods Used by India, China, and the United States

Aileen Thomas, CURO Summer Research Fellow
Dr. Nicole Lazar, Department of Statistics
How Random is Pseudorandom

Kathryn Turner, CURO Summer Research Fellow
Dr. Shelley Hooks, Department of Pharmaceutical and Biomedical Sciences
Comparison of RGS Regulation of LPA Signaling in Prostate Cancer and Ovarian Cancer

Manouela Valtcheva, CURO Summer Research Fellow
Dr. Jennifer McDowell, Department of Psychology
Antisaccade Performance and Deficit Characteristics in a Normal Population

Hunter Wilson, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
8-Chloro-7-hydroxyquinoline as a Bilogically Useful Photoremovable Protecting Group

Laura Wynn, CURO-OVPR Summer Research Fellow
Dr. Martin Kagel, Department of Germanic and Slavic Languages
Issues in Current Turkish-German Literature
Appendix C
CURO 2007 Summer Research Fellows

Caroline M. Anderson, CURO-OVPR Summer Research Fellow
Dr. John Turci-Escobar, Department of Music Theory
Dr. Max Reinhart, Department of German
A Psychoanalytical Examination of Wolf and Mörike's Peregrina Songs

Joseph Burch, CURO Summer Research Fellow
Dr. Harry Dailey, Department of Microbiology and Biochemistry & Molecular Biology
Converting Ferrochelatase into a Cytochrome c Like Protein

Amy Burrell, CURO-BHSI Summer Research Fellow
Dr. Debra Mohnen, Department of Biochemistry & Molecular Biology
Analysis of the Transcriptional Expression of Arabidopsis GAUT Genes: 15 Proven and Putative Plant Cell Wall Biosynthetic Galacturonosyltransferases

Lee Ellen Carter, CURO-OVPR Summer Research Fellow
Dr. Fausto Sarmiento, Department of Geography
Ecoregional Conservation Among Indigenous Communities in Cotacachi, Ecuador

Kimberly Delisi, CURO-BHSI Summer Research Fellow
Dr. Ray Kaplan, Department of Infectious Diseases
Parameters Affecting Fecal Egg Count Data for Determining Drug Resistance in Nematode Parasites of Horses

Joshua Dunn, CURO-OVPR Summer Research Fellow
Dr. William Kretzschmar, Departments of Linguistics and English
The Youth of Roswell Voices: A Linguistic Analysis

Katie Flake, CURO-BHSI Summer Research Fellow
Dr. Maor Bar-Peled, Complex Carbohydrate Research Center
The Arabinose Kinase Project

James Gordy, CURO Summer Research Fellow
Dr. Michael Adams, Department of Biochemistry & Molecular Biology
Developing Methodologies for the Study of Small ORFs in P. furiosus

Jana Hanchett, CURO Summer Research Fellow
Dr. David Schiller, Department of Musicology/Ethnomusicology
Latino and Hispanic Musical Influences on Athens-Clarke County

Laura Harrison, CURO-BHSI Summer Research Fellow
Dr. Corrie Brown, Department of Pathology
Campylobacter in the Crypts

Clare Hatfield, CURO-OVPR Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs
Democracy and the Choice of Law: The Intersections of Shari’a, Domestic and International Law

Anna Hudson, CURO Summer Research Fellow
Dr. Richard Dluhy, Department of Chemistry
Using Surface Enhanced Raman Spectroscopy for the Detection of Pathogens
Andy Kragor, CURO-Jane & Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center
Dr. Carl Bergmann, Complex Carbohydrate Research Center
*Unbiased Isolation and Carbohydrate Mapping of Alpha-Dystroglycan*

Brian Laughlin, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center
*Functional Analysis of the Magnaporthe grisea Secretome*

James MacNamara, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Biochemistry & Molecular Biology
*Synthesis of Quinolinol-Based Inhibitors of Rec1p*

Prashant Monian, CURO-Interdisciplinary Toxicology Program Summer Research Fellow
Dr. Brian Cummings, Pharmaceutical & Biomedical Sciences
*Molecular Inhibition of Independent Phospholipase A2 and its Effect on Prostate Cancer Growth*

Neil Naik, CURO-OVPR Summer Research Fellow
Dr. Ruth Harris, Department of Food & Nutrition
*The Effect of Antagonizing Stress Receptors in Rats During Repeated Exposure to Restraint Stress*

Natalie Nesmith, CURO-BHSI Summer Research Fellow
Dr. Mary Bedell, Department of Genetics
*Genetic Studies on the Roles of KITL in Regulating the Proliferation and Apoptosis of Primordial Germ Cells in Mice*

Victor Orellana, CURO Summer Research Fellow
Dr. Nicolás Lucero, Department of Romance Languages
*Unsung Hero: A Literary and Historical Study of Lautaro*

Tulsi Patel, CURO Summer Research Fellow
Dr. Scott Gold, Department of Plant Pathology
*Developing a Biocontrol Agent for Chinese Privet, Ligustrum sinense*

Tomas Pickering, CURO-OVPR Summer Research Fellow
Dr. Dorothy M. Fragaszy, Department of Psychology
*Manner of Hammer Stone Use in Wild Capuchin Monkeys*

Cleveland Piggott, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
*The Formation of Hirano Bodies*

Purvi Sheth, CURO Summer Research Fellow
Dr. Russell Karls, Department of Microbiology
*Characterization of Mycobacterium shorttii*

Traci Tucker, CURO Summer Research Fellow
Dr. Dawn Robinson, Department of Sociology
*Gender and Role Meanings: A Cross-Cultural Comparison*

Jessica Van Parys, CURO-UGA Alumni Association Summer Research Fellow
Dr. David Mustard, Department of Economics
*Does Writing Ability Signal Academic Excellence?: Evidence from the New Scholastic Aptitude Writing Section (SATW)*
Delila Wilburn, CURO Summer Research Fellow
  Dr. Barbara McCaskill, Departments of African American Studies and English
  Beauty Imposed

Karen Wong, CURO Summer Research Fellow
  Dr. Andrew Whitford, Department of Political Science
Appendix D
CURO 2006 Summer Research Fellows

Sarah Breevoort, CURO-BHSI Summer Research Fellow  
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology  
*Construction of Three Rcelp Mutant Plasmids to Aid in the Characterization of Rcelp Enzymatic Activity*

Lauren Coffey, CURO Summer Research Fellow  
Dr. Stephen Shellman, Department of International Affairs

Susan Fang, CURO Summer Research Fellow  
Prof. Christopher Hocking, Studio Foundations

Courtney Grant, CURO-BHSI Summer Research Fellow  
Dr. Julie Coffield, Department of Physiology and Pharmacology  
*An Investigation of Botulinum Neurotoxin Interactions on RhoA Activity Using In Vitro Assays*

Erica Hall, CURO-BHSI Summer Research Fellow  
Dr. Jessie Kissinger, Department of Genetics

Adele Handy, CURO-UGA Alumni Association Summer Research Fellow  
Dr. Greg Robinson, Department of Chemistry

Celan Hardman, CURO Summer Research Fellow  
Prof. Joe Norman, Drawing and Painting

Sana Hashmi, CURO-Jane and Bill Young Scholarship Summer Research Fellow  
Dr. Lance Wells, Complex Carbohydrate Research Center  
*Alteration of Alpha-Dystroglycan and Cancer Progression*

Brian Levy, CURO Summer Research Fellow  
Dr. Larry Nackerud, School of Social Work  
*Courrie – Not Email: Implications for Government Regulation of a Social Phenomenon. A Case Study of Language in France*

Maggie Mills, CURO-NSF/SPIA Summer Research Fellow  
Dr. Stephen Shellman, Department of International Affairs

Anna-Marieta Moise, CURO-BHSI Summer Research Fellow  
Dr. Andrea Hohmann, Department of Psychology  
*Neurochemical Basis of Social Defeat in Syrian Hamsters: Role of Endogenous Cannabinoids*

Lamar Moree, CURO-BHSI Summer Research Fellow  
Dr. Alan Darvill, Complex Carbohydrate Research Center

Jesse Oakley, CURO Summer Research Fellow  
Dr. Laurie Fowler, Department of Ecology  
*Economic Incentives for Private Land Conservation and Sustainable Development: Research into Environmental Policy in Costa Rica and Georgia*

Katie Orlemanski, CURO-OVPR Summer Research Fellow  
Dr. Patricia Richards, Department of Sociology  
*Reclaiming “Development” within the Context of Low-Income Neighborhoods*
Danielle Pearl, CURO-OVPR Summer Research Fellow
Dr. Keith Langston, Germanic and Slavic Languages
Press Freedom, E.U. Accession, and Democracy in Croatia

Daniel Perry, CURO Summer Research Fellow
Dr. David Landau, Department of Physics and Astronomy

Andrew Pierce, CURO Summer Research Fellow
Dr. Thomas McNulty, Department of Sociology

Richard Piercy, CURO-OVPR Summer Research Fellow
Dr. Cory Momany, Department of Pharmaceutical and Biomedical Sciences

Kurinji Pandiyan, CURO Summer Research Fellow
Dr. Steven Holloway, Department of Geography
Understanding Public Space in a New Urbanist Development

Mandy Redden, CURO-BHSI Summer Research Fellow
Dr. Robert Arnold, Department of Pharmaceutical and Biomedical Sciences
Towards a More Effective Delivery System for Anti-Cancer Drugs

Eva Bonney Reed, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology

Lisa Rivard, CURO-Toxicology Summer Research Fellow
Dr. Jeff Fisher, Toxicology

Sonia Talathi, CURO-OVPR Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
Effectiveness of Ca2+-Independent Phospholipase A2 Inhibitors in the Induction of Cheomtherapeutic-Induced Cancer Cell Death

Erika Vinson, CURO Summer Research Fellow
Dr. Richard Siegesmund, Art Education

Joshua Watkins, CURO Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
The Price of Victory: When Leaders Underestimate the Cost of War

Daniel Weitz, CURO-OVPR Summer Research Fellow
Dr. Gary Bertsch, Department of International Affairs
The Impact of a European Union Nuclear Weapons Free Zone on the International Non-Proliferation Regime

Shannon Yu, CURO-BHSI Summer Research Fellow
Dr. Nancy Manley, Department of Genetics

Creating a Culture of Undergraduate Inquiry

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Appendix E
CURO 2005 Summer Research Fellows

Grace Anglin, CURO-OVPR Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
*Family Focused Emotion Communication Training*

Ashley Beebe, CURO Summer Research Fellow
Dr. James R. Holmes, Center for International Trade and Security
*The Influence of Media on Economic Policy in Brazil and Argentina*

Ingrid Bloom, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
*Differentiation of Human Embryonic Stem Cells into Endothelial Progenitors*

Ian Lewis Campbell, CURO Summer Research Fellow
Dr. Glenn Wallis, Department of Religion
*Theories of Mythology and the Way That Myths Have Affected Social and Political Formation*

Kimberly Coveney, CURO-CIT Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
*Role of iPLA2 in Phospholipid Metabolism in Chemotherapeutic-Induced Cancer Cell Death*

William Collier, CURO-OVPR Summer Research Fellow
Dr. Amy D. Rosemond, Institute of Ecology
*Analysis of an Exotic Species’ Interactions with Native Aquatic Trophic Dynamics: Quantifying the Effects of the North American Beaver (Castor canadensis) on Sub-Antarctic Stream Food Webs in the Cape Horn Archipelago, Chile*

John Crowe, CURO Summer Research Fellow
Prof. Mark Callahan, Ideas for Creative Exploration
*AUX Launch: Art, Representation, and Commerce on the Web*

Katie Griffith, CURO Summer Research Fellow
Dr. Diana Ranson, Department of Romance Languages
Dr. Judith Preissle, College of Education
*Assessing Cultural Values and Political Beliefs in a Nicaraguan Classroom: A Participant Observation*

Matthew Haney, CURO-CTEGD Summer Research Fellow
Dr. Rick Tarleton, Department of Cellular Biology
*Antibody Depletion of Highly Abundant Proteins in Trypanosoma cruzi for the Fine-Tuning of Proteomic Analysis*

Ned Hembree, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
*Reel1and Ste24 Inhibition by Dipeptidyl Acyloxymethyl Ketones: A Potential Target for Cancer Therapeutics*

Alicia Higginbotham, CURO Summer Research Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
*Christopher Logue’s Iliad: A Work in Translation*

Scott Jacques, CURO Summer Research Fellow
Dr. Mark Cooney, Department of Sociology
*The Social Reality of Young, Middle Class Drug Dealers*
Lisa Jordan, CURO Summer Research Fellow
Dr. Ruth Harris, Department of Food and Nutrition
The Effect of Leptin on Sympathetic Nerve Activity in White Adipose Tissue

Carey Kirk, CURO-OVPR Summer Research Fellow
Dr. David Z. Saltz, Department of Theatre and Film Studies
The Effectiveness of Drama Techniques in Treating People Suffering from Trauma

Andrew Leidner, CURO-CTEGD Summer Research Fellow
Dr. Pejman Rohani, Institute of Ecology
Coevolutionary Behavior and Interference between Fatal Diseases

Jon McGough, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
The Role of Female Choice in Sexual Selection of Drosophila pseudoobscura

Tatyana Nienow, CURO-BHSI Summer Research Fellow
Dr. Walter K. Schmidt, Department of Genetics
Adapting Yeast for the Study of Pitrilysin and Other M16A Enzymes

Erika Porter, CURO-BHSI Summer Research Fellow
Dr. Charles H. Keith, Department of Cellular Biology
Intrinsic Fluorimetric Imaging of Neural Activation in Cultured Cells and Zebrafish

Kurinji Pandiyan, CURO-CAES Summer Research Fellow
Dr. Raj Rao, Department of Animal and Dairy Science
Dr. Steven Stice, Department of Animal and Dairy Science
Genomic Instability of Human Embryonic Stem Cells

Kelly Proctor, CURO-OVPR Summer Research Fellow
Dr. Lee B. Becker, College of Journalism and Mass Communication
Differences in Environmental Reporting: China and the United States

Rebecca Trupe, CURO Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Family Focused Emotion Communication Training

Russ Richardson, CURO Summer Research Fellow
Dr. Ron Carroll, Institute of Ecology
Sugarcane Processing Waste as a Soil Amendment on Organic, Shade-Grown Coffee under Simulated Drought Conditions for Control of Plant-Parasitic Nematodes

Dustin Williams, CURO-BHSI Summer Research Fellow
Dr. Scott T. Dougan, Department of Cellular Biology
Development of Transgenic Zebrafish to Understand How Activation of Hyal-2 Leads to Tumor Formation

Fei Yang, CURO Summer Research Fellow
Dr. Janet Westpheling, Department of Genetics
Regulation of Branched-Chain Amino Acid Catabolism in Streptomyces coelicor: Applications for Metabolic Engineering of Polyketide Antibiotic Biosynthesis

Stephanie Yarnell, CURO Summer Research Fellow
Dr. Carl Bergmann, Complex Carbohydrate Research Center
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Cara Altimus, CURO Summer Research Fellow
  Dr. Jonathan Arnold, Department of Genetics
  *Isolation of a Light Receptor in the Biological Clock of N. crassa*

Westin Amberge, CURO-BHSI Summer Research Fellow
  Dr. Steven Stice, Department of Animal and Dairy Science
  *Guided Differentiation of Human Embryonic Stem Cells into Endothelial Cells: Focusing on the Ulex Europaeus Agglutinin I Lectin*

Namrata Asuri, CURO Summer Research Fellow
  Dr. Sidney Kushner, Department of Genetics
  *Analysis of the Role of Ribosomal S1 in the Polyadenylation Pathway of Eschericia coli*

Erin Bohan, CURO-OVPR Summer Research Fellow
  Dr. Katarzyna Jerzak, Department of Comparative Literature
  *The Reconciliation of Selves: The Emigrant Experience in America*

Rebecca Brantley, CURO-OVPR Summer Research Fellow
  Ms. Ashley Callahan, Georgia Museum of Art
  *The Early Fashion Design of Mariska Karasz and the Influence of Her Native Hungary*

Josef Broder, CURO Summer Research Fellow
  Dr. Andrew Sornborger, Department of Mathematics
  *Techniques in High Noise Image Analysis*

Beau Bryan, CURO-BHSI Summer Research Fellow
  Dr. Michael Pierce, Department of Biochemistry and Molecular Biology
  *N-Cadherin Gl*

Susannah Chapman, CURO Summer Research Fellow
  Dr. Virginia Nazarea, Department of Anthropology
  *Designing Sui Generis Systems for Traditional Plants and Associated Local Knowledge*

Clayton Griffith, CURO-OVPR Summer Research Fellow
  Dr. Amy Rosemond, Institute of Ecology
  *The Effect of the North American Beaver (Castor Canadensis), an Exotic Herbivore, on the Composition, Structure, and Regeneration of the Riparian Vegetation of Sub-Antarctic Forested Streams in Chile*

Christopher Hale, CURO-BHSI Summer Research Fellow
  Dr. Thomas F. Murray, Department of Physiology and Pharmacology
  *Adolescence as a Distinct Period of Vulnerability to Nicotine Addiction*

Catherine Hudson, CURO-BHSI Summer Research Fellow
  Dr. Harry Dailey, Department of Microbiology and Biochemistry and Microbiology
  *Negatively Affecting the Heme Biosynthetic Pathway in “Escherichia coli”*

Douglas Jackson, CURO Summer Research Fellow
  Dr. Nigel Adams, Department of Chemistry
  *Reactions of Protonated Carboxylic Acid Ions with Amines in the Interstellar Medium*
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Andrew Leidner, CURO-BHSI Summer Research Fellow
Dr. Pejman Rohani, Institute of Ecology
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Janel Long, CURO-OVPR Summer Research Fellow
Dr. Jean Martin-Williams, School of Music
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John McWhorter, CURO-BHSI Summer Research Fellow
Dr. Daniel Colley, Department of Microbiology
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William Parker, CURO Summer Research Fellow
Dr. Marly Eidsness, Department of Chemistry
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Gehres Paschal, CURO-OVPR Summer Research Fellow
Dr. J. David Puett, Department of Biochemistry and Molecular Biology
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Kevin Patrick, CURO Summer Research Fellow
Dr. James Anderson, Department of Classics
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Katherine Price, CURO Summer Research Fellow
Dr. Janet Westpheling, Department of Genetics
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Matthew Rudy, CURO Summer Research Fellow
Dr. Marly Eidsness, Department of Chemistry
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Desiree Smith, CURO Summer Research Fellow
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Christopher Stokes, CURO-OVPR Summer Research Fellow
Dr. Randy Kamphaus, School of Professional Studies
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Shana Strickland, CURO-BHSI Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
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Adam Stroupe, CURO Summer Research Fellow
Dr. Boris Striepen, Department of Cellular Biology
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Teerawit Supakorndej, CURO-BHSI Summer Research Fellow  
Dr. Michael Terns, Department of Biochemistry and Molecular Biology  

Tendoh Timoh, CURO Summer Research Fellow  
Dr. Marly Eidsness, Department of Chemistry  
Fluorophore-modified Nascent Polypeptides

Jora Vaso, CURO-OVPR Summer Research Fellow  
Dr. Katarzyna Jerzak, Department of Comparative Literature  
The Effect of Communism on the Works of Andric, Kadare, and Szymborska

Leslie Wolcott, CURO-OVPR Summer Research Fellow  
Dr. Betty Jean Craige, Center for Humanities and Arts  
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Anthony Anfuso, CURO Summer Research Fellow
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
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Tiffany Beal, CURO-BHSI Summer Research Fellow
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
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Robert Brady, CURO Summer Research Fellow
Dr. Nader Amir, Department of Psychology
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Josef Broder, CURO Summer Research Fellow
Dr. Chi N. Thai, Department of Biological and Agricultural Engineering
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Martha Rose Calamaras, CURO Summer Research Fellow
Dr. Kim Shipman, Department of Psychology
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Daniel del Portal, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
*The Physiological Role of Hirano Bodies*

Dustin Dyer, CURO Summer Research Fellow
Dr. Guigen Zang, Department of Biological and Agricultural Engineering
Dr. Michael Geller, Department of Physics and Astronomy
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Sarah Fritts, CURO Summer Research Fellow
Dr. John P. Carroll, School of Forest Resources
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Betsy Goodwin, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology
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Patrick Gosnell, CURO Summer Research Fellow
Prof. Ben Reynolds, Department of Photography
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Paulette Andrea Greene, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
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Andrea Haltiner, CURO-BHSI Summer Research Fellow
Dr. Ruth Harris, Department of Foods and Nutrition
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Luke Hoagland, CURO-BHSI Summer Research Fellow  
Dr. Marcus Fechheimer, Department of Medical Cellular Biology  
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Christopher “Kit” Hughes, CURO Summer Research Fellow  
Prof. Mark Callahan, School of Art  
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Steven Jocoy, CURO Summer Research Fellow  
Dr. Michael Bender, Department of Genetics

Leena Kukkarni, CURO Summer Research Fellow  
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology  
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Valerie Marshall  
Dr. Ben Blount, Department of Anthropology

Ashley Neary  
Dr. Susan Sanchez, Department of Medical Microbiology and Parasitology  
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Ngozi Ogbuehi, CURO Summer Research Fellow  
Dr. Mary Alice Smith, Department of Environmental Health Science  
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Melissa Payton, CURO Summer Research Fellow  
Dr. Lillian Eby, Department of Psychology  
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Ryan Rhome, CURO Summer Research Fellow  
Dr. Jan Westpheling, Department of Genetics  
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Susan Ritger, CURO-BHSI Summer Research Fellow  
Dr. Duncan C. Ferguson, Department of Physiology and Pharmacology  
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Ben Solomon, CURO Summer Research Fellow  
Dr. Kevin McCully, Department of Exercise Science  
Measuring Age Related Changes in Muscle Compliance Using Ultrasound

Mary Tolcher, CURO Summer Research Fellow  
Dr. Tim Hoover, Department of Microbiology  
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Meghan Wilson, CURO-BHSI Summer Research Fellow  
Dr. James Lauderdale, Department of Cellular Biology  
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**Former CURO Summer Research Fellows**

**Ryan Wilson**, CURO Summer Research Fellow  
Roger Moore, Department of Landscape Architecture

**Thomas Wood**, CURO Summer Research Fellow  
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology  
*Analysis and Characterization of CAAX Proteases*
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Nadia Behizadeh
Dr. Tricia Lootens, Department of English

Ashley D. Chadha
Dr. Michael McEachern, Department of Genetics
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Emily DeCrescenzo
Dr. Susan Sanchez, Department of Biochemistry and Molecular Biology
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Ivy Forkner
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
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Cory S. Gresham
Dr. James B. Stanton, Department of Pathology
Dr. Corrie C. Brown, Department of Pathology
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Nowell Hesse
Dr. Maor Bar-Peled, Department of Plant Biology
Identification of Nucleotide-Sugar Biosynthetic Genes Involved in Glycoconjugate Synthesis

Matt Hoffman
Dr. Will York, Department of Biochemistry and Molecular Biology
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Parker Hudson III
Dr. Mary Bedell, Department of Genetics

Britt Johnson
Dr. Janet Westpheling, Department of Genetics
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LeeAnn Jones
Dr. Massimo Palmarini, Department of Medical Microbiology
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Jenna Lee
Dr. Andrew Herod, Department of Geography
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Judson A. Lewis
Dr. John F. McDonald, Department of Genetics
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Dr. Scott Pratt, Department of Animal and Dairy Science  
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Julie Orlemanski  
Dr. Jed Rasula, Department of English  
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Gautham Pandiyan  
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Joanne Shinpoch  
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Dr. Scott Atkinson, Department of Economics  
Dr. Michael Rauscher, Department of International Economics, Rostock University  
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Dr. Thomas Cerbu, Department of Comparative Literature  
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Ben Walters  
Dr. Elizabeth Brient, Department of Philosophy  
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Lauren Watson  
Dr. Jeffery Berejikian, Department of Political Science

Katherine Williams  
Dr. Kojo Mensa-Wilmot, Department of Cellular Biology  
Dr. Anne Clark, Oxford University

Brad Wright  
Dr. Larry Nackerud, School of Social Work  
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CURO 2001 Summer Research Fellows

Siobahn Beaton
Dr. Debra Mohnen, Complex Carbohydrate Research Center
Progress toward the Partial Purification of a Pectin Biosynthetic Gene

David Cureton
Dr. Janet Westpheling, Department of Genetics
Development of an In Vitro Packaging System for a Streptomyces Bacteriophage

Jon E. Davis
Dr. Gary Bertsch, Department of Political Science
Identifying the Risks of China’s Nuclear Weapons Command-and-Control System in the Event of Political Crisis

Sayan De
Dr. Max Reinhart, Department of Germanic and Slavic Languages
The Progress and Modernization of Former East German Healthcare after Communism

Lawrence Dougherty
Dr. Daniel Promislow, Department of Genetics
Exploring Olfactory Response in Drosophila melanogaster and Evolutionary Theory of Aging

Matt Edwards
Dr. Gary Bertsch, Department of Political Science
Evaluating the Moscow Center for Export Control’s Role as a Non-Proliferation Epistemic Community Member

Ben Emanuel
Dr. Frances Teague, Department of English
Shakespeare on Screen: Henry in Hollywood

Jeff Halley
Dr. Sheng Cheng Wu, Department of Biochemistry and Molecular Biology
Cell Wall-Degrading Enzymes from the Fungus That Causes the Devastating Rice Blast Disease

Peter Harri
Dr. Kojo Mensa-Wilcot, Department of Cellular Biology
Gene Expression in Leishmania: Control of Protein Synthesis in Leishmania 5’ Untranslated Regions

Amanda Hudson
Dr. Michael Terns, Department of Biochemistry and Molecular Biology
Screening Mutant Yeast Strains for Abnormalities in the Localization of snoRNA

Kenneth Miller
Dr. Timothy Dore, Department of Chemistry
Synthesis and Use of Caged Compounds to Explore Cellular Processes

Lorina Naci
Professor William Paul, Jr., School of Art
Each morning I get up with one word in mind: plastik...
Lynn Nguyen  
Dr. Mark Wheeler, Department of Dance  
*Chinese Classical Dance*

Cori Pelletier  
Dr. Roy Grant, Department of Music Therapy  
*Music Therapy with Premature Infants*

Kate Smith  
Dr. Kenneth S. Latimer, Department of Pathology  
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Buudoan V. Tran  
Dr. Karl N. Kirschner, Complex Carbohydrate Research Center  
Dr. Robert J. Woods, Complex Carbohydrate Research Center  
*Parameter Development and Application of the Glycam Force Field for Sialic Acid Derivatives*

John Woodruff  
Dr. Harry Dailey, Department of Microbiology  
*The Generation of Mutations in the n-Terminal Region of the Protoporphyrinogen Oxidase of Bacillus subtilis to Create a Protein Capable of Mitochondrial Targeting in Mammalian Cells*
CURO Summer Research Fellowship

The Center for Undergraduate Research Opportunities (CURO) awards the Summer Research Fellowship to academically talented undergraduates who participate in research during the summer term at the University of Georgia. The number of fellowships varies from year to year, based on funding. Successful applicants receive a financial award of $3,000 and present their research at the CURO undergraduate research symposium. (Those students who receive $3,000 must use $500 toward presenting their research at a regional or national conference.)

In order to be selected for a Summer Research Fellowship, interested students must have at least a 3.4 GPA, thirty hours of UGA credit, and must commit to the following:

1. Enrolling in two sequential Honors undergraduate research courses: HONS 4960H and HONS 4970H or HONS 4970H and HONS 4980H. Students who wish to complete thesis during the summer should check with Dr. Williams and their faculty research mentor. If approval is granted, the student will register for HONS 4980H and HONS 4990H. Students who are awarded the fellowship must register for these classes for the summer session before they are eligible to receive fellowship monies. If, during the course of the fellowship, the student withdraws from these classes for any reason, the stipend must be returned in full. CURO Fellows must resign from any other UGA employment to be eligible for funding and may not be enrolled in any other courses. CURO will create 6 hours of Honors research courses for the student in OASIS.

2. Submitting an abstract of the summer research to Mr. Matt Jordan by the last day of finals of the summer semester, for possible presentation at the annual CURO Symposium the following spring. Fellowship recipients are required to attend the upcoming Symposium, even if their abstract is not selected for presentation.

3. Participating in panel discussions with the CURO staff throughout the year to encourage an appreciation for undergraduate research at UGA.

Students who will be traveling internationally as part of their research must complete additional paperwork through CURO and the Office of International Education and are required to purchase travel insurance (approximately $1 per day) through the Office of International Education for their time abroad.
2011 Selection Committee

Dr. Brian Cummings  Associate Professor, Department Pharmaceutical & Biomedical Sciences
Dr. Kevin McCully  Professor, Department of Kinesiology
Dr. Pamela Orpinas  Professor, Department of Health Promotion & Behavior
Dr. Hugh Ruppersburg  Senior Associate Dean, Franklin College of Arts & Sciences
Dr. Susan Sanchez  Professor, Department of Infectious Diseases
Dr. Cynthia Suveg  Assistant Professor, Department of Psychology
Chair: Dr. David Williams  Associate Provost and Director, Honors Program

Special thanks to the following sponsors of the 2011 Summer Research Fellowship:

The Office of the Senior Vice President for Academic Affairs and Provost
The Office of the Vice President for Instruction
The Office of the Vice President for Research
The UGA Alumni Association
Honors Program
The Jane and Bill Young Scholarship
April 20, 2011

Dear UGA Faculty and Students:

I am delighted and honored to name 32 CURO Summer Research Fellows for 2011, each of whom is featured in this Book of Abstracts with a summary of his or her faculty-mentored research project. The goal of the CURO Summer Research Fellowship is to provide opportunities for intensive, immersive, faculty-guided research experiences for academically talented undergraduates. The program advances the students’ knowledge and abilities to think critically, solve problems and contribute to greater understanding of the world.

The CURO 2011 Summer Research Fellowship is funded through the Honors Program, the President's Office, the Office of the Senior Vice President for Academic Affairs and Provost, the Office of the Vice President for Instruction, the Office of the Vice President for Research, the Alumni Association, the Athletic Association and the Jane and Bill Young Scholarship.

I am exceptionally proud of the quality of the contributions of present and past CURO Summer Fellows and with the mentorship of faculty researchers and their graduate students. The Summer Fellowship program has contributed to building a culture of undergraduate inquiry at the University of Georgia, and the CURO Summer Fellows serve as ambassadors, sharing their enthusiasm and expertise in a variety of professional forums on campus as well as at regional, national, and international meetings.

Please join me in congratulating these young scholars on the occasion of being awarded these prestigious fellowships. Please join me also in thanking the faculty research mentors whose support and guidance are crucial to the CURO Summer Fellows’ success.

Sincerely yours,

David S. Williams
Associate Provost and Director, Honors Program
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The Legacy of Truth: Analyzing the Impact of the Truth and Reconciliation Commission on South Africa’s Millennial Generation

Lauren Anderson

In 1990, South African President F.W. de Klerk had announced that the long reigning National Party would initiate peace negotiations with the opposing African National Congress and begin dismantling the country’s violent system of apartheid. These talks led to South Africa’s first fully democratic accomplishment, the presidential election of Nelson Mandela. But uncertainty followed: How does a historically divided nation start to address the wrongs of the past? The Truth and Reconciliation Commission (TRC), established in 1995, was to serve as the method of this transition.

Expansive literature exists on the nature of the TRC as a public body of knowledge and compromise and on the ramifications of this kind of institution in achieving justice. Such studies examine the inadequacies and strengths of the TRC experience, considering a national quest for truth a critical, but flawed, aspect of conflict resolution. However, not all scholars in the subject share this optimistic stance, and many question the righteousness of amnesty and the concept of “forgiveness” as a politically loaded tool.

While much research is dedicated to exploring the TRC as an institution, especially its capacity to facilitate social unity without the use of legal justice, few studies have analyzed the commission’s relevance in the lives of South Africa’s modern youth. The experiences of South Africans who participated in the TRC process are well documented, but what about the voices of those born during the early years of peace negotiations and post-apartheid government?

I seek to examine the truth commission’s role in shaping the ideologies of these young adults, individuals likely knowing little about the TRC during its existence but who are now living with the consequences of its legacy. Initially, I will conduct twenty interviews with college students at the University of Stellenbosch, employing an age group ranging from 18-22 to fit the time period between the final years of National Party rule and the election of Mandela. The focus of these interviews will be to obtain a sense of what the TRC means now, if anything, to South Africa’s millennial generation, especially with regards to issues of race, the government’s role in teaching the historical truths, post-apartheid generational identity.

My work can contribute new information to ongoing academic discussions of sustainable peace and development in post-conflict territories. Uniquely focused on the viewpoints of South Africa’s young adult society, the emphasis of the study is to gauge how the future of a nation is built upon the political and social actions of the past, in this case, the TRC. Consequently, the results of this project should demonstrate the enduring strengths and weaknesses of the Truth and Reconciliation Commission and the validity of using such institutions.

Faculty Research Mentor: Dr. Amy Ross, Department of Geography
Drag’s Not a Drag: Narrative Inquiry of Serious Drag Performers

Joshua Trey Barnett

In an effort to bring more trans issues to the forefront of leisure studies and rhetorical scholarship, the present study employs narrative inquiry to better understand the genderqueer life experiences of serious drag performers (“queens” and “kings”).

The following research questions will focus our investigation: What are the important stories and events that have shaped the performer’s drag identity? What are the daily struggles and joys of being a serious drag performer? What is interesting or meaningful about managing a multiple-gendered identity? What are the relationships between drag performers and the queer community in terms of activism, friendships, politics, and space?

Given the options surrounding qualitative research, narrative inquiry was determined as the most appropriate methodology for the study of drag performers because of its inherent potential to (a) position participant’s gendered subjectivities; (b) illuminate examples of agency and cultural contestation; (c) reveal human transformation; and (d) promote advocacy through connection with the reader. While many styles of narrative inquiry exist, we will infuse biographical and experience-centered approaches since the experience-centered narrative “… assumes that narratives are: sequential and meaningful; are definitely human; ‘re-present’ experience, reconstituting it, as well as expressing it; (and) display transformation and change.” Moreover, narrative inquiry is significant because it puts the participants in the center of the research process as the “expert” of their own life story.

Samples will be comprised of between ten and twenty serious drag performers from several cities in the United States. Each participant will take part in an unstructured interview, a format allowing participants to share their stories in ways they feel most appropriate, providing an opportunity to be heard in ways that otherwise might be dismissed or misdirected. Our research questions will largely focus the conversations. Furthermore, the narrative platform allows the participant to create and become “part of a written document—a testimony of what occurred at a particular moment of history.” Once the interviews are complete they will be transcribed. We will then employ thematic, dialogic, and structural methods of qualitative analysis. We may supplement interview data with publicly available marketing materials and fieldnotes from any public performances that we attend.

We hope to illuminate the nuanced ways in which serious drag performers negotiate everyday life by encouraging participants to tell their own stories and to write their own histories. We hope the narratives might provide a vehicle to lessen the struggle of others by creating a safer public space for those finding themselves transgressing expected gender norms. We also hope that these narratives will help us advocate for the recognition of the aspirations and struggles often faced by people presenting gender in ways that may be different than what others expect, ranging from fluid to static, from stereotypical to unconventional.

Faculty Research Mentor: Dr. Corey W. Johnson, Department of Recreation & Leisure Studies
Organizational commitment refers to an individual’s psychological attachment to the workplace organization, and demonstrates that this construct plays an important role in how the individual worker adjusts to the workplace, and is a strong predictor of turnover, absence and performance. Since the 1960s, organizational scientists have devoted a great deal of research time to not only understanding what constitutes this concept, but also to understanding the workplace's antecedents and consequences for the individual and the organization.

Dr. Robert Vandenberg has noted that while using the contemporary theoretical frameworks to explain organizational commitment is relatively strong, there are major problems with the measures used to apply the commitment construct. Specifically, the “newest” measure is nearly 40 years old. Furthermore, it was developed and validated primarily using subjects from the depression era and World War II generation (and, to a small degree, those born immediately after WWII), a generation that believed in lifetime employment in the same organization and in being loyalty for loyalty's sake. The content domain of most psychological measures like organizational commitment is derived using an individuals’ perspective. It is the content domain of the construct that dictates how the actual items are written. Thus, in the case of the organizational commitment measures, their content domain is based on a perspective that does not characterize the contemporary workforce. Since the late 1970s, the U.S. workplace has undergone dramatic changes (e.g., numerous recessions, globalization, war on terror, etc.). Individuals entering the workplace today expect that their careers will take place within several organizations, and that there are “no guarantees.” Thus, what constitutes organizational commitment from their perspective differs drastically from the perspectives used to validate the measures that are still used today to operationalize the commitment construct in research projects. In short, it is time to re-evaluate how commitment is being measured relative to the perspective of the current workforce.

The proposed study intends to use the students in executive and evening MBA programs in Atlanta, Georgia. Individuals in these programs work full-time and represent a strong cross-section of people in the workplace. Ultimately, we wish to answer the question: what is the content domain of organizational commitment in the current workplace? The answer to that question will determine what adjustments need to be undertaken to more accurately measure commitment in order to tap into the construct as defined by today’s workforce. Moreover, the proposed study seeks to develop a structured interview technique and learn how to conduct a professional interview. This will be accomplished, first, by interviewing employees that differ in tenure, age, and job ranking. This range of employees will help establish patterns in employees' answers or validate our claim that individuals look at commitment differently now than in the past. After interviewing the individuals, data will be analyzed through a computer software content analysis program. The content analysis program looks for patterns and commonalities from the interviews to identify the key elements in the content domain of the commitment construct. It is from this domain that a new survey will emerge and/or modifications to the current measures will be undertaken.

**Faculty Research Mentor: Dr. Robert Vandenberg, Department of Management**
The proposed studies explore the relationship between stereotypes of Black Americans presented in reality television shows and the racial attitudes of White Americans. They also explore the possibility that this relationship is affected by White Americans’ real-world and mediated exposure to diversity.

Study 1 will survey White Americans regarding their reality television viewership and their racial attitudes.

In study 2, participants will view a clip from a reality television show that is either highly- or un-stereotypical of Black Americans. Participants will then complete a survey on racial attitudes.

Study 3 will content analyze reality television shows to determine which specific aspects of the shows may drive overall depictions of Black Americans.

Study 4 will then manipulate this content to better determine possible effects on dependent variables.

It is hypothesized that the more negative stereotypes of Black Americans a show contains, the more likely it is that White Americans who possess negative racial attitudes will consider these stereotypes to be accurate portrayals. It is also hypothesized that more intergroup contact will lead to more positive racial attitudes, regardless of stereotype knowledge. Such findings will elucidate the real world effect the unreal stereotypes displayed in this type of television media has on minorities.

**Faculty Research Mentor:** Dr. Kecia Thomas, Department of Psychology
Algae Biofuel Development: Growth Efficiency

William Costanzo

The government has officially made the call for biofuels to replace traditional gasoline fuels. The Energy Independence and Security Act, passed in 2009, calls for “32 billion gallons of biofuels to be produced per year by 2022.” No longer will the United States be able to support its need for energy simply on the efficiency of gasoline combustion.

Currently, there are multiple sources of biofuels that have been produced successfully. Many of these sources are either not efficient enough (energy/cost density is too low) or would require too much of the U.S. cropland to be effective. Algae biofuels is the only source of biofuels that concurrently satisfy both of those requirements; only 2% of the nation’s croplands would be converted to algae plants to produce 50% of the nation’s needed fuels.

Unfortunately, algae biofuels are presently too expensive to be produced on a grand scale. 40% of the total cost of producing algae biofuels (inclusive of building plants, bioconverters, fermenting stations, etc.) is simply in the 10 day process of having the algae grow to its full biomass and lipid-mass. By the research of a UGA graduate student, Ryan W. Hunt, it was determined that different biochemical stimulants, the most prominent being Napthalene Acetic-Acid (NAA), can cause the algae to grow to thicker biomasses and with more lipid content than simply growing on their own. Further, Hunt went on to test combination of stimulants and found that in combination, these increased the growth of the algae more so than any single stimulant.

In reading Hunt’s dissertation, I found a surprising fact: although *C.Sorokiniana*, administered NAA, showed over 150% biomass increase after a full 10-day growth cycle to those without stimulant, the growth was actually decreased once measured after a half of a cycle (5 days from administration). This fact led me to a particular realization; Hunt administered each of his stimulants (even the trials with multiple stimulants) on day one of the cycle. What if the stimulants were given on day 2? 3? 5? Or half-dosages on each of day 1 and day 5? How then would the growth behavior be affected?

The proposed study will build upon what Hunt has already proven using NAA and *C.Sorokiniana*. And if hypotheses get proven correct by the experiments, then that 40% cost of algae growth can be decreased even further. The more economic algae biofuels are, the more quickly the nation can begin replacing gasoline with a fuel source that is more efficient, more renewable, less pollutant, and overall a better option for all energy requirements.

*Faculty Research Mentor:* Dr. K.C. Das, Department of Biological & Agricultural Engineering
The Recombinant Expression of Proteins in the Glycosylation of Mammalian Cells

Dervin Cunningham

Complex carbohydrates attached to glycoproteins, glycolipids, and proteoglycans play numerous roles in biological recognition events including protein targeting and clearance, immune surveillance, inflammatory reactions, hormone action, viral infection, arthritis, host-pathogen interactions, cell migration and pattern formation during embryogenesis, and metastasis. These varied roles and functions provide an additional level of “information content” that must be appropriately encoded by carbohydrate modification enzymes. In addition, most recombinant human therapeutics are glycoproteins and production of appropriate glycoforms require a detailed understanding of the host glycosylation machinery.

Despite the critical importance of carbohydrate structures in mammalian biology, little is known about the enzymes that synthesize these glycans, including a biochemical and structural understanding of their substrate specificities and mechanisms of action. About 190 glycosyltransferases (GTs) are involved in glycan extension of mammalian glycans and approximately 75 glycoside hydrolases (GHs) are involved in glycan processing and catabolism. Heterologous expression of these glycan-modifying enzymes is challenging because most require eukaryotic cells for protein production, since they cannot be expressed in a functional form in bacteria or cell-free systems. Furthermore, well-defined complex carbohydrates are difficult to obtain in sufficient quantities for biochemical or structural studies.

The goals of this summer project focus on the expression, purification, and characterization of one member of the glycosylation enzyme family (FUT9) that plays an important role in creating carbohydrate structures that are involved in cell adhesion events in the immune system. The project will involve generation of large-scale DNA preparations of the respective expression construct from bacteria and isolation as plasmid DNA. This involves generation of large scale bacterial cultures and isolation of the DNA from cell lysates using DNA isolation columns, a procedure that I have already employed in the lab several times. The DNA will then be introduced into mammalian cells for protein production by a procedure that results in the “transfection” of the DNA construct through the use of a liposomal reagent that binds to the DNA and helps in uptake by the mammalian cells. Prior to transfection, I will gain experience in propagating mammalian cells in suspension culture, a procedure that requires sterile techniques that will prevent bacterial contamination of the mammalian cultures. Once the cells have been transfected for 3-6 days, the cultures will be harvested, the cells removed by centrifugation, and the amount of recombinant product expressed and secreted into the media will be determined by SDS-gel electrophoresis and immunoblotting. If a reasonable expression level of the recombinant protein is detected in the cultures, the protein will be purified by column chromatography over an affinity column (Ni2+-NTA agarose) to bind the recombinant product and wash away contaminating media proteins. The recombinant protein will then be selectively eluted by washing with a buffer containing imidazole and the recovery of the protein will be determined by SDS gel electrophoresis. Functional enzyme assays will be performed with time available. The isolated protein will be used for further biochemical and structural studies.

Faculty Research Mentor: Dr. Kelley Moremen, Department of Biochemistry & Molecular Biology
Characterization of Enzymes Produced by Genetically Engineered *Hypocrea jecorina* and Their Use in Fermentation by Recombinant *E. coli.*

Abid Fazal

While many resources are being utilized as renewable energy sources, ‘biomass feedstocks’ is the only alternative that can be directly used as a replacement for liquid petroleum. The emission that results from burning biofuel is recycled by the growing feedstock, decreasing the accumulation of greenhouse gases. The use of domestically produced biofuel from biomass not only reduces the dependence on foreign oil and offers tremendous opportunities for sustainable economic growth. In the United States, almost all ethanol is currently produced by fermenting corn starch; however, this creates competition between fuel and food supply, increasing food prices. To remedy this problem, feedstocks that are not consumed by humans can be used, such as lignocellulosic biomass. Lignocellulosic materials are mainly composed of 40-50% cellulose, 25-35% hemicelluloses and the rest being lignin and pectin, all of which cannot be metabolized by humans.

Among lignocellulosic biomass sources, pectin rich process materials are considered viable alternatives as they are not used for human consumption and their use as animal feed is of marginal economic value. These residues are available in relatively large amounts and are stockpiled in processing plants, which may decrease transportation and collection costs. 1.5 million tons of dry sugarbeet pulp are generated annually by U.S. processors. Sugarbeet pulp is an enormous untapped source of the valuable polysaccharide pectin, which accounts for 10 to 30% of its dry mass.

Many lignocellulosic biomass require mechanical or theromochemical pretreatment before they can be converted to ethanol. However, residues like sugar beet pulp do not require these pretreatments because they are already partially processed, which further simplifies the bioconversion process. Our laboratory has recently engineered a strain of the fungus *Hypocrea jecorina* to secrete polygalacturonase (PG), a major enzyme needed for pectin deconstruction, in addition to the many cellulases (which degrade cellulose polymers to their fermentable monomer unit, glucose) it already produces. As a complement with pectin rich substrates, our lab has also engineered a recombinant bacterial *E. coli*. This engineered bacterium, in addition to possessing naturally occurring enzymes that degrade cellulose and cellobiose, secretes additional enzymes to complete pectin degradation following PG activity.

This study will involve characterizing the enzymes produced by the recombinant fungus *H. jecorina* grown on sugar beet pulp. After enzyme characterization, experiments will be performed to determine if we can minimize or eliminate the use of commercial enzymes required to convert biomass feedstocks to ethanol using recombinant *E. coli* as biocatalyst. Currently the use of hydrolytic enzymes such as cellulase, cellobiose, and pectinase is the main contributor of the high cost of biomass to bioethanol conversion processes. Thus, evaluating the efficiency of two genetically engineered organisms could make way for a self-sustaining and more independent economy that is less dependent on the limited reservoirs of fossil fuels.

*Faculty Research Mentor: Dr. Joy Peterson, Department of Microbiology*
When animals become stressed, heterophils (the avian equivalent to mammalian neutrophils) migrate to the bloodstream, from reserve pools. These cells, a key component of the immune system, are phagocytic, and engulf bacteria and other foreign particles. Paradoxically, during stress, the rate of bacteria-killing by the blood declines, suggesting that despite an overall increase in the number of heterophils during stress, the efficiency of these cells may be depressed. Thus, the primary goal of this project will be to compare heterophil function before and after a stressor.

Measures of pathogen clearance are becoming more frequently studied by animal ecologists. In addition to direct counts of immune cells, techniques have been developed for assessing the function of these cells either by directly observing phagocytic activity or indirectly by quantifying the magnitude of bacteria killing in vitro. This project will use both direct and indirect methods to quantify heterophil function. Additionally, the project will be to compare rates of bacteria-killing in culture with direct observation (via microscopy) of heterophil phagocytosis.

Birds (house finches, northern cardinals, tufted titmice) will be captured with mist nets at feeding stations set up in the rear of the ecology building, under the supervision of Dr. Andy Davis, who is licensed to trap birds by the federal Bird Banding Lab and the state of Georgia. Upon capture, birds will be brought into the building and a blood sample (50µl) drawn immediately for a baseline sample. Birds will then be held in paper bags in the lab for two hours, a time frame which is known to cause stress, and which allows for the influx of heterophils into the bloodstream. Then a second blood sample (50µl) will be drawn to serve as the stressed sample.

On the same day of capture, baseline and stressed blood samples will be processed to determine the rate of heterophil phagocytosis and bacteria-killing. For this, 10µl of each sample will be diluted with 190µl CO₂-independent media enriched with 4mM L-glutamine, and to each dilution a 20µl suspension of ~800 colony forming units (CFUs) of Escherichia coli will be added. Solutions will be incubated at 37°C for 30 minutes then 5µl will be used to make a smear on a microscope slide and 50µl of the blood-bacteria mixture will be plated in duplicate onto tryptic soy agar plates. In addition, three plates will be inoculated with diluted bacteria alone and phosphate buffered saline to serve as positive and negative controls, respectively. All plates will be incubated at 37°C, and the number of CFUs per plate will be quantified after 24 hours to determine relative bacteria killing ability. The smears will be stained with giemsa, then viewed under 1000X with a light microscope and the number of heterophils containing bacteria (or actively engulfing bacteria) will be counted. The proportion of cells engulfing bacteria will be used as the index of heterophil phagocytosis.

I predict positive correlations between the abundance of heterophils, their phagocytic activity and overall bacteria killing under baseline conditions. In response to stress, I expect that the correlation between these variables will disappear.

Faculty Research Mentor: Dr. Vanessa Ezenwa, Odum School of Ecology
The Role of Cysteine Residues in the Function of the Ras Converting Enzyme (Rcelp)

Nisha George

Oncogenic forms of the Ras GTPases are involved in approximately 30% of human cancers. Studies with Rcelp deficient yeast reveal that the yeast is incapable of producing fully modified Ras and the α-factor mating pheromone without the protease. It is predicted that inhibition of Rcelp could diminish the activity of oncogenic Ras. Hence, Rcelp is considered a target for the development of cancer therapeutics. However, despite the clinical relevance of Rcelp, its enzymatic action remains undefined.

Rcelp does not have a readily identifiable protease motif. Certain amino acids have been identified as reportedly critical for the function of Rcelp, and these include cysteine, glutamate and histidine residues. One study proposes that Rcelp is a cysteine protease. However, a bioinformatic study of Rcelp orthologs identified a set of conserved residues (α histidine and two glutamates) that are typically found in metal-dependent enzymes. Another study confirmed that these residues are indeed required for the activity of Rcelp in vivo, suggesting that Rcelp is a metalloprotease.

The role of cysteine residues in the function of Rcelp is still debated. One particular cysteine mutant of yeast Rcelp (C251A) is inactive against one reporter, Biopep, in vitro substrate, but not against other reporters such as K-Ras4b, in vitro substrate, or α-factor, in vivo substrate. Further complicating the issue is an unpublished observation by the Schmidt laboratory that yeast Rcelp lacking all seven native cysteine residues are functional in vivo but not against an in vitro substrate recognized by Rcelp C251A. These experiments involve substrates that contain a CAAX motif but are of different lengths.

I will be testing the hypothesis that Rcelp recognizes its substrates through both cysteine-dependent and cysteine-independent mechanisms. In my research, I will use genetic, biochemical and mutational approaches to gain insight into the role of cysteine residues in the function of Rcelp. I expect to demonstrate, using in vivo reporters, that the catalytic site of the protease does not require a conserved cysteine but that proper recognition of substrates requires cysteine residues under certain conditions (i.e. short substrates). I will use Saccharomyces cerevisiae for these studies because its haploid genome allows for easy manipulation of genes, and the similarities between yeast and human genomes make yeast a perfect model for studying the properties of Rcelp.

For the experimental approach, I will be use ubiquitin α-factor fusions and α-factor assays to evaluate the role of substrate length in affecting recognition by both wildtype and Rcelp cysteine mutants. The α-factor mating pheromone contains a CAAX motif and is a reporter protein useful for investigating the role of Rcelp. The ubiquitin fusion technique allows for in vivo production of α-factor molecules having various lengths. Findings to pinpoint the cysteine residues required for substrate recognition and the residues on the substrate that are being recognized.

Because of the potential of this protease in chemotherapeutic treatment, a better understanding would help to know its role in treating cancer and even improve the efficacy of future treatments targeting this protease.

Faculty Research Mentor: Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology
Sensory Systems at Play in Drosophila Courtship
Erin Giglio

This project seeks to understand the mechanisms by which a species alters courtship to avoid hybridizing with another species. To this end, I am focusing my work on two closely-related species of fruit flies: *Drosophila recens* and *D. subquinaria*. These two species provide a good model, having only recently diverged from one another. Previous research found that populations differ in their levels of mate discrimination, depending on whether they coexist with other species. Flies from populations coexisting with the other species are choosier when selecting a mate than flies from non-coexisting populations.

To more closely study the divergence, differences in respective sensory systems will be examined. The pressures *D. recens*’s presence places on the behavior of *D. subquinaria* will be examined among flies from populations that do and do not overlap with *D. recens*. This allows an examination of the effect that the presence of a closely related sister species has on a species differentiated primarily by behavior.

Within each population, I am investigating the role of four physical sensory systems in *Drosophila* courtship. First, wing displays and songs made by rubbing wings together are common aspects of *Drosophila* courtship behavior. By removing the wings I can determine the role that vision and hearing play in courtship behavior. I will further test the role of sound by removing the arista, which is at the tip of the antenna and contains most of the sound receptors. Secondly, smell is an important part of species differentiation, as flies produce a number of species- and sex-specific cuticular hydrocarbons that act as pheromones. The majority of smell receptors cluster on the antenna; therefore I will examine the effect of antenna removal on courtship success. Finally, in an effort to discern whether visual displays made by *Drosophila* males are important, I will blind flies by coating their eyes with nontoxic metallic paint marker. All organ removals or blindings will be conducted under carbon dioxide anesthesia. Control flies will not be manipulated but will experience the same anesthesia.

For each sensory system, I will set up 30 pairs for each cross within each population and species: The crosses will include altered male with intact female, altered male with altered female, intact male with altered female, and intact male and female flies. I will place each pair of sexually mature virgin flies together in a vial for 24 hours, then remove the male and score the vial for mating success by noting whether offspring have been produced. This will enable me to detect whether males and females use different mating cues as well as whether there are population-specific differences. I predict the latter, since populations vary in mating behavior.

To date have three out of four of the manipulations for *D. subquinaria* from a population living in the same area as *D. recens* have been completed. My data suggests that pheromones are an important mating cue for females, while visual cues are more important to males. Through this research, we will learn not only what maintains the difference between the two species but more generally about how behavioral changes affect the process of speciation.

**Faculty Research Mentor: Dr. Kelly Dyer, Department of Genetics**
From Malpractice to Medicare: Addressing the Legal Needs of Primary Care Physicians

Osama Hashmi

As the Patient Protection and Affordable Care Act goes into effect between now and 2014, physicians will need to navigate an even more complex legal environment. During this time period, policy researchers will be asked to evaluate alternatives to improve and reform the current legal problems in healthcare delivery. As these issues become a more prominent aspect of physician life, affecting primary care recruitment, this research will be crucial in promoting a better system of healthcare for the United States.

Physician networks have been created around the nation to promote the interests of various specialty and general practice groups. This study proposes to analyze the specific legal needs of primary care physicians and provide a tool to help physicians manage the legal frameworks in which they practice. This research is comparative and qualitative in its design. A legal policy review and intensive case studies of various physician groups will be conducted. This study will explore some of the legal issues for American primary care physicians while also exploring different alternatives for addressing these diverse issues as health reform is implemented.

The proposed project fits into the NIH-funded PACO, “Policy-Academic-Career-Outcome Model” team project headed by Dr. Monica Gaughan, my proposed faculty mentor, and Dr. Sangwook Kang (University of Connecticut). The legal issues that physicians face are, by their nature, among the many barriers for students’ entrance into medical careers. The insights gained from this research will assist the PACO team in formulating closed-ended questions to appear on the PACO survey in 2012. I am currently an active member of the PACO team, which includes professors, research professionals, doctoral and master’s students, as well as two other undergraduates. A significant part of my Fellowship experience during this summer will be to continue my involvement in project meetings with PACO as well as assist in instrument development and sampling for the survey.

The proposed study seeks to assess the legal needs of American physicians, especially those in primary care, and analyze possible solutions to the policy issues physicians face. My individual contribution to the study will be to employ various policy analysis tools to analyze the legal needs of primary care physicians and to provide an instrument that physicians can use to navigate the legal network. This research will involve travelling to Washington, D.C to work on-site with various groups working in the field and analyzing the current national health care policy environment related to the primary care labor force. Staying in constant contact with my mentor, I will be making design decisions on the content of my analysis as well as the desired outcome of my research. The considerable expertise on the PACO team will be available to me throughout the summer via email, video conferencing, and occasional face-to-face meetings. In accordance with the PACO project, my research aims to analyze the legal network which serves as a barrier for many primary care careers and to publish an instrument that these physicians can use to understand these legal barriers.

Faculty Research Mentor: Dr. Monica Gaughan, Department of Health Policy & Management
The proposed research will make use of a paradigm for quantifying linguistic culture, Affect Control Theory (ACT), in order to begin a systematic comparative analysis of Arabic and English linguistic cultures. ACT is a mathematical theory of social behavior that describes how actors import cultural meanings into face-to-face interactions. The theory rests in part on a sociological principle proposing that, in social interactions, humans seek to maintain their identities and the identities of others in order to ensure that an “expressive order” is sustained. ACT indexes the affective meaning of words along three universal dimensions of meaning: evaluation (good to bad), potency (powerful to weak) and activity (lively to quiet), collectively abbreviated “EPA.” These generalized meanings are known to be widely shared across a culture, but also provide a good metric for indexing differences between cultures.

ACT expresses, in a set of equations, the way that sentiments imported can predict people’s actions, feelings, and attributions during interaction. ACT researchers have worked to compile cultural “dictionaries” containing generalized meanings (in EPA) of social identities and behaviors. These dictionaries have been compiled in English, Japanese, Chinese, French and German, but never in Arabic. A new four-year, five country study launched this year will remedy this. This study will collect data in four Arabic-speaking countries, one in each of the major dialect regions – Egypt, North African Berber region (Morocco, Tunisia), Saudi peninsula (e.g., Jordan, Syria, Saudi Arabia, Yemen, Kuwait, Qatar), and the Fertile Crescent.

I have been working on the earliest stages of this project, analyzing and interpreting the results of a pilot study conducted in the U.S. among Arabic speaking and English speaking U.S. residents. My own research offers a unique focus in the area of religion. Because many of the surveyed Arabic-speakers are professing Muslims and many of the English-speakers are professing Christians, I believe that religion may be a critical contributor to cultural variance in this study.

The full study will survey 2000 individuals from each of four Arabic speaking countries, 2000 U.S. English speakers, 2000 native Arabic speakers who are transient U.S. residents (e.g., graduate students), and 2000 native Arabic speakers who are longer term immigrants. Roughly half of these data will be collected from the Georgia site over a several year period. I will seek to explain the variance through a detailed analysis of Islam and Christianity, drawing chiefly from the central religious texts (the Bible, the Qur’an and the Hadith), commentary and peer-reviewed articles. Through this study I hope to contribute to a deeper understanding of Islam and Arabic linguistic culture.

Faculty Research Mentor: Dr. Dawn Robinson, Department of Sociology
A Comparative Study of Feminism in Southern Literature: Uncle Tom, 
Beulah and Aunt Phillis's Cabin

Ransom Jackson

My project for the Summer Research Fellowship is to compare and contrast three novels by three very different women set in the plantation South between 1851 and 1859, looking for underlying social politics and feminist declarations. In the early 1830’s, the plantation novel helped to cement white women’s roles in society as domestic creatures cast in the impervious mold of chastity, piety, purity and domesticity. With the publication of *Uncle Tom’s Cabin* in 1852, Harriet Beecher Stowe gave women voices that conflicted with the images portrayed in these earlier works. Following Stowe’s landmark success and publication, Mary H. Eastman of Virginia delivered her antithesis to Stowe with *Aunt Phillis’s Cabin: The Southern Life As It Is*. Within seven years of both publications on two opposing viewpoints of slavery, a Georgia writer by the name of Augusta Evans published *Beulah*, the story of a young woman conflicted about her identity in a strong Southern society.

This project will compare these three novels and reveal how the authors push their female characters strong identities. I will then examine whether there is consensus about women’s “sphere of influence” or in fact a counter definition that these authors are attempting to register. Were they in agreement about the social roles that women should play? Did they contest the roles society had placed on them? Were these female authors trying to recast their positions in the male-dominated world of slavery, capitalism and social behavior? I will sift through the correspondence of Stowe, Eastman and Evans, looking for answers to these and related questions. Also, I will look at the published accounts and reviews both from the North and the South to ascertain what men and women thought of the female characters represented in all three novels. Furthermore, I will research scholarly material from various disciplines that will relate to the topic of this project and will interview several noted scholars of feminism in literature, such as Dr. Johanna Shields of the University of Alabama at Huntsville, Francis Smith Foster of Emory University, and Barbara McCaskill here at the University of Georgia.

*Faculty Research Mentor: Dr. John C. Inscoe, Department of History*
Detection of Mycobacterial Genes Involved in Vitamin 1B12 Uptake
Elena James

The strategy for identifying B12 uptake mutants stems from a knowledge of how Mtb controls expression of the metE gene which codes for MetE, a B12-independent enzyme that converts homocysteine to methionine. Mtb also has a second enzyme MetH that can produce methionine, but this enzyme requires B12 to be functional. To avoid over-synthesis of methionine, in B12 abundance, expression of the metE gene is inhibited by the binding of B12 to the RNA sequence upstream of metE known as a B12 riboswitch. My project will use this B12 riboswitch to control expression of a drug resistance gene to select for mutants unable to uptake B12.

Research thus far has resulted in the development of an intermediate plasmid that will be further modified for screening B12 uptake mutants. I started with plasmid pMV261, which can replicate in E. coli and in mycobacteria and contains a gene that codes for resistance to the antibiotic kanamycin. The goal is to modify this plasmid such that the metE B12 riboswitch controls expression of an apromycin resistance gene (apr) and another gene (sacB). Sites on pMV261 were identified for insertion of these genes. Upstream of these sites, I first cloned transcription terminator rrrnB T2 to prevent other parts of the plasmid from transcribing through the genetic elements that I will insert into the plasmid. This new plasmid, pMV261T2, was transformed into E. coli cells and selected for by plating cells on medium containing kanamycin and confirmed to be correct by DNA sequencing. Next, the metE B12 riboswitch and upstream promoter region were inserted downstream of rrrnB T2 as determined by restriction enzyme analysis. Upon confirmation by DNA sequencing, this plasmid will be named pMV261T2ribo.

To fully develop the screening plasmid, the apr gene and the sacB gene (which codes for a counter-selectable marker in the presence of sucrose) will be inserted into pMV261T2ribo downstream of the B12 riboswitch promoter, allowing for B12-regulated and concerted expression of apr and sacB from the metE promoter. This plasmid will then be transformed into two nonviral mycobacterium species (M. smegmatis and M. bovis BCG) to determine the levels of apromycin resistance relative to the amount of B12 added to culture media. Next, a temperature-sensitive phage with a transposon will be used to randomly insert a hygromycin resistance gene (hyg) into the chromosome. The bacteria will then be plated on medium containing B12, hygromycin, and apromycin to obtain mutants with inhibited B12 uptake or an interrupted B12 riboswitch that allows the apr gene to be expressed. The sacB gene will be used to screen out any mutants that resulted from spontaneous apromycin resistance as these bacteria would survive if plated on medium containing sucrose. To identify which genes were disrupted by hyg in any B12 uptake mutants, the chromosomal DNA will be sequenced using primers that bind to the ends of hyg.

Faculty Research Mentor: Dr. Russell Karls, Department of Infectious Diseases
Development of Nut Cracking Skills in Young Bearded Capuchin Monkeys

Kellie Laity

Nut-cracking is an unusual skill in non-human primates, known only to occur in some populations of chimpanzees and capuchin monkeys. Nut-cracking in wild monkeys is thought to be a tradition, meaning that young monkeys learn this part through social influences. Every youngster learns to crack the nuts although they are not taught by the adults. Instead, youngsters develop these skills by repetitive exploratory practice, banging nuts and stones on different surfaces for several years before ever cracking a nut. We know that: 1) Youngsters watch and listen to adults crack open nuts. 2) Youngsters encounter the anvil sites with previously cracked nuts, and spend time there manipulating stones and bits of nuts. These two features suggest that the activity of other monkeys affects the young monkeys’ motivation to practice actions relevant to cracking nuts. Demonstrating that social influences support youngsters to practice is a necessary component to confirm that nut-cracking is a tradition in wild bearded capuchin monkeys. I will accompany Dr. Dorothy Fragaszy, Psychology to Piauí, Brazil for eight week to study how the social context of adults cracking nuts affects the practicing of the youngsters.

We will quantify how adults’ cracking activity motivates the youngsters to practice cracking and establish if there is a temporal relation between adults’ action and youngsters’ actions. For example, if a youngster sees or hears an adult crack a nut, then is it more likely practice cracking in a short time frame compared to other times? Another part of the study will be to evaluate the effects of youngsters encountering an anvil site with bits of previously cracked nuts. We want to evaluate if the specific features of the anvil site promotes the youngsters to practice cracking.

We will study a known group of wild bearded capuchin monkeys at the field site in Piauí, Brazil. We will observe individual young monkeys between the ages of six months and five years that do not crack whole nuts and record their actions, their location (whether at anvil site or elsewhere), and whether any other individual is cracking a nut, and if so, if that individual is in line of sight or hearing distance of the youngster. We will conduct the observation in teams. At the same time as one observer a young monkey, another observer will collect data on other individuals for percussive and nut-cracking activities. Subsequently we will merge the two data sets to examine temporal contingencies between events and the youngsters’ activities. I intend to process that data collected from the summer over the next academic year in order to prepare it for publication.

Our study will provide an empirical evaluation of the hypothesis that nut-cracking is a tradition. It can illustrate how social influences can promote learning a skill that is not directly taught to the next generation. Larger implications of the study concern the necessary conditions that promote traditions in non-human primates. This is an important issue in contemporary behavioral studies in biology and anthropology that has been highlighted in recent scientific literature and in public events.

Faculty Research Mentor: Dr. Dorothy Fragaszy, Department of Psychology
Characterization of the Tneap Complex in the CRISPR-Cas Viral Defense System of Prokaryotes
Marianne Ligon

The CRISPR-Cas system is a recently discovered defense system against genome invaders present in approximately 40% of bacteria and 90% of archaea. The system provides adaptive, genetically-heritable immunity against viruses, plasmids, and other invasive mobile genetic elements. The CRISPR loci represent genetic operons comprised of repeats and invader-derived DNA sequences that are transcribed and processed down to small crRNAs (CRISPR RNAs), which guide the silencing of corresponding invaders in a process often compared to, though distinct from, eukaryotic RNA interference.

Cas genes encode a large family of proteins divided into modules using phylogenetic data. Core Cas proteins (Cas1-6) pervade across many bacterial and archaeal systems, while various Cas subtypes are more narrowly conserved and less widely spread. Little more than predicted functional domains are known about the majority of the Cas proteins. The novel Tneap subtype consists of three subtype-specific Cas proteins: Cst1, Cst2, and Cas5t. This novel module together with the core Cas3 protein is predicted to be involved in target recognition and nucleic acid cleavage, functioning to silence foreign DNA or RNA. Previously, the lab has isolated a RNP (ribonucleoprotein) complex consisting of Cst1, Cst2, Cas5t, and mature crRNAs from native Pyrococcus furiosus cell extract. Otherwise, nothing is currently known about the Tneap complex.

This research project seeks to reconstitute the Tneap RNP complexes of Pyrococcus furiosus and Thermococcus kodakaraensis from recombinant proteins and synthetic RNAs in order to understand the function of these proteins in the CRISPR-Cas defense system. The three Tneap genes and the cas3 gene from P. furiosus and T. kodakaraensis have been cloned into expression vectors in Escherichia coli to produce recombinant proteins for in vitro studies. These proteins will be used to determine the protein-protein and protein-RNA interactions within the Tneap RNP complex architecture. I will then test the role of the RNP complex in invader recognition and silencing using functional assays against RNA and DNA targets to determine if the Tneap complex cleaves these nucleic acid targets in a homology dependent manner. I will also investigate the role of Cas3 in target recognition and invader silencing in combination with the Tneap complex, as it is predicted to be the effector nuclease in this process.

This research will provide some of the first complete data on the biochemical functionality of the CRISPR-Cas defense system, specifically the first examination of the function of the novel Tneap complex as an immunity effector complex. Understanding the CRISPR-Cas mechanism will provide insight into the basic biology of prokaryotes.

Faculty Research Mentors: Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
There is an abundance of bonded pairs of interstellar atoms, with no reasonable explanation for existence. While these pairs are formed on the surface of dust grains, probabilities associated with these interactions remain uncertain for many elements. I will focus on simulating the sticking coefficients of carbon, nitrogen and oxygen, for example; using the classical molecular dynamics technique.

Using spectral analysis, which describes properties of space by analyzing beams of light passed through it, scientists have discovered an abundance of elements in regions of interstellar space. There is, for example, an abundance of paired hydrogen molecules in certain areas. Without the presence of other surfaces in the same region, these pairings would seem to defy the first law of thermodynamics. Because there is no surrounding atmosphere, simple collisions would result in some sort of radiation (light, etc.) or the bonded atoms would have to be the result of a three-body collision. While both of these scenarios are possible, the number of molecules is much too large to be explained only by these two statistically rare situations.

Research into icy dust grains can lead to an explanation of the phenomenon. Scientists have found that if one free atom can stick to the surface of a substrate like dust or ice, and can diffuse around on the surface, it can bond with another atom. The collision energy can be conserved and the molecule can use the bonding energy to shoot off into space. This model has been accepted as the most probable solution, and many models and simulations have been formulated in an attempt to describe a more complete picture of this system. Some studies have been done with hydrogen, and scientists have determined the “sticking probability” for hydrogen at certain temperatures. Still, the probability of particular elements sticking is uncertain for many other elements.

With the right software, we can simulate this system to predict a more accurate sticking coefficient. The method we use is called Molecular Dynamics, a type of simulation that predicts the movements of atoms by integrating Newton’s equations of motion multiple times, according to a preset time step. Because it is impossible to accurately integrate these equations for every instant in time, a time step is chosen, and the integral is taken at each multiple of that step. Essentially, the results get more and more accurate as the time step becomes smaller. The important consideration is making the step small enough to provide accurate answers, yet large enough to allow reasonable calculation time.

Creating an accurate simulation involves setting up realistic conditions using a software package called Packmol, through which users create an input file of initial coordinates and trajectories. This input file can be run in a Large-scale Atomic/Molecular Massively Parallel Simulator (LAMMPS) which is where we create the molecular dynamics code we use to simulate these events. The LAMMPS code output records the measurements of the system’s progress for each time during a particular time step. The various results are brought to life using visualization software.

Faculty Research Mentor: Dr. Steven Lewis, Department of Physics & Astronomy
Bovine tuberculosis, caused by Mycobacterium bovis, is a serious, reportable, zoonotic problem primarily affecting bovids worldwide. While previously thought to be controlled in the United States, this disease has recently re-emerged due to wildlife reservoirs and commercial cattle movement (Thoen et al., 2007). In the US alone, bovine TB has been reported in four states, with 58 herds affected between 2003 and 2009 (NASS Agriculture Statistics). This disease has cost the US cattle industry $100 million from 1997 to 2007 (Thoen et al., 2007). “128 out of 155 countries reported the presence of M. bovis infection and/or clinical disease in their cattle population during the period between 2005 and 2008,” according to the OIE (World Organization for Animal Health). If the disease dynamics are not properly studied and consequently controlled, more states will become bovine TB positive and humans will be at a higher risk for contracting this disease from infected livestock.

A recent study of bovine TB in African Buffalo performed by our collaborator, Dr. Vanessa Ezenwa, has shown that de-worming these animals allowed for better control of M. bovis infection, suggesting that intestinal nematode infection has an inhibitory effect on the ability of the immune system to combat M. bovis. (Ezenwa et al., 2010). This summer, we plan to study this intriguing effect in the mouse model. Infection by intestinal helminths triggers a Th2-skewed immune response, while M. bovis control requires an effective Th1 response. We therefore hypothesize that when an animal is infected with intestinal nematodes, the systemic Th2-skewed environment created by the immune system down-regulates the Th1 response and therefore decreases the animal’s ability to fight the mycobacterial infection.

We will co-infect mice with the intestinal nematodes Heligosomoides polygyrus and Nippostrongylus brasiliensis, followed by intratracheal instillation with M. bovis, in order to recreate the conditions found in the Ezenwa African buffalo study. The control groups will include mice that are mock-infected, or infected with either nematodes or M. bovis only. At specific time points after infection, tissues from several organs including the lung, intestines, liver, spleen, and regional lymph nodes will be harvested for histopathology, flow cytometry (to determine recruited leukocyte subsets), and lymphocyte proliferation assays. Serum will also be collected to study the systemic cytokine response. This study will provide insight into how nematode and mycobacterial co-infection, a common scenario in cattle, as well as humans in developing countries, affect the development of each disease.

**Faculty Research Mentor:** Dr. Kaori Sakamoto, Department of Pathology
Assembly of High Density Lipoproteins via Retained N-terminal Signal Peptides
Tuiumkan Nishanova

Some of the recently discovered functions of High Density Lipoproteins (HDLs) include immunity against pathogens and antioxidant and antithrombotic functions. The physiological roles of high density lipoproteins are in large determined by their protein composition. There are several ways that an apoprotein may associate into lipoproteins such as HDLs. One way includes association of the apoprotein via alpha helices. Recent discoveries have revealed a new way for certain apoproteins to associate with HDLs. It has been shown for Paraoxonase 1 and apolipoprotein M that their retained N-terminal signal peptide serve as anchors that allow for association of these apolipoproteins into their respective high density lipoproteins. Haptoglobin-related protein (Hpr), found in Trypanosome Lytic Factors, a subclass of HDLs providing humans with innate immunity against trypanosome brucei brucei, is another apolipoprotein with a retained, hydrophobic N-terminal signal peptide. Submitted and preliminary data have shown that synthetic peptides matching in sequence to these retained N-terminal peptides show specificity for fluid lipid environments. Fluidity and phospholipid composition play a role in the dynamics of HDL and the tasks of associated proteins. We propose to characterize a mechanism of HDL subspeciation, that is, the role of retained N-terminal signal peptides and lipid fluidity in the assembly of biochemically distinct HDL particles.

Our hypothesis is that the retained N-terminal signal peptide of Hpr is necessary for its association with high density lipoproteins. To test this hypothesis, we will use purified Hpr and recombinant Hpr, which lacks its N-terminal signal peptide, and compare their association with TLF-depleted high density lipoproteins. This experiment will directly test the requirement of retained signal peptide of Hpr with HDLs.

Paraoxonase 1 and apolipoprotein M are found only in certain populations of high density lipoproteins, even though they both use their retained N-terminal signal peptides to associate with their respective lipoproteins. Preliminary and submitted data show that the Hpr signal peptide shows specificity for fluid liposome vesicles. We will use model liposomes and reconstituted HDLs to test the idea that the general physical property of lipid fluidity is the basis for the specific assortment of Hpr, Paraoxonase 1, and apolipoprotein M in high density lipoprotein.

The mechanism of protein distribution, and thus their function, across the subsets of HDLs has not yet been described. The essential hypothesis of this proposal is that lipid fluidity determines the distribution and assembly of apolipoproteins with retained N-terminal signal peptides across the subsets of HDLs. These studies will help us better understand the kinds of protein-lipid interactions that take place within high density lipoproteins. This, in turn, may improve our understanding and approach in treating diseases that arise because of deviated HDL assembly, such as diabetes, and metabolic and heart diseases.

Faculty Research Mentor: Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology
Modeling Subtelomeric Growth and the Adaptive Telomere Failure Hypothesis

Farres Obeiden

The adaptive telomere failure hypothesis proposes that telomeres may have evolved to partially fail at a certain rate in some or all conditions to accelerate recombinational exchanges in subtelomeric regions. This is a mechanism by which subtelomeric genes could adapt rapidly to changing environments. With guidance from Dr. David Hall, I will construct and analyze a model to address the viability of the adaptive telomere hypothesis.

The model will simulate a population of mitotically growing individuals. An individual-based modeling system will best allow us to capture the important aspects of the system including the mechanisms of recombination, the types of loci, and the selection acting on those loci. Each individual will have a set number of chromosomes. At each time step, a proportion of the population will die and be replaced by the mitotic offspring of the remaining individuals. The likelihood that a particular individual will contribute to the next generation is based on its relative fitness, which is determined by its genetic make-up and the current environment. This model will incorporate three types of genes: housekeeping genes that are required in all environments and may or may not exhibit dosage compensation, neutral genes that do not affect fitness, and contingency genes that are beneficial only in some environments. We will model environments that change temporally, and those that vary spatially. Within an individual, chromosomes will be subject to adjustable rates of random, double-strand breakage which may lead to various outcomes depending on the nature of the recombination/repair events.

Once the model is constructed in Mathematica, we will analyze the evolution of the genome with no selection. The expectation is that some genes like housekeeping genes without dosage compensation will maintain a constant number while others like neutral genes will exhibit changes in copy number due to genetic drift. Then we will examine the model under varying selective pressures. The prediction is that recurring selection pressures on contingency genes, which may select for cycles of gene amplification and loss, will cause these genes to become concentrated at subtelomeric regions. The model will aid us in addressing whether high rates of recombination near telomeres are favored in a population undergoing selection on contingency genes because of an inherently higher ability to rapidly alter gene dose. As a control, we will also examine a population in which there is no beneficial effect of contingency genes to make sure that it is the effect of the contingency loci that is important. This directly examines the adaptive telomere failure hypothesis by addressing whether instability in telomere regions can be favored through an effect on contingency genes.

Faculty Research Mentor: Dr. David Hall, Department of Genetics
Recently, certain hydrolytic enzymes, including glycosidases, have been shown to modify the structure of glycans within the extracellular space, consequently altering their binding properties and influencing the function of cell surface glycoproteins. The known enzymes include both sialidases and sulfatases but the full extent of extracellular glycosidases capable of modifying cell-surface carbohydrates has not been described.

During the characterization of zebrafish glycosidases in our laboratory, a novel \( \beta \)-galactosidase activity was identified in brain samples with high residual activity under neutral conditions, far from the acidic optimum that is characteristic of lysosomal glycosidases. Affinity chromatography ensures that this enzyme does not reside within the lysosome by isolating enzymes lacking high-mannose N-type glycans. Further analysis led to the discovery of a similar activity in both mouse and cat brain tissues. Significant data lies in the mouse brain tissue samples, as activity not only persists at neutral pH but appears substantially activated as well. We believe this activity represents a novel \( \beta \)-galactosidase enzyme that is enriched in the brains of organisms ranging from zebrafish to mammalian species such as cat and mouse. Importantly, the neutral optimum of this activity suggests that it acts outside the cell and may modify extracellular glycoproteins.

The presence of an extracellular \( \beta \)-galactosidase-like enzyme with the ability to hydrolyze glycosidic linkages at a neutral pH can have multiple effects on a cell. Potentially, these secreted \( \beta \)-galactosidase enzymes would modify cell-surface glycans by cleaving terminal galactose residues on glycoproteins and glycolipids. The removal of terminal galactose residues as in the aforementioned case can result in altered binding to galectins, a type of galactose-specific lectins. Lectins modulate distinct cellular processes, such as cancer progression, immune response and cellular development, all of which can be affected through ligand modification by an extracellular \( \beta \)-galactosidase enzyme. Obviously events such as these occurring in a vital area such as the brain could be detrimental. With laboratory results from brain tissue studies suggesting that extracellular modification by \( \beta \)-galactosidase could very well be occurring due to high levels of activity at neutral pH, there is a need to further biochemically characterize this activity in order to fully understand the effects of its function, especially with the strong correlation seen between the brain tissues studied of mouse and zebrafish to that of humans.

This research will entail biochemical characterization of the novel enzyme, by primarily addressing the following three questions: Is this enzyme structurally capable of residing in the extracellular matrix? Does the isolated novel enzyme, one lacking mannose-6-phosphorylation, possess differential inhibition than that of the lysosomal \( \beta \)-galactosidase? Is the novel enzyme indeed capable of cleaving extracellular glycans?

**Faculty Research Mentor:** Dr. Richard Steet, Department of Biochemistry & Molecular Biology
In the fourth installment of his namesake series, Harry Potter finds himself, once again, alone. And then a miracle happens. One owl after the next arrives with presents, birthday cake and heartwarming letters from each of Harry’s beloved friends. Harry rests in assurance that the people he loves are all around him.

In *Cinderella*, we see much different portrayals of loss and loneliness. There are no instant apparitions of wizards or owls—not even a fairy godmother—to end Cinderella’s suffering. She must look within herself. As she grieves for her dead parents, Cinderella runs out into the forest and weeps until her tears dampen the ground. Her grief is deep, all consuming. A tree grows from the place where her tears watered the soil. Cinderella snaps off its silver branches and sells them to buy her ball gown and slippers. Rising above suffering, she pursues her own happiness.

Early confrontation with or awareness of issues of love, loss, fear, grief and sorrow are fundamental to a child’s development as a sympathetic being who strives to relate to and make meaning of their environment. Thus, portraits of these confrontations seem equally fundamental, as they may guide a child’s response to their own experiences. Across various works of canonical children’s literature worldwide, issues of love, loss, and fear are approached in vastly different ways. In some works, suffering is short-lived and quickly resolved, and the emphasis is placed on celebrating its resolution and moving forward. In contrast, other works portray suffering that lingers, deepens, and calls for endurance. Each portrayal, as it exists within its own cultural context and presents its own set of morals and values, lends its influence to the young reader in the early process of shaping that reader’s worldview, morals, and values.

I propose to compare portrayals of love, loss, fear, grief, and sorrow in world children’s literature, examining them their historical and cultural contexts. I hope to gain a better understanding of the implications that exposure to these different works can have for a child’s learning and development. I plan to develop a model for analyzing and comparing children’s literature with the goal of exploring how portrayals of essential human themes may affect children’s learning and development. Working through this model for analyzing children’s literature from an interdisciplinary approach, I hope to draw implications for how children’s literature might be chosen—both the books given to children in the classroom and outside of it. Above all, it is my hope that this method will inform children’s educational curriculum, providing our students with strong foundations in empathy, compassion, and strength through emotion.

By contributing to the discussion about children’s literature from this interdisciplinary perspective, and by suggesting standards upon which works are chosen for students through my model, I also hope to contribute to thinking about the way children’s literature is taught. With children’s emotional and developmental needs as the primary focus of my work, reading, and analysis, this study will look for silver branches for children to grasp, rather than for owls to carry them away.

*Faculty Research Mentor: Dr. Katarzyna Jerzak, Department of Comparative Literature*
Intracellular Blood Parasites of Common Freshwater Turtle Species in Georgia: Prevalence and Burden

Luben Raytchev

Previous studies have shown that the prevalence of the hemogregarines varies, both within a specific host and among the different turtle species in a population. These differences could be related to leech abundance or behavioral peculiarities of different species of turtles, such as distinct basking behaviors. The latter could result in differential exposure to leeches. Another possible reason for the differences in prevalence of hemogregarines in freshwater turtles is a variance between habitats, both natural and human-induced. These habitats’ conditions could alter leech abundance and augment hemogregarine prevalence in communities of turtles present in the waterbody. Because these parasites cannot be distinguished based on morphology, it is currently unknown if the different turtle species are infected with the same parasite or different parasites. Not knowing the diversity of parasites within these hosts has limited previous studies. This study seeks to examine differences in parasite prevalence among common turtle species at two sites in Georgia and to relate any differences to habitat or behavior.

Two sites have been selected: various water bodies in Clarke County, which have varying degrees of human impact, and a relatively pristine environment located in southwest Georgia (The Joseph Jones Ecological Research Center in Baker County). The common species of turtles present at both sites and that will be examined in this project include the common musk turtle (Sternotherus odoratus), pond sliders (Trachemys scripta), painted turtles (Chrysemys picta), and various types of map turtles (genus Graptemys). Turtles will be trapped by standard methods and a blood sample collected in order to prepare a thin blood smear for future molecular analysis. The blood samples will be analyzed for the presence of hemogregarines and the level of infection in each specimen will be determined. We will look for differences in the level of leech parasitism and the prevalence and level of hemogregarine parasitism (burden) between basking and bottom-dwelling species. In addition, we will test for differences in parasite prevalence and burden between individual turtle species from the different habitats. The geographical surroundings of the turtles may be important regarding the prevalence of hemogregarine parasites and perhaps the burdens due to pollutants or other unnatural or natural compromising factors. For example, turtles in more pristine environments may be less prone to hemogregarine infections or exhibit lower levels of infection than turtles in more impacted habitats. Conversely, pristine environments may be more suitable for the leech vectors which would result in higher prevalence, but because turtles are less stressed in a natural environment, their parasite burdens may be lower. If hemogregarines cause disease, the most impacted turtles would be those with higher parasite burdens.

A future goal of this work will be to genetically differentiate between the species of hemogregarines between the different host turtles. Currently, experimental infections are the only way to distinguish between species, but are not practical or logistically possible in many cases. Hemogregarines are not necessarily host specific, so there is a possibility that multiple turtle species harbor the same parasite and that multiple parasite species are present in a single host; thus, a molecular approach will be useful for future studies.

Faculty Research Mentor: Dr. Michael Yabsley, Department of Wildlife Disease Ecology
The implementation and sustainability of EBT’s for smoking are powerful tools that could have profound effects on health care. With drug and alcohol treatment centers already established throughout the country, the costs of including EBT’s would be minimal in comparison with the positive change smoking cessation could have on drug and alcohol treatment and overall health of addicts. This change cannot be brought about effectively without sufficient research on the implementation and sustainability of EBT’s. By focusing on that implementation and sustainability, this proposed application has clear public health (including public health policy) relevance.
In order to measure progress toward established sustainability goals, UGA Costa Rica will carry out an annual sustainability audit, designed as a student-driven research internship. As one of three research interns selected to produce the 2011 UGA Costa Rica Sustainability Report, I will conduct research to track progress in areas of resource use, and will make recommendations for adjusting the 2015 action plan according to these results. This data will be gathered from bills, statements and other accounting records from the previous year, and from other reports produced by the UGA Costa Rica campus administrative staff. I will also directly participate in carrying out a solid waste audit, and will personally observe other practices being put in place, or lack thereof, such as signage, placement of recycling bins, etc.

During the study’s eight-week research period, I will use two third-party evaluation tools to analyze campus sustainability from different perspectives. The use of the Ethics-Based Assessment Tool, a new addition to the 2011 report, is intended “to evaluate and improve both their level of declared commitment and their level of performance in pursuit of a more just, sustainable, and peaceful world.”

I will conduct both formal and informal interviews with campus staff, faculty, and community members using the aforementioned evaluation tools. In addition, I will document the efforts of UGA Costa Rica to participate in addressing identified community needs, to extend outreach services within the broader community, treatment of workers, etc., and will review new sustainability-related instruction and research initiatives As a participant observer, I will take part in campus activities (e.g., tree planting to offset carbon emissions, garden work to help harvest the food to be served to students, etc.) to gain an understanding of how the culture of the UGA Costa Rica campus activities relate to sustainability.

Finally, rather than simply update the 2010 Report, I will work with my team members to write a final summary report for 2011 that follows a similar structure, allowing for ease of comparison from year-to-year, while also presenting the information and our analysis in a fresh and compelling way. Once back in Athens, I will work into the Fall 2011 semester with Dr. Quint Newcomer and my research partner to assist with final report production, printing and distribution.

Strategic Direction VII of the University of Georgia 2020 Strategic Plan is labeled “Improving Stewardship of Natural Resources and Advancing Campus Sustainability.” The document notes, “the university campus should be an example to others in reducing its environmental footprint to the greatest extent possible.” The UGA Costa Rica annual Sustainability Report is an important document for the broader UGA community. As explained by the Director of the UGA Office of Sustainability, Kevin Kirsche, “this report will not only prove effective for for current and future practices at UGA Costa Rica, but provides an example for others in the University of Georgia community and beyond.”

**Faculty Research Mentor:** Dr. Quint Newcomer, Director, UGA Costa Rica
Over-expressed or mutated Ras may become oncogenic in its functionality, characterized by deregulation of the cell cycle and rampant cell growth. Thus, Ras and the proteins that regulate Ras localization and functionality, such as Ras converting enzyme (Rce1p), are potential targets of anti-cancer therapeutics. The CaaX (Cysteine-aliphatic-aliphatic-Variable) amino acid motif at the carboxy-terminus of Ras is the substrate for extensive post-translational modification to ensure the localization of Ras to the plasma membrane. After translation, the “CaaX box” of Ras is post-translationally modified in three sequential steps to achieve functional localization: 1) Prenylation of the cysteine residue thiol with either a farnesyl or geranylgeranyl isoprenoid group to form a stable thioether bond; 2) Endoproteolysis by Rce1p to cleave the peptide bond between the Cysteine and first aliphatic residue of the CaaX motif to leave the carboxy-terminus exposed, and 3) Methylsterification of the newly exposed carboxy-terminus of the cysteine residue. It is hypothesized that inhibition of the Rce1-protease will inhibit Ras signaling within the cell because loss of function of this crucial step will cause improper Ras localization and function.

This study seeks to create a cell-based assay to investigate improper Ras processing in cells lacking Rce1p. This should allow an investigation of novel Rce1p inhibitors’ pharmacological ability to disrupt Ras processing on a dose-dependent basis. Rce1p is a potential cancer target because fibroblast cells lacking the Rce1 gene grow slowly, have reduced ability of anchorage-independent growth, and are compromised in their ability to transform into tumors, hallmarks of tumorigenesis. Rce1p inhibitors exist in several categories: non-specific protease inhibitors, substrate mimetics, and natural products. Generally, none of these types of inhibitors are particularly useful as probes of Rce1 function because of issues with specificity and cell permeability. Dore and Schmidt Laboratories have collaborated to identify a number of inhibitors of Rce1 that are of interest. A fluorescence-based in vitro assay and a Ras localization assay performed in S. cerevisiae cause localization of Ras to the cytosol. Mammalian Assays in mammalian cells examine the intracellular localization of Ras upon the inhibition of Rce1 have yet to be fully investigated.

I will create a cell-based assay to measure Ras localization. NIH 3T3 and Mouse Embryonic Fibroblast cells will be transiently transfected with a GFP-tagged Ras DNA construct. Cells will be examined using fluorescence microscopy. Possible candidates of GFP-Ras are N-Ras, H-Ras, or K-Ras4B, as seen in studies by Mark Philips. Negative controls will be cells solely transfected with the GFP-Ras construct. It is expected that Ras in these cells will localize solely to the plasma membrane, fluorescing green around the edges of the cell. Positive controls will be double knockout MEFs for the Rce1 gene. These cells are expected to localize Ras only to the cytosol of the cell, eliciting punctuated staining/fluorescence. Cells co-transfected with inhibitors will first be tested for single-point inhibition. Next, dose-response assays will be conducted, from which dose response curves will be constructed and EC50 values will be calculated by counting the number of cells expressing the mis-localized Ras phenotype.

Faculty Research Mentors: Dr. Timothy Dore, Department of Chemistry, and Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology
Grief smote my heart to think…
What souls I knew, of great and sovran
Virtue, who in that Limbo dwell suspended.
(Inferno, Canto IV 41-45)

Since almost immediately after publication, the gruesome humanity of the Inferno has inspired countless artworks. Historically this art, like Sandro Botticelli’s manuscript illustrations, Fra Angelico’s Santa Maria degli Angeli altarpiece, and Michelangelo Buonarroti’s Sistine frescos, has focused primarily on the theology of the poem. Early works like these used frightful images of hell inspired by Dante to demonstrate God’s might and the importance of the Catholic Church. More recently, however, artists such as Auguste Rodin and Sandow Birk have shifted the artistic focus from the eternal and divine to the immediate, human experience of the characters of the Inferno. Rodin removes hellish settings from his art to emphasize the emotive forms of figures, while Birk re-envisions these settings by placing the damned in recognizable, contemporary settings. For today’s increasingly secular culture, Dante’s Inferno retains a resonance less present in Purgatorio and Paradiso precisely because the characters’ utter isolation from God brings them to the forefront of the reader’s attention. Ironically, the flawed and fleeting qualities of these characters make their brief, fragmented stories ultimately universal and undying. These qualities, though difficult to portray in words, communicate beautifully in imagery. Over the past six hundred years, numerous paintings, frescos, etchings, drawings, and sculptures influenced by the Inferno have compellingly represented the universal conditions of these tormented individuals. If granted a CURO Summer Fellowship, I will construct a series of photographic illustrations in which I re-envision the Inferno in a manner relevant to contemporary culture.

Firstly, this research will involve a thorough analysis of Dante’s Inferno within the context of The Divine Comedy in addition to an art historical survey of work influenced by the literature. I will examine artists’ interpretations and depictions of the work within their respective cultural contexts, paying close attention to the religiosity of the artists’ goals and their depictions of the souls of hell as either background elements or forefront subjects. Once I have established a thorough foundation for my own art, I will plan out and construct a series of photographic images illustrating the Inferno in a visual fashion most meaningful to contemporary society given the gradual evolution of people’s religious, moral, political, and personal beliefs over the past seven hundred years. Utilizing a combination of photographic techniques and computer manipulation I will create these images in an appropriately contemporary medium.

To strengthen my research, I will take a multi-disciplinary approach, exploring literature, mythology, art history, philosophy, and photography. I also will draw upon the related CURO research that I conducted last semester. Nevertheless, I will maintain my central focus on making original photographic art. Through this research, I seek to gain an understanding of the Inferno and the artistic developments it influenced and from this understanding reinterpret and re-contextualize the timeless, humanist motifs of Dante’s masterwork in a series of original photographic artworks.
Genomes are under the constant threat of deleterious alteration or disruption from exogenous genomic elements, thus, the evolution of defensive systems that function to protect cellular genomes from attack. One such system discovered in prokaryotic organisms has the ability to not only silence invaders but also to acquire heritable immunity from genome invaders. Known as the CRISPR-Cas System, this immune system functions in three basic steps. First, short invader-derived genetic material is incorporated into the host CRISPR locus (Acquisition Stage). Second, CRISPR loci are transcribed and are processed into functional mature CRISPR RNAs (crRNA) consisting a single invader targeting sequence (Biogenesis Stage). Finally, the crRNAs assemble with Cas (CRISPR-associated) proteins to form ribonucleoprotein (RNP) complexes that target and silence invading nucleic acids (Invader Silencing Stage). The CRISPR-Cas system is found in nearly all known archaeal organisms and about half of the bacteria including the majority of microbes that are important in industry and disease. Understanding this system is of the utmost importance as it holds great potential in creating new classes of antibiotics and for bacterial gene manipulation.

My focus resides with a prokaryote that outlines a well-studied CRISPR-Cas system. This bacterium, Streptococcus thermophilus, has recently been shown to have the ability to acquire resistance to a number of bacteriophages through destruction of invader-derived dsDNA. The Cas protein, Csn-1, has been found to be required for this invader silencing, however its precise role in defense has yet to be determined. My goal is to determine the role that Csn-1 plays in defense of silencing invaders, possibly through direct cleavage of invader dsDNA and/or a potential role in the crRNA biogenesis. Thus far I have cloned genes coding for Csn-1 proteins into bacterial expression vectors, expressed, and purified the proteins. I will soon test the ability of Csn-1 to cleave invader-derived dsDNA using a crRNA guide to determine if Csn-1 functions in the Invader Silencing Stage of the CRISPR-Cas immune pathway. Furthermore, several predicted catalytic amino acids have been identified in Csn-1 that comprise two predicted endonuclease active sites. If catalytic activity is observed directly by Csn-1, then putative catalytic residues will be substituted through site-directed mutagenesis to assess whether these amino acids are required for catalysis as well as which predicted endonuclease active site is responsible for cleavage. Finally, to ensure the findings are physiologically relevant, I plan to reintroduce the mutant Csn-1 proteins into a mutant strain of Streptococcus thermophilus that lacks Csn-1, and assess effects on crRNA biogenesis and invader (phage and/or plasmid) silencing. These findings will provide the first molecular details of CRISPR mediated silencing of invader-derived dsDNA.

Faculty Research Mentors: Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Hidden in the bogs of the eastern United States is North America’s smallest chelonian, the bog turtle (Glyptemys muhlenbergii). Habitat loss and deterioration through wetland drainage, basin impoundment, and woody plant encroachment have resulted in this turtle being listed on the Endangered Species Act as Threatened Due to Similarity of Appearance in the South (Jensen et al. 2008). Here in Georgia there are seven known bog turtle populations (T. Floyd, herpetologist, Georgia Department of Natural Resources (DNR), personal communication). South Carolina has records of only five individuals, and they have not been observed there in six years (S. Bennett, State Herpetologist, South Carolina DNR, personal communication). Yet both states are struggling to find the funding and personnel to conserve these turtles. The purpose of my research is to aid the efforts of these states by (1) developing an ecological model to better predict where bog turtle populations should occur in those states, and (2) ascertain the best methodology and minimal effort required to determine, with confidence, whether bog turtles are present at a site. The goal of my summer research project would be to focus on objective (2).

It may seem rather easy to assess whether bog turtles are present at a site, but as is the case with many rare and enigmatic species, their habits present a challenge for biologists. Bog turtles are small, spend most of their time buried in mud, have cryptic coloration, and are not present in large numbers in bogs where they are found. This makes assessing their population status extremely difficult. The two methods currently used to search for bog turtles are visual searches accompanied by probing (using a stick to feel around in the mud for the turtles) and trapping. A recent study by Somers and Mansfield-Jones (2008) in North Carolina shows that trapping is a better method for capturing turtles. They delineate how much effort is required to obtain a 95% probability of trapping a turtle. This has been the only study of its kind, and so its effectiveness remains to be tested, especially in other states. Establishing a standard method to obtain this 95% probability is essential to discovering new populations. Although site absence can never absolutely be determined, a confidence level would enable researchers to quantitatively assess the likelihood of occupancy.

To accomplish my summer research goal, I would trap Georgia’s seven known bog turtle populations using a standardized method I design to determine the amount of trapping effort required to positively detect a bog turtle. By determining the minimum effort required for a positive detection, I can then estimate the effort required to say with 90-95% certainty that if a turtle was not discovered, the species is truly absent from a site. The results from this study could then be used to develop a monitoring program for bog turtles in South Carolina and Georgia. The information from the ecological model (objective 1) and my summer field work would then allow me to search for bog turtles in South Carolina, which would be only the second attempt in the past twenty years.

**Faculty Research Mentor:** Dr. John Maerz, Warnell School of Forestry & Natural Resources
Establishing Clear Cut-Off Scores to Develop Classification Criteria for Subgroups of Individuals with CAI
Christopher Sudduth

After suffering a lateral ankle sprain, a significant number of people report residual symptoms such as pain, swelling, and a feeling of the ankle “giving way.” These repetitive feelings of ankle joint instability and/or recurrent lateral ankle sprains after an initial lateral ankle sprain has been coined Chronic Ankle Instability (CAI) and may be attributable to either mechanical instability (MI) or functional instability (FI) or a combination of both (5). As described by Hertel (5), MI or laxity beyond normal physiological range is a result of mechanical insufficiencies most likely due to pathologic laxity, arthokinematic laxity, degenerative changes, and/or synovial changes. FI, or frequent feelings of the ankle giving way/ankle joint instability, is most likely a result of functional insufficiencies due to impaired proprioception, impaired neuromuscular control, strength deficits, and impaired postural control.

Studies aiming to quantify and evaluate treatment for functional insufficiencies have failed to yield consistent results. One proposed reason for the variability in results is the ambiguity in terms used by researchers and discrepancies in inclusion criteria. Standardization of inclusion criteria and definitions will make comparisons easier, lessen the variability between studies, and improve our overall understanding of how FI and MI contribute to CAI eventually leading to better treatment of CAI and improved ankle functionality after a sprain.

To standardize the terms and inclusion criteria used by researchers, Delahunt has offered operational definitions and outlined standardized criteria when assessing CAI patients. One criterion requires instrumented measures to assess the presence of MI. This may be done using a portable ankle arthrometer, a device that contains an instrumented measure for both force application and movement of the joint subsequent to the force application. Arthrometers are commonly used during stress x-rays to determine laxity in the joint. Hubbard and others have already shown a degree of mechanical laxity to be present in some ankles with FI. However, no cut-off scores have been established that delineate clear sub-groups of persons with CAI. The portable ankle arthrometer may be a beneficial way to objectively assess ankle laxity and classify the extent of MI and any relationship to FI.

The overall purpose of this study is to develop classification criteria for subgroups of CAI by establishing clear cut-off scores. By investigating ankle laxity using a portable ankle arthrometer, coupled with self-reported measures of function and balance ability, we hope to provide future research groups and clinicians with an objective measure for MI and decrease variability and inconsistencies between studies.

Faculty Research Mentor: Dr. Cathleen Brown, Department of Kinesiology
The Involvement of Coenzyme Q (50) and Tau in the formation of Hirano Bodies
Connor Sweetnam

The exact process of how Hirano bodies are formed is not known, however they are largely thought to result from aberrant functions of actin microfilaments that maintain cellular structure. The physiological function of Hirano bodies is also unknown, but recent findings suggest a possible protective role for Hirano bodies in Alzheimer’s disease. They were shown to sequester the two proteins most associated with Alzheimer’s disease pathology, APP (Amyloid Precursor Protein) and tau, and to down regulate cell death dependent upon the cleaved intracellular domain of APP (AICD).

To further understand the function of Hirano bodies and the process by which they are able to sequester these proteins, it is important to investigate their composition and formation. Coenzyme Q (50) (a quinone compound involved with the citric acid cycle) has recently been suggested as an important component of Hirano bodies. Researchers from the Universidad Autonoma de Madrid found that Hirano bodies taken from Alzheimer’s disease brains contain Coenzyme Q (50). They showed that Coenzyme Q (50) causes the aggregation of tau, and in the presence of tau and beta-actin Coenzyme Q (50) induces the formation of Hirano body-like structures.

The central question of my research is whether Hirano bodies require Coenzyme Q (50) to form, and if they require it to sequester tau. If I find that Coenzyme Q (50) is necessary for attracting tau to Hirano bodies, then I will have elucidated a mechanism by which Hirano bodies sequester tau; if I find that Coenzyme Q (50) is necessary for the formation of Hirano bodies, then I can confirm Hirano body formation to be Coenzyme Q (50) dependent.

My experimental approach will be relatively simple, allowing me to complete the research by the end of the summer fellowship. I will use astrocytoma (H4) cells in my experiments. The H4 cell is a mammalian brain cell that is convenient for these experiments because it lacks endogenous tau. To express Hirano bodies, the cells must be transfected with CT-GFP (amino acids 124-295 of the 34 kDa actin bundling protein fused to green fluorescent protein).2 The model Hirano bodies created in this manner will be better representations of in vivo Hirano bodies than those created by the Madrid researchers (they simply mixed beta-actin, tau, and Coenzyme Q (50) and called the resulting structures Hirano bodies).4 In addition to CT-GFP, I will add varying amounts of Coenzyme Q (50) and express exogenous tau in the H4 cells (all cells contain Coenzyme Q (50), so I must add more). I will use electron microscopy to observe if varying amounts of tau and Coenzyme Q (50) affect the number and morphology of the Hirano bodies. With immunofluorescence microscopy, I can also determine the effect of Coenzyme Q (50) on the localization of tau.

Differences in the number or morphology of Hirano bodies in cells with tau and Coenzyme Q (50), as compared with control Hirano bodies, would confirm that the Madrid researchers’ results were not an artifact. In addition, it would show that tau and Coenzyme Q (50) play a role in the formation of Hirano body-like structures in an actual cell.

Faculty Research Mentors: Dr. Marcus Fechheimer, Department of Cellular Biology, and Dr. Ruth Furukawa, Department of Cellular Biology
Determining the Effect of Oncogenic Mutations on EGFR Protein Kinase Activation and Phosphorylation

Nakul Talathi

The proposed study seeks to research the main protein studied in the Kannan Lab, Epidermal Growth Factor Receptor (EGFR or ErbB1). EGFR has been a very well-studied protein, mostly due to implication in many cancers. Even though EGFR has been researched exhaustively, little is still known to which residues are oncogenic in nature when mutated. The rationale for this fact is: A) lack of high-throughput ways to study this protein and B) there has been over 500 different mutations found in various cancer types. To overcome these large problems we have taken a bioinformatic approach that increases throughput and refines the amount of residues needed to be characterized. Our lab, using computational analysis, was able to determine these evolutionarily conserved residues that we hypothesize are important for functioning of the protein. With this bioinformatic data, our next step is to validate that these residues are indeed integral in EGFR mechanism. Currently, the main technique for this validation in the lab is using site-directed point mutagenesis to plasmid that encodes for EGFR, and then transfecting this plasmid into mammalian cell line (e.g. HEK 293T or CHO cells) followed by using Western Blots to determine activation (EGFR activation is determined by phosphorylation, which is a modification to that protein that turns it “on”). Thus my first experiments will be to conduct the point mutagenesis to the EGFR plasmid. To do this I will perform polymerase chain reaction (PCR) to the parental plasmid (EGFR with no mutation) to create a mutated plasmid. This PCR reaction will create a heterogeneous solution (mutated and parental plasmids) that will be treated with an enzyme, DPN1, that will digest the parental plasmid, leaving the mutated plasmid left. This mutated plasmid will then be transformed into E. coli and plated on antibiotic selective plates. Next we will choose a colony from a plate that we will allow to grow-up overnight to increase the amount of plasmid. Finally, we will harvest the cells and use a Qiagen mini plasmid kit that will purify our mutated plasmid of interest from the E. coli. Once we have confirmed we have the right plasmid at hand, our lab uses lipid-based approach to allow this new plasmid to be permeable to mammalian cell where the encoded protein will now be translated. Stimulation or activation of EGFR protein is done through the use of peptide named Epidermal Growth Factor (EGF), which in turn causes EGFR to autophosphorylate itself. Following EGF stimulation, the cells will be lysed and then run on sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE); SDS-PAGE will separate proteins on the basis of their charge. To further understand the proteins we have we will perform a Western Blot to gather the transfection efficiency and amount of EGFR activation. Western Blots imply the use of a membrane for proteins to adhere to in concert with antibodies. Antibodies serve to specifically detect proteins of interest—as previously stated to help determine transfection and EGFR activation—and for visualization of interaction as is the case for our secondary antibody that relies on a fusion of antibody and a protein that is known to irradiate light for visualization (e.g. Horseradish peroxidase). The end goal of this project is to characterize a residue in EGFR that previously was a black box. This new founded knowledge will be extremely useful in helping to further understand the mechanism of EGFR.

Faculty Research Mentor: Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology
The proposed study will focus on examining how protein functions change after post-translational alterations have occurred. The particular modification I will be studying is the addition of N-acetylglucosamine (O-GlcNAc) to amino acid residues present on nuclear and cytoplasmic proteins. Currently, it is impractical to study the function of O-GlcNAc in mammalian species because the loss of O-GlcNAc is lethal. However, the genetic tools provided by Drosophila, allow us to examine the effects of increasing and decreasing O-GlcNAc levels in specific tissues. The main goal of this project is to analyze the glycans and glycoprotein functions in Drosophila with altered O-GlcNAc levels.

In our experimentation, we will be using O-GlcNAc transferase (OGT) and N-acetylglucosamine (OGA) to alter O-GlcNAc levels. These enzymes catalyze the addition of GlcNAc to serine and threonine residues of proteins. We will then turn-on and turn-off the expression of these enzymes in specific embryonic stages and tissues. We can follow the status of O-GlcNAc using antibodies that recognize O-GlcNAc, OGT, and OGA.

Previous work has identified specific phenotypes associated with changes in O-GlcNAc including the loss of cross veins in wings and the loss of an entire posterior wing section. We will further examine these phenotypes by focusing on the development of the larval wing discs. By dissecting these discs and analyzing them through Western blots, we will be able to examine specific protein expression from a given sample of tissue. In conclusion, by examining the disruption of OGT and OGA production, we will be able to provide insight into the signaling pathways present between cells in many diseases including diabetes, neurodegenerative disorders, and cancer.

Faculty Research Mentors: Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology, and Dr. Lance Wells, Department of Biochemistry & Molecular Biology
No developed biofuel cell has successfully produced the amount of electricity necessary for even the smallest medical devices. Currently, enzymatic glucose-O₂ biofuel cells, which rely on the oxidation-reduction of the organic carbohydrate glucose to produce electricity, still produce power three to four orders of magnitude below that required for a pacemaker. Additionally, the cells also possess an operational lifetime which requires them to be replaced every few days, as opposed to every ten years when using the current pacemaker batteries.

The key to increasing the yield of these glucose-O₂ biofuel cells is to increase the effectiveness of the electrical contact between a fuel cell’s electrode and the electron source—in this case between the electrode and the enzyme’s cofactor. Unfortunately, these cofactors are generally encased deep within the enzyme, surrounded by protons that create an energy barrier to transporting electrons out of the enzyme. Electron transfer requires that the chemical linking between the two locations possess very specific characteristics in order to act as a conductive pathway out of the enzyme. Self-assembled monolayers have shown some promise in this role, yet the electron transfer rate decays exponentially with distance traveled along these systems, creating another barrier to energy production. Use of conductive conjugated polymers as monolayers, however, has demonstrated improvements in both electron transfer rate and a lack of decay in electron transfer at distances of up to 3 nm. Through these methods, researchers have detected electron transfer rates four-fold greater than previously measured.

The Locklin Group has created a synthetic mechanism to utilize these conjugated polymers as “molecular wires” which stretch directly between the enzymatic cofactor and the bio-fuel cell’s electrode. Using surface-initiated polymerization, electroactive polymer brushes of specific conjugated polymers can be grafted to the surface of the electrode, with the conjugation length and density each controlled by reaction time and concentration of the individual monomers which make up the polymers. Additionally, the mechanism allows for termination of the polymer chains using specific molecules. By using this previously developed technique, we plan to terminate the polymerization process using the enzymatic cofactors of the redox-active species utilized in glucose-O₂ biofuel cells. A subsequent reconstitution of the enzyme will create a direct link between the electron source and the electrode, allowing for study and analysis of the conductive properties of long conjugated molecular wires. Furthermore, the direct electrical contact will improve the operation of fuel cells, and create an opportunity for efficient biofuel cell use.

Faculty Research Mentor: Dr. Jason Locklin, Department of Chemistry
Measuring Lactate Production to Understand Transketolase and its Isoforms in Breast Cancer Cells

Star Ye

Transketolase (TKT) requires thiamine pyrophosphate (TPP) or thiamine diphosphate (ThDP), a thiamine-derivative cofactor, for proper functioning. Examining gene expression in various microenvironments is essential because the tumor microenvironment tends to be extremely variable; cancer cells located close to blood vessels access oxygen while other cells more distant experience hypoxia. Under hypoxia, TKT is the only thiamine-dependent enzyme that functions (the other two thiamine-dependent enzymes function in the Krebs cycle). TKT also has two other isoforms, transketolase-like 1 (TKTL1), and transketolase-like 2 (TKTL2), and several studies indicate that TKTL1 is upregulated in cancer cells, contributing to survival and proliferation. Also, my previous research demonstrates that TKTL1 expression in various breast cancer cell lines is extremely variable under various conditions of oxygen exposure.

Hypoxia-inducible factor 1 (HIF-1), a transcription factor composed of two subunits, HIF-1α and HIF-1β, becomes active under hypoxic conditions and increases anaerobic glycolytic pathways. Hypoxia as well as several other reaction intermediates and stimuli are implicated in the stabilization of HIF-1α, and HIF-1α appears to control several phenotypic characteristics of cancer cells, including increased proliferation, increased fermentation of glucose, decreased suppression of apoptosis, and increased angiogenesis. Because of the increased glucose flux entering non-oxidative PPP, its activity increases in hypoxia, and in turn, activity of transketolase is suspected to increase as well. Therefore, cancer cell survival appears to be mediated by hypoxia.

The primary product of glucose fermentation is lactate. Therefore, by measuring lactate concentrations, the activity of transketolase and its isoforms can be inferred. My current research goal is to understand the role of transketolase and its isoforms in breast cancer, especially TKTL1 because of its known variable expression in breast cancer cells. Of the many breast cancer cell lines, I will study the BT474 cell line. First, I will measure lactate concentration in the cell media as a function of BT474 cells’ incubation time under normal conditions to demonstrate that lactate is a reliable indicator of transketolase activity; I expect that increased incubation time would give increased lactate concentrations in the cell media. Then, I will use similar procedures to measure lactate levels of BT474 cells under hypoxic conditions to observe the impact of the microenvironment on lactate production, indirectly studying its impact on transketolase and its isoforms. I hypothesize that hypoxic conditions will increase lactate production because of increased transketolase activity in hypoxia. I will also measure lactate levels of BT474 cells in thiamine-deficient media. The concentration of lactate upon the removal of thiamine is expected to decrease because thiamine is necessary for the functioning of TKT, and without TKT, the PPP is halted. In terms of gene expression, my previous research has not established a clear trend for TKTL1 in BT474 cells; however, the impact of suppressing of TKTL1 in measuring lactate may shed light on its role. Understanding the implications of transketolase and its isoforms’ may prove these enzymes as novel targets for cancer drugs. This research is a continuation of my prior lab work of examining TKT, TKTL1, and TKTL2 gene expression in various cells.

Faculty Research Mentor: Dr. Jason Zastre, Department of Pharmaceutical & Biomedical Sciences
Appendix A
CURO 2010 Summer Research Fellows

Jessica Alcorn
Dr. Audrey Haynes, Department of Political Science
The Validity of the News Marketing Hypothesis

Amarachi Anukam
Dr. Pamela Orpinas, Department of Health Promotion & Behavior
Healthy Teens: A Longitudinal Study of ‘at risk’ Secondary Students

Thomas Bailey
Dr. William Kretzschmar, Department of English
Six Bodies: A Quantitative Analysis of Japanese Discourse Features

Michael Bray
Dr. Kelly Dyer, Department of Genetics
Genetic Analysis of Pigmentation in Drosophila tenebrosa

Ebony Caldwell
Dr. Monica Gaughan, Department of Health Policy & Management
Influences on the Outlook of the Post-college Educational Opportunities and Choices of Undergraduate Science Majors

Caitlin Cassidy
Dr. William Kretzschmar, Department of English
The Art of Persuasion: How Small Business Owners Use Speech to Market Products in Roswell, GA

Meagan Cauble
Dr. Mike Adams, Department of Biochemistry & Molecular Biology
Mechanism of plant biomass conversion without pre-treatment by anaerobic thermophilic bacterium Caldicellulosiruptor bescii

Daniel Celluci
Dr. Steven Lewis, Department of Physics & Astronomy
Applications of Molecular Dynamics Simulations to Models of Gas-Grain Interactions in the Interstellar Medium

Jessica Fazio
Dr. Richard Hubbard, Department of Chemistry
Carvone Luche Reduction Followed by Optical Activity Determination

JoyEllen Freeman
Dr. Barbara McCaskill, Department of English
Georgia Slaves in Transatlantic Culture: Blind Tom and William and Ellen Craft

Debashis Ghose
Dr. Joy Doran-Peterson, Department of Microbiology
Engineering Saccharomyces Yeast Strains to Better Ferment Pine Wood Biomass to Ethanol

Camille Gregory
Drs. Marcus Fechheimer and Ruth Furukawa, Department of Cellular Biology
Creating a Transgenic Mouse to Study the Physiological Role of Hirano Bodies in the Progression of Alzheimer's Disease
**Shanterian Hester**  
Dr. Michael Pierce, Department of Biochemistry & Molecular Biology  
*Exercising Glycoproteomics Analyses to Discover New Breast Cancer*

**Georgianna Mann**  
Dr. Sonia Hernandez, Warnell School of Forestry and Natural Resources  
*Bufo marinus Pathogen and Parasite Analysis as a Model for Ecosystem Change*

**Krelin Naidu**  
Dr. Brian Cummings, Department of Pharmaceutical & Biomedical Sciences  
*Epigenetic Effects of Bromate on p21 and Histone-2AX Expression in HEK293 Cells*

**Rebecca Parker**  
Dr. Kevin McCully, Department of Kiniseology  
*Effects on Blood Flow Velocity and Arterial Diameter Produced by Compression Therapy in SCI Individuals*

**Jay Patel**  
Dr. Boris Striepen, Department of Cellular Biology  
*Characterization of Striated Fiber Assemblin Proteins in T. gondii*

**Rachel Perez**  
Dr. J. Peter Brosius, Department of Anthropology  
*Oil Palm Proliferation in Peru*

**Ryan Prior**  
Dr. Katarzyna Jerzak, Department of Comparative Literature  
*Foundations of Medical Philosophy in Ancient Civilizations*

**Malavika Rajeev**  
Dr. Sonia Altizer, Odum School of Ecology  
*The Effect Of Parasite Infection on Monarch Butterfly Mating Behavior*

**Hope Rogers**  
Dr. Jonathan Evans, Department of English  
*Real-World Applications of Tolkien’s Races and Cultures*

**Carla Rutherford**  
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology  
*Human Resistance to Infection by African Trypanosomes*

**Laura Smart**  
Dr. Rheeda Walker-Obasi, Department of Psychology  
*Dialectical Behavior Therapy and Distraction: Using the Cold Pressor Test to Determine Efficacy*

**Stephen Thompson**  
Dr. George Majetich, Department of Chemistry  
*Application of Friedel-Crafts Annulations to Conjugated Dienones and Silyl Substituted Arene Rings for the Synthesis of Complex Tricycles*

**Jake Young**  
Professor George Contini, Department of Theatre & Film Studies  
*A Study Of The Psycho-Physical Performance Technique Of Michael Chekhov*
Appendix B
CURO 2009 Summer Research Fellows

Christine Akoh, CURO-OVPR Summer Research Fellow
Dr. Joseph Frank, Department of Foods & Nutrition
Effect of Mono and Divalent Cations on Biofilm Formation in a Prolific Biofilm Forming Strain of Listeria Monocytogenes Cultured in a Chemically Defined Medium

Sambita Basu, CURO-Jane and Bill Young Scholarship Summer Fellow
Dr. Gerardo Alvarez-Manilla, Department of Biochemistry & Molecular Biology
Protein-linked Glycoconjugates as Biomarkers for Cancer of Other Physiological Processes

Chip Blackburn, CURO-OVPI Summer Fellow
Dr. Hugh Ruppersburg, Department of English
Harry Crews and the Tradition of Southern Fiction-Writing

Corbin Busby, CURO Research Fellow
Dr. Isabelle Wallace, Lamar Dodd School of Art
Imaging masculinity in Contemporary Fashion Photography

Kelly Cummings, CURO-OVPR Summer Fellow
Dr. Scott Schatzberg, College of Veterinary Medicine
Differentiation of Natural and Post-vaccinal Canine Distemper Virus Encephalomyelitis

Charles Ginn, CURO Research Fellow
Dr. Hugh Ruppersburg, Department of English
Charting the Oppression of Minority Groups through Southern Gothic Literature

Erin Hansen, CURO Research Fellow
Dr. Jennifer McDowell, Department of Psychology
Effects of Daily Saccade Practice on Behavioral and Neural Plasticity in Schizophrenics

Dillon Horne, CURO-OVPI Summer Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
The Development and Implications of Predictive Modes of Thought from the Renaissance to Modernity

Tiffany Hu, CURO Research Fellow
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology
Re-examine Alternative Editing and Understanding the Protein Diversity in T. brucei

Whitney Ingram, CURO-OVPI Summer Fellow
Dr. Yiping Zhao, Department of Physics & Astronomy
Optimization and Analysis of Titanium Dioxide Nanorod Photodegradation

Daniel Jordan, CURO Research Fellow
Dr. Betty Jean Craige, Department of Comparative Literature
German Sustainable Farming as a Model for Resource Stewardship

Fahad Khan, CURO-ITP Summer Fellow
Dr. Jason Zastre, Department of Pharmaceutical & Biomedical Science
Highly Active Antiretroviral Therapy

Max Klein, CURO-UGA Alumni Association Summer Fellow
Dr. Richard Steet, Department of Biochemistry & Molecular Biology
Gauging the Developmental Impact of Impaired Glycoprotein Breakdown in Zebrafish
Former CURO Summer Research Fellows

Susan Klodnicki, CURO-OVPR Summer Fellow
Dr. Jim Lauderdale, Department of Cellular Biology
Dr. Andrew Sornborger, Department of Mathematics and Engineering
PTZ and Other Chemoconvulsant Effects on Adult Zebrafish

Bridget Mailey, CURO Research Fellow
Dr. Amy Ross, Department of Geography
The ICC and the US: How have the Actions of the US Affected the ICC in the Past and how will they Affect the ICC in the Future?

Francisco Marrero, CURO Research Fellow
Dr. Leidong Mao, Department of Engineering
Development of Ferrofluid Based Platform for Particles and Cellular Manipulation

Amar Mirza, CURO Research Fellow
Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology
A Computational Study of the Crystalline Structure of Tyrosine Kinase Mutants

Cody Nichol, OVPR Research Fellow
Dr. Cynthia Suveg, Department of Psychology
Empirical Examination of Child Emotion Assessments: A Comparison of Child, Parent and Behavioral Observation Methods

Emily Pierce, CURO Summer Fellow
Dr. Wayne Parrot, Department of Crop & Soil Sciences
Genetic Alteration of the Soybean to Promote Astaxanthin Production

Akanksha Rajeurs, CURO Research Fellow
Dr. Russell Karls, Department of Infectious Diseases
Develop an Efficient Method to Create Marked and Unmarked Mutations in the Human Genome

Al Ray, III, OVPI Research Fellow
Dr. Susan Sanchez, Department of Infectious Diseases
Relationship between Epidemiology of Salmonella in Non-Domestic Avian Species and Humans in the Southeastern United States

Joe Reynolds, CURO Research Fellow
Dr. Frank Harrison, Department of Philosophy
Analysis of the Nature of the Individual and the Notion of his Happiness

Matthew Sellers, CURO Research Fellow
Dr. Hugh Ruppersburg, Department of English
Finding God in the Poetry of Robert Penn Warren

Michael Slade, CURO Research Fellow
Dr. Frank Harrison, Department of Philosophy
Implicit System of Rational Thought Analogous to Modern First-Order and Modal Logics in Plato’s Late Dialogues

Alex Walker, OVPR Research Fellow
Dr. Timothy Dore, Department of Chemistry
Synthesis of BHQ-dithiol as a Photoremovable Protecting Group for Mifepristone
Shuyan Wei
Dr. Scott Schatzberg, College of Veterinary Medicine
Development of Consensus-Degenerate Hybrid Oligonucleotide Primers (CODEHOPs) for Retroviral Discovery

2009 Howard Hughes Medical Institute EXORP Student

Valeriya Spektor
Dr. Sue Wessler, Department of Plant Biology
Designing Teaching Modules for Genome Analysis
Appendix C
CURO 2008 Summer Research Fellows

Zachary Anderson, CURO Summer Research Fellow
Dr. Peter Brosius, Department of Anthropology
Multicultural Perspectives on Landscape Change

Matthew Belcher, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry & Molecular Biology
Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Determinants in the Localization of Telomerase to Telomeres

Mary Elizabeth Blume, CURO-OVPR Summer Research Fellow
Dr. Stefaan Van Liefferinge, Department of Art History
Uncovering Traditions of the Gothic Style in the Architectural Plans of Saint Germain-des-Pres and Saint Martin-des-Champ in Paris

Melissa Brody, CURO-OVPR Summer Research Fellow
Dr. Ron Carroll, Odum School of Ecology
Interactions of Bees and Hummingbirds with Hamelia patens

Carolyn Crist, CURO-UGA Summer Research Fellow
Dr. John Greenman, Grady College of Journalism & Mass Communications
News in the Black Belt: Teaching Journalists how to Cover Poverty in Persistently Poor Counties

M. Logan Davis, CURO-BHSI Summer Fellow
Dr. James Franklin, Department of Pharmaceutical & Biomedical Sciences
Long-Range Retrograde Transduction of Trophic and Survival Signals in Mouse Sympathetic Neurons

Marcus Hines, CURO-BHSI Summer Research Fellow
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology
Dr. Lance Wells, Department of Biochemistry & Molecular Biology
Analyzing the Function of O-GlcNAc in Drosophila

Haylee Humes, CURO Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
How AICD and Fe65 are Recruited to Hirano Bodies

Lindsay Jones, CURO Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry & Molecular Biology
Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Identification and Characterization of a Nuclease that Functions in an RNA-Mediated Viral Defense Pathway (RNAi) in Prokaryotes

Tyler Kelly, CURO Summer Research Fellow
Dr. Elham Izadi, Department of Mathematics
Usage of Linear Subspaces with Varieties

Jung Woong Kim, CURO Summer Research Fellow
Dr. Andrew Sorenborger, Department of Mathematics
Dr. James Lauderdale, Department of Cellular Biology
Imaging of Endogenous Ca2+ Waves in Developing Zebrafish
Jennifer Lee, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology
Understanding Pediatric Symptoms

Sharon McCoy, CURO-OVPR Summer Research Fellow
Dr. Chad Howe, Department of Romance Languages
Dialect Perceptions of Spanish Speakers in Georgia

Katherine McGlamry, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology
Glycan Interactions and the Development and Spread of Cancer Cells

Alice Meagher, CURO-BHSI Summer Research Fellow
Dr. Michael Adams, Department of Biochemistry & Molecular Biology
Expression and Characterization of the Heterologously Expressed Soluble Hydrogenase I from Pyrococcus furiosis

Madison Moore, CURO-BHSI Summer Research Fellow
Dr. Jennifer McDowell, Department of Psychology
Behavioral and Neural Plasticity Following Daily Practice of Saccade Tasks in Schizophrenia

Emily Meyers, CURO-OVPR Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
The Advantage of Weakness: How Weak States can Overcome Military Might of Strong States

Kelly Nielsen, CURO-OVPR Summer Research Fellow
Prof. George Contini, Department of Theatre & Film Studies
Augusto Boal’s Invisible Theatre: Political Play with an Unassuming Audience

Sean O’Rourke, CURO Summer Research Fellow
Dr. Kathy Simpson, Department of Kinesiology
Neuromuscular Activation and Movement Kinematics Exhibited During the Sit-to-Stand by Multiple Sclerosis Individuals

Julie Patel, CURO Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
Military Interventions by Powerful States

Neil Pfister, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry & Molecular Biology
Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Interactions that Define the Organization of RNA-Protein Complexes Involved in Prokaryotic RNA Interference

Stefann Plishka, CURO-Franklin College of Arts and Sciences Summer Research Fellow
Dr. Asen Kirin, Department of Art History
Imagining Constantinople: Imperial Houses of Worship as Symbols of State Ideology

Katie Pyne, CURO Summer Research Fellow
Dr. Jerome Legge, Department of International Affairs
Refugees and Internally Displaced People: How Effective are the United Nations, Nongovernmental Organizations, and Subsequent Initiatives in Pacifying this Complex Humanitarian Crisis?

Joseph Rimando, CURO-Interdisciplinary Toxicology Program Summer Research Fellow
Dr. Ralph Tripp, Department of Infectious Diseases
Understanding and Preventing the Interaction between RSV’s G Protein and the CX3CR1 Cell Receptor
Aalok Sanjanwala, CURO Summer Research Fellow
  Dr. Marcus Fechheimer, Department of Cellular Biology
  Dr. Ruth Furukawa, Department of Cellular Biology
  *The Effect of Hirano Bodies on Mutated Tau Protein*

Neeraj Sriram, CURO Summer Research Fellow
  Dr. Mark Eiteman, Department of Biological & Agricultural Engineering
  *Solving the World’s Energy Crisis – Not One Sugar at a Time*

Giridhar Subramanian, CURO Summer Research Fellow
  Dr. Brock Tessman, Department of International Affairs
  *Power and Influence in Southeast Asia: A Study of the Methods Used by India, China, and the United States*

Aileen Thomas, CURO Summer Research Fellow
  Dr. Nicole Lazar, Department of Statistics
  *How Random is Pseudorandom*

Kathryn Turner, CURO Summer Research Fellow
  Dr. Shelley Hooks, Department of Pharmaceutical & Biomedical Sciences
  *Comparison of RGS Regulation of LPA Signaling in Prostate Cancer and Ovarian Cancer*

Manouela Valtcheva, CURO Summer Research Fellow
  Dr. Jennifer McDowell, Department of Psychology
  *Antisaccade Performance and Deficit Characteristics in a Normal Population*

Hunter Wilson, CURO Summer Research Fellow
  Dr. Timothy Dore, Department of Chemistry
  *8-Chloro-7-hydroxyquinoline as a Biologically Useful Photoremovable Protecting Group*

Laura Wynn, CURO-OVPR Summer Research Fellow
  Dr. Martin Kagel, Department of Germanic & Slavic Languages
  *Issues in Current Turkish-German Literature*
Appendix D
CURO 2007 Summer Research Fellows

Caroline M. Anderson, CURO-OVPR Summer Research Fellow
Dr. John Turci-Escobar, Department of Music Theory
Dr. Max Reinhart, Department of German
*A Psychoanalytical Examination of Wolf and Mörike's Peregrina Songs*

Joseph Burch, CURO Summer Research Fellow
Dr. Harry Dailey, Department of Microbiology and Biochemistry & Molecular Biology
*Converting Ferrochelatase into a Cytochrome c Like Protein*

Amy Burrell, CURO-BHSI Summer Research Fellow
Dr. Debra Mohnen, Department of Biochemistry & Molecular Biology
*Analysis of the Transcriptional Expression of Arabidopsis GAUT Genes: 15 Proven and Putative Plant Cell Wall Biosynthetic Galacturonosyltransferases*

Lee Ellen Carter, CURO-OVPR Summer Research Fellow
Dr. Fausto Sarmiento, Department of Geography
*Ecoregional Conservation Among Indigenous Communities in Cotacachi, Ecuador*

Kimberly Delisi, CURO-BHSI Summer Research Fellow
Dr. Ray Kaplan, Department of Infectious Diseases
*Parameters Affecting Fecal Egg Count Data for Determining Drug Resistance in Nematode Parasites of Horses*

Joshua Dunn, CURO-OVPR Summer Research Fellow
Dr. William Kretzschmar, Departments of English
*The Youth of Roswell Voices: A Linguistic Analysis*

Katie Flake, CURO-BHSI Summer Research Fellow
Dr. Maor Bar-Peled, Complex Carbohydrate Research Center
*The Arabinose Kinase Project*

James Gordy, CURO Summer Research Fellow
Dr. Michael Adams, Department of Biochemistry & Molecular Biology
*Developing Methodologies for the Study of Small ORFs in P. furiosus*

Jana Hanchett, CURO Summer Research Fellow
Dr. David Schiller, Department of Musicology/Ethnomusicology
*Latino and Hispanic Musical Influences on Athens-Clarke County*

Laura Harrison, CURO-BHSI Summer Research Fellow
Dr. Corrie Brown, Department of Pathology
Campylobacter in the Crypts

Clare Hatfield, CURO-OVPR Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs
*Democracy and the Choice of Law: The Intersections of Shari’a, Domestic and International Law*

Anna Hudson, CURO Summer Research Fellow
Dr. Richard Dluhy, Department of Chemistry
*Using Surface Enhanced Raman Spectroscopy for the Detection of Pathogens*
Former CURO Summer Research Fellows

Andy Kragor, CURO-Jane & Bill Young Scholarship Summer Research Fellow  
Dr. Lance Wells, Complex Carbohydrate Research Center  
Dr. Carl Bergmann, Complex Carbohydrate Research Center  
Unbiased Isolation and Carbohydrate Mapping of Alpha-Dystroglycan

Brian Laughlin, CURO-BHSI Summer Research Fellow  
Dr. Alan Darvill, Complex Carbohydrate Research Center  
Functional Analysis of the Magnaporthe grisea Secretome

James MacNamara, CURO Summer Research Fellow  
Dr. Timothy Dore, Department of Biochemistry & Molecular Biology  
Synthesis of Quinolinol-Based Inhibitors of Rce1p

Prashant Monian, CURO-Interdisciplinary Toxicology Program Summer Research Fellow  
Dr. Brian Cummings, Pharmaceutical & Biomedical Sciences  
Molecular Inhibition of Independent Phospholipase A2 and its Effect on Prostate Cancer Growth

Neil Naik, CURO-OVPR Summer Research Fellow  
Dr. Ruth Harris, Department of Food & Nutrition  
The Effect of Antagonizing Stress Receptors in Rats During Repeated Exposure to Restraint Stress

Natalie Nesmith, CURO-BHSI Summer Research Fellow  
Dr. Mary Bedell, Department of Genetics  
Genetic Studies on the Roles of KITL in Regulating the Proliferation and Apoptosis of Primordial Germ Cells in Mice

Victor Orellana, CURO Summer Research Fellow  
Dr. Nicolás Lucero, Department of Romance Languages  
Unsung Hero: A Literary and Historical Study of Lautaro

Tulsi Patel, CURO Summer Research Fellow  
Dr. Scott Gold, Department of Plant Pathology  
Developing a Biocontrol Agent for Chinese Privet, Ligustrum sinense

Tomas Pickering, CURO-OVPR Summer Research Fellow  
Dr. Dorothy M. Fragaszy, Department of Psychology  
Manner of Hammer Stone Use in Wild Capuchin Monkeys

Cleveland Piggott, CURO-BHSI Summer Research Fellow  
Dr. Marcus Fechheimer, Department of Cellular Biology  
The Formation of Hirano Bodies

Purvi Sheth, CURO Summer Research Fellow  
Dr. Russell Karls, Department of Microbiology  
Characterization of Mycobacterium shottsii

Traci Tucker, CURO Summer Research Fellow  
Dr. Dawn Robinson, Department of Sociology  
Gender and Role Meanings: A Cross-Cultural Comparison

Jessica Van Parys, CURO-UGA Alumni Association Summer Research Fellow  
Dr. David Mustard, Department of Economics  
Does Writing Ability Signal Academic Excellence?: Evidence from the New Scholastic Aptitude Writing Section (SATW)
Delila Wilburn, CURO Summer Research Fellow  
Dr. Barbara McCaskill, Departments of African American Studies and English  
Beauty Imposed

Karen Wong, CURO Summer Research Fellow  
Dr. Andrew Whitford, Department of Political Science
Appendix E
CURO 2006 Summer Research Fellows

Sarah Breevoort, CURO-BHSI Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
*Construction of Three Rcelp Mutant Plasmids to Aid in the Characterization of Rcelp Enzymatic Activity*

Lauren Coffey, CURO Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Susan Fang, CURO Summer Research Fellow
Prof. Christopher Hocking, Studio Foundations

Courtney Grant, CURO-BHSI Summer Research Fellow
Dr. Julie Coffield, Department of Physiology and Pharmacology
*An Investigation of Botulinum Neurotoxin Interactions on RhoA Activity Using In Vitro Assays*

Erica Hall, CURO-BHSI Summer Research Fellow
Dr. Jessie Kissinger, Department of Genetics

Adele Handy, CURO-UGA Alumni Association Summer Research Fellow
Dr. Greg Robinson, Department of Chemistry

Celan Hardman, CURO Summer Research Fellow
Prof. Joe Norman, Drawing and Painting

Sana Hashmi, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center
*Alteration of Alpha-Dystroglycan and Cancer Progression*

Brian Levy, CURO Summer Research Fellow
Dr. Larry Nackerud, School of Social Work
*Courrie – Not Email: Implications for Government Regulation of a Social Phenomenon. A Case Study of Language in France*

Maggie Mills, CURO-NSF/ SPIA Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Anna-Marieta Moise, CURO-BHSI Summer Research Fellow
Dr. Andrea Hohmann, Department of Psychology
*Neurochemical Basis of Social Defeat in Syrian Hamsters: Role of Endogenous Cannabinoids*

Lamar Moree, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center

Jesse Oakley, CURO Summer Research Fellow
Dr. Laurie Fowler, Department of Ecology
*Economic Incentives for Private Land Conservation and Sustainable Development: Research into Environmental Policy in Costa Rica and Georgia*

Katie Orlemanski, CURO-OVPR Summer Research Fellow
Dr. Patricia Richards, Department of Sociology
*Reclaiming “Development” within the Context of Low-Income Neighborhoods*
Former CURO Summer Research Fellows

Danielle Pearl, CURO-OVPR Summer Research Fellow
Dr. Keith Langston, Germanic and Slavic Languages
*Press Freedom, E.U. Accession, and Democracy in Croatia*

Daniel Perry, CURO Summer Research Fellow
Dr. David Landau, Department of Physics and Astronomy

Andrew Pierce, CURO Summer Research Fellow
Dr. Thomas McNulty, Department of Sociology

Richard Piercy, CURO-OVPR Summer Research Fellow
Dr. Cory Momany, Department of Pharmaceutical and Biomedical Sciences

Kurinji Pandian, CURO Summer Research Fellow
Dr. Steven Holloway, Department of Geography
*Understanding Public Space in a New Urbanist Development*

Mandy Redden, CURO-BHSI Summer Research Fellow
Dr. Robert Arnold, Department of Pharmaceutical and Biomedical Sciences
*Towards a More Effective Delivery System for Anti-Cancer Drugs*

Eva Bonney Reed, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology

Lisa Rivard, CURO-Toxicology Summer Research Fellow
Dr. Jeff Fisher, Toxicology

Sonia Talathi, CURO-OVPR Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
*Effectiveness of Ca2+-Independent Phospholipase A2 Inhibitors in the Induction of Chemotherapeutic-Induced Cancer Cell Death*

Erika Vinson, CURO Summer Research Fellow
Dr. Richard Siegesmund, Art Education

Joshua Watkins, CURO Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
*The Price of Victory: When Leaders Underestimate the Cost of War*

Daniel Weitz, CURO-OVPR Summer Research Fellow
Dr. Gary Bertsch, Department of International Affairs
*The Impact of a European Union Nuclear Weapons Free Zone on the International Non-Proliferation Regime*

Shannon Yu, CURO-BHSI Summer Research Fellow
Dr. Nancy Manley, Department of Genetics
Appendix F

CURO 2005 Summer Research Fellows

Grace Anglin, CURO-OVPR Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
*Family Focused Emotion Communication Training*

Ashley Beebe, CURO Summer Research Fellow
Dr. James R. Holmes, Center for International Trade and Security
*The Influence of Media on Economic Policy in Brazil and Argentina*

Ingrid Bloom, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
*Differentiation of Human Embryonic Stem Cells into Endothelial Progenitors*

Ian Lewis Campbell, CURO Summer Research Fellow
Dr. Glenn Wallis, Department of Religion
*Theories of Mythology and the Way That Myths Have Affected Social and Political Formation*

Kimberly Coveney, CURO-CIT Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
*Role of iPLA2 in Phospholipid Metabolism in Chemotherapeutic-Induced Cancer Cell Death*

William Collier, CURO-OVPR Summer Research Fellow
Dr. Amy D. Rosemond, Institute of Ecology
*Analysis of an Exotic Species’ Interactions with Native Aquatic Trophic Dynamics: Quantifying the Effects of the North American Beaver (Castor canadensis) on Sub-Antarctic Stream Food Webs in the Cape Horn Archipelago, Chile*

John Crowe, CURO Summer Research Fellow
Prof. Mark Callahan, Ideas for Creative Exploration
*AUX Launch: Art, Representation, and Commerce on the Web*

Katie Griffith, CURO Summer Research Fellow
Dr. Diana Ranson, Department of Romance Languages
Dr. Judith Preissle, College of Education
*Assessing Cultural Values and Political Beliefs in a Nicaraguan Classroom: A Participant Observation*

Matthew Haney, CURO-CTEGD Summer Research Fellow
Dr. Rick Tarleton, Department of Cellular Biology
*Antibody Depletion of Highly Abundant Proteins in Trypanosoma cruzi for the Fine-Tuning of Proteomic Analysis*

Ned Hembree, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
*Reel1and Ste24 Inhibition by Dipeptidyl Acyloxyymethyl Ketones: A Potential Target for Cancer Therapeutics*

Alicia Higginbotham, CURO Summer Research Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
*Christopher Logue’s Iliad: A Work in Translation*

Scott Jacques, CURO Summer Research Fellow
Dr. Mark Cooney, Department of Sociology
*The Social Reality of Young, Middle Class Drug Dealers*
Lisa Jordan, CURO Summer Research Fellow
Dr. Ruth Harris, Department of Food and Nutrition
The Effect of Leptin on Sympathetic Nerve Activity in White Adipose Tissue

Carey Kirk, CURO-OVPR Summer Research Fellow
Dr. David Z. Saltz, Department of Theatre and Film Studies
The Effectiveness of Drama Techniques in Treating People Suffering from Trauma

Andrew Leidner, CURO-CTEGD Summer Research Fellow
Dr. Pejman Rohani, Institute of Ecology
Coevolutionary Behavior and Interference between Fatal Diseases

Jon McGough, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
The Role of Female Choice in Sexual Selection of Drosophila pseudoobscura

Tatyana Nienow, CURO-BHSI Summer Research Fellow
Dr. Walter K. Schmidt, Department of Genetics
Adapting Yeast for the Study of Pitrilysin and Other M16A Enzymes

Erika Porter, CURO-BHSI Summer Research Fellow
Dr. Charles H. Keith, Department of Cellular Biology
Intrinsic Fluorimetric Imaging of Neural Activation in Cultured Cells and Zebrafish

Kurinji Pandiyan, CURO-CAES Summer Research Fellow
Dr. Raj Rao, Department of Animal and Dairy Science
Dr. Steven Stice, Department of Animal and Dairy Science
Genomic Instability of Human Embryonic Stem Cells

Kelly Proctor, CURO-OVPR Summer Research Fellow
Dr. Lee B. Becker, College of Journalism and Mass Communication
Differences in Environmental Reporting: China and the United States

Rebecca Trupe, CURO Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Family Focused Emotion Communication Training

Russ Richardson, CURO Summer Research Fellow
Dr. Ron Carroll, Institute of Ecology
Sugarcane Processing Waste as a Soil Amendment on Organic, Shade-Grown Coffee under Simulated Drought Conditions for Control of Plant-Parasitic Nematodes

Dustin Williams, CURO-BHSI Summer Research Fellow
Dr. Scott T. Dougan, Department of Cellular Biology
Development of Transgenic Zebrafish to Understand How Activation of Hyal-2 Leads to Tumor Formation

Fei Yang, CURO Summer Research Fellow
Dr. Janet Westpheling, Department of Genetics
Regulation of Branched-Chain Amino Acid Catabolism in Streptomyces coelicor: Applications for Metabolic Engineering of Polyketide Antibiotic Biosynthesis

Stephanie Yarnell, CURO Summer Research Fellow
Dr. Carl Bergmann, Complex Carbohydrate Research Center
Cara Altimus, CURO Summer Research Fellow  
Dr. Jonathan Arnold, Department of Genetics  
*Isolation of a Light Receptor in the Biological Clock of N. crassa*

Westin Amberge, CURO-BHSI Summer Research Fellow  
Dr. Steven Stice, Department of Animal and Dairy Science  
*Guided Differentiation of Human Embryonic Stem Cells into Endothelial Cells: Focusing on the Ulex Europaeus Agglutin I Lectin*

Namrata Asuri, CURO Summer Research Fellow  
Dr. Sidney Kushner, Department of Genetics  
*Analysis of the Role of Ribosomal S1 in the Polyadenylation Pathway of Eschericia coli*

Erin Bohan, CURO-OVPR Summer Research Fellow  
Dr. Katarzyna Jerzak, Department of Comparative Literature  
*The Reconciliation of Selves: The Emigrant Experience in America*

Rebecca Brantley, CURO-OVPR Summer Research Fellow  
Ms. Ashley Callahan, Georgia Museum of Art  
*The Early Fashion Design of Mariska Karasz and the Influence of Her Native Hungary*

Josef Broder, CURO Summer Research Fellow  
Dr. Andrew Sornborger, Department of Mathematics  
*Techniques in High Noise Image Analysis*

Beau Bryan, CURO-BHSI Summer Research Fellow  
Dr. Michael Pierce, Department of Biochemistry and Molecular Biology  
*N-Cadherin Gl*

Susannah Chapman, CURO Summer Research Fellow  
Dr. Virginia Nazarea, Department of Anthropology  
*Designing Sui Generis Systems for Traditional Plants and Associated Local Knowledge*

Clayton Griffith, CURO-OVPR Summer Research Fellow  
Dr. Amy Rosemond, Institute of Ecology  
*The Effect of the North American Beaver (Castor Canadensis), an Exotic Herbivore, on the Composition, Structure, and Regeneration of the Riparian Vegetation of Sub-Antarctic Forested Streams in Chile*

Christopher Hale, CURO-BHSI Summer Research Fellow  
Dr. Thomas F. Murray, Department of Physiology and Pharmacology  
*Adolescence as a Distinct Period of Vulnerability to Nicotine Addiction*

Catherine Hudson, CURO-BHSI Summer Research Fellow  
Dr. Harry Dailey, Department of Microbiology and Biochemistry and Microbiology  
*Negatively Affecting the Heme Biosynthetic Pathway in “Escherichia coli”*

Douglas Jackson, CURO Summer Research Fellow  
Dr. Nigel Adams, Department of Chemistry  
*Reactions of Protonated Carboxylic Acid Ions with Amines in the Interstellar Medium*
**Former CURO Summer Research Fellows**

Andrew Leidner, CURO-BHSI Summer Research Fellow  
Dr. Pejman Rohani, Institute of Ecology  
*Parasitoid Behavior and Evolutionary Dynamics*

Janel Long, CURO-OVPR Summer Research Fellow  
Dr. Jean Martin-Williams, School of Music  
The Partitas of Franz Krommer and Natural Horn Technique

John McWhorter, CURO-BHSI Summer Research Fellow  
Dr. Daniel Colley, Department of Microbiology  
*Induction of the Regulatory Ligand PD-L2 and the Co-regulatory Receptor PD-1 on CD4 Lymphoctes During Early Experimental Schistosomiasis Mansoni*

William Parker, CURO Summer Research Fellow  
Dr. Marly Eidsness, Department of Chemistry  
*Trigger Factor*

Gehres Paschal, CURO-OVPR Summer Research Fellow  
Dr. J. David Puett, Department of Biochemistry and Molecular Biology  
*Activating Mutations of the Lutropin/Choriogonadotropin Receptor Associated with Familial Precocious Puberty, Male Pseudohermaphroditism, Hypogonadism, Amenorrhea, Leydig cell Hyperplasia, and Metastatic Thyroid Carcinoma*

Kevin Patrick, CURO Summer Research Fellow  
Dr. James Anderson, Department of Classics  
*Cicero and the Foundations of a Legal Education at Rome*

Katherine Price, CURO Summer Research Fellow  
Dr. Janet Westpheling, Department of Genetics  
*Site Specific Chromosomal Integration Mediated by Bacteriophage Integrase*

Matthew Rudy, CURO Summer Research Fellow  
Dr. Marly Eidsness, Department of Chemistry  
*Analysis of Cotranslational Protein Folding in E-coli and Determination of the Role of the Trigger Factor Gene in the Folding Process*

Desiree Smith, CURO Summer Research Fellow  
Dr. Roberta Fernandez, Department of Romance Languages  
*Projecting a Positive Educational Experience for Latina/os in the South*

Christopher Stokes, CURO-OVPR Summer Research Fellow  
Dr. Randy Kamphaus, School of Professional Studies  
*Family Health and Classroom Behavior: A Pilot Study*

Shana Strickland, CURO-BHSI Summer Research Fellow  
Dr. Kimberly Shipman, Department of Psychology  
*Emotional Regulation and Coping Skills in Maltreated Children*

Adam Stroupe, CURO Summer Research Fellow  
Dr. Boris Striepen, Department of Cellular Biology  
*Drug and Nutrient Trafficking in the Human Pathogen Cryptosporidium parvum*

Teerawit Supakorndej, CURO-BHSI Summer Research Fellow  
Dr. Michael Terns, Department of Biochemistry and Molecular Biology

Tendoh Timoh, CURO Summer Research Fellow
  Dr. Marly Eidsness, Department of Chemistry
  Fluorophore-modified Nascent Polypeptides

Jora Vaso, CURO-OVPR Summer Research Fellow
  Dr. Katarzyna Jerzak, Department of Comparative Literature
  The Effect of Communism on the Works of Andric, Kadare, and Szymborska

Leslie Wolcott, CURO-OVPR Summer Research Fellow
  Dr. Betty Jean Craige, Center for Humanities and Arts
  The Environment in Georgia’s Literature, Past and Present
**Former CURO Summer Research Fellows**

**Appendix H**

*CURO 2003 Summer Research Fellows*

- **Anthony Anfuso,** CURO Summer Research Fellow  
  Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology  
  *Developing a Fast Plant Expression System to Identify Biosynthetic Genes Involved in Pectin Synthesis*

- **Tiffany Beal,** CURO-BHSI Summer Research Fellow  
  Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology  
  *Determining How Pectins Inhibit Cancer Growth and Metastasis*

- **Robert Brady,** CURO Summer Research Fellow  
  Dr. Nader Amir, Department of Psychology  
  *Malleability of Interpretation Bias in Social Anxiety and General Anxiety*

- **Josef Broder,** CURO Summer Research Fellow  
  Dr. Chi N. Thai, Department of Biological and Agricultural Engineering  
  *Operational Characteristics of a Mobile Spectral Imaging System for Plant Health Detection*

- **Martha Rose Calamaras,** CURO Summer Research Fellow  
  Dr. Kim Shipman, Department of Psychology  
  *Emotional Understanding in Abused and Neglectful African-American Families*

- **Daniel del Portal,** CURO-BHSI Summer Research Fellow  
  Dr. Marcus Fechheimer, Department of Cellular Biology  
  *The Physiological Role of Hirano Bodies*

- **Dustin Dyer,** CURO Summer Research Fellow  
  Dr. Guigen Zang, Department of Biological and Agricultural Engineering  
  Dr. Michael Geller, Department of Physics and Astronomy  
  *Energy Dissipation in Nanomechanical Resonators*

- **Sarah Fritts,** CURO Summer Research Fellow  
  Dr. John P. Carroll, School of Forest Resources  
  *An Inventory and Assessment of Medicinal Plants and Animals Used by Makuleke Traditional Healers on the Northern Boundary of the Kruger National Park, South Africa*

- **Betsy Goodwin,** CURO-BHSI Summer Research Fellow  
  Dr. Ronald Blount, Department of Psychology  
  *A Study of the Psychology of Pediatric Pain and Chronic Illness*

- **Patrick Gosnell,** CURO Summer Research Fellow  
  Prof. Ben Reynolds, Department of Photography  
  *The Beautiful and the Absurd*

- **Paulette Andrea Greene,** CURO-BHSI Summer Research Fellow  
  Dr. Wyatt Anderson, Department of Genetics  
  *Conspecific Sperm Precedence and Speciation in Drosophila pseudoobscura*

- **Andrea Haltiner,** CURO-BHSI Summer Research Fellow  
  Dr. Ruth Harris, Department of Foods and Nutrition  
  *The Effects of Leptin on Leptin Receptor Expression in High-Fat Fed Mice*
Former CURO Summer Research Fellows

Luke Hoagland, CURO-BHSI Summer Research Fellow
  Dr. Marcus Fechheimer, Department of Medical Cellular Biology
  *The Role of Myosin II in Hirano Body Development and the Impact of Hirano Bodies on Cell Viability*

Christopher “Kit” Hughes, CURO Summer Research Fellow
  Prof. Mark Callahan, School of Art
  *Tagging*

Steven Jocoy, CURO Summer Research Fellow
  Dr. Michael Bender, Department of Genetics

Leena Kukkarni, CURO Summer Research Fellow
  Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
  *Identification Characterization of Enzymes and Gene Products Involved in the Synthesis of Pectic Polymers Using Mucilage as Acceptors*

Valerie Marshall
  Dr. Ben Blount, Department of Anthropology

Ashley Neary
  Dr. Susan Sanchez, Department of Medical Microbiology and Parasitology
  *Sensitive and Specific Detection of Fungal Keratitis in Horses*

Ngozi Ogbuehi, CURO Summer Research Fellow
  Dr. Mary Alice Smith, Department of Environmental Health Science
  *Comparing Apoptosis During Different Stages of Limb Development in Chick Embryos*

Melissa Payton, CURO Summer Research Fellow
  Dr. Lillian Eby, Department of Psychology
  *Antecedents and Consequences of Networking Behavior for Individuals Seeking Reemployment*

John Drew Prosser, CURO Summer Research Fellow
  Dr. Wyatt Anderson, Department of Genetics
  *Kin Recognition in Drosophila paulistorum*

Ryan Rhome, CURO Summer Research Fellow
  Dr. Jan Westpheling, Department of Genetics
  *Analysis of bkdR Protein Function in Stephtomyces coelicolor and S. avermitilis*

Susan Ritger, CURO-BHSI Summer Research Fellow
  Dr. Duncan C. Ferguson, Department of Physiology and Pharmacology
  *Immunoreactivity and Bioactivity of Recombinant Thyrotropins (TSH)*

Ben Solomon, CURO Summer Research Fellow
  Dr. Kevin McCully, Department of Exercise Science
  *Measuring Age Related Changes in Muscle Compliance Using Ultrasound*

Mary Tolcher, CURO Summer Research Fellow
  Dr. Tim Hoover, Department of Microbiology
  *Identification of Developmentally Regulated Proteins in the Budding Bacterium Hyphomonas neptunium*

Meghan Wilson, CURO-BHSI Summer Research Fellow
  Dr. James Lauderdale, Department of Cellular Biology
  *Pax 6b*
Ryan Wilson, CURO Summer Research Fellow
   Roger Moore, Department of Landscape Architecture

Thomas Wood, CURO Summer Research Fellow
   Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology

*Analysis and Characterization of CAAX Proteases*
Former CURO Summer Research Fellows

Appendix I
CURO 2002 Summer Research Fellows

Nadia Behizadeh
Dr. Tricia Lootens, Department of English

Ashley D. Chadha
Dr. Michael McEachern, Department of Genetics
Characterization of stn-1 M1 mutant in K. lactis

Emily DeCrescenzo
Dr. Susan Sanchez, Department of Biochemistry and Molecular Biology
Development of a Detection Method for TSST-1 exotoxin from Staphylococcus aureus Associated with Toxic Shock Syndrome in Horses Directly from Clinical Samples

Ivy Forkner
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
Functional Expression of Putative Biosynthetic Genes for Pectin: A Plant Polysaccharide with Anti-Cancer Activity

Cory S. Gresham
Dr. James B. Stanton, Department of Pathology
Dr. Corrie C. Brown, Department of Pathology
Development of a Reverse Transcriptase-Polymerase Chain Reaction Based Assay for the Detection and Differentiation of Dolphin Morbillivirus and Porpoise Morbillivirus

Nowell Hesse
Dr. Maor Bar-Peled, Department of Plant Biology
Identification of Nucleotide-Sugar Biosynthetic Genes Involved in Glycoconjugate Synthesis

Matt Hoffman
Dr. Will York, Department of Biochemistry and Molecular Biology
Comparative Structural Analysis of Xyloglucans from Plants in the Subclass Asteridea

Parker Hudson III
Dr. Mary Bedell, Department of Genetics

Britt Johnson
Dr. Janet Westpheling, Department of Genetics
The Use of Generalized Transduction for Combinatorial Biosynthesis of Novel Antibiotics

LeeAnn Jones
Dr. Massimo Palmarini, Department of Medical Microbiology
Mechanisms of JSRV-Induced Cell Transformation InVivo

Jenna Lee
Dr. Andrew Herod, Department of Geography
A Study of Sustainable Economic Development in Croatia

Judson A. Lewis
Dr. John F. McDonald, Department of Genetics
Evolutionary Contributions of Retrotransposon Elements in the Genome of D. melanogaster
Former CURO Summer Research Fellows

Cheryl L. Maier  
Dr. Scott Pratt, Department of Animal and Dairy Science  
*Comparative Analysis of Nuclear Proteins Present in Donor Cells Used for the Nuclear Transfer Process and Cloning*

Julie Orlemanski  
Dr. Jed Rasula, Department of English  
*Sounding and Silencing: Suspended States in the Works of Thomas Pynchon*

Gautham Pandiyan  
Dr. Jacek Gaertig, Department of Cellular Biology  
*Study of Cilial Growth Suppression Mechanism in Tetrahymena Thermophila*

Joanne Shinpoch  
Dr. Daniel Dervartanian, Department of Biological Sciences  
*Purification and Characterization of Nickel Protein(s) from Bovine Heart and Their Relationship to Heart Disease*

John Stark  
Dr. Scott Atkinson, Department of Economics  
Dr. Michael Rauscher, Department of International Economics, Rostock University  
*An Economic Labor Supply Analysis of Poland’s Planned Entry into the European Union with Regard to the German Economy*

Joshua Striker  
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    Synthesis and Use of Caged Compounds to Explore Cellular Processes

Lorina Naci
    Professor William Paul, Jr., School of Art
    Each morning I get up with one word in mind: plastik...
Former CURO Summer Research Fellows

Lynn Nguyen
   Dr. Mark Wheeler, Department of Dance
   Chinese Classical Dance

Cori Pelletier
   Dr. Roy Grant, Department of Music Therapy
   Music Therapy with Premature Infants

Kate Smith
   Dr. Kenneth S. Latimer, Department of Pathology
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to Create a Protein Capable of Mitochondrial Targeting in Mammalian Cells
Summer Fellowship chair: Dr. David S. Williams, Associate Provost and Director, Honors Program

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Cover design: William Reeves, UGA Printing

Published by: Honors Program, The University of Georgia

Printed by: Central Duplicating, The University of Georgia

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April 24, 2012

Dear UGA Faculty and Students:

I am delighted and honored to recognize this year’s CURO Summer Research Fellows, each of whom is featured here with a summary of his or her faculty-mentored research project. The goal of the CURO Summer Research Fellowship is to provide opportunities for intensive, immersive, faculty-guided research experiences for academically talented undergraduates. The program advances the students’ knowledge and abilities to think critically, solve problems, and contribute to a greater understanding of the world.

The 2012 CURO Summer Research Fellowship is funded through the Honors Program, the President’s Office, the Office of the Senior Vice President for Academic Affairs and Provost, the Office of the Vice President for Instruction, the Office of the Vice President for Research, the Alumni Association, the Athletic Association, and the Jane and Bill Young Scholarship.

I am exceptionally proud of the quality of the contributions of present and past CURO Summer Fellows and with the mentorship provided by our exceptional faculty. The Summer Fellowship program has contributed to building a culture of undergraduate inquiry at the University of Georgia, and the CURO Summer Fellows serve as ambassadors, sharing their enthusiasm and expertise in a variety of professional forums on campus as well as at regional, national, and international meetings.

Please join me in congratulating these young scholars on the occasion of being awarded these prestigious fellowships. Please join me also in thanking the faculty research mentors whose support and guidance are crucial to the CURO Summer Fellows’ success.

Sincerely yours,

Dr. David S. Williams, ’79, ’82
Associate Provost and Director
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2012 CURO Summer Fellowship Selection Committee:

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Dr. Brian Cummings  Department of Pharmaceutical & Biomedical Sciences
Dr. Monica Gaughan  Department of Health Policy & Management
Dr. Patricia Hunt-Hurst  Department of Textiles, Merchandising & Interiors
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The easiest and least expensive way to combat water shortages is to decrease the quantity wasted by improving current water management techniques and systems. This can be accomplished through analyzing the collection, storage, allocation, transportation, and source of a water supply and then comparing the findings to regional population needs. Currently, methods are being implemented such as lining the bottom of bodies of water with plastic or concrete. This strategy is proving to be “nearly 90% efficient” in prevent water loss (Schwartz and Ibaraki 2011). The choice of the most promising strategy depends on factors including: location, seasonal variety, availability of resources, and water depth levels below the surface. A better understanding of water scarcity and efficiency on a regional scale is needed before viable solutions to better utilize the limited resource can be established.

The purpose of this study is to collect data on rural water systems of three villages within the Kilimanjaro District of Tanzania as a model in an attempt to complete the first step in finding ways to help communities best use the water that they already have. Rural Africans generally have two sources of water. The first is rainwater, which is stored for future use, and the second is from a type of well where water can be extracted from the ground or a local river (Mul et al., 2010). Rainwater is the most convenient source of water for Africans because it does not need to be transported long distances. The study will determine water availability at a village level by relying upon Google Maps and geographic information systems. The project will also establish water use through collecting qualitative data from observation and communication with local citizens, aiming to interview three to four people per day. Findings will then be compared to current statistics from sources like the World Health Organization, established on a much larger scale, to determine validity. The qualitative data collected from local representatives within the community will be multiplied by the number of people within the village, allowing an estimation of the water shortage that needs to be corrected.

Time is limited. If the world continues to watch idly on the sidelines, millions of people will lose their lives. Sub-Saharan Africa is facing the world’s cruelest drought because of its ever-growing population and the encroaching Sahara desert. The trend is similar in other dry and developing nations as well (Mul et al., 2010). The bleak future that faces millions can only be overcome by on the ground communication with knowledgeable local villagers and agricultural farmers who know the intricacies of the water limitations and distributions, since these people are the ones that depend upon them to survive.

The ultimate drive of this project is to ensure that the precious water available within Tanzania is being utilized to its maximum potential with as little waste as possible through efficient water management. To accomplish this goal, the project will determine ways to improve current water transportation and storage methods to increase proficiency. Researching and improving water
management systems for places like Tanzania, where the water crisis has already taken hold, will be of immense value. The study will have impacts on other regions of the world—including the United States—that have not yet fallen victim to severe drought, as the world enters into an increasingly drier future.
Striated Fiber Assemblin Protein Function in *Tetrahymena*

2012 Summer Fellow: Conner Blackwell

Research Mentor: Dr. Boris Striepen, Department of Biochemistry & Molecular Biology

*Toxoplasma gondii* is a parasite in the phylum Apicomplexa that afflicts many warm-blooded animals around the globe. While commonly asymptomatic in most healthy hosts, the parasite has been known to be fatal in immunocompromised individuals. Notably, *T. gondii* is closely related to the causative agents of malaria and cryptosporidiosis along with other livestock diseases. Thus, it serves as an informative model for understanding the entire phylum.

This parasite has a protein whose purpose is not fully understood: the striated fiber assemblin (SFA) protein. This protein became a subject of research after studying the parasite's replicative cycle. The parasite forms two daughter cells within the mother cell, and the mother cell releases the newly formed parasites. It was unknown how the cell segregated all the necessary cellular components into each of the daughter cells. However, centrosomes are believed to play a major role in the organization of both chromosomes and organelles during the cell cycle. For instance, centrosomes are connected to the centromeres and to the apicoplast, a specialized organelle specific to the phylum. It is proposed that the SFA proteins form a fiber, providing the link between the centrosomes and the daughter cells. When SFA proteins are knocked down in *Toxoplasma*, the parasite cannot make daughter cells. Therefore, we hypothesize that the SFA proteins position the microtubule-organizing centers that are required for daughter cell assembly. Further research into this protein could open new doors to drug targets against the parasites as well as a more solid understanding of how cells organize themselves during cellular division. However, direct testing of our hypothesis is not practical in *Toxoplasma*. Thus, the study of SFA will be extended into another organism, a ciliate protozoa called *Tetrahymena*, in order to determine what its role is in this particular organism.

While it is believed that SFA coordinates cellular division in *Toxoplasma*, it may have a different role in *Tetrahymena*. Our hypothesis is that SFA forms a fiber that has a role in positioning the microtubule-organizing center responsible for ciliary assembly. The method of testing this hypothesis will be similar to the process used in researching its role in *Toxoplasma*. First we will attempt to localize the SFA proteins in *Tetrahymena* using reagents developed for the immunofluorescence microscopy analysis of the *Toxoplasma* protein; these are expected to cross-react.

Secondly, we will make a mutant *Tetrahymena* cell by removing the SFA gene by recombination. A strand of DNA with antibiotic resistant functions will replace the SFA gene. After exposing it to this antibiotic, only the ones that successfully acquired the new gene and excised the SFA gene will survive, and these will be ready for analysis. The effects of this removal will be studied by extensive microscopy. This will confirm that we have successfully knocked out the SFA protein. We will also analyze the cilia to determine if they are in the proper place or are present at all.
Proposals

Analyzing the mutant *Tetrahymena* will reveal if SFA proteins have the ascribed role. Protein localization shown by the immunofluorescence microscope will hint at the functions of these proteins. An expected result of mutating the cell would be mislocalization of the microtubule-organizing center that is at the base of each cilium. The removal of these centers could have many consequences: the cilia may not be produced; the growth rate may be affected; the cilia may not be able to move, completely losing function. The results of this study will reveal the function of SFA in more than just *Tetrahymena*. Just as the studies on *Toxoplasma* have revealed its role in cellular division in apicomplexans, these studies will reveal the function of the SFA proteins and their general role in cellular organization.
The Characterization of Long Flagella Protein 4 in *Tetrahymena thermophila*

2012 Summer Fellow: Stephen Bocarro

Research Mentor: Dr. Jacek Gaertig, Department of Cellular Biology

Dr. William Dentler of the University of Kansas used mass spectrometry to identify a cluster of proteins that are enriched in cilia in *Tetrahymena*. In collaboration with Dr. Dentler, the Gaertig laboratory has set out to identify proteins that localize to the tips of cilia, which carry so-called ciliary cap complexes. The caps are believed to be essential for regulation of ciliary assembly and specifically for determination of the length of cilia. For the past year and a half, I have been working on the screening of proteins that could reside in the cap complexes by adding a GFP tag genetically to each candidate protein. Of the proteins that I have overexpressed in *Tetrahymena*, Long Flagella protein 4 (LF4) is of particular interest based on the observed phenotypes. Previous studies of *Chlamydomonas reinhardtii*, a green algae that has two long flagella used for motility, by Dr. Paul A. Lefebvre have shown that mutations in the LF4 gene result in abnormally long flagella. Further studies on the protein have shown LF4 to act as a protein MAP kinase.

When I overproduced LF4 in *Tetrahymena*, two changes occurred: cell paralysis and arrest in cytokinesis. Earlier studies showed that *Tetrahymena* uses cilia for cell motility, phagocytosis and completion of cytokinesis. Thus, it is very likely that overproduction of LF4 leads to shortening of cilia. The phenotype that I encountered for overexpression of LF4 is consistent with that observed by Dr. Lefebvre. Since a loss of function mutation in LF4 causes the lengthening of flagella, one can extrapolate that the overexpression of LF4 should shorten cilia. When normal healthy growing cells are used in the expression of LF4, the cells look larger than usual, indicating that the mechanism for separating the two cells at the stage of cytokinesis is affected by the lack of ciliary function. The LF4 overproducing cells appear larger though because these cells still continue to divide all of its organelles in the absence of cell motility and cytokinesis. This observation is important because it indicates that the LF4 overproducing cells still go through the cell cycle while lacking cilia. Thus, the overexpression phenotype seems specific to the pathway of cilia assembly.

I will use two methods to identify the function of LF4 in the cilia of *Tetrahymena*. Immunoprecipitation with antibodies against GFP attached to LF4 will be used to purify proteins that are bound to LF4. This will help us understand which proteins LF4 interacts with and therefore affects when it is overexpressed. In addition to immunoprecipitation, the gene for LF4 will be knocked out in order to determine how the cell functions in response to a complete depletion of LF4 transcription. The function of LF4 should be made clear using both of these methods. Both of these methods could help to identify proteins that are substrates of LF4 kinase activity. Using the first method, such proteins could be bound to LF4 and have increased levels of phosphorylation. Using the second method, such proteins would have a lower level of phosphorylation. In the future, such candidates could be evaluated directly as substrates for LF4 kinase activity. Revealing the substrate of LF4 activity could be key to understanding how the length of cilia is established.
Identification of GABA-Responsive Neurons in the Zebrafish Brain
2012 Summer Fellow: Hope Foskey
Research Mentor: Dr. Jim Lauderdale, Department of Cellular Biology

Seizure-like patterns in electrophysiological recordings of zebrafish brains can be induced by exposure to PTZ, a chemoconvulsant that blocks the GABA$_{\Lambda}$ and GABA$_{C}$ receptors (GABA$_{\Lambda}$R and GABA$_{C}$R). GABA is the major inhibitory neurotransmitter in the brain. However, the neural circuits by which PTZ propagates seizure activity are unknown. The hypothesis being tested is that seizure activity is mediated by discrete circuits in the brain. This hypothesis will be tested using a combination of molecular, cellular, and functional approaches.

Over 2 million people in the United States have experienced unprovoked seizure activity or have been diagnosed with epilepsy. While medication has been developed that can help some people control their seizures, the mechanism by which seizures occur is not well understood. Additionally, it is unknown why children and adults respond differently to seizure treatment. Zebrafish (Danio rerio) is emerging as a vertebrate model in the study of seizure disorders. Previous work by the Baraban and Lauderdale laboratories have demonstrated that zebrafish exhibit changes in brain activity that are comparable to those observed in human seizures. My proposed study is expected to provide insight into GABA-mediated circuits involved in propagation of seizure activity in the zebrafish brain. Because seizure mechanisms appear to be conserved in vertebrates, knowledge of these circuits will provide novel insight into the mechanisms underlying human seizures.

Because of the differences observed between human seizures in adults and children, experiments will be run on both adult and larval zebrafish to trace the development of the neural circuits by which seizures occur. An adult zebrafish brain will be dissected and cryosectioned transversely. Cells expressing GABA$_{\Lambda}$R will be labeled using an antibody against this receptor, and nuclei will be labeled using DAPI. This succession of stains will display where GABA$_{\Lambda}$ receptors are located versus where cell bodies are located. Sections will then be stained for GABA, GAD 65/67, and finally c-fos. GAD is the enzyme that catalyzes the decarboxylation of glutamate to GABA, and c-fos is a protein expressed in neurons that are under stress. These experiments will be repeated on zebrafish larvae at 3, 5, and 7 days post-fertilization. Because c-fos expression is up-regulated by seizure activity, c-fos expression levels will be compared between animals with and without exposure to PTZ. C-fos expression will be quantitated by Western blot analysis. Antibody staining and Western blot analysis will be performed following standard protocols.

I expect that these experiments will identify the neural pathways that are affected by PTZ and therefore of which neurons propagate seizures. Because the Lauderdale lab already has evidence that the electrophysiological response to PTZ is different between adults and larvae, I expect that the circuits will also exhibit developmental differences. Specifically, I predict that there will be many more neurons contributing to the circuit in an adult relative to the larvae.
Though few are aware of it, Athens, Georgia is currently home to a small community of Burmese political refugees of the Karen ethnic group. These individuals, forced to leave their homeland by ongoing government persecution, continue each day the process of remembering and reaffirming their cultural traditions while seeking to find meaning and belonging in their new environment.

Through engaging in interviews and gardening practices with the Karen people, I seek to examine the anthropological phenomenon of the ‘landscape of the interior’ as confronted by a new, ‘alien’ environment, particularly as experienced from the immigrant perspective. Recognizing the value of preserving not only genetic biodiversity but also culturally situated knowledge, I plan to collect and preserve – through the process of ‘memory banking’ – the ethnobotanical traditions of the Karen people and their cultural relationship to the natural environment.

My research will involve conducting and recording interviews with members of the Karen refugee community living in Georgia with the end result of producing a compiled ‘register’ of various species and varieties of ‘Karen’ plants, their characteristics, methods of cultivation, uses, and cultural significance. In order to facilitate the ease and clarity of interviews and to build a reciprocal and collaborative relationship, I will offer participants English language tutoring, focusing particularly on terms related to agriculture and the environment. My research work will ultimately culminate in a thesis examining the role of the ‘landscape of the interior’ in shaping perception and interaction with a new inhabited environment, an area of cultural anthropology in which much remains to be studied and understood.

This investigation additionally seeks to benefit the Karen people and the community at large by encouraging the re valorizing of traditions, creating senses of connection and ‘rootedness’ and preserving the ethnobotanical knowledge and traditions of a culture seeking to survive harsh persecution. I approach this research with the belief that the practices of remembrance are often the strongest means of combatting forces of injustice and oppression.

The CURO summer fellowship will enable me to expand my ongoing research to include participants living in various regions of Georgia and having resided in the United States for differing degrees of time. This will allow for a broader, more in-depth investigation of Karen ethnobotanical knowledge and a richer understanding of the phenomena of transnational senses of place.
In his paramount book *The Origin of Species*, Charles Darwin included a single drawing, one that has become representative of his theory of evolution as descent with modification from a common ancestor. This simple drawing has led to the study of phylogenetics, which works to infer evolutionary relationships among living organisms. Today, phylogenetics utilizes the powerful tools of molecular biology and is an indispensable tool for research in genetics, biology, agriculture, and medicine. The goal of my project is to use phylogenetic analyses to reconstruct the history of the quinaria group within the genus *Drosophila*, and then to use the resulting phylogenetic tree to trace the histories of various ecological and morphological traits across this species group.

For the last century, the fly *Drosophila melanogaster* has been a very useful and powerful model organism for genetic research (DeSalle 1994). Within the *Drosophila* genus there are actually more than 2000 species, each occupying a different ecological niche. One group of *Drosophila* species, the quinaria group, is biologically interesting because it is evolutionarily young, having undergone adaptive radiation between 10 and 15 million years ago. Since that time, multiple episodes of reproductive isolation have resulted in about 20 distinct species. These species exhibit a range of diversity with respect to host preference and toxin resistance (Spicer and Jaenike 1996), pigmentation (Dombeck and Jaenike 2004), circadian rhythms (Simunovic and Jaenike 2006), and parasite infection and prevalence (Perlman and Jaenike 2003; Jaenike 2007; Haselkorn et al 2009). While some species are morphologically very different, others are morphologically identical, making distinction on these grounds impossible. In addition, extensive hybridization has occurred among species within the group, resulting in genomic regions that descend from adjacent species. These factors make phylogenetic characterization difficult for the quinaria group. In order to disentangle this phylogeny, gene sequence data from multiple loci across each species’ genomes must be analyzed.

I will employ a combination of molecular and computational analyses in order to conduct my research. To begin, I will choose approximately 10 loci (gene fragments) from each of the 20 species under investigation, including loci from mitochondrial DNA, the X and Y chromosomes, and the autosomes, or non-sex chromosomes (reviewed in Brito and Edwards 2008). I will amplify target regions of the DNA using the polymerase chain reaction, or PCR. Each fragment will be sequenced and these results will be aligned across species to determine regions of genetic change. With these data, I will conduct phylogenetic analyses, first on each individual locus and then on all of the loci together, to construct a big picture of the evolutionary changes that have occurred. These analyses will rely heavily on Bayesian and maximum likelihood statistical methods to determine
which gene and species trees are best supported. With these results, I will then be able to trace the history of variable, ecologically relevant traits such as host preference, toxin resistance, mating behaviors, and pigmentation. Host preference is especially interesting within the quinaria group, because a number of host switches have occurred over the course of evolution, resulting in species divergence with respect to preferred food source (Spicer and Jaenike 1996). A number of traits are related to host preference, including toxin resistance. Resistance is widespread among species that feed on mushrooms, but absent from those who feed on rotting vegetation. These traits are biologically relevant to our understanding of speciation as a result of host switches, which are common in nature.

Other members of the Dyer lab have already collected about half of these data. Therefore, I anticipate having most of my sequence data collected midway through the summer. I began this project this semester and will continue to gather data through the summer, transitioning into my thesis, which I will write in the fall. Through this project I will learn a variety of modern molecular genetic techniques as well as statistical methods for data analysis. Furthermore, this project will place various evolutionary traits of the quinaria group in a phylogenetic context that will trace patterns of morphological, behavioral, and ecological evolution.

References:


This study would examine wage fluctuations in the Georgia labor market, and assess whether there is a relation to recent state immigration law reform.

On May 13, 2011, Governor Nathan Deal signed the “Immigration Reform and Enforcement Act of 2011.” Among its provisions, the bill requires companies to screen their payrolls for undocumented immigrants more thoroughly than ever before. The legislation discourages undocumented immigrants from participation in the labor market because it stokes fears of deportation.

Representative Matt Ramsey (R), author of the Georgia House of Representatives version of the bill, said shortly after its approval, “there are millions of Georgia citizens working and raising their families, who no longer are willing to accept the loss of job opportunities to the nearly 500,000 illegal aliens in our state . . .[.]” This statement and others made by Ramsey’s congressional peers suggest the motivation behind the bill was in part rooted in driving undocumented immigrants out of the state labor market in order to create openings for natural citizens.

Has the bill been successful in this stated purpose? Gauging the effects of undocumented immigrants on the labor market presents a steep problem—how can an economist account for a sector of the labor force that is, by definition, off the books? By putting a microscope on wages, it is possible to determine whether there has been any abrupt decline in the supply of labor since the Immigration Reform bill has come into effect, without relying on an inevitably flawed estimation of the number of undocumented immigrants who have left the Georgia labor market.

Determining whether recent reform of state immigration policy has elevated or depressed wages has wide-ranging applicability. Beyond its face value conclusions, such a study would shine a light on the relationship between undocumented labor and the Georgia economy. This study has the potential to inform contentious public policy. The prevalence of similar legislation in other states like Arizona and Alabama makes this study relevant, and lends it urgency.
The Need for Universal Design: An Environmental Assessment of Residential Interior Spaces and the Built Environment

2012 Summer Fellow: Brittany McGrue
Research Mentor: Professor Sarah Zenti

The Americans with Disabilities Act (ADA) became law in 1992, mandating that all facilities incorporate accommodations for those with disabilities with those for the general public. Until the ADA became law, those with disabilities were provided with separate facilities, if they were provided with any at all. The law stipulates that people with disabilities were a part of the general public and should be treated as such. Therefore, all spaces designed after the law’s passing, both public and private, were to follow the ADA guidelines. When designing spaces, interior designers now have more codes to abide by. Some notable ADA design standards include doors that are three feet in width, hallways that are 36”–42” wide, and a 60” turning radius by the bed so as to accommodate those in wheelchairs. While these regulations and standards made buildings and designed spaces more accessible to those with disabilities, they also highlight their differences. To combat this, some designers began operating under the principles of Universal Design. Universal Design “implies that well-planned [spaces] will meet the needs of every user without drawing attention to persons with disabilities.” This means that instead having an accessibility ramp, buildings would have their entry on a level grade, eliminating the need for an alternate route for those who cannot go up steps.

While most public spaces are now being designed with ADA codes and standards in mind, accessibility features are frequently “add-ons.” And many private spaces, such as homes, employ only the minimum ADA standards in their designs. The goal of this research project is to determine what accessibility features are lacking in typical public and private spaces. This summer, I will be having surgery on my foot, forcing me to use crutches and a wheelchair. My full range of motion will be severely limited, making accessibility accommodations relevant to my life. While researching ADA standards and regulations, and Universal Design, I will gain firsthand understanding of what it is like to be disabled, though my disability will only be temporary. I will attempt to maneuver around not only my own home, but also homes of acquaintances in my area to determine what features are missing from normal homes to make them accessible. I will also be going to typical public locations to document my experiences and note how accessible their facilities are to those who are disabled. I will also visit facilities for the disabled such as assisted living facilities in order to see what ADA standards these places incorporate that other spaces lack. Throughout my research process I will learn about Universal Design and how to implement these principles in the built environment. I will also take note of any places that good use of Universal Design principles.

This research will provide much needed insights into ADA standards and regulations and the importance of Universal Design. Combining my personal experience with research that I find will allow me to understand what ADA standards are being overlooked, and which are barely being
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met. I will also be able to see where Universal Design can be incorporated to make accessibility accommodations less obvious. In this day and age, discrimination has been long considered taboo, but most accessibility add-ons call unnecessary attention to those who are disabled. This research will show ways to use universal design to minimize access disparities.

References:

Ca\(^{2+}\)/Calmodulin Dependent Protein Kinase (CAMK) Group: Evolution of Dynamic Regulatory Modules
2012 Summer Fellow: Tuan Nguyen
Research Mentor: Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology

Protein kinase belongs to one of the largest and most diverse gene superfamilies in the genome. It acts as an indispensable molecular switch in virtually all cell signaling processes by adding phosphate group to proteins. Throughout the course of evolution, protein kinase diverges into different groups and families to perform varied functions. Among them, the Ca\(^{2+}\)/calmodulin-dependent protein kinase (CAMK) group contains members implicated in many important physiological processes such as cell differentiation, learning, and muscle contraction etc. Although CAMK group’s structural and biochemical data are vast, a systematic evolutionary characterization of amino acid/residue constraint is lacking. Some residues are conserved in all protein kinases, while others are only conserved in certain kinase groups or different families within a group. Can we gain any insights on how the conservation of these residues contributes to functional divergence of kinase in the CAMK group and families within it?

With the guidance of Dr. Kannan, I plan to address that question by looking this group of molecules from an evolutionary perspective to understand how they’re uniquely regulated. Using a rigorous statistical approach called Contrast Hierarchical Alignment and Interaction Network (CHAIN) analysis, which aligns a set of desired amino acid sequences, divides the sequences into different groups, and identifies distinguishing sequence patterns in each category, I plan to characterize the residue constraints that distinguish CAMK group from the eukaryotic protein kinase superfamily and those that distinguish different families from others in CAMK group. Using the sequence patterns revealed by CHAIN, I plan to analyze them with the wealth of structural data provided by solved crystal structures—map them out, align them, and visualize residue interactions in different states. Furthermore, I will use various biopython based tools such as energy analysis program to analyze these interactions on a kinome level. Databases such as Uniprot/Swissprot, Protein Data Bank, COSMIC, Pfam, KINbase, etc. will be extensively used to explore for further structural and chemical information pertaining to family specific kinases. When needed, we will use modeling tools to probe residue interactions for a selected few kinase families that currently do not have any solved structures.

Preliminary analysis for CAMK group and families reveals unique motifs at docking sites and uncharacterized allosteric network. Further sequence constraints analysis may explain unique regulatory mechanisms and properties of each CAMK family; however, accomplishing those tasks entails learning more tools in bioinformatics to shed light on how CAMK family specific conservations complement CAMK group constraints, requiring more time.
Understanding how CAMK functions require extensive and carefully designed experiments. One way to guide such studies is to formulate suitable hypotheses using a systematic evolutionary study characterizing divergent sequence patterns. Because malfunctioning CAMKs are implicated in many diseases, such as cancer, our studies provide clues to combat mutations and shed insights on molecular basis of various physiological processes associated with the CAMKs.
Pharmaceuticals must undergo various biological processes before they are able to positively affect the human body. Drug transporter proteins of the ATP-Binding Cassette (ABC) superfamily play a major role in the movement of pharmaceuticals through the cells of the body. Some of these proteins hinder the effects of medicine by effluxing drugs from the cell. Human MDR1 is one of these multi-drug resistant proteins responsible for decreasing the effectiveness of anticancer drugs, as well as serving as a gatekeeper across the blood-brain barrier. Although MDR1 is known for its wide substrate promiscuity, the binding sites and mechanisms of the protein are not completely understood. In this laboratory, mouse-MDR3, a close analog of human-MDR1, will be studied in an attempt to determine the structural basis of multi-drug resistance. This will be done by observing and analyzing the interactions of MDR3 with the anti-coagulant warfarin.

To begin the experiment, computer models of the protein and substrate will be developed using PyMol and Avogadro. With this information, a docking program called AutoDock will be used to establish a testable hypothesis on the binding sites of the protein and mechanisms of transport. Concurrently, recombinant mouse-MDR3 will be grown and isolated from P. Pastoris yeast.

Once the protein has been purified, tests will be run to characterize the protein-substrate interactions of MDR3 and warfarin. First, fluorescence spectroscopy will be run to create a qualitative picture of the interactions. The presence and extent of drug binding can be documented by allowing warfarin and a fluorescent indicator to compete for the binding sites in MDR3. Second, saturation transfer difference nuclear magnetic resonance imaging (STD NMR) will be used to collect quantitative data on the protein-drug binding. This method will allow for the documentation of which ligand of warfarin is involved in binding. The binding of sites of MDR3 may be determined by considering the binding orientation of warfarin within the protein.

In the long run, information compiled on mouse-MDR3 will be used to begin studies on human-MDR1. Classifying the activity of this protein will allow for future studies on limiting drug resistance and increasing the effectiveness of pharmaceuticals.
Proposals

Effects of Anthropogenic Land Use on Reservoir Host Potential of the Common Opossum *Didelphis marsupialis* in Panama

2012 Summer Fellows: Ronke Olowojesiku
Research Mentor: Dr. Nicole Gottdenker, Department of Pathology

Certain kinetoplastid protozoa give rise to zoonotic, vector-borne diseases of public health significance. Two such protozoa include *Trypanosoma cruzi* and *Leishmania* spp. *T. cruzi* and *Leishmania* spp. are the etiological agents of Chagas disease and leishmaniasis, respectively (1, 4). These diseases are recognized by the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) as neglected tropical diseases. Neglected tropical diseases are those typically associated with low-income and marginalized communities (3, 4). The relatively high prevalence of these diseases in developing nations impedes human well-being, as well as economic and industrial growth. Therefore, the control of neglected tropical disease transmission is important to public health officials. Currently, it is estimated that 9 million people are infected with *T. cruzi* across the world, with the largest concentration of infections being in Latin America (3). Worldwide, it is estimated that 12 million people are suffering from leishmaniasis across 88 tropical and subtropical countries (1, 4).

One of the most important similarities between Chagas disease and leishmaniasis is that their transmission in humans is commonly maintained by wild mammal reservoirs in peridomestic habitats (3, 5). An understanding of ecological factors that can influence the transmission of these diseases is therefore both beneficial and vital. Previous studies have shown a strong correlation between the increase of vector abundance and infection prevalence and the amount of anthropogenic land use in a given area (2). One major form of human habitat disturbance in the areas affected by vector-borne diseases is deforestation (6). Studies involving *Anopheles* mosquitoes, the vectors of malaria, in portions of the Peruvian Amazon show that deforestation can alter the breeding ground and shelters for the mosquitoes which consequentially increases the intensity of vector-to-human contact (2, 6). Although changing vector responses to habitat disturbance have been intensively studied, we do not know if the reservoir potential of wildlife hosts can change in response to anthropogenic disturbance.

The goal of the proposed research project is to observe effects that anthropogenic land use has on the ability of a wildlife host to serve as a reservoir for *T. cruzi* and *Leishmania* spp. transmission in Panama. The reservoir host of interest for this study is *Didelphis marsupialis*, the common opossum, because it is considered one of the most important reservoir hosts for *T. cruzi* and *Leishmania* spp. in the country (3, 5). I hypothesize that the reservoir host infection prevalence with *T. cruzi* and *Leishmania* spp. increases as habitats become more disturbed by humans. This project will be conducted across a gradient of habitat disturbance in the areas adjacent to the Panama Canal. For this study, blood and tissue samples will be collected from opossums in protected contiguous forests around the Panama Canal Zone and from opossums in peridomestic areas in rural
samples will then be tested using standard molecular diagnostic techniques that have proven to be successful in past studies. Such methods include immunofluorescent antibody test, indirect agglutination test, and the polymerase chain reaction. The data from these tests will then be analyzed and the results from the environments of interest will be compared. The findings of this study can prove to be useful in further understanding the various complexities surrounding the epidemiology of Chagas disease and leishmaniasis, allowing for the development of better disease control methods.

References


This study focuses on *Mycoplasma pneumoniae*, a major cause of bronchitis and atypical or “walking” pneumonia in humans. *M. pneumoniae* forms a terminal organelle at one pole and mediates gliding motility with this structure. This motility, combined with the ability to adhere to epithelial cells, is involved in the pathogenic process by enabling the mycoplasmas to translocate from the tips of bronchial cilia to the host cell surface. The terminal organelle constitutes the gliding machinery and is defined by an internal rod-shaped cytoskeleton and nap-like surface protrusions. Although many proteins comprise the terminal organelle, this study will focus solely on P1. The P1 protein on the terminal organelle functions in both cell adherence and motility, and there is evidence to suggest that P1 repeatedly catches and releases the gliding surface to thrust the mycoplasma cell forward. The binding target of adhesion has been suggested to be sialic acid, present at the tips of polysaccharides on animal cell surfaces.

Hemadsorption is a convenient model for studying mycoplasma adherence to host cells. When wild-type mycoplasma cells are introduced to blood, a certain percentage of the bacteria bind to erythrocytes while the rest do not. If the nonbonding mycoplasmas are incubated for a few hours and then reintroduced to blood, the same percentage of mycoplasmas will bind again. This phenomenon implies that the non-binding cells in the population regain binding capabilities after a certain period of time. To understand the dynamics of the P1 protein in this process, we plan to observe changes in the location and quantity of P1 before and after the mycoplasma cells have been incubated with blood cells. To locate the P1 protein, monoclonal antibodies specific to P1 are introduced to the sample and a stain is added so the antibodies that attach onto P1 fluoresce. The antibodies cannot attach if the site on the organism is made inaccessible due to changes in conformation associated with ability to bind blood cells. We hope to see that after introduction to blood the percentage of cells whose P1 protein fluorescence increases over time.

The purpose of this investigation is to quantitatively analyze the function and changes of the P1 protein in *Mycoplasma pneumoniae*. The project mainly involves viewing and analysing images of mycoplasma cells. Round cover slips prepared with poly-L-Lysine will be inoculated with the bacteria and then incubated with the bacteria for a certain period of time. The cover slips are then put through a series of washes to remove unbound mycoplasma cells, fix bound cells, and permeabilize the cells to allow antibodies to bind freely to their specific targets on the cells. The cells will then be blocked to prevent the P1 antibodies from binding non-specifically to materials that are not P1. After the cells are blocked, the primary antibody, which is one of several anti-P1 monoclonals, will be added and the cover slips washed. Next, the secondary antibody is added and the cover slips are washed and then mounted/sealed. The slides are viewed through a microscope...
Proposals

under 100x oil immersion. Pictures are taken with Open Lab software and analysed for fluorescence intensity and distribution using Image J software.
Proposals

Finite-Difference Time-Domain Investigations of Metamaterials  
2012 Summer Fellow: Elliot Outland  
Research Mentor: Dr. William Dennis, Department of Physics and Astronomy

Metamaterials, artificially engineered materials possessing special properties that may not be found in nature, have a variety of applications in many fields. While interdisciplinary collaborative research efforts have yielded interesting results regarding the properties of these materials, there remains much to learn. Through our summer research, we hope to gain a better understanding of the underlying mechanics of these materials; what makes them work the way they do?

Our research would use the MIT Electromagnetic Equation Program (MEEP) to perform a finite-difference time-domain (FDTD) analysis of wave propagation through these negative-index materials. The FDTD method uses Maxwell's equations at a time step in order to solve for information at another time step, which can then be used to solve for information at another time step and so on. Solving equations can continue in this manner until the behavior of the wave is fully understood. Using MEEP, we first specify the properties and configurations of the materials and the frequency and characteristics of waves in our simulation. From there, we can examine the interaction between them; an example of a simple simulation would be a continuous wave of light passing through a plate of glass. The simulation generates a file from which numerical data can be obtained and analyzed. MEEP also allows us to produce visual representations of the wave's interaction with the material. This allows us to understand the simulation from both a quantitative and qualitative standpoint.

One property of particular interest to our research is that of negative refractive index, which are materials that reverse the direction of propagation of light waves passing through them. Negative refractive indices have a number of implications; one interesting characteristic of negative index materials is the ability to achieve resolutions beyond the diffraction limit. This trait allows for the production of superlenses, which are capable of producing images of resolutions that are out of reach of conventional optical materials. The same trait also permits the potential use of negative-index materials to create superior waveguides, such as those used in signal transmission. Further, negative refractive indices are not grounded in classical optics; their existence may merit a reexamination of some basic laws of optics.
Proposals

Neural-Mechanisms Underlying the Gap Effect: Why is 200 the Magic Number?
2012 Summer Fellow: David Parker
Research Mentor: Dr. Jennifer McDowell, Department of Psychology

In order to navigate our environment, we generate 3-5 rapid eye movements (saccades) per second and close to 100,000 saccades per day. Saccades enable us to collect and process visual information that we use to read, alert us to motion, and gives us the ability to maintain a static picture of a constantly changing 3-D world. The goal of the study that I would be working on is to understand the underlying neural mechanisms that allow for saccade generation and explain the behavioral phenomenon that occurs when a gap interval is introduced between a fixation cue and the onset of a peripheral stimulus.

Participants in this study will complete two types of eye movement tasks: prosaccade (rapid redirection of gaze from a center fixation point to a peripheral cue) and antisaccade eye movement tasks (rapid redirection of gaze from a center fixation point to the mirror location of a peripheral cue). In past studies it has been shown that when a gap interval is introduced between a fixation cue and the peripheral stimulus in prosaccade tasks, it enables subjects to generate a proportion of “express saccades” that are produced 40-50% faster than normal saccades (Saslow 1967). Additionally, during antisaccade trials it greatly increases the number of antisaccade errors (unintentional glances towards the peripheral cue). This suggests that in some trials the gap interval creates a bypass of the internally driven impulse control in favor of an externally driven ocular motor goal and that extremely fast prosaccades cause antisaccade errors. The highest proportion of express saccades and antisaccade errors occur when a 200ms gap interval is introduced (Fischer and Weber, 1997; Clementz et al, 1996).

Using dense array electroencephalography (EEG) at the UGA Bioimaging Research Center and saccadic eye movement tasks, the study will examine the underlying neural activity that occurs during the pre-gap and gap period of the task. The study design will consist of two groups of 20 neurologically healthy subjects. Both groups will complete prosaccade and antisaccade eye movement tasks in the EEG environment. During each task there will be a gap interval between 0 and 400ms in 100ms steps between the offset of the fixation cue and the onset of the peripheral cue. For each of the two saccade types (prosaccade and antisaccade), the blocked interval group will complete five runs of 250 trials, one run for each gap duration. The interleaved group will complete 5 runs of 250 trials, with an equal proportion of each gap interval randomly presented during each run. Thus, there will be a between-subjects factor of presentation type (blocked vs. interleaved) and a within-subjects factor of gap duration (0, 100, 200, 300, 400ms).

Two previous studies (Hamm et. al 2010; Hamm et. al 2012) have shown that express saccades and antisaccade errors vary with the instantaneous phase of fronto-occipitally distributed alpha band oscillations (7-10Hz) occurring immediately before the onset of the gap period. The
variance in the gap interval will enable us to examine which of the pre-cue brain events are markers of fixation disengagement, target anticipation, or a combination overlap of both. Understanding the overlap in time and space of elicited brain events with the alpha oscillatory phases could explain why the 200ms gap duration elicits the highest proportion of express saccades and antisaccade errors. By varying whether a subject can predict the duration of the gap interval, we hope to establish whether the timing of the motor preparation and alignment of visual-motor alpha oscillations is under the control of the subjects.

As a Summer Research Fellow, I would be conducting cutting edge research and have substantial exposure to the EEG machines at the UGA Bioimagining Research Center. I would be trained on how to collect, score, process, and analyze both behavioral and EEG data. By working on this study I will have the unique experience of being able to make a contribution to our knowledge of the neural mechanisms that explain why a 200ms gap interval causes us to generate the highest number of express saccades and antisaccade errors, which will give us significant insights into the underlying neural substructure of saccade generation.

Sources:


Development of Nut Cracking Skills in Young Bearded Capuchin Monkeys

2012 Summer Fellow: Anakela Popp

Research Mentor: Dr. Dorothy Fragaszy, Department of Psychology

Bearded capuchin monkeys (Cebus libidinosus) in the wild crack nuts using stone tools at anvil sites in order to get to the fruit inside. In non-human primates, nut-cracking is an uncommon skill, observed only in some populations of capuchin monkeys and chimpanzees. Juveniles learn this behavior even though they are not directly taught by other capuchins. They instead develop this behavior through practice by banging nuts on various surfaces, including anvils. This practice often occurs for several years before the monkey will crack a nut. From previous observation, we know that aspects of nut-cracking are age dependent and skill develops with age. We also know that juveniles see and hear other monkeys crack nuts and they encounter anvil sites with the remains of previously cracked nuts. This summer will be the third time point in an ongoing project led by Dr. Fragaszy of the Psychology department. For eight weeks we will be at the field site in Piauí, Brazil, looking at the activity of young monkeys. My project will focus on social facilitation between juveniles in similar age cohorts and facilitation among kin.

Previous project objectives have been to quantify how adult cracking behavior promotes the juveniles’ start to the nut cracking behavior. This summer, we hope to investigate the emergence of nut-cracking behavior in the three eighteen month olds in the population, each of whom has 0-3 older siblings. We want to see if this cohort and their older siblings facilitate learning among each other. We will look at the relative “attractiveness” of learning from juveniles of similar a similar age versus from adult monkeys. We will also investigate the role that kinship plays in facilitation of behavior.

We will study a known group of wild bearded capuchin monkeys at the field site in Piauí, Brazil. We will do focal observations on young monkeys between the ages of 6 months and 5 years, we will focus on those aged 18 months. These monkeys do not yet crack nuts, and we will record their actions, location (at an anvil site or somewhere else), and the other individuals near the juvenile. One researcher will observe the focal individual, and another will pay attention to the monkeys nearby the focal monkey. Each sample will be a minimum of ten and a maximum of twenty minutes. Previous trips have shown that this is a reasonable amount of time to follow the monkeys. Subsequently we merge the two kinds of data so that we can tally how the focal monkey’s behavior is patterned in time with respect to the behavior of its neighbors.

This study will provide insight into the significance of peer facilitation and social learning. It can show a relationship between kinship and learning, and illustrate how social influences can enhance and promote learning skills that are not directly taught to the next generation. This is a new component for Dr. Fragaszy’s project, which has focused until now on the role of adult partners for young learners.
There is much evidence to support the claim that the global climate is changing, but we have very little data to understand how individual shifts in weather patterns will affect species. Insects may be especially sensitive to weather shifts since their development is closely tied to temperature. They may also experience climate-induced asynchrony with host plants, increased parasitism and predation, and increased susceptibility to fungal and other pathogens. Moths are a diverse taxon, readily observable at lights, and often identifiable from photographs. Their natural history (herbivory in larval stages, pollination as adults, multiple generations, vulnerability to predators, parasitoids and diseases) could easily be affected by shifts in weather patterns. I propose to study how weather patterns across two years may affect moth species distribution, relative abundance, phenology and voltinism at UGA Costa Rica campus in San Luis de Monteverde, Costa Rica. This project will also establish a baseline for longer-term monitoring of moths at the field station.

There are over 165,000 known Lepidoptera species, and an estimated 100,000 species yet to be described. While there are 2,467 moths species recorded in Georgia, moth diversity in Costa Rica is much higher. The Monteverde Cloud Forest Reserve alone boasts at least 5,000 moth species. The nearby UGA Costa Rica campus includes cloud forest and drier habitats, with both cleared and forested areas, and has low levels of light pollution, making it an ideal study location.

Studying how species respond to climate is a difficult task, because it is impractical to conduct randomized, replicated experiments at a regional scale. Therefore, this study will take advantage of natural experiments to compare species occurrences over time, across sites, and correlate them with weather data. My goal is to test whether the variables we are measuring in the tropics are more or less stable than the ones collected for temperate populations.

The following methods are best practices based on Discover Life's moth research in Clarke County (see http://www.discoverlife.org/moth). I will set up four replicate sites around the UGA Costa Rica campus. Sites will consist of a simple shelter, a plain white wall surface, and a light source to attract moths. I will photograph all specimens at each site nightly, 3 hours before sunrise, allowing the maximum number of moths to accumulate before switching lights out so that they escape bird predation. I will upload photographs daily to a database on Discover Life (www.discoverlife.org), label them with locality, date and time information, and then identify them to species whenever possible. I will build an online identification guide to expedite species identification, similar to the one we have for Clarke County:
The agreement with the Costa Rica campus will allow for two consecutive summers of sampling. The first summer will serve as a population baseline. I will identify species using the collection at the National Biodiversity Institute of Costa Rica (INBio) and other resources from the literature. The second summer's samples will be compared to those of the first year. I will tabulate nightly numbers of specimens of each species at each of the four sites. For monitoring and analysis I will choose 50 to 100 species that are relatively common, occur across all sites, and are readily identifiable. I will analyze the species data with temperature, humidity, precipitation and lunar cycles using the weather station on campus.
Comparative Study of Chemical Flocculation vs. Autoflocculation for Microalgae Harvesting, *Scenedesmus bijuga*, *Chlorella minutissima*, and *C. sorokiniana*

2012 Summer Fellow: Nicholas Richwagen
Research Mentor: Dr. K.C. Das, Department of Biological & Agricultural Engineering

Flocculation is an inexpensive method of microalgae collection; different flocculation techniques are currently being explored. What is the comparative efficiency of different flocculating polymers, i.e., how fast do polymers act on suspended microalgae? Are chemical flocculating agents cost effective enough to warrant their use relative to autoflocculation of algae in a basic environment?

Fast-growing algae species, particularly green microalgae, are grown for their application in waste-water management and biofuel production (McKenna, 2006). Flocculation is widely used in algaculture for harvesting, and cationic polymeric flocculants have been proven to be highly effective in causing freshwater algae to settle (Sukenik et al, 1988). Although there is an abundance of polymers available for wastewater management, no studies have systematically analyzed the relative efficacy of different polymers in flocculating microalgae. Additionally, it is uncertain if polymeric flocculants are an economically viable way to harvest algae, considering autoflocculation in a basic environment as a potential option (Sukenik and Shelef, 1984). In this experiment, the effectiveness of different Zetag® polymers on flocculating microalgae will be explored. The polymers will be tested on three species of algae, *Scenedesmus bijuga*, *Chlorella minutissima*, and *C. sorokiniana*; strains from these two genera are native to Georgia and have been the subject of much recent research (Allen and Irving, 2011; Das et al 2011; Tang et al 2011). These three species will also be tested for their autoflocculation potential with the addition of a strong base. The experiment should determine (1) the optimal polymers for flocculating each algal strain and (2) whether chemical flocculation is worth its costs. The conclusions from this experiment should inform how ponds should be flocculated for large-scale algae production.

The research will take place at the Bioconversion Research and Education Center (B.R.E.C.) lab on South Milledge Avenue. The lab facility has two growth chambers where the algae strains will be grown in 20L glass carboys and aerated with carbon dioxide. For the polymeric flocculation tests, 1L samples of each algae strain will be removed from the carboys and placed in Imhoff cones to observe settling.

Stock culture preparation: Three 20 L glass carboys, carboy caps, and aeration tubing will be sterilized using a dilute bleach solution. 45 L of BG-11 growth media will be prepared, 15 L for each carboy. The growth media will be pH adjusted to 7.5 and sterilized in an autoclave. The growth media will then be poured into the carboys. The three carboys will be placed in a growth chamber and inoculated with 1L of *Scenedesmus bijuga*, *Chlorella minutissima*, and *C. sorokiniana* respectively. The
lights in the growth chamber operate on a 12 hour light/dark schedule. As the culture volumes decrease throughout the experiment, BG-11 media will be prepared and added as necessary.

Testing the polymeric flocculants: After 5 days of culture growth, 1L will be removed from each carboy under aseptic conditions and placed in Imhoff cones. 1mL of diluted polymer (2% w/w) is placed in each cone. The algae solution in each cone is stirred until the algae start to form noticeable clumps. The time each solution takes to fully flocculate is recorded. The flocculating ability of each polymer is also qualitatively assessed with before and after photographs of each Imhoff cone.

The 15L algae solutions cannot be put on laboratory shakers, so conditions in the carboys will not exactly mirror the mechanical stirred large ponds. Although other algal strains at the BREC lab are being assessed for biofuel capabilities, the experiment will focus only on the most commonly utilized species within the *Scenedesmus* and *Chlorella* genera.

References:


Changing Food Security Strategies in Northeast Brazil: The Impact of 15 years of Development Policies on Household Ability to Buffer Drought Impacts

2012 Summer Fellow: John Rodriguez
Research Mentor: Dr. Donald Nelson, Department of Anthropology

Due to increasing frequency of climatic disturbances, reducing vulnerability to climate risk has become a development priority. The concept of vulnerability permits an assessment of household sensitivity to climatic extremes (i.e. the destructive consequences) and the resilience of households (i.e. the capacity to recuperate from disaster). In response, public policies are designed to affect one or both of these characteristics. This study, situated in Northeast Brazil, will document the articulation and private adaptation efforts to climate variability and their influence on increasing food security. It will add to the growing body of literature that explores the optimal allocation of public funding to reduce the risks of climate-related threats.

Ceará, Brazil is a semi-arid region in which drought has proven to be an intractable problem for both households and local governments. Drought is a constraint to development in this region that its impacts include reduced economic and social well-being. Since the calamitous drought of 1877—the results of which ended the lives of 500,000 inhabitants—policymakers have searched for technological approaches to eliminate the impact of drought. These efforts include the construction of canals, water resources, road ports, and the drilling of wells. During the 1980s, major World Bank financing invested in integrated rural development projects. Today, concern remains as to whether these programs address the high risk of subsistence agriculture in Northeast Brazil.

This study seeks to determine which investments to build adaptive capacity—defined by assets and resources that can be mobilized to prevent, cope, and recover from a climatic disturbance—are most effective. To do so, we will interview 500 households in six municípios (comparable to U.S. counties) within Ceará. The team will conduct a longitudinal comparison of the results with data from a similar survey performed in 1997. We will explore the evolution of vulnerability profiles over the last fifteen years as a function of government-led intervention and private attempts to mitigate the negative impacts of drought.

With this purpose in mind, I will play an important role in preparing for the field work and the data collection. First, as part of my ANTH 4960H course, I will familiarize myself with the topic of vulnerability by exploring existing literature. In addition, I will help establish the survey criteria and develop the questionnaire for comprehensive interviews. Once in the field, we will interview key informants, institutional actors, and households in the public and private sectors. I will travel to Ceará, Brazil from May 12, 2012 to June 10, 2012. I will train with the other enumerators during the first two weeks, and then I will help collect data from two municípios (approximately 160 households).

Within the overarching project I will focus specifically on the issue of food security, a topic I became interested in as a Roosevelt Scholar last semester. Specifically, I will analyze qualitative data to determine how coping strategies to maintain adequate food and water intake have changed during the previous fifteen years. In 1997, household respondents reported the timing and types of activities they undertook in response to drought events. I will ask similar questions this summer. I expect to find that food insecurity remains a significant problem. However, I believe that as a result of public investments the duration and magnitude of periods of food insecurity will have diminished. I intend to use this data in order to write a Thesis. The project’s overall goal is to provide empirical analysis of public adaptation investments. My focus will be on how these investments change the experience of food security for people living in the region. This type of analysis will have relevance for development beyond the state of Ceará.
Characterization of the *Tneap* Complex in the CRISPR-Cas Viral Defense System of Prokaryotes

2012 Summer Fellow: Cole Skinner

Research Mentors: Drs. Michael and Rebecca Terns, Department of Biochemistry & Molecular Biology

Bacteria and Archaea have developed a complex immune system called the CRISPR-Cas system that allows these prokaryotes to fend off invasion by nucleic acids of viruses or plasmids. The CRISPR-Cas system has been observed in roughly 90% of archaea and 40% of bacteria. The CRISPR (Clustered Regularly Interspaced Short Palindromic Repeat) locus is comprised of short repeat sequences which are separated by similarly-sized variable sequences. These variable sequences have been shown to be derived from invader sequences such as viruses and plasmids. Upon infection, the CRISPR-Cas system recognizes and incorporates these pieces of foreign DNA into the CRISPR loci. The CRISPRs are transcribed and processed into short CRISPR RNAs (or crRNAs), which are integrated into Cas (CRISPR-associated)-protein containing complexes. CRISPR RNAs (crRNAs) direct Cas proteins to complementary foreign genetic material. The Cas proteins are thought to silence RNA and DNA invaders by binding and cleaving complementary, invading nucleic acids. This gene based immunity can be passed down to subsequent generations and added to whenever new foreign genetic material presents itself.

Six core cas genes (cas1-6) have been identified which appear in a wide variety of bacteria and archaea, but only Cas1 and Cas2 are universal and most organisms do not contain all six. In addition, all CRISPR-containing organisms possess one or more of nine sets of subtype-specific cas genes. For example, the *Tneap* subtype consists of three subtype-specific Cas proteins: Cst1, Cst2, and Cas5t. The core protein Cas3 is proposed to function with the *Tneap* subtype-specific proteins to cleave foreign DNA. Previous work in the Terns’ Lab has found that Cst2 and Cas5t bind crRNAs to form stable crRNPs, but the addition of Cst1 is required for target DNA binding.

In my research project, I want to compare the functions of recombinant *Tneap* proteins from the hyperthermophilic archaeons *Pyrococcus furiosus* and *Thermococcus kodakaraensis*. Previously, *Escherichia coli* containing plasmids carrying the *Tneap* and cas3 genes from both organisms have been constructed by the Terns’ lab. These strains produce recombinant proteins that can be extracted and purified for use in electrophoretic mobility shift assays (EMSA). These assays will be used to characterize the protein-RNA interactions by visualizing 1) crRNP (ribonucleoprotein) formation and 2) subsequent target DNA binding, in the presence of different combinations of the *Tneap* proteins and mature crRNAs. Subsequently, I will attempt to show recruitment of Cas3 onto the crRNP followed by cleavage of the DNA target. To do this, I will perform cleavage assays to determine the functionality of these *Tneap* RNPs in silencing invader DNAs. Cas3 has been shown to independently cleave RNA and DNA in *Methanothermobacter jannaschii* and *Pyrococcus furiosus*, but no evidence of its activity in the context of a crRNP has been recorded. After observing *Tneap* complex
binding of nucleic acids, I will incorporate Cas3 into the Tnep RNP assays to see if it will cleave the target with the guidance of the Tnep protein complex.

Characterizing the pathways of the Tnep module in Thermococcus kodakaraensis adds one more piece to the puzzle of understanding the functioning of the CRISPR-Cas immune system as a whole. CRISPR pathways are very complex and diverse and have to be isolated and studied individually to make sense of the entire system. A complete understanding of the mechanisms of the CRISPR-Cas system will make way for biomedical advancements pertinent to bacterial immunization and combating viruses and drug resistant bacteria.

Citations:


Pharmacologic Rescue of Mutations that Affect Tissue-Specific Glycan Expression in *Drosophila melanogaster*

2012 Summer Fellow: Brittany Truitt

Research Mentor: Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology

Cell-cell signaling is very important in the development and specialization of cells and ultimately determines the expression of gene products in tissues. This signaling is regulated by glycans on the surface of the cell. Manipulation of cell signaling through a change in glycan expression can lead to altered phenotypes, many of which are present in certain diseases (2,3). However, regulatory mechanisms that control glycan expression and glycoprotein glycosylation have not yet been fully described. A better understanding of these regulatory mechanisms will highlight their relevance for human pathologies and identify targets for new drug treatments.

*Drosophila* provides a good tool for studying the regulation of vertebrate glycosylation because it shares many genes with humans. Previous research has shown that glycosylation in *Drosophila* is controlled by the Toll-like receptor pathway (TLR) (3). This pathway regulates expression of glycans called HRP epitopes in the central nervous system and peripheral nervous system of the Drosophila embryo. An identified mutation in the TLR pathway, called *sff* B22, demonstrates the sugar-free frosting (*sff*) phenotype, which is a lack of HRP epitope expression. This strain has shown an alteration in geotaxis behavior and glycan expression when compared to the wild-type (3,4). Previous research shows that this geotaxis phenotype can be corrected through treatment with monoamine oxidase inhibitors and selective serotonin reuptake inhibitors (anti-depressants) of *Drosophila* embryos (4). This finding leads to the hypothesis that HRP epitope expression can also be rescued by such treatments. If drug treatment does indeed show a change in epitope expression, more information about glycosylation can also be identified and new insights into the molecular pathology associated with human depressive disease may be generated. This research will attempt to demonstrate a change in HRP epitope expression using various pharmacological treatments in the hopes of discovering more information about glycosylation in general.

Stocks of both the mutant *sff* B22 and the wild-type (OreR) will be prepared. Drosophila will be allowed to lay for a maximum of 16 hours and embryos will be collected. A process called HRP staining will then be implemented. The first step is dechorionation, which uses bleach to remove the chorion layer, a hard, semipermeable outer shell. The embryos will then be transferred to an eppendorf tube containing the drug dissolved in PBS. The optimized dilution to use will be determined prior to experimentation. The embryos will be given time for the drug to penetrate the membrane and then washed with a wash solution of PBS and Triton-X100. The embryos will be placed in a 25°C chamber overnight. The next stage is fixing the embryos with a formaldehyde/heptane mixture to stabilize the embryos for analysis of HRP-epitope expression. Next the vitelline membrane will be cracked by vigorously shaking the tube containing the embryos.
This creates small holes in the outer membrane, which will allow the drug and the antibodies to enter the embryo. The embryos will be treated with primary antibody, followed by secondary antibody. The presence of HRP epitope bound to antibodies will be shown with DAB staining or fluorescence. Numerous trials using various drug treatments in varying concentrations will be performed.

After appropriate staining techniques are performed, the embryos can be viewed under a microscope. It is suspected that sffB22 embryos subjected to drug will show a different level of HRP epitope expression along areas such as the nerve cord and posterior hindgut, proving that glycosylation has been affected. It is expected that the HRP epitope expression will be increased and look more similar to the OreR wild type embryo. Previous, preliminary experimentation shows that the MAOI Phenelzine caused increased epitope expression so it is possible that other anti-depressants will do the same. However, Phenelzine caused another dominant phenotype in the embryos known as arrested development. This means that they did not develop fully and thus showed no fluorescent staining (1). It is hoped that optimizing the drug dosage regimen will lead to reproducible drug effects and provide clear results concerning the effects of drug treatment on glycosylation.
The Role of Secretory Phospholipase A₂ in Bile Acid-Induced Prostate Cancer Cell Death

2012 Summer Fellow: Stephanie Wilding
Research Mentor: Dr. Brian Cummings, Department of Biochemistry & Molecular Biology

Prostate cancer is the second leading cause of cancer-related death in men in the United States¹. Secretory phospholipase A₂ (sPLA₂) are esterases that degrade phospholipids and are secreted to the extracellular side of cells². Recent studies show that sPLA₂ expression in prostate cancers correlates to metastasis and poor prognosis³,⁴. My previous work used quantitative reverse transcriptase-polymerase chain reaction assays to show that several different sPLA₂ isoforms are expressed in three different prostate cancer cell lines (PC-3, LNCaP, and DU-145). These isoforms include Groups IB, IIA, V, and X. Group IB sPLA₂, Group IIA sPLA₂ and Group V sPLA₂ were expressed at higher levels in PC-3 cells, compared to LNCaP cells, which had higher levels of expression than DU-145 cells. Group X sPLA₂ had the highest levels of expression in PC-3 cells followed by DU-145 cells, with low levels of expression in LNCaP cells.

Recent studies from the laboratory of my advisor, Dr. Brian S. Cummings, demonstrated the design of lipids-based nanoparticulate drug carriers that are targeted by sPLA₂⁵. This study showed that Groups IIA and III sPLA₂ could degrade these drug carriers and increase drug release. Unfortunately, the above studies were not performed in cells, and degradation and drug release was induced by addition of exogenously added sPLA₂. Thus, it is not known if endogenous sPLA₂ isoforms could have similar effects on these nanoparticles. sPLA₂ require mM concentrations of Ca²⁺ for activity; however, this level of calcium in the bloodstream can cause damage to other cells and is not necessarily present in the tumor microenvironment. A new method of activation of sPLA₂ is needed if it is to be used as a molecular target for anticancer drugs or delivery using these nanoparticles.

Recent studies show that bile acids cause apoptosis in colon cancer cell lines⁶ and that bile acids increase sPLA₂ activity, contributing to lung damage⁷. Based on this observation, I hypothesized that we could use bile acids to increase endogenous sPLA₂ activity, which would increase the degradation of lipid-based nanoparticles and enhance drug release. The overall result of these increases would be increased therapeutic efficacy of chemotherapeutics. My preliminary data shows that treatment of PC-3, LNCaP, and DU-145 cells with bile acids induced time- and concentration-dependent cell death; however, it does not tell me anything about the mechanism of cell death or role of sPLA₂ in this process, or if this would increase the efficacy of these nanoparticles.

The hypothesis of my work is that the activation of sPLA₂ with bile acids would increase prostate cancer cell death induced by sPLA₂-targeted lipid-based nanoparticles. The goals of my CURO Summer Research Fellowship would be to use bile acids to increase the expression of sPLA₂.
Proposals

in PC-3, LNCaP and DU145 cells. I will use three different types of bile acids including chenodeoxycholic acid (CDCA), deoxycholic acid (DCA), and lithocholic acid (LCA). In Part 1 of my work I will treat cells with these lipids and assess changes in sPLA₂ expression using qPCR. In Part 2 of my work I will correlate these changes to alterations in cell death induced by the chemotherapeutics doxorubicin and cisplatin. In Part 3 of my work I will determine if bile acids alter the efficacy of these chemotherapeutics when they are delivered using sPLA₂-targeted nanoparticles. Cell death will be measured based on the staining of MTT, a mitochondrial dye, and measuring apoptosis (apoptotic marker) and propidium iodide (necrotic marker) staining using flow cytometry. These aims are achievable for a summer research project as I already am working in the laboratory, growing and treating these cells and performing qPCR. I also have preliminary data already determining the proper concentrations and time-points to conduct these studies. I will have to learn the flow cytometry methods. What I hope to learn from these aims is if bile acids can be used as an adjunct to chemotherapy for treatment of prostate cancer.


Defining the Latino Experience in Roswell, GA: A Study in Sociolinguistics
2012 Summer Fellow: Anna Wilson
Research Mentor: Dr. Bill Kretzschmar, Department of English

Where once Spanish was relegated to historically Hispanic-influenced parts of the country, it can now be heard in virtually every corner of our nation. Hispanics, or Latinos as they preferred to be called, are an integral component of our society, and have molded a place for themselves in our communities. Many studies have been conducted in those aforementioned “historically” Spanish-speaking areas, namely the Southwest and the Northeast (New York City). Outside of this range, however, few linguistics scholars have characterized the nature of the many Latinos communities that exist. Using the framework of my faculty mentor, I propose contributing to the field an in-depth sociolinguistic description of the Latino community of Roswell, Georgia by conducting a series of interviews. The framework to which I refer is Dr. William Kretzschmar’s Roswell Voices Project, which since 2002 has collaborated with the local Convention and Visitors Bureau in order to create a historical and dialectal perspective of the city. In the Fall Semester of this academic year, I began working with Dr. Kretzschmar to familiarize myself with the literature and to launch a pilot study. I succeeded in carrying out one interview. (The participant was about my age and had the sniffles.) This semester, I am continuing to work with him to further the same study and become versant on Spanish in the United States.

From my experiences in Roswell searching for a volunteer interviewee, I have realized that my methods of requesting directly for an interview were ineffectual. For the summer of 2012, I propose conducting an ethnographic study by which I become a participant observer in the Latino culture of Roswell. Attempting to access this community from the outside has been inadequate; therefore, I will try to see it through their eyes, from the inside out. Using this approach, I will aim to conduct a series of interview either in English or Spanish, depending on the speaker’s comfort level. I will then examine the data, transcribe them, and search them for sociolinguistic indicators. I hypothesize based on the pilot study that upon entering into Roswell’s society, Latinos encounter a dichotomy not only in socioeconomic class, but also in group identity and preset social norms based off it, as well as acceptance by the outside community as a direct result of differences in community involvement. Sociolinguistic indicators will be linguistic usages that reflect these combined forces, specifically that the less permanent, accepted, and involved portion of Roswell’s Latinos will employ non-prestige language, while the opposite will be true of the more permanent, accepted, and involved group.
Appendix A
2011 CURO Summer Research Fellows

Lauren Anderson  
Dr. Amy Ross, Department of Geography  
The Legacy of Truth Analyzing the Impact of the Truth and Reconciliation Commission on South Africa’s Millennial Generation

Joshua Trey Barnett  
Dr. Corey W. Johnson, Department of Recreation & Leisure Studies  
Drag’s Not a Drag: Narrative Inquiry of Serious Drag Performers

Brooke Bauer  
Dr. Robert Vandenberg, Department of Management  
Organizational Commitment in the Workplace

Melissa Brown  
Dr. Kecia Thomas, Department of Psychology  
Black Stereotypes in Reality Television and the Reinforcement of Prejudiced Attitudes

William Costanzo  
Dr. K.C. Das, Department of Biological & Agricultural Engineering  
Algae Biofuel Development Growth Efficiency

Dervin Cunningham  
Dr. Kelley Moremen, Department of Biochemistry & Molecular Biology  
The Recombinant Expression of Proteins in the Glycosylation of Mammalian Cells

Abid Fazal  
Dr. Joy Peterson, Department of Microbiology  
Characterization of Enzymes Produced by Genetically Engineered *Hypocrea jecorina* and Their Use in Fermentation by Recombinant *E. coli.*

Melanie Fratto  
Dr. Vanessa Ezenwa, Odum School of Ecology  
Testing Bacteria-Killing Ability in Songbirds with Two Approaches Before and After Acute Stress

Nisha George  
Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology  
The Role of Cysteine Residues in the Function of the Ras Converting Enzyme (Rcelp)

Erin Giglio  
Dr. Kelly Dyer, Department of Genetics  
Sensory Systems at Play in Drosophila Courtship

Osama Hashmi  
Dr. Monica Gaughan, Department of Health Policy & Management  
From Malpractice to Medicare Addressing the Legal Needs of Primary Care Physicians
Appendices A-K

Anna Beth Havenar
Dr. Dawn Robinson, Department of Sociology
Religion and Impression Change Dynamics An Affect Control Theory Analysis of Christianity and Islam

Ransom Jackson
Dr. John C. Inscoe, Department of History
A Comparative Study of Feminism in Southern Literature Uncle Tom, Beulah and Aunt Phillis's Cabin

Elena James
Dr. Russell Karls, Department of Infectious Diseases
Detection of Mycobacterial Genes Involved in Vitamin 1B12 Uptake

Kellie Laity
Dr. Dorothy Fragazy, Department of Psychology
Development of Nut Cracking Skills in Young Bearded Capuchin Monkeys

Marianne Ligon
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Characterization of the Tnep Complex in the CRISPR-Cas Viral Defense System of Prokaryotes

Katherine Manrodt
Dr. Steven Lewis, Department of Physics & Astronomy
The Molecular Dynamics of Atomic Sticking Coefficients

Lindsey Megow
Dr. Kaori Sakamoto, Department of Pathology
Intestinal Nematode Infection’s Inhibitory Effect on M. bovis

Tuiumkan Nishanova
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology
Assembly of High Density Lipoproteins via Retained N-terminal Signal Peptides

Farres Obeidin
Dr. David Hall, Department of Genetics
Modeling Subtelomeric Growth and the Adaptive Telomere Failure Hypothesis

Joshua Parker
Dr. Richard Steet, Department of Biochemistry & Molecular Biology
Identification and Characterization of a Novel Beta-Galactosidase Enzyme in Brain

Lea Rackley
Dr. Katarzyna Jerzak, Department of Comparative Literature
Finding the Child in Children’s Literature

Luben Raytchev
Dr. Michael Yabsley, Department of Wildlife Disease Ecology
Intracellular Blood Parasites of Common Freshwater Turtle Species in Georgia Prevalence and Burden
Appendices A-K

Mark Rolfsen
Dr. Jessica Muilenburg, Department of Health Promotion & Behavior
The Implementation of Effective Smoking Cessation Intervention for Drug and Alcohol Addicts in Substance Abuse Treatment

Dana Schroeder
Dr. Quint Newcomer, Director, UGA Costa Rica
An Applied Research Examination of Progress Toward Sustainability Goals at UGA's Costa Rica Campus in San Luis de Monteverde, Costa Rica

Daniel Sharbel
Dr. Timothy Dore, Department of Chemistry, and Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology
Assessing Rec1-Protease Inhibition in a Cell-Based Fluorescence Ras Localization Assay

Daniel Smith
Dr. Michael Marshall, Lamar Dodd School of Art
Contemporary Interpretation of Dante Alighieri's Inferno Through Photographic Illustration

Justin Smith
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Characterization of a Putative Endonuclease-RNA Complex Involved in CRISPR-Mediated Viral Defense

Theresa Stratmann
Dr. John Maerz, Warnell School of Forestry & Natural Resources
The Science of Monitoring Rare Species Developing Methods for Surveying and Monitoring Bog Turtles

Christopher Sudduth
Dr. Cathleen Brown, Department of Kinesiology
Establishing Clear Cut-Off Scores to Develop Classification Criteria for Subgroups of Individuals with CAI

Connor Sweetnam
Dr. Marcus Fechheimer, Department of Cellular Biology, and Dr. Ruth Furukawa, Department of Cellular Biology
The Involvement of Coenzyme Q (50) and Tau in the Formation of Hirano Bodies

Nakul Talathi
Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology
Determining the Effect of Oncogenic Mutations on EGFR Protein Kinase Activation and Phosphorylation

Korry Tauber
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology, and Dr. Lance Wells, Department of Biochemistry & Molecular Biology
Examining the Function of O-GlcNAc in Drosophila to Analyze Intercellular Signaling Pathways

Nathan Usselman
Dr. Jason Locklin, Department of Chemistry
Synthesis of Enzyme Functionalized Conjugated Polymers for Implantable Power Sources
Appendices A-K

Star Ye
Dr. Jason Zastre, Department of Pharmaceutical & Biomedical Sciences
Measuring Lactate Production to Understand Transketolase and its Isoforms in Breast Cancer Cells
Appendix B
2010 CURO Summer Research Fellows

Jessica Alcorn
Dr. Audrey Haynes, Department of Political Science
The Validity of the News Marketing Hypothesis

Amarachi Anukam
Dr. Pamela Orpinas, Department of Health Promotion & Behavior
Healthy Teens: A Longitudinal Study of ‘at risk’ Secondary Students

Thomas Bailey
Dr. William Kretzschmar, Department of English
Six Bodies: A Quantitative Analysis of Japanese Discourse Features

Michael Bray
Dr. Kelly Dyer, Department of Genetics
Genetic Analysis of Pigmentation in Drosophila tenebrosa

Ebony Caldwell
Dr. Monica Gaughan, Department of Health Policy & Management
Influences on the Outlook of the Post-college Educational Opportunities and Choices of Undergraduate Science Majors

Caitlin Cassidy
Dr. William Kretzschmar, Department of English
The Art of Persuasion: How Small Business Owners Use Speech to Market Products in Roswell, GA

Meagan Cauble
Dr. Mike Adams, Department of Biochemistry & Molecular Biology
Mechanism of plant biomass conversion without pre-treatment by anaerobic thermophilic bacterium Caldicellulosiruptor bescii

Daniel Celluci
Dr. Steven Lewis, Department of Physics & Astronomy
Applications of Molecular Dynamics Simulations to Models of Gas-Grain Interactions in the Interstellar Medium

Jessica Fazio
Dr. Richard Hubbard, Department of Chemistry
Carvone Luche Reduction Followed by Optical Activity Determination

JoyEllen Freeman
Dr. Barbara McCaskill, Department of English
Georgia Slaves in Transatlantic Culture: Blind Tom and William and Ellen Craft

Debashis Ghose
Dr. Joy Doran-Peterson, Department of Microbiology
Engineering Saccharomyces Yeast Strains to Better Ferment Pine Wood Biomass to Ethanol
Camille Gregory  
Drs. Marcus Fechheimer and Ruth Furukawa, Department of Cellular Biology  
Creating a Transgene Mouse to Study the Physiological Role of Hirano Bodies in the Progression of Alzheimer's Disease

Shanterian Hester  
Dr. Michael Pierce, Department of Biochemistry & Molecular Biology  
Exercising Glycoproteomics Analyses to Discover New Breast Cancer

Georgianna Mann  
Dr. Sonia Hernandez, Warnell School of Forestry and Natural Resources  
Bufo marinus Pathogen and Parasite Analysis as a Model for Ecosystem Change

Krelin Naidu  
Dr. Brian Cummings, Department of Pharmaceutical & Biomedical Sciences  
Epigenetic Effects of Bromate on p21 and Histone-2AX Expression in HEK293 Cells

Rebecca Parker  
Dr. Kevin McCully, Department of Kiniseology  
Effects on Blood Flow Velocity and Arterial Diameter Produced by Compression Therapy in SCI Individuals

Jay Patel  
Dr. Boris Striepen, Department of Cellular Biology  
Characterization of Striated Fiber Assemblin Proteins in T. gondii

Rachel Perez  
Dr. J. Peter Brosius, Department of Anthropology  
Oil Palm Proliferation in Peru

Ryan Prior  
Dr. Katarzyna Jerzak, Department of Comparative Literature  
Foundations of Medical Philosophy in Ancient Civilizations

Malavika Rajeev  
Dr. Sonia Altizer, Odum School of Ecology  
The Effect Of Parasite Infection on Monarch Butterfly Mating Behavior

Hope Rogers  
Dr. Jonathan Evans, Department of English  
Real-World Applications of Tolkien's Races and Cultures

Carla Rutherford  
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology  
Human Resistance to Infection by African Trypanosomes

Laura Smart  
Dr. Rheeda Walker-Obasi, Department of Psychology  
Dialectical Behavior Therapy and Distraction: Using the Cold Pressor Test to Determine Efficacy
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Stephen Thompson
Dr. George Majetich, Department of Chemistry
Application of Friedel-Crafts Annulations to Conjugated Dienones and Silyl Substituted Arene Rings for the Synthesis of Complex Tricycles

Jake Young
Professor George Contini, Department of Theatre & Film Studies
A Study Of The Psycho-Physical Performance Technique Of Michael Chekhov
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Appendix C
2009 CURO Summer Research Fellows

Christine Akoh, CURO-OVPR Summer Research Fellow
Dr. Joseph Frank, Department of Foods & Nutrition
Effect of Mono and Divalent Cations on Biofilm Formation in a Prolific Biofilm Forming Strain of Listeria Monocytogenes Cultured in a Chemically Defined Medium

Sambita Basu, CURO-Jane and Bill Young Scholarship Summer Fellow
Dr. Gerardo Alvarez-Manilla, Department of Biochemistry & Molecular Biology
Protein-linked Glycoconjugates as Biomarkers for Cancer of Other Physiological Processes

Chip Blackburn, CURO-OVPI Summer Fellow
Dr. Hugh Ruppersburg, Department of English
Harry Crews and the Tradition of Southern Fiction-Writing

Corbin Busby, CURO Research Fellow
Dr. Isabelle Wallace, Lamar Dodd School of Art
Imaging masculinity in Contemporary Fashion Photography

Kelly Cummings, CURO-OVPR Summer Fellow
Dr. Scott Schatzberg, College of Veterinary Medicine
Differentiation of Natural and Post-vaccinal Canine Distemper Virus Encephalomyelitis

Charles Ginn, CURO Research Fellow
Dr. Hugh Ruppersburg, Department of English
Charting the Oppression of Minority Groups through Southern Gothic Literature

Erin Hansen, CURO Research Fellow
Dr. Jennifer McDowell, Department of Psychology
Effects of Daily Saccade Practice on Behavioral and Neural Plasticity in Schizophrenics

Dillon Horne, CURO-OVPI Summer Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
The Development and Implications of Predictive Modes of Thought from the Renaissance to Modernity

Tiffany Hu, CURO Research Fellow
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology
Re-examine Alternative Editing and Understanding the Protein Diversity in T. brucei

Whitney Ingram, CURO-OVPI Summer Fellow
Dr. Yiping Zhao, Department of Physics & Astronomy
Optimization and Analysis of Titanium Dioxide Nanorod Photodegradation

Daniel Jordan, CURO Research Fellow
Dr. Betty Jean Craig, Department of Comparative Literature
German Sustainable Farming as a Model for Resource Stewardship

Fahad Khan, CURO-ITP Summer Fellow
Dr. Jason Zastre, Department of Pharmaceutical & Biomedical Science
Highly Active Antiretroviral Therapy
Max Klein, CURO-UGA Alumni Association Summer Fellow  
Dr. Richard Steet, Department of Biochemistry & Molecular Biology  
Gauging the Developmental Impact of Impaired Glycoprotein Breakdown in Zebrafish

Susan Klodnicki, CURO-OVPR Summer Fellow  
Dr. Jim Lauderdale, Department of Cellular Biology, and Dr. Andrew Sornborger, Department of Mathematics and Engineering  
PTZ and Other Chemoconvulsant Effects on Adult Zebrafish

Bridget Mailey, CURO Research Fellow  
Dr. Amy Ross, Department of Geography  
The ICC and the US: How have the Actions of the US Affected the ICC in the Past and how will they Affect the ICC in the Future?

Francisco Marrero, CURO Research Fellow  
Dr. Leidong Mao, Department of Engineering  
Development of Ferrofluid Based Platform for Particles and Cellular Manipulation

Amar Mirza, CURO Research Fellow  
Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology  
A Computational Study of the Crystalline Structure of Tyrosine Kinase Mutants

Cody Nichol, OVPR Research Fellow  
Dr. Cynthia Suveg, Department of Psychology  
Empirical Examination of Child Emotion Assessments: A Comparison of Child, Parent and Behavioral Observation Methods

Emily Pierce, CURO Summer Fellow  
Dr. Wayne Parrot, Department of Crop & Soil Sciences  
Genetic Alteration of the Soybean to Promote Astaxanthin Production

Akanksha Rajeurs, CURO Research Fellow  
Dr. Russell Karls, Department of Infectious Diseases  
Develop an Efficient Method to Create Marked and Unmarked Mutations in the Human Genome

Al Ray, III, OVPI Research Fellow  
Dr. Susan Sanchez, Department of Infectious Diseases  
Relationship between Epidemiology of Salmonella in Non-Domestic Avian Species and Humans in the Southeastern United States

Joe Reynolds, CURO Research Fellow  
Dr. Frank Harrison, Department of Philosophy  
Analysis of the Nature of the Individual and the Notion of his Happiness

Matthew Sellers, CURO Research Fellow  
Dr. Hugh Ruppersburg, Department of English  
Finding God in the Poetry of Robert Penn Warren

Michael Slade, CURO Research Fellow  
Dr. Frank Harrison, Department of Philosophy  
Implicit System of Rational Thought Analogous to Modern First-Order and Modal Logics in Plato’s Late Dialogues
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**Alex Walker**, OVPR Research Fellow
Dr. Timothy Dore, Department of Chemistry
Synthesis of BHQ-dithiol as a Photoremovable Protecting Group for Mifepristone

**Shuyan Wei**
Dr. Scott Schatzberg, College of Veterinary Medicine
Development of Consensus-Degenerate Hybrid Oligonucleotide Primers (CODEHOPs) for Retroviral Discovery

**2009 Howard Hughes Medical Institute EXORP Student**

**Valeriya Spektor**
Dr. Sue Wessler, Department of Plant Biology
Designing Teaching Modules for Genome Analysis
Appendix D
2008 CURO Summer Research Fellows

Zachary Anderson, CURO Summer Research Fellow
Dr. Peter Brosius, Department of Anthropology
Multicultural Perspectives on Landscape Change

Matthew Belcher, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Determinants in the Localization of Telomerase to Telomeres

Mary Elizabeth Blume, CURO-OVPR Summer Research Fellow
Dr. Stefaan Van Liefferinge, Department of Art History
Uncovering Traditions of the Gothic Style in the Architectural Plans of Saint Germain-des-Pres and Saint Martin-des-Champ in Paris, France

Melissa Brody, CURO-OVPR Summer Research Fellow
Dr. Ron Carroll, Odum School of Ecology
Interactions of Bees and Hummingbirds with Hamelia patens

Carolyn Crist, CURO-UGA Summer Research Fellow
Dr. John Greenman, Grady College of Journalism & Mass Communications
News in the Black Belt: Teaching Journalists how to Cover Poverty in Persistently Poor Counties

M. Logan Davis, CURO-BHSI Summer Fellow
Dr. James Franklin, Department of Pharmaceutical & Biomedical Sciences
Long-Range Retrograde Transduction of Trophic and Survival Signals in Mouse Sympathetic Neurons

Marcus Hines, CURO-BHSI Summer Research Fellow
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology, and Dr. Lance Wells, Department of Biochemistry & Molecular Biology
Analyzing the Function of O-GlcNAc in Drosophila

Haylee Humes, CURO Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
How AICD and Fe65 are Recruited to Hirano Bodies

Lindsay Jones, CURO Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Identification and Characterization of a Nuclease that Functions in an RNA-Mediated Viral Defense Pathway (RNAi) in Prokaryotes

Tyler Kelly, CURO Summer Research Fellow
Dr. Elham Izadi, Department of Mathematics
Usage of Linear Subspaces with Varieties
Jung Woong Kim, CURO Summer Research Fellow  
Dr. Andrew Sorenborger, Department of Mathematics, and Dr. James Lauderdale, Department of Cellular Biology  
Imaging of Endogenous Ca2+ Waves in Developing Zebrafish

Jennifer Lee, CURO-BHSI Summer Research Fellow  
Dr. Ronald Blount, Department of Psychology  
Understanding Pediatric Symptoms

Sharon McCoy, CURO-OVPR Summer Research Fellow  
Dr. Chad Howe, Department of Romance Languages  
Dialect Perceptions of Spanish Speakers in Georgia

Katherine McGlamry, CURO-Jane and Bill Young Scholarship Summer Research Fellow  
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology  
Glycan Interactions and the Development and Spread of Cancer Cells

Alice Meagher, CURO-BHSI Summer Research Fellow  
Dr. Michael Adams, Department of Biochemistry & Molecular Biology  
Expression and Characterization of the Heterologously Expressed Soluble Hydrogenase I from Pyrococcus furiosis

Madison Moore, CURO-BHSI Summer Research Fellow  
Dr. Jennifer McDowell, Department of Psychology  
Behavioral and Neural Plasticity Following Daily Practice of Saccade Tasks in Schizophrenia

Emily Meyers, CURO-OVPR Summer Research Fellow  
Dr. Patricia Sullivan, Department of International Affairs  
The Advantage of Weakness: How Weak States can Overcome Military Might of Strong States

Kelly Nielsen, CURO-OVPR Summer Research Fellow  
Prof. George Contini, Department of Theatre & Film Studies  
Augusto Boal’s Invisible Theatre: Political Play with an Unassuming Audience

Sean O’Rourke, CURO Summer Research Fellow  
Dr. Kathy Simpson, Department of Kinesiology  
Neuromuscular Activation and Movement Kinematics Exhibited During the Sit-to-Stand by Multiple Sclerosis Individuals

Julie Patel, CURO Summer Research Fellow  
Dr. Patricia Sullivan, Department of International Affairs  
Military Interventions by Powerful States

Neil Pfister, CURO-BHSI Summer Research Fellow  
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology  
Interactions that Define the Organization of RNA-Protein Complexes Involved in Prokaryotic RNA Interference

Stefann Plishka, CURO-Franklin College of Arts and Sciences Summer Research Fellow  
Dr. Asen Kirin, Department of Art History  
Imagining Constantinople: Imperial Houses of Worship as Symbols of State Ideology
Katie Pyne, CURO Summer Research Fellow
Dr. Jerome Legge, Department of International Affairs
Refugees and Internally Displaced People: How Effective are the United Nations, Nongovernmental Organizations, and Subsequent Initiatives in Pacifying this Complex Humanitarian Crisis?

Joseph Rimando, CURO-Interdiciplinary Toxicology Program Summer Research Fellow
Dr. Ralph Tripp, Department of Infectious Diseases
Understanding and Preventing the Interaction between RSV’s G Protein and the CX3CR1 Cell Receptor

Aalok Sanjanwala, CURO Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology, and Dr. Ruth Furukawa, Department of Cellular Biology
The Effect of Hirano Bodies on Mutated Tau Protein

Neeraj Sriram, CURO Summer Research Fellow
Dr. Mark Eiteman, Department of Biological & Agricultural Engineering
Solving the World’s Energy Crisis – Not One Sugar at a Time

Giridhar Subramanian, CURO Summer Research Fellow
Dr. Brock Tessman, Department of International Affairs
Power and Influence in Southeast Asia: A Study of the Methods Used by India, China, and the United States

Aileen Thomas, CURO Summer Research Fellow
Dr. Nicole Lazar, Department of Statistics
How Random is Pseudorandom

Kathryn Turner, CURO Summer Research Fellow
Dr. Shelley Hooks, Department of Pharmaceutical & Biomedical Sciences
Comparison of RGS Regulation of LPA Signaling in Prostate Cancer and Ovarian Cancer

Manouela Valtcheva, CURO Summer Research Fellow
Dr. Jennifer McDowell, Department of Psychology
Antisaccade Performance and Deficit Characteristics in a Normal Population

Hunter Wilson, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
8-Chloro-7-hydroxyquinoline as a Bilogically Useful Photoremovable Protecting Group

Laura Wynn, CURO-OVPR Summer Research Fellow
Dr. Martin Kagel, Department of Germanic & Slavic Languages
Issues in Current Turkish-German Literature
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Appendix E

2007 CURO Summer Research Fellows

Caroline M. Anderson, CURO-OVPR Summer Research Fellow
Dr. John Turci-Escobar, Department of Music Theory, and Dr. Max Reinhart, Department of German
A Psychoanalytical Examination of Wolf and Mörike’s Peregrina Songs

Joseph Burch, CURO Summer Research Fellow
Dr. Harry Dailey, Department of Microbiology and Biochemistry & Molecular Biology
Converting Ferrochelatase into a Cytochrome c-like Protein

Amy Burrell, CURO-BHSI Summer Research Fellow
Dr. Debra Mohnen, Department of Biochemistry & Molecular Biology
Analysis of the Transcriptional Expression of Arabidopsis GAUT Genes: 15 Proven and Putative Plant Cell Wall Biosynthetic Galacturonosyltransferases

Lee Ellen Carter, CURO-OVPR Summer Research Fellow
Dr. Fausto Sarmiento, Department of Geography
Ecoregional Conservation Among Indigenous Communities in Cotacachi, Ecuador

Kimberly DeLisi, CURO-BHSI Summer Research Fellow
Dr. Ray Kaplan, Department of Infectious Diseases
Parameters Affecting Fecal Egg Count Data for Determining Drug Resistance in Nematode Parasites of Horses

Joshua Dunn, CURO-OVPR Summer Research Fellow
Dr. William Kretzschmar, Departments of English
The Youth of Roswell Voices: A Linguistic Analysis

Katie Flake, CURO-BHSI Summer Research Fellow
Dr. Maor Bar-Peled, Complex Carbohydrate Research Center
The Arabinose Kinase Project

James Gordy, CURO Summer Research Fellow
Dr. Michael Adams, Department of Biochemistry & Molecular Biology
Developing Methodologies for the Study of Small ORFs in \textit{P. furiosus}

Jana Hanchett, CURO Summer Research Fellow
Dr. David Schiller, Department of Musicology/Ethnomusicology
Latino and Hispanic Musical Influences on Athens-Clarke County

Laura Harrison, CURO-BHSI Summer Research Fellow
Dr. Corrie Brown, Department of Pathology
Campylobacter in the Crypts

Clare Hatfield, CURO-OVPR Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs
Democracy and the Choice of Law: The Intersections of Shari’a, Domestic and International Law

Anna Hudson, CURO Summer Research Fellow
Dr. Richard Dluhy, Department of Chemistry
Using Surface Enhanced Raman Spectroscopy for the Detection of Pathogens

Andy Kragor, CURO-Jane & Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center, and Dr. Carl Bergmann, Complex Carbohydrate Research Center
Unbiased Isolation and Carbohydrate Mapping of Alpha-Dystroglycan

Brian Laughlin, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center
Functional Analysis of the Magnaporthe grisea Secretome

James MacNamara, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Biochemistry & Molecular Biology
Synthesis of Quinolinol-Based Inhibitors of Rec1p

Prashant Monian, CURO-Interdisciplinary Toxicology Program Summer Research Fellow
Dr. Brian Cummings, Pharmaceutical & Biomedical Sciences
Molecular Inhibition of Independent Phospholipase A2 and its Effect on Prostate Cancer Growth

Neil Naik, CURO-OVPR Summer Research Fellow
Dr. Ruth Harris, Department of Food & Nutrition
The Effect of Antagonizing Stress Receptors in Rats During Repeated Exposure to Restraint Stress

Natalie Nesmith, CURO-BHSI Summer Research Fellow
Dr. Mary Bedell, Department of Genetics
Genetic Studies on the Roles of KITL in Regulating the Proliferation and Apoptosis of Primordial Germ Cells in Mice

Victor Orellana, CURO Summer Research Fellow
Dr. Nicolás Lucero, Department of Romance Languages
Unsung Hero: A Literary and Historical Study of Lautaro

Tulsi Patel, CURO Summer Research Fellow
Dr. Scott Gold, Department of Plant Pathology
Developing a Biocontrol Agent for Chinese Privet, Ligustrum sinense

Tomas Pickering, CURO-OVPR Summer Research Fellow
Dr. Dorothy M. Fragaszy, Department of Psychology
Manner of Hammer Stone Use in Wild Capuchin Monkeys

Cleveland Piggott, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
The Formation of Hirano Bodies

Purvi Sheth, CURO Summer Research Fellow
Dr. Russell Karls, Department of Infectious Disease
Characterization of Mycobacterium shottsii

Traci Tucker, CURO Summer Research Fellow
Dr. Dawn Robinson, Department of Sociology
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Jessica Van Parys, CURO-UGA Alumni Association Summer Research Fellow
Dr. David Mustard, Department of Economics
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Delila Wilburn, CURO Summer Research Fellow
Dr. Barbara McCaskill, Departments of African American Studies and English
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Karen Wong, CURO Summer Research Fellow
Dr. Andrew Whitford, Department of Political Science
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2006 CURO Summer Research Fellows

Sarah Breevoort, CURO-BHSI Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
Construction of Three Rcelp Mutant Plasmids to Aid in the Characterization of Rcelp Enzymatic Activity

Lauren Coffey, CURO Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Susan Fang, CURO Summer Research Fellow
Prof. Christopher Hocking, Studio Foundations

Courtney Grant, CURO-BHSI Summer Research Fellow
Dr. Julie Coffield, Department of Physiology and Pharmacology
An Investigation of Botulinum Neurotoxin Interactions on RhoA Activity Using In Vitro Assays

Erica Hall, CURO-BHSI Summer Research Fellow
Dr. Jessie Kissing, Department of Genetics

Adele Handy, CURO-UGA Alumni Association Summer Research Fellow
Dr. Greg Robinson, Department of Chemistry

Celan Hardman, CURO Summer Research Fellow
Prof. Joe Norman, Drawing and Painting

Sana Hashmi, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center
Alteration of Alpha-Dystroglycan and Cancer Progression

Brian Levy, CURO Summer Research Fellow
Dr. Larry Nackerud, School of Social Work
Courrie – Not Email: Implications for Government Regulation of a Social Phenomenon. A Case Study of Language in France

Maggie Mills, CURO-NSF/SPIA Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Anna-Marieta Moise, CURO-BHSI Summer Research Fellow
Dr. Andrea Hohmann, Department of Psychology
Neurochemical Basis of Social Defeat in Syrian Hamsters: Role of Endogenous Cannabinoids

Lamar Moree, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center

Jesse Oakley, CURO Summer Research Fellow
Dr. Laurie Fowler, Department of Ecology
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Katie Orlemanski, CURO-OVPR Summer Research Fellow
Dr. Patricia Richards, Department of Sociology
Reclaiming “Development” within the Context of Low-Income Neighborhoods

Danielle Pearl, CURO-OVPR Summer Research Fellow
Dr. Keith Langston, Germanic and Slavic Languages
Press Freedom, E.U. Accession, and Democracy in Croatia

Daniel Perry, CURO Summer Research Fellow
Dr. David Landau, Department of Physics and Astronomy

Andrew Pierce, CURO Summer Research Fellow
Dr. Thomas McNulty, Department of Sociology

Richard Piercy, CURO-OVPR Summer Research Fellow
Dr. Cory Momany, Department of Pharmaceutical and Biomedical Sciences

Kurinji Pandiyan, CURO Summer Research Fellow
Dr. Steven Holloway, Department of Geography
Understanding Public Space in a New Urbanist Development

Mandy Redden, CURO-BHSI Summer Research Fellow
Dr. Robert Arnold, Department of Pharmaceutical and Biomedical Sciences
Towards a More Effective Delivery System for Anti-Cancer Drugs

Eva Bonney Reed, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology

Lisa Rivard, CURO-Toxicology Summer Research Fellow
Dr. Jeff Fisher, Toxicology

Sonia Talathi, CURO-OVPR Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
Effectiveness of Ca2+-Independent Phospholipase A2 Inhibitors in the Induction of Cheomterapeutic-Induced Cancer Cell Death

Erika Vinson, CURO Summer Research Fellow
Dr. Richard Siegesmund, Art Education

Joshua Watkins, CURO Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
The Price of Victory: When Leaders Underestimate the Cost of War

Daniel Weitz, CURO-OVPR Summer Research Fellow
Dr. Gary Bertsch, Department of International Affairs
The Impact of a European Union Nuclear Weapons Free Zone on the International Non-Proliferation Regime

Shannon Yu, CURO-BHSI Summer Research Fellow
Dr. Nancy Manley, Department of Genetics
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2005 CURO Summer Research Fellows

Grace Anglin, CURO-OVPR Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Family Focused Emotion Communication Training

Ashley Beebe, CURO Summer Research Fellow
Dr. James R. Holmes, Center for International Trade and Security
The Influence of Media on Economic Policy in Brazil and Argentina

Ingrid Bloom, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
Differentiation of Human Embryonic Stem Cells into Endothelial Progenitors

Ian Lewis Campbell, CURO Summer Research Fellow
Dr. Glenn Wallis, Department of Religion
Theories of Mythology and the Way That Myths Have Affected Social and Political Formation

Kimberly Coveney, CURO-CIT Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
Role of iPLA2 in Phospholipid Metabolism in Chemotherapeutic-Induced Cancer Cell Death

William Collier, CURO-OVPR Summer Research Fellow
Dr. Amy D. Rosemond, Institute of Ecology
Analysis of an Exotic Species' Interactions with Native Aquatic Trophic Dynamics: Quantifying the Effects of the North American Beaver (Castor canadensis) on Sub-Antarctic Stream Food Webs in the Cape Horn Archipelago, Chile

John Crowe, CURO Summer Research Fellow
Prof. Mark Callahan, Ideas for Creative Exploration
AUX Launch: Art, Representation, and Commerce on the Web

Katie Griffith, CURO Summer Research Fellow
Dr. Diana Ranson, Department of Romance Languages, and Dr. Judith Preissle, College of Education
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Matthew Haney, CURO-CTEGD Summer Research Fellow
Dr. Rick Tarleton, Department of Cellular Biology
Antibody Depletion of Highly Abundant Proteins in Trypanosoma cruzi for the Fine-Tuning of Proteomic Analysis

Ned Hembree, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
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Alicia Higginbotham, CURO Summer Research Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
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Scott Jacques, CURO Summer Research Fellow
Dr. Mark Cooney, Department of Sociology
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Lisa Jordan, CURO Summer Research Fellow
Dr. Ruth Harris, Department of Food and Nutrition
The Effect of Leptin on Sympathetic Nerve Activity in White Adipose Tissue

Carey Kirk, CURO-OVPR Summer Research Fellow
Dr. David Z. Saltz, Department of Theatre and Film Studies
The Effectiveness of Drama Techniques in Treating People Suffering from Trauma

Andrew Leidner, CURO-CTEGD Summer Research Fellow
Dr. Pejman Rohani, Institute of Ecology
Coevolutionary Behavior and Interference between Fatal Diseases

Jon McGough, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
The Role of Female Choice in Sexual Selection of Drosophila pseudoobscura

Tatyana Nienow, CURO-BHSI Summer Research Fellow
Dr. Walter K. Schmidt, Department of Genetics
Adapting Yeast for the Study of Pitrilysin and Other M16A Enzymes

Erika Porter, CURO-BHSI Summer Research Fellow
Dr. Charles H. Keith, Department of Cellular Biology
Intrinsic Fluorimetric Imaging of Neural Activation in Cultured Cells and Zebrafish

Kurinji Pandiyan, CURO-CAES Summer Research Fellow
Dr. Raj Rao, Department of Animal and Dairy Science, and Dr. Steven Stice, Department of Animal and Dairy Science
Genomic Instability of Human Embryonic Stem Cells

Kelly Proctor, CURO-OVPR Summer Research Fellow
Dr. Lee B. Becker, College of Journalism and Mass Communication
Differences in Environmental Reporting: China and the United States

Rebecca Trupe, CURO Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Family Focused Emotion Communication Training

Russ Richardson, CURO Summer Research Fellow
Dr. Ron Carroll, Institute of Ecology
Sugarcane Processing Waste as a Soil Amendment on Organic, Shade-Grown Coffee under Simulated Drought Conditions for Control of Plant-Parasitic Nematodes

Dustin Williams, CURO-BHSI Summer Research Fellow
Dr. Scott T. Dougan, Department of Cellular Biology
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Fei Yang, CURO Summer Research Fellow
Dr. Janet Westpheling, Department of Genetics
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Stephanie Yarnell, CURO Summer Research Fellow
Dr. Carl Bergmann, Complex Carbohydrate Research Center
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2004 CURO Summer Research Fellows

**Cara Altimus**, CURO Summer Research Fellow  
Dr. Jonathan Arnold, Department of Genetics  
Isolation of a Light Receptor in the Biological Clock of *N. crassa*

**Westin Amberge**, CURO-BHSI Summer Research Fellow  
Dr. Steven Stice, Department of Animal and Dairy Science  
Guided Differentiation of Human Embryonic Stem Cells into Endothelial Cells: Focusing on the Ulex Europaeus Agglutin I Lectin

**Namrata Asuri**, CURO Summer Research Fellow  
Dr. Sidney Kushner, Department of Genetics  
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**Erin Bohan**, CURO-OVPR Summer Research Fellow  
Dr. Katarzyna Jerzak, Department of Comparative Literature  
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**Rebecca Brantley**, CURO-OVPR Summer Research Fellow  
Ms. Ashley Callahan, Georgia Museum of Art  
The Early Fashion Design of Mariska Karasz and the Influence of Her Native Hungary

**Josef Broder**, CURO Summer Research Fellow  
Dr. Andrew Sornborger, Department of Mathematics  
Techniques in High Noise Image Analysis

**Beau Bryan**, CURO-BHSI Summer Research Fellow  
Dr. Michael Pierce, Department of Biochemistry and Molecular Biology  
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**Susannah Chapman**, CURO Summer Research Fellow  
Dr. Virginia Nazarea, Department of Anthropology  
Designing Sui Generis Systems for Traditional Plants and Associated Local Knowledge

**Clayton Griffith**, CURO-OVPR Summer Research Fellow  
Dr. Amy Rosemond, Institute of Ecology  
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**Christopher Hale**, CURO-BHSI Summer Research Fellow  
Dr. Thomas F. Murray, Department of Physiology and Pharmacology  
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**Catherine Hudson**, CURO-BHSI Summer Research Fellow  
Dr. Harry Dailey, Department of Microbiology and Biochemistry and Microbiology  
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Dr. Nigel Adams, Department of Chemistry  
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**Andrew Leidner**, CURO-BHSI Summer Research Fellow  
Dr. Pejman Rohani, Institute of Ecology  
Parasitoid Behavior and Evolutionary Dynamics

**Janel Long**, CURO-OVPR Summer Research Fellow  
Dr. Jean Martin-Williams, School of Music  
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**John McWhorter**, CURO-BHSI Summer Research Fellow  
Dr. Daniel Colley, Department of Microbiology  
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**William Parker**, CURO Summer Research Fellow  
Dr. Marly Eidsness, Department of Chemistry  
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**Gehres Paschal**, CURO-OVPR Summer Research Fellow  
Dr. J. David Puett, Department of Biochemistry and Molecular Biology  
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**Kevin Patrick**, CURO Summer Research Fellow  
Dr. James Anderson, Department of Classics  
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**Katherine Price**, CURO Summer Research Fellow  
Dr. Janet Westpheling, Department of Genetics  
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**Matthew Rudy**, CURO Summer Research Fellow  
Dr. Marly Eidsness, Department of Chemistry  
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**Desiree Smith**, CURO Summer Research Fellow  
Dr. Roberta Fernandez, Department of Romance Languages  
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**Christopher Stokes**, CURO-OVPR Summer Research Fellow  
Dr. Randy Kamphaus, School of Professional Studies  
Family Health and Classroom Behavior: A Pilot Study

**Shana Strickland**, CURO-BHSI Summer Research Fellow  
Dr. Kimberly Shipman, Department of Psychology  
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**Adam Stroupe**, CURO Summer Research Fellow
Dr. Boris Striepen, Department of Cellular Biology
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**Teerawit Supakorndej**, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry and Molecular Biology

**Tendoh Timoh**, CURO Summer Research Fellow
Dr. Marly Eidsness, Department of Chemistry
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**Jora Vaso**, CURO-OVPR Summer Research Fellow
Dr. Katarzyna Jerzak, Department of Comparative Literature
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**Leslie Wolcott**, CURO-OVPR Summer Research Fellow
Dr. Betty Jean Craige, Center for Humanities and Arts
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2003 CURO Summer Research Fellows

Anthony Anfuso, CURO Summer Research Fellow
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
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Tiffany Beal, CURO-BHSI Summer Research Fellow
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
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Robert Brady, CURO Summer Research Fellow
Dr. Nader Amir, Department of Psychology
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Josef Broder, CURO Summer Research Fellow
Dr. Chi N. Thai, Department of Biological and Agricultural Engineering
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Martha Rose Calamaras, CURO Summer Research Fellow
Dr. Kim Shipman, Department of Psychology
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Daniel del Portal, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
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Dustin Dyer, CURO Summer Research Fellow
Dr. Guigen Zang, Department of Biological and Agricultural Engineering
Dr. Michael Geller, Department of Physics and Astronomy
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Sarah Fritts, CURO Summer Research Fellow
Dr. John P. Carroll, School of Forest Resources
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Betsy Goodwin, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology
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Patrick Gosnell, CURO Summer Research Fellow
Prof. Ben Reynolds, Department of Photography
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Paulette Andrea Greene, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
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**Andrea Haltiner**, CURO-BHSI Summer Research Fellow
Dr. Ruth Harris, Department of Foods and Nutrition
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**Luke Hoagland**, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Medical Cellular Biology
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**Christopher “Kit” Hughes**, CURO Summer Research Fellow
Prof. Mark Callahan, School of Art
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**Steven Jocoy**, CURO Summer Research Fellow
Dr. Michael Bender, Department of Genetics

**Leena Kukkarni**, CURO Summer Research Fellow
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
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**Valerie Marshall**
Dr. Ben Blount, Department of Anthropology

**Ashley Neary**
Dr. Susan Sanchez, Department of Medical Microbiology and Parasitology
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**Ngozi Ogbuehi**, CURO Summer Research Fellow
Dr. Mary Alice Smith, Department of Environmental Health Science
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**Melissa Payton**, CURO Summer Research Fellow
Dr. Lillian Eby, Department of Psychology
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**John Drew Prosser**, CURO Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
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**Ryan Rhome**, CURO Summer Research Fellow
Dr. Jan Westpheling, Department of Genetics
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**Susan Ritger**, CURO-BHSI Summer Research Fellow
Dr. Duncan C. Ferguson, Department of Physiology and Pharmacology
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**Ben Solomon**, CURO Summer Research Fellow
Dr. Kevin McCully, Department of Exercise Science
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Mary Tolcher, CURO Summer Research Fellow
Dr. Tim Hoover, Department of Microbiology
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Ryan Wilson, CURO Summer Research Fellow
Roger Moore, Department of Landscape Architecture

Thomas Wood, CURO Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
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Nadia Behizadeh
Dr. Tricia Lootens, Department of English

Ashley D. Chadha
Dr. Michael McEachern, Department of Genetics
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Emily DeCrescenzo
Dr. Susan Sanchez, Department of Biochemistry and Molecular Biology
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Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
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Nowell Hesse
Dr. Maor Bar-Peled, Department of Plant Biology
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Matt Hoffman
Dr. Will York, Department of Biochemistry and Molecular Biology
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Dr. Mary Bedell, Department of Genetics

Britt Johnson
Dr. Janet Westpheling, Department of Genetics
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LeeAnn Jones
Dr. Massimo Palmarini, Department of Medical Microbiology
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Jenna Lee
Dr. Andrew Herod, Department of Geography
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Judson A. Lewis
Dr. John F. McDonald, Department of Genetics
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Dr. Jed Rasula, Department of English  
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Dr. Jacek Gaertig, Department of Cellular Biology  
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Joanne Shinpoch  
Dr. Daniel Dervartanian, Department of Biological Sciences  
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John Stark  
Dr. Scott Atkinson, Department of Economics, and Dr. Michael Rauscher, Department of International Economics, Rostock University  
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Joshua Striker  
Dr. Thomas Cerbu, Department of Comparative Literature  
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Nwakaso Umejiego  
Dr. Boris Striepen, Department of Cellular Biology  
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Ben Walters  
Dr. Elizabeth Brient, Department of Philosophy  
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Lauren Watson  
Dr. Jeffery Berejikian, Department of Political Science

Katherine Williams  
Dr. Kojo Mensa-Wilmot, Department of Cellular Biology, and Dr. Anne Clark, Oxford University

Brad Wright  
Dr. Larry Nackerud, School of Social Work  
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2001 CURO Summer Research Fellows

Siobahn Beaton
Dr. Debra Mohnen, Complex Carbohydrate Research Center
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David Cureton
Dr. Janet Westpheling, Department of Genetics
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Jon E. Davis
Dr. Gary Bertsch, Department of Political Science
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Dr. Max Reinhart, Department of Germanic and Slavic Languages
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Lawrence Dougherty
Dr. Daniel Promislow, Department of Genetics
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Matt Edwards
Dr. Gary Bertsch, Department of Political Science
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Ben Emanuel
Dr. Frances Teague, Department of English
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Jeff Halley
Dr. Sheng Cheng Wu, Department of Biochemistry and Molecular Biology
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Peter Harri
Dr. Kojo Mensa-Wilcot, Department of Cellular Biology
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Amanda Hudson
Dr. Michael Terns, Department of Biochemistry and Molecular Biology
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Kenneth Miller
Dr. Timothy Dore, Department of Chemistry
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Lorina Naci  
Professor William Paul, Jr., School of Art
Each morning I get up with one word in mind: plastik…

Lynn Nguyen  
Dr. Mark Wheeler, Department of Dance
Chinese Classical Dance

Cori Pelletier  
Dr. Roy Grant, Department of Music Therapy
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Kate Smith  
Dr. Kenneth S. Latimer, Department of Pathology
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Buudoan V. Tran  
Dr. Karl N. Kirschner, Complex Carbohydrate Research Center, and Dr. Robert J. Woods, Complex Carbohydrate Research Center
Parameter Development and Application of the Glycam Force Field for Sialic Acid Derivatives

John Woodruff  
Dr. Harry Dailey, Department of Microbiology
The Generation of Mutations in the n-Terminal Region of the Protoporphyrinogen Oxidase of *Bacillus subtilis* to Create a Protein Capable of Mitochondrial Targeting in Mammalian Cells
Summer Fellowship chair:  Dr. Martin P. Rogers, Associate Director of Honors Program and Center for Undergraduate Research Opportunities

Book of proposals:  Matthew Jordan, Program Coordinator, Center for Undergraduate Research Opportunities

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Cover design:  William Reeves, UGA Printing

Published by:  Honors Program, The University of Georgia

Printed by:  Central Duplicating, The University of Georgia

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Welcome

April 23, 2013

Dear UGA Faculty and Students:

We are delighted and honored to recognize this year’s CURO Summer Research Fellows, each of whom is featured here with a summary of his or her faculty-mentored research proposal. The goal of the CURO Summer Research Fellowship is to provide opportunities for intensive, immersive, faculty-guided research experiences for academically talented undergraduates. The program advances the students’ knowledge and abilities to think critically, solve problems, and contribute to a greater understanding of the world.

We are exceptionally proud of the quality of the contributions of present and past CURO Summer Fellows and with the mentorship provided by our exceptional faculty. The Summer Fellowship program has contributed to building a culture of undergraduate inquiry at the University of Georgia, and the CURO Summer Fellows serve as ambassadors, sharing their enthusiasm and expertise in a variety of professional forums on campus as well as at regional, national, and international meetings.

The 2013 CURO Summer Research Fellowship is funded through the Honors Program, the Office of the Senior Vice President for Academic Affairs and Provost, and the Alumni Association.

Please join us in congratulating these young scholars on the occasion of being awarded these prestigious fellowships. Please join us also in thanking the faculty research mentors whose support and guidance are crucial to the CURO Summer Fellows’ success.

Sincerely,

Dr. David S. Williams, ’79, ’82
Associate Provost and Director

Dr. Martin P. Rogers, ’01, ’11
Associate Director
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Photochemical Production of Reactive Oxygen Species in the North Pacific
2013 Summer Fellow: Meg Adams
Research Mentor: Dr. William Miller, Department of Marine Sciences

There is an intimate connection between the ocean and the Earth’s atmosphere. The exchange of carbon between the ocean and the atmosphere plays a big role in the global carbon budget. At the ocean-atmosphere interface, carbon exchange, in the form of carbon dioxide (CO2), makes the ocean either a source or a sink for carbon. The amount of dissolved organic carbon (DOC) in the ocean is equal to the carbon in the entire atmosphere. Therefore, interconversion between DOC and CO2 is essential to understanding air-sea carbon exchange and global carbon budgets. Complex models have been developed to predict the critical pathways controlling the global carbon budget, but in order for these models to be quantitative, modelers need great amounts of good data that show which reactions are important, at what rate these carbon transformations occur, and the efficiency of production for critical compounds. The better and more complete the data, the better the models will be.

Photochemistry is important to carbon cycles because it drives reactions involving DOC that produce carbon monoxide (CO) and carbon dioxide (CO2) that can be directly released into the atmosphere. Photochemistry can only occur to depths that sunlight penetrates into the ocean (approximately 100 meters in blue water). Current photochemical models only address DOC compounds in this surface layer. However, in the deep ocean there are huge reservoirs rich in DOC. These pools of carbon come to the surface very slowly, so models in the past tended to ignore them. However, when these pools do come to the surface after approximately 800 years in the dark, they may exhibit a significant increase in photochemically produced CO and CO2. The question is, how should models account for this photochemistry?

In order to answer this question, I will participate on a research cruise aboard the RV Thompson, where we will take water samples from the Gulf of Alaska and stations along the P-line in the North Pacific, a very well-studied and well-characterized area. We will collect water samples from three depths at each of about forty stations, at abyssal, mesopelagic, and shallow depths. For each sample, we will analyze the hydrogen peroxide (H2O2), carbon monoxide (CO), and superoxide (O2-) photoproduction rates and quantum reaction efficiencies in photochemical experiments at sea. H2O2 and its photochemical precursor O2- give an excellent indication of overall DOC photoreactivity. CO represents a direct loss of DOC to the atmosphere and can be directly related to CO2 photoproduction, which is extremely hard to quantify in blue water. The water samples will be irradiated using a solar simulator, and the concentrations of the three analytes (H2O2, CO, and O2-) will be determined at several time points throughout the irradiation using chemiluminescence and gas chromatography.

These experiments will be carried out on all samples with 3000 meters depth, and photochemical analyses performed on the research vessel. I will be involved in all phases of this part of the project, from collecting water, to irradiations, manipulating data, and interpreting results. I will prepare an in-depth scientific paper detailing the results of one of the stations. The paper will be submitted to a scientific journal for publication.

Detailed results comparing deep and shallow DOC pools from a representative station will form the basis of the required CURO poster presentation, and a paper to be submitted to JURO.
The Importance of Local Grassroots Organizations in the Reshaping of Afro-Argentine Consciousness

2013 Summer Fellow: Tiffany Brown
Research Mentor: Dr. Nicolás Lucero, Department of Romance Languages

In her 2007 study, historian Erika Edwards notes the apparent non-existence of Argentines of African descent in the mind of the general populace. My personal experience in this Latin American country attests to this statement. As a person of color living in Argentina for three months, I was often mistaken for an Afro-Brazilian or an African. “There are no black people in Argentina,” observed many Argentines I met. This repeated declaration piqued my interest. How could a demographic that once made up roughly 33% of the total population of Buenos Aires be decimated so thoroughly within a century that many do not acknowledge their existence?

Throughout history, the narrative of Afro-Argentines has generally been silenced or ignored. As a result, few studies exist on this particular population of Argentine society. However, as government support and social consciousness increase so too does the need to educate the public. In recent years, Argentina has experienced a resurgence in "orgullo negro" or black pride. Afro-Argentine groups like Misibamba and AfricaVive have dedicated themselves to promoting awareness and reconstructing the Afro-Argentine’s role in Argentine history and society. The founders and members of these organizations work to dispel the myth that “there are no black people in Argentina” and that no cultural remnants of their existence remain. Through cultural events and programs, they serve to educate the Argentine public about the persistence of the Afro-descendant population and preserve the traditions of their African inheritance.

My investigation will add to the discourse surrounding Afro-Argentine history and traditions as well as address the scarcity in this area of research. This study will take me to Argentina in the midst of the black consciousness movement, and I will examine the importance of grassroots organizations and local efforts in the fight for self-identification and reaffirmation of self-worth in a society that has long dismissed their contributions. Through interviews with experts, leaders of grassroots organizations, and a cultural anthropologist who has written extensively on Afro-Argentine culture, I will gain insight into the black consciousness movement and its implications on Argentine society. I will also consult non-black Argentines, related literature and other media to augment the perspectives provided by the Afro-Argentines I encounter. Through this study, I aim to provide a clearer picture on the Argentine black consciousness movement. I believe this research is important in lending a voice to a movement and perspectives that until very recently have not been given much funding or consideration in documenting the experiences of this often forgotten segment of Argentine society. It is my sincerest hope that this study serves to spread awareness about the importance of self-identity and local organization in the fight to redefine and reconstruct history.

References:


2. Edwards, Erika D. "An African Tree Produces White Flowers: Black Consciousness in the Afro-
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<http://scholarworks.gvsu.edu/cgi/viewcontent.cgi?article=1007&context=mcnair>.
Exploring the Content and Structure of Proteoglycans in Rice Suspension Culture Cells
2013 Summer Fellow: Stanislav Bushik
Research Mentor: Dr. Debra Mohnen, Department of Biochemistry & Molecular Biology

The rice plant is arguably the most important source of sustenance for a large portion of the world, and a successful and plentiful harvest is the only thing standing in the way of starvation for countless people around the world. If there was a way to engineer the rice plant to produce a larger yield of food, be more resistant to pathogens, and be able to grow in adverse conditions, the threat of famine could be eliminated from many regions of the world. In addition, if the rice plant could be engineered to produce more usable biomass, the non-edible portions of the plant could be used to create biofuels by converting them to sugars and then to ethanol. The focus of my project in Dr. Mohnen’s lab will be to identify genes that code for functional proteoglycans in rice cells, and find a way to modify these genes in order to make the rice plants provide more biomass, make them more resistant to pathogens, and/or make them more durable by being able to survive high salt conditions and drought. The importance of proteoglycans in plant cell wall structure and growth has only very recently been discovered in the Mohnen lab. My proposed research will be among the first to investigate this area in rice and other grasses.

The first step of the research will be to separate and purify the proteoglycans that rice cells in suspension culture secrete into the liquid media. This will be accomplished by using high performance liquid chromatography (HPLC) as well as anion exchange, size exclusion, and reverse phase chromatography to separate the multitude of secreted proteoglycans into fractions that can be individually identified. The second step will be to perform structural analysis of the proteoglycans. The techniques to be used include the identification of protein sequences through proteomics and the characterization of the sugars through glycosyl residue composition and linkage analyses based on Mass spectroscopy and nuclear magnetic resonance. The glycans will also be characterized by chemical and enzymatic degradation. These studies will eventually lead to the identification of the proteoglycans secreted by the rice cells. The third step of the research will be to determine the function of the genes encoding the identified proteoglycans. Once the amino acid sequence of the proteins is determined, a Basic Local Alignment Search Tool (BLAST) will be used to identify the genes that encode the proteins. Transgenic rice plants with modified expression of the discovered genes encoding the protein core of the proteoglycans will be generated to analyze the function of the proteoglycan in the rice plant. This will be accomplished by mutant studies where the genes may be knocked out, knocked down, or over expressed, which will show the function of the genes in vivo. The goal is to attempt to discover genes that show potential for modification in diverse ways that result in beneficial effects on the plant, as described above.

References:

Sex Ratio and Risky Behavior on College Campuses in the United States  
2013 Summer Fellow: Anne Chen  
Research Mentor: Dr. Christopher Cornwell, Department of Economics

This study aims to focus on areas where there are surplus women in America, and the effects it has on individual risky behavior. The Atlantic correspondent Hanna Rosin focuses on this issue in a series of articles published in the magazine, and in a recently published book, *The End of Men: And the Rise of Women*. Rosin describes the end of the industrial revolution, where men dominated and supplied the labor market, which demanded heavy lifting and intense physical labor. In today’s economy, women occupy 13 of the 15 industries with the highest projected growth over the next decade (Rosin 2010).

Additionally, Mara Hvistendahl notes in *Unnatural Selection* that “75 percent of sperm sorting patients Genetics and IVF Institute takes on” request for baby girls for simple reasons that girls are “more likely to perform [well in school] and less likely to misbehave” (Hvistendahl 256). It is unclear just how much the recent surplus of women in environments such as the corporate workplace and higher education will affect social behaviors. The World Bank recently published a commentary on the topic, highlighting “cities will increasingly need to give young men a hand in helping them to get where they’re going,” as more women dominate today’s labor markets, noting that 60 percent of the Wall Street Occupiers were men (Hoornweg 2012).

Several recent studies focused on the role of mass incarceration in creating imbalanced sex ratios, emphasizing the effects on the spread of sexually transmitted infections, including Blankenship, *et al* in 2010 and Cornwell and Cunningham in 2008. Indeed, these studies suggest that areas of high incarceration rates in specifically black males lead to higher incidences of STI rates.

The context for this study will largely focus on college campuses – national universities, such as the University of Georgia, where females are represented in large majorities. I will be concerned with whether these imbalanced sex ratios induce risky behavior, such as excessive alcohol consumption and unprotected sexual activity. The idea is that the shortage of men in the college dating market encourages women to engage in riskier behaviors in an effort to secure and maintain a relationship. Using data on alcohol arrest records, enrollment, and STI rates, we will analyze the relationship between schools with shortages in men and the rates in alcohol arrests and STI.

The college campuses in this study serve as a microcosm of communities in the United States, where women are pulling away from men on economic grounds. This leaves a minority of men who receive exemplary credentials to compete with their female counterparts. The biggest question in this equation is how behaviors will shift in this type of environment, and how this may affect future policy in education, law enforcement, and beyond.

Works Cited:


Proposals


Investigation of CRISPR/Cas Viral Defense System in *Streptococcus thermophilus*

2013 Summer Fellows: Megan Chesne
Research Mentors: Drs. Michael and Rebecca Terns, Department of Biochemistry & Molecular Biology

Bacteria and archaea have adapted a versatile immune system called the CRISPR (Clustered, Regularly Interspaced, Short Palindromic, Repeat) -Cas (CRISPR associated) system to defend against invading nucleic acids of viruses or plasmids. Considering that approximately 10^25 infections occur every second\(^1\), an efficient defense mechanism is of great necessity for the survival of these microorganisms. The CRISPR-Cas system is present in approximately 85% of archaea and 50% of bacteria\(^2\). CRISPR loci are composed of identical short repeat DNA sequences separated by variable spacer sequences. The spacer sequences are identical to those found in invaders. When a microorganism is attacked by a phage, the CRISPR system identifies a segment of the invading DNA then incorporates it into the CRISPR array. The foreign DNA is then used as a template to generate CRISPR RNAs (crRNAs)\(^2\). The Cas-protein complexes within the microorganism use the crRNA as a guide to target and disrupt the specific invading sequence\(^2\). The CRISPR-Cas system is advantageous for prokaryotes, as it provides heritable immunity that builds with each successive infection.

For my summer research project, I will use *Streptococcus thermophilus* as a model organism, which possesses four total CRISPR systems (CRISPR 1-4). Previous research in our lab has shown that CRISPR systems 1, 3, and 4 are active for defending against invading plasmids with engineered target sequences. CRISPR2, however, was shown to be inactive in this process. Sequence analysis shows that Csm6, a protein that is intact in other active Csm type CRISPR systems\(^3\), is truncated in CRISPR2. We hypothesize that the Csm6 is essential for the defense mechanism of CRISPR2. To test this hypothesis, we will obtain another *Streptococcus thermophilus* strain (JIM 8232) that possesses the CRISPR2 module of interest with an intact Csm6. We plan to test the CRISPR2 defense in the JIM 8232 strain. We also plan to complement the defect in the original *Streptococcus thermophilus* CRISPR2 system by overexpressing Csm6 from JIM8232. My ultimate goal is to understand the defense mechanism of CRISPR2 system and the role of Csm6 in this process.

Investigating the defense mechanism of CRISPR2 module in *Streptococcus thermophilus* will contribute greatly to understanding the complexity of the entire CRISPR-Cas immune system. The CRISPR-Cas immune system is a young and exciting field. A greater understanding of the intricate mechanisms of the CRISPR-Cas system can lead to breakthroughs in biomedical research and related biotechnology.

References:


Proposals

staphylococci by targeting DNA.” Science 322: 1843–1845.
Influence of Octopamine in Parental Behaviors of *Nicrophorus vespilloides*

2013 Summer Fellow: Mary Douthit

Research Mentor: Dr. Allen Moore, Department of Genetics

Scientists have long thought socialization to be one of the most significant evolutionary factors differentiating humans from other animals. Social interactions may dramatically influence an individual’s fitness, resulting in a type of natural selection termed “social selection” (Wolf et al. 1999). One of the most commonly studied social interactions for many organisms is that between parents and offspring; however, few studies have quantified patterns of genetic variation in parent and offspring behaviors expressed during this interaction (Lock et al. 2004). Evolutionary and behavioral geneticists explain that “genetic analyses of behavior are central to topics ranging from understanding past selection and predicting future evolution to explaining the neural and hormonal control of behavior” (Boake et al. 2002). Here I propose to study the influence of an important neurotransmitter, octopamine, on the parental behavior of a beetle.

Burying beetles (*Nicrophorus* spp.) are unusual among insects and animals in general, because both males and females directly care for offspring. Parents bury vertebrate carcasses as food for their larvae. They then maintain this resource against intruders and microbial decay until larvae arrive. After the larvae arrive, they feed them individually. This unique behavior makes burying beetles a model organism for studying the evolutionary and behavioral genetics influencing parental behaviors, and more broadly social interactions. By measuring the expression of specific candidate genes I will help elucidate if and how varying amounts of a neurotransmitter affect *N. vespilloides*’ social behavior.

The biogenic amine octopamine (OA), a structural analog of vertebrate norepinephrine, is a molecule that acts as both a neurotransmitter and a neurohormone (Farooqui 2012). Within my study, I will confine assays to its neurotransmitter role where increased expression has been linked to increased aggression in *Drosophila*, crickets and other related insects (Susanne C. et al. 2007; Stevenson et al. 2005). My project will focus on the expression of the five octopamine receptors and tyramine β-hydroxylase (Tβh), the enzyme responsible for producing OA, in males and females when mating as well as in male beetles when placed in a “fight or flight” environment. Within our study species, males and females must act in a coordinated fashion and be extremely tolerant of each other during larval care. Outside of a parental state, adults are not very tolerant of each other and can harass each other until one is seriously injured. I therefore predict that OA expression will be high in the beetles outside of this parental behavioral state but low in individuals actively caring for or preparing to care for larvae.

As a continuation of my spring 2013 research, I will hunt for octopamine genes and receptors and PCR verify their sequence and identity. I will then run qRT-PCR with cDNA brain samples from *N. vespilloides* sampled from both sexes from five behavioral states: virgin, mated with a mouse, mated without a mouse, individuals actively caring for larvae, and post-caring. Because I believe that aggression needs to be depressed during periods of sociality, I hypothesize to find the least OA expression in individuals actively caring for larva, followed by individuals mated with a mouse, then mated without a mouse. I hypothesize that I will find the highest OA expression in virgin and post-caring individuals. Once differential gene expression has been observed, I plan to pharmacologically manipulate the amount of OA within the beetle and determine what alternate effects the neurotransmitter may have on the insect’s social behavior.

This work has the potential to help elucidate the molecular influences on parental behavior and more broadly sociality. The evolution of mammalian social behavior and social selection largely helped allow humans to separate themselves from other mammals thousands of years ago. As
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Genetic tools for studying adaptation in behavior advance and recognition of widespread genetic homology increases, studies analyzing candidate genes like mine show more promise for understanding the evolution of social behaviors as well as genetic diseases affecting human social interactions. Such studies may ultimately lead to the advancement of treatments for individuals afflicted with psychological and developmental disorders.

References:


Exploring the Clinical Association between Placental Malaria and Preeclampsia: Assessing the Possibility of a Parasite-induced Imbalance in Tissue Factor and Angioregulatory Protein Production

2013 Summer Fellow: Allison Doyle
Research Mentor: Dr. Julie Moore, Department of Infectious Disease

In 2010, the World Health Organization estimated that over 200 million malaria infections occurred globally, resulting in 655,000 deaths. Pregnant women and children under five years of age are the most vulnerable and severely impacted groups, with 55 million pregnant women exposed to malaria annually. Ninety percent of all malaria deaths occur in Sub-Saharan Africa, where infection with Plasmodium falciparum, which causes severe malaria, is most common. Pregnancies in women living in malaria-endemic regions are associated with high levels of P. falciparum parasitemia and high rates of maternal morbidity, including severe anemia and placental malaria (PM). PM is associated with increased risk for adverse perinatal outcomes, including low birth weight and stillbirth.

PM is characterized by sequestration of the malarial parasite in the placenta, which results in the accumulation of parasitized red blood cells (pRBCs) and the infiltration of inflammatory cells in the placental intervillous space. However, exactly how malaria infection during pregnancy contributes to the development of disease is not well characterized. One adverse health outcome clinically associated with PM is preeclampsia (PE), which is defined as pregnancy-induced maternal hypertension and proteinuria. Clinical studies have shown significant imbalances in the levels of angioregulatory proteins and hemostatic factors in pregnant women with PE or PM relative to healthy ones. An investigation of these pathways will provide insight into the mechanisms by which PM may induce PE in infected pregnant women.

We hypothesize that exposure of the placental syncytiotrophoblast cell layer (the fetal epithelial tissue in contact with maternal blood) to the parasite induces an imbalance in angioregulatory protein production by these cells in a tissue factor (TF)-dependent manner. TF is a protein necessary for formation of thrombin, which is vital to blood coagulation. Our objective is to determine the extent to which this syncytiotrophoblast exposure to malaria disturbs production of the angioregulatory factors Fms-like Tyrosine Kinase-1 (sFlt-1), Vascular Endothelial Growth Factor-A (VEGF-A), Angiopoietin-1 (ANG-1), and Angiopoietin-2 (ANG-2). To achieve this, we will perform experiments in two stages to test two working hypotheses. The first proposes that pRBCs induce an imbalance in the production of these angioregulatory proteins by the syncytiotrophoblast. To this end, we will expose cultured human trophoblast cells to either medium, uninfected red blood cells, hemozoin (product formed from parasitic digestion of hemoglobin), or pRBCs. Subsequently, levels of sFlt-1, VEGF-A, ANG-1, and ANG-2 secreted by the trophoblasts will be measured by ELISA. RNA will be isolated from trophoblast cell lysates, and sFlt-1, VEGF-A, ANG-1, and ANG-2 mRNA expression will be measured by RT-PCR as an additional measure of angioregulatory factor production.

It has previously been shown that thrombin can directly stimulate the release of sFlt-1 from the trophoblast. Additionally, work in the Moore lab has shown that coagulation likely plays an important role in the pathogenesis of PM. Therefore, our second hypothesis proposes that TF expressed on the surface of trophoblasts influences the secretion of angioregulatory proteins during malarial infection of the placenta. We will stimulate the trophoblast cells as in the first stage. Cell lysates will then be assayed for TF concentrations using a hemostasis analyzer. We expect to observe that the parasite stimulates increased trophoblast secretion of sFlt-1. Since increased sFlt-1 has been clinically associated with PE, pRBC-induced secretion of sFlt-1, either directly or through increased
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TF expression, could provide an important mechanistic link between PM and PE. We also expect that TF secretion by the trophoblasts will increase after malaria exposure. Increased TF should generate thrombin during TF-mediated activation of the extrinsic pathway of coagulation and further upregulate the release of sFlt-1 and other angioregulators. These results together would suggest that exposure of trophoblast cells to pRBCs in PM induces an imbalance of angioregulatory proteins in the placenta that could result in vascular dysfunction. This malaria-induced disruption of angioregulation may be an important link between PM and PE.

References:


The Preliminary Investigation of Whether Switchgrass SND1 Orthologs Can Activate the Secondary Wall Biosynthesis

2013 Summer Fellow: Jane Egbosiuba
Research Mentor: Dr. Zheng-Hua Ye, Department of Plant Biology

In plants, there are two types of cell walls that are formed: primary and secondary cell walls. Primary cell walls provide mechanical strength for the cell as it grows and divides. Secondary cell walls are produced once the cell has ceased to grow. For plants, secondary cell walls help produce strong xylem fibers, which are used to transport water and minerals from the roots to the remaining parts of the plant. The secondary cell walls all offer strong rigid structure, which allows trees and other woody plants to stand tall for many years. Secondary cell walls serve a very important impact for human life because they are huge components for woods and other products such as paper, musical instruments and many others (Zhong and Ye 2009). Secondary cell walls in wood and fibers are also important renewable sources of biofuels. Therefore, this could reduce our dependency on other resources such as petroleum. My research focuses on the transcriptional regulation of secondary cell wall production in biofuel crop plants. Transcription factors control the activation of genes in the genome. The transcription factor binds to DNA and other proteins, in order to turn genes off or on. Transcription factors work by recognizing certain nucleotide sequences before the gene on the chromosome. The transcription factor that this research will be focusing on is SND1. This particular transcription factor is known to activate the biosynthesis of the secondary wall and particularly the secondary biosynthesis of Arabidopsis. We will be investigating whether switchgrass SND1 orthologs can activate the secondary wall biosynthetic program, as does Arabidopsis SND1. Switchgrass, also known as Panicum virgatum, is a warm-season tall grass found in North America. It is very versatile and adaptable. Today, it is mostly used to control erosion. Switchgrass is also known to provide excellent habitat for wildlife. Research has proven that switchgrass is a good renewable bioenergy crop because of its ability to produce high yields on marginal farmlands. Benefits such as stand longevity, drought and flooding resistance, relatively low herbicide and fertilizer input requirements are some of the many advantages of producing switchgrass.

Using various scientific techniques, we will investigate whether switchgrass SND1 orthologs play a role in the biosynthesis of secondary wall biosynthesis. This research project involves the use of the GenBank database to identify switchgrass transcription factor genes that show close sequence homolgy to the Arabidopsis SND1 gene. The PCR will be used to amplify the switchgrass transcription factor cDNA, and they will be engineered between the CaMV 35S promoter and a terminator in an expression vector. The engineered genes will be transferred into Arabidopsis protoplasts to test their ability for activation of secondary wall biosynthesis genes.

Works Cited:

Gender is, above all, a social construct, arbitrary and varying from one society to another, related to sex but not identical with it . . . Moreover, the relations between gender and sex are as various and problematic as those between signifying words and signified meanings or between poetic fictions and the elusive “realities” they imitate.

-Androgyny, Mimesis, and the Marriage of the Boy Heroine on the English Renaissance Stage, Phyllis Rackin

In the dissolution of gender binaries, there is no simple explanation connecting gender and sexual orientation. Rackin reaches for her own expression of gender’s relationship to sexuality in the signifier and signified corollary. She relates sexuality to an arbitrary object that is inevitably expressed and ultimately seen through gender. In this way, Rackin positions gender as an art in observation and expression, not unlike the forming of poetry based on experiences, or in the case of my research, the capturing of light within a camera.

In the film Boys Don’t Cry directed by Kimberly Peirce, the protagonist Brandon seeks peace within his identity. Born female, Brandon actively rejects his biological gender and the gender binary present within his Southern, agrarian, environment. Peirce positions Brandon’s battle as a transgender male as the focus of the film, often allowing the immediacy of Brandon’s changing gender to replace narrative relevance. Many films like Boys Don’t Cry that explore transgender conditions assume a similarly chaotic and overwhelming representation, discouraging nuance in the realms of narrative structure and cinematography. This extreme representation verges on creating another binary, failing to communicate the reality of gender as a complex spectrum. As part of this research and analysis, I will write and direct a narrative short film that embodies the immediate role of the gender spectrum in the progression of film as art, focusing on the concentrated decisions of cinematography and narrative progression.

This research contains the survey and analysis of film works, literature, journal articles, and philosophy, searching for other directors’, artists’, and scholars’ interpretations of the gender spectrum. I will explore the interplay between gender as an expression of sexuality and seek to convey this signified and signifier relationship through the mimetic relationship of manipulated light to exposed film or sensor. In this sense, the execution will be both philosophically and technically applied, verging on a manipulated view that communicates a complex notion of transgender life.

From these philosophical and technical underpinnings, I will complete a screenplay that I will have worked on incrementally during my research this semester. As the director I will concentrate on authoring the actors’ performances and planning the cinematic shots, keeping in mind the need for a nuanced expression of gender as a spectrum. I will also lead a crew that will handle the other aspects of the filmmaking process, cooperating towards the vision expressed in the screenplay. Due to the nature of filmmaking, the preproduction process needed to make a polished film must start months prior. My current research with Prof. Smith has begun this process to ensure that if granted a CURO Summer Fellowship, the summer period can be dedicated to the research towards and finalization of the script, its characters, the shooting of the film, and the editing of the footage into its final form.
Works Cited:


In his essay “Coming to Terms with Slavery,” historian Ira Berlin discusses the anonymity of the “plantation generation” of slaves; writing, “[t]he biographies of individual men and women, to the extent that they can be reconstructed, are thin to the point of invisibility.” This is a troubling and thankfully untrue assertion. Through my research, I will continue to prove that contrary to Berlin’s statement, 21st century historians can erase the invisibility of the lives of the “plantation generation” of slaves by creating detailed biographies and fully developed historiographical analyses of the slaves’ lives and communities. I will continue to expand the sizable foundation of research that I have amassed (and presented) on the slave community that existed on the Shields plantation (currently known as the Shields-Etheridge Heritage Farm) in nearby Jefferson, Georgia. Through analysis and reconstruction of the lives of the slaves who served the Shields family (a feat possible due to the vast array of primary documents on the farm as well as courthouse and census records), I will tell the story of slavery on the Shields plantation. This is not an insignificant story, and thus research on this slave community will allow me to broaden the scope of my analysis to the general slave experience in the rural lands that surround Athens, Georgia.

The slave experience on the Shields plantation was one filled with the same forces of white fear, capitalism, and paternalism that slaves everywhere were forced to confront. Thus, by “linking the particular with the universal,” as historian David E. Kyvig would put it, I will show how the story of slavery on the Shields plantation fundamentally tells the story of the slave experience in the antebellum South.

The continuity in the documentation of slavery on the farm, as well as of African-American sharecropping after emancipation, provides a tremendous opportunity for African-American genealogical tracing. An integral part of this research project has been, and will continue to be, mapping the genealogy of the slaves on the Shields-Etheridge Heritage Farm. Already, I have traced the genealogy of the first slave Leah, purchased by the family in 1799, to modern times. Amazingly, her family is having a family reunion this summer in Stone Mountain, Georgia, and I (along with Susan Chaisson the owner of the farm) will be in attendance. African-American genealogical tracing has been a task I have sought to incorporate into my project this semester, and I intend to make an even more significant contribution to African-American genealogy through my research over the summer.

In an effort to add depth to the biographies and analysis on the lives of these slaves, I will be working on obtaining (and possibly creating) compelling visuals to accompany my extensive written work. Hope Hilton, the curator of the Athens Institute for Contemporary Art, will advise and guide my use of the various photographs of people and documents that help in “fleshing-out” the story of slavery on the Shields plantation. Amazingly, a photograph exists of a slave named Jarva, as well as a 1946 Christmas family photograph picturing the children and grandchildren of Shields slaves sitting with the white Shields-Etheridge family.

On one hand, the story of slavery on the Shields plantation is filled with the many complexities that highlight the challenges of recreating a slave community and tracing African-American genealogy. On the other hand, the story of slavery on the Shields plantation is crucial to expanding our understanding of slavery in the lands surrounding Athens. Furthermore, the focus of this project on understanding the lives of individual slaves will expose and possibly ameliorate some of the struggles that inevitably arise in dealing with the place of slavery in our state and national memories.

Proposals

The Heritage of Slavery on the Shields-Etheridge Farm

2013 Summer Fellow: Seth Euster

Research Mentor: Christopher Lawton, Department of History
References:


Proposals

Investigating Female Re-mating Rates in Wild *Drosophila neotestacea* and Their Association with Sex-ratio Drive
2013 Summer Fellow: Emily Fawcett
Research Mentor: Dr. Kelly Dyer, Department of Genetics

Selfish genetic elements are portions of DNA that increase rates of their own transmission without benefitting the organism itself or increasing its fitness. Sex ratio (SR) drive is a specific type of selfish genetic element found on the X chromosome that acts in males to destroy sperm that carry a Y chromosome. Thus, males that carry a SR drive X-chromosome produce almost exclusively female offspring. If the SR drive chromosome spreads and the population becomes heavily female-biased, many females will go unmated because males are rare. This can ultimately lead to the extinction of the population and the selfish element (Jaenike 2001).

In the fly *Drosophila neotestacea*, the frequency of SR varies among populations from 0 to 30%, although the exact cause for this variation is unknown (Dyer 2012). One factor that may be important in this variation is the mating rate: since SR drive kills half of a male's sperm, an SR male may become sperm limited and thus sire fewer offspring when flies mate often (Price et al. 2010). The Dyer Lab has found that in the lab, females from populations with a higher prevalence of SR drive mate less often than females from populations where SR is rare. Polyandry, or multiple mating by a female, may lower levels of SR in a population because it leads to increased sperm competition and thus lowers SR male fertility relative to non-SR males.

I will investigate female mating rates in wild-caught female flies and determine whether patterns of female mating in the wild are the same as those found in the lab (Price et al. 2011). I will focus on two populations in the Great Smoky Mountains in Tennessee that are known to differ in SR frequency between high versus low elevation populations (13% and 25%, respectively). I hypothesize that if levels of female mating are important in the persistence of SR, then there will be a difference in number of males a wild-caught female has mated with between high and low elevation populations. Specifically, I predict that wild-caught females from high elevation where SR is rare will have mated with more males than females from low elevation where SR is common.

Last summer, the Dyer Lab collected flies from high and low elevations in the Smokies, and froze the wild females and their offspring. I will use 20 of these wild-caught females from each elevation and 20 offspring from each female. I will extract DNA from these samples and use four highly polymorphic microsatellite loci to examine each of them. I am currently continuing the work that I started last semester by determining which microsatellite loci are the most variable (Dyer 2007).

Microsatellites are sequences found in genomes that vary in length. They are the basis of analyses such as genetic fingerprinting and are commonly used in human paternity analysis and crime scene forensic studies. The more variable a particular microsatellite locus is, the more useful it is in paternity analysis because it has a greater confidence in assigning whether two individuals are sired by the same father.

From here, I will use statistical analyses, specifically Bayesian methods, to infer how many males sired each female’s brood and thus estimate the female mating rate in the wild. First, I will determine if there is a difference in female mating rate in high versus low elevation populations. Second, since we already have estimates for the prevalence of SR in high versus low elevation populations, I will also determine whether the female mating rate is associated with local SR prevalence. This experiment will allow me to determine if patterns found in the lab are also found in the wild. Through studying levels of multiple mating in natural populations, this experiment will lead
to a greater understanding of the evolution of selfish genetic elements and the mechanisms that affect their spread in the wild.

References:


According to the biological species concept, a species is a group of interbreeding organisms that are reproductively isolated from other like groups (Mayr 1942). With respect to this concept, many biologists have sought to elucidate the evolution of reproductive barriers to understand the forces that drive speciation. The evolution of prezygotic reproductive isolation (e.g., behavioral or ecological differences that prevent zygote formation) is often a straightforward consequence of divergent natural selection for distinct environments (Coyne and Orr 2004), but the evolution of postzygotic reproductive isolation (hybrid lethality and hybrid sterility) has captivated biologists because it cannot be favored by natural selection (Darwin 1859). Although we now have genetic models to explain how such hybrid incompatibilities arise (Bateson 1909; Dobzhansky 1937; Muller 1942), their underlying molecular and evolutionary mechanisms are still enigmatic. With the proposed research, I will investigate the genetics of hybrid lethality between two species of *Mimulus*, *M. tilingii* and *M. guttatus*. It is known that imprinted genes, which are differentially expressed depending on their parent of origin, regulate endosperm development in flowering plants (Gehring et al. 2004). Because endosperm defects often cause embryonic lethality (Lin 1984), I hypothesize that this reproductive barrier between *Mimulus* species could be due to an incompatibility between imprinted genes (e.g., Kohler et al. 2010; 2011).

The *Mimulus* genus is a rising system for studying the genetics of speciation, especially in regards to reproductive barriers (Wu et al. 2007). In this study, we will focus on the genetics of early embryonic lethality between inbred lines of *M. tilingii* and *M. guttatus* (derived from a high-alpine population in California and a coastal population in Oregon, respectively). These two species exhibit strong postzygotic reproductive isolation in spite of their recent divergence, providing an opportunity to examine the evolution of such barriers (Coyne and Orr 1989).

With this study, I propose to measure the strength of reproductive isolation and to identify the genes that cause early embryonic lethality in *Mimulus*. First, to quantify the strength of hybrid lethality I will perform interspecific crosses between 20 individuals of each parental line. I will also artificially self-pollinate each individual to provide a baseline for the fertility of our individual inbred focal lines. Seeds from these crosses will be analyzed by eye for viability and then planted and germinated under controlled conditions at the UGA Botany Greenhouses; after four weeks without germination individual seed will be deemed inviable. This experiment will determine whether visual inspection of seed viability is an accurate predictor of germination rates. Second, to investigate the genetics of hybrid lethality, I will cross first generation hybrids, F1s, with both parental lines to form two backcross mapping populations (N = 150 each) with individuals that carry a variety of genomic combinations. I will classify phenotypes by crossing individuals back to the parental lines and scoring their corresponding proportion of viable seed. For each mapping population, I will perform genotyping-by-sequencing using methods developed by Andolfatto et al. 2011 and our lab (A. Kenney unpubl.). To identify genomic regions that contribute to hybrid lethality, I will create a linkage map using JoinMap and will perform quantitative trait locus (QTL) mapping using rQTL. These regions will be screened for candidate genes known to be involved in genomic imprinting in other flowering plant species.

To date, I have seeds for parental lines and reciprocal F1 hybrids. I am also currently performing backcrosses to generate our mapping populations. With this research I will gain insight
into the forces that guide the evolution of speciation and learn the molecular genetics and evolutionary basis of hybrid incompatibilities.

References:


The Connection between Glycosaminoglycans and Pectins
2013 Summer Fellow: Elizabeth Guarisco
Research Mentor: Dr. Carl Bergmann, Department of Biochemistry & Molecular Biology

Glycosaminoglycans (GAGs) are polyanionic macromolecules localized in the extracellular matrix that have important structural roles, but also affect the properties and mechanism of cell function. The chondroitins, a class of GAG, have been shown to act directly upon cell receptors or via interactions with growth factors, and serve as biomarkers for disease diagnosis and progression. Chondroitins interact with a diverse assortment of proteins due to their ubiquitous appearance in the extracellular matrix and on cell surfaces (Prabhakar et al. 2005). Chondroitinases cleave chondroitins at specific glycosidic linkages (Capila et al. 2002). Chondroitins and the enzymes capable of their destruction warrant understanding due to the diverse cellular processes they are involved in: differentiation, communication, proliferation, adhesion, and migration (Huang et al. 2002). Furthermore, the application of chondroitin degrading enzymes extends to wound healing, tissue growth, angiogenesis in abolishing tumors, and curing diseases involving GAG-binding proteins on the pathogen (Fikri et al. 2007).

The corresponding plant matrix polysaccharides are the pectin polysaccharides, partially esterified macromolecular polygalacturonic acids (Gemeiner 2012). Glycosaminoglycans and pectins provide, in separate species, similar functions. The exploration and utilization of the natural properties of pectins has resulted in diversified and varied applications. Pectins are currently utilized as antidiarrheal substances, toxin adsorbers, and are capable of immunostimulating activity, antiulcer activity, anti-metastasis activity, anti-mutagenic activity, anti-nephrosis, cholesterol decreasing activity (Yamada 1996), and even induction of apoptosis in colonic adenocarcinoma cells (Olano-Martin et al. 2003).

The similarity between the functions of pectins and GAGs suggests possible insights into the mechanism by which pectins impact human health. The three-dimensional structures between bacterial enzymes which degrade chondroitins and fungal enzymes which degrade pectins (PDEs or pectin degrading enzymes) show striking similarity. Previous studies in our lab, based on this three-dimensional structural similarity, revealed that pectins are able to bind glycosaminoglycan degrading enzymes and alter their glycosidic activity. Likewise, chondroitins are able to bind pectin degrading enzymes and alter activity. Pectin degrading enzymes could alter cell processes moderated by GAGs and how chondroitins perform, opening up the utilization of these molecules in treatment of conditions such as spinal cord injury, where improper deposition of chondroitins leads to inhibition of new axon growth. Those results were based on activity assays and changes in fluorescence to demonstrate predicted conformational changes in binding. What was needed was direct evidence of the thermodynamics of binding of pectins to chondroitinases and chondroitins to PDEs. This can be obtained using SPR (surface Plasmon resonance).

I began this project in fall 2012 by working out the initial conditions to immobilize PDEs and chondroitinases on an SPR sensor chip. I have begun testing combinations of the pectins, chondroitins, PDEs and chondroitinases. This will continue through the summer, and should provide the data to add to the fluorescence and activity results to more fully understand the interaction among these molecules.

During the summer, I will also begin to test the effects of EPGs, a class of PDE, and pectins in vivo. The common fruit fly, Drosophila melanogaster, provides a useful model system to investigate the biological function of molecules. Drosophila makes chondroitin and heparin sulfate and also has its own set of GAG degrading enzymes, but it does not have any pectin degrading enzymes. By generating transgenic Drosophila strains that do express the PDEs or that express inhibitory
proteins that block PDE activity, we will be able to assess whether changes in GAG biosynthesis or degradation affect development. Depending on the phenotypes that we observe, it may be possible to identify specific cell signaling pathways that are most sensitive to altered GAG levels. This in vivo approach is likely to reveal new functions for GAGs and new ways to manipulate the availability of these important extracellular molecules.

References:


Norse Mythology in Modern Popular Culture
2013 Summer Fellow: Joseph Hopkins
Research Mentor: Dr. Alexander Sager, Department of Germanic and Slavic Studies

Norse mythology, the historical mythology of the North Germanic peoples, has returned as a major cultural force in modern popular culture in recent years. Recent international blockbusters such as “Thor” (2011), “The Avengers” (2012), “The Hobbit” (2012), and “Django Unchained” (2012) borrow core elements from Norse mythology, including characters, plot lines, and even wholesale lists of names, and upcoming sequels, such as “Thor: the Dark World” (2013) and two upcoming sequels to “The Hobbit,” show that this widespread cinematic fascination will only continue. Meanwhile, a seemingly never-ending stream of video games featuring references to Norse mythology continues to flow, such as “The Elder Scrolls V: Skyrim” (2011) and “World of Warcraft” (2004, ongoing expansions). These successes have generated millions upon millions of dollars in revenue.

Other forms of the arts, too, are replete with references to the subject; particular genres of music show a consistent fascination with the topic, with musical groups such as the melodic death metal band Amon Amarth (Sweden), who have recently conducted regular tours of the United States. Outside of the subcultural arena, companies such as Odin (designer clothing, New York) and Loki (active wear, Colorado) directly reference Norse gods. And this is but a small sample; references such as these are seemingly everywhere.

As a new religious movement, Germanic Neopaganism (or Germanic Heathenry) is also growing. A form of Germanic Neopaganism now constitutes the largest non-Christian religious sect in Iceland¹ and forms continue to grow in North America, where the first heathen politician, Dan Halloran, now holds office in Queens, New York as a member of the New York City Council from the 19th district².

Norse mythology was, to varying extents, deleted under Christianization. Yet with secularism as a component of society and with the advent of the internet it has again appeared among its linguistic descendants³ as a cultural component at multiple levels of Western society. Is some sort of cultural metamorphosis occurring? Are these old myths taking on a new life of their own under the influence of modern popular culture? Will they eclipse the influence of Classical mythology? With our proposal we hope to shed light on the place of Norse mythology in modern popular culture.

Analyzing a diverse yet targeted data sample may provide some answers. The public understanding of this material and currents of influences at play have been little studied, however. Therefore, under the guidance of Dr. Alexander Sager of the Germanic and Slavic Studies Department here at UGA, we propose that I, Joseph Hopkins, interview individuals in both Georgia and Scandinavia (based primarily in Copenhagen, Denmark) from a variety of walks of life—from bankers to neopagans—on their understanding of Norse mythology.

Using interview questions developed by Dr. Sager and myself (with the assistance of graduate student Matthew May of UGA’s Department of Sociology), these targeted interviews will be recorded, transcribed, and made publicly available. We aim to process at least several dozen interviews. This data will be analyzed and lines of influence will be identified.

As I have some background in photography, consenting subjects will also be photographed. The results of this survey will be detailed in future presentations. Data gathered will inform future projects of my own on the topic of the modern relevance of Norse mythology in popular culture.

The raw data sample and its results will be of particular interest to philologists, anthropologists, folklorists, theologists, sociologists, and academic departments considering the addition of a Norse mythology course. Additionally, while conducting research in the field, a syllabus
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based on the reception of Germanic mythology in the modern era developed by Dr. Sager and myself will be adhered to.

Notes:

1. For a statistical breakdown of religious groups in Iceland, see Statistics Iceland: http://www.statice.is/Statistics/Population/Religious-organizations


3. Old Norse was a major influence on its sister language, Old English. Anglo-Saxon mythology descended from the same source as Norse mythology; the religion of a common people speaking a language generally referred to as Proto-Germanic.
Effects of Music on Male Aggression: Do Lyrics Really Matter?
2013 Summer Fellow: Courtland Hyatt
Research Mentor: Dr. Amos Zeichner, Department of Psychology

Since the beginning of the 20th century, human accessibility to media has increased substantially. Technological advancements like radio, television, and the Internet have revolutionized our ability to consume media, both in quantity and content. Like all other media, this explosion has inextricably transformed music in availability. Listeners no longer need to be physically present for a piece’s performance to experience it. In fact, it is difficult to escape the presence of music in modern social life. As the pervasion of music in human life grows, so does its impact on psychological health and behavior. Thus, elucidating the relationship between music and behavior is imperative, specifically deleterious behavior such as aggression.

Previous studies on music, lyrics, and aggression have confirmed the presence of a relationship among these constructs, but its parameters remain uncertain. Anderson and colleagues conducted a study that found that exposure to music with violent lyrics related to aggressive cognition and affect (Anderson et al. 2003). Unfortunately, this study did not examine the relationship between these risk factors and actual aggressive behavior. In a seminal paper, Fischer and Greitemeyer (2006) conducted a study wherein participants listened to songs with either misogynous or neutral lyrics followed by participation in an aggression paradigm. Findings indicated that men who were proximately exposed to misogynous lyrics aggressed significantly more toward a female confederate than they did toward a male, and that these men also aggressed significantly more toward the female than did men proximately exposed to neutral lyrics.

Despite this study’s important findings, its methodology had important limitations, which include the stimuli used, such as extreme disparities in lyrical content between the songs within the misogynous condition, and genre inconsistency; one variation of the misogynous condition contained a “punk rock” song, another a “hip-hop” song, and the neutral condition contained neither. As each of the aforementioned musical styles is traditionally upbeat and energetic, the subsequent aggressive behavior observed in the study could have resulted from arousal (being “hyped up” and “energized”) by the music rather than being inspired by the lyrical content. The present study will attempt to address these limitations and reexamine the relationship between misogynous lyrics and male aggression toward women. It is hypothesized that men in the misogynous lyric condition will exhibit higher levels of aggression toward a female confederate than a male, and these men will also aggress more toward the female than men in the neutral lyric condition.

One hundred-twenty men will be recruited as volunteers for a two-part study. In Part 1, participants will complete questionnaires designed to gather information about past aggressive behavior and personality traits (e.g. narcissism) that have been associated with aggressive behavior. In order to control for demand characteristics, participants will wait at least two days before completing Part 2, in which they will be exposed to one of two pieces of music, one with misogynous lyrics, and the other with neutral lyrics. The two pieces of music will have identical accompaniment tracks and will only differ in lyrical content. Furthermore, in order to control for music-related arousal, the accompaniment track will not be upbeat and energetic. To ensure attendance to the stimuli, participants will be informed that they will be asked to express their opinion of the piece at the end of the experiment. The songs will be specifically constructed for this project to ensure that participants have not had differential levels of prior exposure to the song. To measure aggression, the present study will make use of the Response-choice Aggression Paradigm, which involves a bogus reaction time competition against an ostensible confederate (Zeichner, Frey,
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Parrott, & Butryn 1999). Opponent gender will be systematically varied in order to examine the lyrics’ effects on male aggression toward both women and men. During the summer, I will conduct several pilot studies to ensure that the stimuli are interpreted as intended, and begin to run male participants from the Psychology Department research participant pool.

References:


The Effects of Autophagy and Necroptosis in the Murine Model of Placental Malaria

2013 Summer Fellow: Mathew Joseph
Research Mentor: Dr. Julie Moore, Department of Infectious Diseases

A major health issue in the developing world during pregnancy is malaria; nearly half the world’s population lives in a high-risk area (warm and humid areas) and the infectious disease results in close to one million fatalities yearly. *Plasmodium falciparum*, transmitted by the *Anopheles* mosquito, is the deadliest protozoan parasite which causes malaria in humans. The Moore Lab works with two types of malaria: cerebral and placental. Placental malaria is characterized by the accumulation of parasitized red blood cells and migration of leukocytes into the placenta. This disease is known as placental malaria (PM) and leads to stillbirth, low birth weight, and abortion. My intended project proposal for this summer will seek to study the mechanisms underlying PM.

Autophagy is a catabolic process and a vital cellular response. This occurs during periods of nutrient deprivation, low energy levels, and intracellular stress. Autophagy describes the process by which cells use lysosomal machinery to degrade and recycle organelles into their organic components for energy. We hypothesize that accumulation of parasitized red blood cells and infiltration of leukocytes in the placenta during malaria infection will induce excessive autophagic activity in the placenta, thereby contributing to poor birth outcome. We intend to initiate studies of malaria during pregnancy using *Plasmodium chabaudi* AS (a rodent-infecting plasmodial species that resembles *Plasmodium falciparum*) to infect C57BL/6J (B6) and A/J mice as model platforms for understanding the immunopathogenesis of PM. On day zero of pregnancy, mice will be infected with 1,000 *P. chabaudi*-infected red blood cells. Throughout gestation, secreted cytokines and chemokines will be assayed by ELISA, an assay which uses antibodies and visual color changes to identify substances. In this case, we will be looking for inflammatory proteins that may stress the placenta and initiate the autophagy pathway. Tissues from mice spleens and fetoplacental units will be collected at sacrifice and homogenized for proteins and RNA isolation. cDNA will be made from the RNA and real-time PCR will be performed to assess levels of autophagy-related genes relative to the housekeeping gene 18S rRNA. Markers for autophagy to be used in PCR include LC3a, LC3b, BEC-1, and Atg5. These markers all correspond to transcripts of activated proteins in the autophagic pathway. Immunohistochemistry will be performed to histologically view markers for autophagy-related proteins in situ. Using fluorescence microscopy, we will also be able to visualize details of the cell and localize autophagy occurrences. We will compare the data obtained for four autophagy markers between infected pregnant (IP) A/J and B6 mice and their uninfected pregnant (UP) counterparts. If our hypothesis is correct, we expect higher levels of autophagy in IP B6 mice as compared to the other experimental mice.

We are also interested in necroptosis, a programmed and regulated process leading to the formation of necrotic tissue. This has been implicated to occur in malarial infections, and necrosis of the placenta and embryo has been observed in the Moore lab. The RIP1/RIP3 necrosome, part of the cellular growth pathway, is known to be activated during necroptosis. Following the autophagy experiments, we intend to use real-time PCR to compare levels of RIP1 and RIP3 between IP and UP B6 and A/J mice to note any possible differences in expression of the necroptosis pathway. If results are positive, a future direction would be to conduct the same experiments using RIP3 knockout mice, to see if these mice still undergo necroptosis.

Preliminary data indicate that *Plasmodium chabaudi* induces local and systemic proinflammatory responses, and autophagic response data will be analyzed to assess correlation with pregnancy outcome. In conclusion, our research analyzes the mechanistic basis for malaria-
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induced compromise of pregnancy, especially midgestation, when high parasitic density is coincidental with pregnancy loss in our model. This proposal for the summer promises to reveal common and critical mechanisms which contribute universally to malaria compromised pregnancies.

References:


Assessing Potential Range Shifts of the American Alligator with Sea Level Rise
2013 Summer Fellow: Lara Mengak
Research Mentor: Dr. Nathan Nibbelink, Warnell School of Forestry and Natural Resources

Rising sea levels precipitated by climate change threaten the southeastern coasts of the United States. Specifically, models indicate a substantial loss of salt marsh habitat and a transition from current freshwater marsh to saltwater and brackish marsh habitat, which could significantly affect marsh-dependent species. Historically, species have responded to sea level rise by migrating further inland; however, the current rate of predicted environmental change may be too rapid for adaptation and important coastal habitat and species will be lost. One such species, the American alligator (*Alligator mississippiensis*), functions as a keystone species and an ecosystem engineer by creating “gator walls.” Many other species depend on these wallows, or small freshwater pools, during dry months.

Despite its currently stable population size, the alligator is listed as “threatened due to similarity of appearance” to other endangered crocodilian species. As a top predator, alligators also pose the potential for conflict with humans. As sea levels continue to rise and alligator habitat distributions shift, alligators may be forced into increasing contact with humans. The alligator’s conservation status and potential for conflict make an understanding of its potential responses to environmental change critical. Determining how alligator habitat may change with sea level rise will be important in guiding future management recommendations.

My research will assess the potential response of American alligators to predicted sea level rise by examining changes in their habitat location and quality. Using available literature, I have defined potential alligator habitat as brackish or saltmarsh habitat close to freshwater habitat. Potential habitat was classified into SLAMM (Sea Levels Affecting Marshes Model) habitat categories. We used SLAMM outputs in a preliminary model to show how the quality of alligator habitat is predicted to change. This model is based on the hypothesis that high quality habitat includes areas at the transition between fresh and saltwater habitat. Habitat in these areas best optimizes the distance between good habitat for nesting (freshwater) and the most productive foraging habitat (saltwater). The model outputs also show high quality habitat area increasing as it moves further inland. With sea level rise, this high quality habitat will move closer to human populated areas.

I will test hypotheses about what constitutes good alligator habitat during the summer by collecting occupancy and abundance data for alligators. Data will be collected using spotlight surveys at a gradient of sites along the Georgia coast from saltmarsh and brackish marsh to adjacent freshwater areas. Field data will then be used to predict suitable alligator habitat, which can then be projected into the future using SLAMM 6 land cover projections. Additionally, I will use the models to determine the distance between alligator habitat and developed areas to assess the potential for conflict.

Like all coastal species, the alligator may be significantly affected by sea level rise. The transition of marsh habitat coupled with changes in habitat area and quality will pose particular challenges to alligators and those that work to manage and protect their populations. This project will provide better estimations of the alligator’s response to sea level rise and result in valuable management recommendations.

References:


2013 Summer Fellow: Kelly Murray
Research Mentor: Dr. Catherine Pringle, Odum School of Ecology

In Trinidadian streams, guppies (*Poecilia reticulata*) have naturally colonized or were introduced to regions where previously only one other fish species, the killifish *Anablepsoides hartii*, existed. Communities with and without guppies can be found in the same stream, less than 200m apart, separated by large barrier waterfalls, above which killifish, but not guppies, can migrate. Long-term research in this system has shown that guppy introductions to these low-predation sites can initiate evolution of guppy life history traits\(^1\) and may cause changes in ecosystem-level processes\(^2,3\). Here we will study how guppy presence influences populations of the leaf-shredding caddisfly, *Phylloicus hansoni*, which is a dominant decomposer in these tropical streams\(^4\). Leaf input is a key source of nutrients for headwater streams\(^5\), and shredding invertebrates like *Phylloicus* have an important role in leaf breakdown within a stream ecosystem\(^6,7\).

A previous survey of macroinvertebrates in the paired killifish+guppy (KG) and killifish-only (KO) reaches of eight streams showed that regions with guppies generally have higher abundances of *Phylloicus*. Killifish, which consume *Phylloicus*, have densities typically 3-4 times higher in KO sites than KG sites. We hypothesize that differential predation pressure by killifish, due to niche partitioning in response to guppy presence, is also contributing to observed differences. This is currently being investigated with a gut content analysis project. To further examine *Phylloicus* population characteristics and leaf decomposition as a function of fish assemblage, studies focusing on *Phylloicus* abundances and life history will be continued in Trinidad this summer. Leaf-packs will be placed in both KO and KG reaches to be colonized by *Phylloicus*. These samples will provide data on abundances of *Phylloicus* in addition to changes in leaf mass over time as a function of shredding activity by *Phylloicus*. We predict that KG reaches will be associated with both larger *Phylloicus* populations and more rapid leaf breakdown.

To analyze how life history traits of this caddisfly species could also be impacted by differential predation pressure between reaches, we will measure body size of *Phylloicus* specimens and study the progression of life stages of individuals from different reaches. We hypothesize that killifish in KO reaches place greater predation pressure on larger *Phylloicus* individuals, which would result in a higher frequency of smaller individuals in the stream community. Size-specific predation can induce life history evolution, because selection will favor individuals that reproduce earlier and at smaller sizes\(^8\). Predation pressure can cause faster rates of development in aquatic insects, which results in smaller size at metamorphosis\(^9\). We will test this prediction by investigating the life cycle of *Phylloicus* in Trinidadian streams with differential predation risk. We will study patterns of development in this species by collecting specimens of various sizes and observing growth of individuals in a laboratory setting. We aim to determine whether *Phylloicus* individuals from KO sites metamorphose at smaller sizes than those from KG sites.

Field work and experiments will be conducted in Trinidad over several weeks in May 2013, while sample processing and data analysis will be completed in Athens. Quantifying *Phylloicus* demography can further our understanding of how changes in a community of fish can impact macroinvertebrate populations, which also affects invertebrate-mediated processes, including the decomposition of allochthonous material. The effects on *Phylloicus* populations provide an opportunity to translate the impacts of guppy introduction and subsequent killifish predation response on the availability of resources through leaf decomposition rates, due to *Phylloicus*’ function
as a shredding invertebrate. We can use this system to study how changes in community interactions can have cascading effects on ecosystem-level processes within the unique context of the evolutionary and ecological feedbacks within these Trinidadian streams.

References:


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Analysis of Cancer Mutations in Protein Kinases using Semantic Web Technologies

2013 Summer Fellow: Anish Narayanan
Research Mentor: Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology

Protein kinases are essential regulators in the cell and constitute one of the largest and most diverse gene superfamilies in the genome. By driving cellular activities through a process of phosphorylating protein substrates, kinases play an important role in signal transduction pathways and the coordination of cell processes. Currently, there is a vast amount of useful data present online regarding protein kinases collected from various high throughput studies. However, the information is scattered across many websites, such as UniProt, Kinbase, COSMIC, and Reactome, each of which specializes in one narrow aspect of kinase knowledge. How can we solve the challenge of data integration in a manner that can be used to formulate valuable and insightful conclusions?

Ontologies are one way to solve this problem of integrability. By combining the information from all of these data sources into one location, cross comparisons can easily be made between these different databases. Our lab developed ProKinO (the Protein Kinase Ontology) with this goal in mind. Using this powerful tool, it is now possible, for example, to link mutation data (from COSMIC) to pathway and reaction data (from Reactome) by querying a single composite database to perform complex bioinformatics analyses. In order to illustrate the potential value of such a data-mining approach, I have written a series of simple data SPARQL queries for ProKinO. Then, by meticulously analyzing the data generated from them, I have drawn some interesting conclusions about the fundamental nature of kinases by studying the relationships between subdomains, structures, isoforms, mutations, and other intriguing kinase properties.

One of the unique benefits of ProKinO with respect to uncovering new results is that specific queries can readily be zoomed in on for further study. An example of this stemmed from a query which was designed to count the isoforms of all kinases across species. From the results gathered here, it was noted that there was one kinase, Kin1, which had thirteen different isoforms. Using this finding and sequence data gathered from the ontology, the various alternative splicings were determined. This agrees with fact that Kin1 expression is controlled post-transcriptionally in a manner that results in differential expression during embryo, larva, and adult organism development. Another advantage to the ProKinO approach is that it allows for the accomplishment of global analyses that would otherwise be exceedingly tedious with the current tools available to biochemists. One interesting query that resulted from this top-down approach involved discovering trends in mutational distributions across kinases based on the amino acids that constituted the primary structures of those proteins. By scanning over 500 different human kinases for documented mutations found within their sequences, an interesting distribution of wild type amino acids prone to mutations was tabulated; some amino acids, such as arginine, appeared in the results several times more than would be expected. Based on this peculiar finding, our group was then able to further explore the distribution for each of the amino acids across different defined regions of the kinase domain (assisted by even more data gathered from other ProKinO SPARQL queries).

Even with these connections made, there are still plenty of unique relationships that remain hidden. I hope to uncover and describe a handful of these over the course of the summer fellowship. Under the guidance of Dr. Kannan, one of the patterns that I will be examining is the natural co-occurrence of mutations in kinases. Based on the patient data that ProKinO had compiled, I am searching for groups of mutations that repeatedly appear together in patients and am studying what common phenotypes are expressed in such individuals. One kinase in particular, EGFR (epidermal growth factor receptor), is rich in the occurrence of pairs of mutations, which
agrees with previous work. Combined with three-dimensional protein kinase structure data, I hope to find an explanation for the tandem appearance of these and other mutations.

References:


Characterization of the Light Signaling System in Fireflies
2013 Summer Fellow: Jennifer Pallansch
Research Mentor: Dr. David Hall, Department of Genetics

The universal nature of communication systems makes an understanding of their evolution a central question in biology. All signals, including chemical, sound, and light, must be produced, propagated through variable environments, and then received by target individuals, with little loss of information. In the vast majority of species, the molecules underlying signal production and reception are usually unknown or complex, which makes an understanding of their evolution essentially intractable. The system in which I work is one of few exceptions. Signaling in the firefly beetle family has a well-characterized molecular basis for both reception, controlled by proteins in the opsin family, and light production, which facilitates a genetic study of their communication (Branchini, Southworth, Khattak, Michelini, & Roda, 2005; Yuichi & Takahiko 2009). My project focuses on light production.

Light in fireflies is produced when the enzyme luciferase catalyzes the oxidation of its substrate, luciferin (da Silva & da Silva 2012). Across firefly species several different light colors are produced, ranging from orange to blue. However, this variation has not been precisely characterized outside of the luciferase gene in *Photinus pyralis* nor has its genetic basis been examined (Marques & da Silva, 2009). Further, there is essentially no information on light color variation within a species. My project will fill two gaps in our knowledge concerning firefly light production. First, I will characterize the light color produced across species and the variation within species. Changes in light color will be mapped to the phylogeny of fireflies to test several hypotheses for the evolution of changes in light color. Second, I will use molecular techniques to express luciferase from several species to test the hypothesis that this enzyme is the sole determinant of the light color variation (Hosseinkhani 2011).

To examine the variation within and among species, I will utilize field measurements of light production across several species. In the summer of 2012, I developed protocols for handling fireflies after capture to elicit flashes and record their emission spectra using a portable diffraction spectrophotometer (Jaz Optics). This summer, I will measure spectra across additional species and populations within species during extended field trips with a graduate student in the lab. This data will then be analyzed to test two primary hypotheses concerning evolution of light color. One hypothesis states that light color evolves in response to changes in activity period, which is determined by the time a species is most active. Another states that light color evolves due to changes in background vegetation. Primarily, these changes reflect field versus forest habitats. I will test these hypotheses using comparisons on a phylogeny and by examining the geographic distribution of color across populations within species and its association with ambient light and activity times.

During the fall, I was able to develop a protocol for the expression of the luciferase enzyme in a bacterium, *Escherichia coli*. In short, the sequence of the luciferase protein was determined for a species, and the intron-free coding sequence was obtained from a company and cloned into an expression vector. The substrate, luciferin, was added and the emission spectra measured. I am thus able to measure emission spectra of the enzyme *in vitro* to compare to field data. This summer, I will clone, express and measure spectra of luciferase enzymes from several species to test whether the enzyme alone determines the spectra measured in the field. This process allows the effects of changes in luciferase sequence to be established and tests for the involvement of other factors in color shifts.
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Combining the *in vivo* and *in vitro* spectrum comparisons and field data, the luciferase system presents a unique opportunity to contribute to a complete understanding of the evolution of a signal in a communication system. Together with other work in the lab characterizing the receiver, my research will position the firefly light signaling system as one of the premier models for understanding the evolution of communication systems.

References:


Exploring Effects of Stress and Dominance on the Weaning Strategies of Female Rhesus Macaques
2013 Summer Fellow: Katie Patrick
Research Mentor: Dr. Laurie Reitsema, Department of Anthropology

I have set out to gain knowledge, through isotopic analysis, on how stress affects the weaning process of female rhesus macaques, a crucial aspect of parental investment. Parental investment and parent-offspring conflict are both important concepts in evolutionary and behavioral ecology. Parental investment refers to the cost of current investment in offspring to future reproduction. Because investment in current offspring can limit future reproduction, parent-offspring conflict arises when current offspring try to maximize the resources they extract from the parent while the parent tries to balance their current investment with future reproduction (Vandeleest & Capitanio 2012). Female mammals provide parental investment through high energetic investment in milk and suppression of ovulation while nursing (Lee 1996); therefore, weaning, to accustom one’s young to take nourishment in something other than suckling, represents an important event for female mammals. Weaning allows a female to resume sexual receptivity, and shorter weaning periods mean shorter inter-birth intervals. Assuming shorter weaning periods do not compromise infant or adult survival, shorter weaning periods can increase a female’s fitness.

Among highly social mammals such as many primates, factors that may affect the weaning process may be social rank and associated stress levels. In general, dominant individuals have more access to mates and resources and on average show lower stress levels compared to subordinate individuals (Michopoulos et al. 2012). Therefore, dominant females may benefit from frequent mating opportunities and shorter weaning intervals. In contrast, subordinate individuals exhibit higher levels of stress hormone cortisol, known to negatively affect the reproductive system (Mas-Rivera & Bercovitch 2008). Furthermore, subordinate monkeys are known to be more protective of their offspring, indicating that stress and social status are influential in child rearing strategies. Altogether, I hypothesize that high ranking females will wean their offspring earlier than low ranking females.

Under the supervision of Dr. Reitsema, I will be conducting a study of social rank, stress, and weaning among rhesus macaques. Rhesus macaques are well-studied non-human primates, known to be good model systems for humans due to similarities in our immune systems. I will use measures of carbon and nitrogen stable isotopes and cortisol levels in blood samples of high and low ranking females to measure the relationship between stress and rank, and how these two factors are related to a mother’s weaning strategy. Stable isotopes are means to test the relative importance of different food resources, and can be used to measure the weaning process by estimating the relative contribution of solid foods to milk in an infant’s diet (Kurle 2002). Carbon is used to track the introduction of solid foods into the infant’s diet, while nitrogen values monitor the length of breast-feeding (Crowley 2012). Blood samples have already been collected from 10 mother-infant pairs of captive rhesus macaque females at the Yerkes Primate Research Center. Infant ages during blood sampling were 1, 2, and 5 months. I will use 200 uI of blood and 3ml of breast milk for stable isotope analysis. Sample preparation will take place at the University of Georgia Department of Anthropology, and analysis will be conducted at the Center for Applied Isotope Studies at the University of Georgia. I expect to find that stable isotope values will reach the levels of their mothers faster in high ranking vs. low ranking females (since a shorter weaning period implies infants will consume a diet most similar to their mothers more quickly), and I expect cortisol levels will be lower in the highest ranking individuals.

In addition to informing the theory on parental investment, this research has applications to understanding the effect of stress on parental care with applications to primate conservation and human welfare. This study will ideally be the basis for a future longitudinal study of how late vs. early weaning affects developmental health and socialization, and also, how differing weaning strategies and stress
levels affect a female’s fitness. By understanding the role of weaning and stress on fitness and ontogeny, we can acquire knowledge on how to improve reproductive success and developmental health for both primates and humans.

References:


Kurle, C. M. (2002). Stable-isotope ratios of blood components from captive northern fur seals (Callorhinus ursinus) and their diet: applications for studying the foraging ecology of wild otariids.” [Article]. Canadian Journal of Zoology, 80(5), 902.


Lester Moody: A Man, a River, and a Quest for Industry in the Twentieth Century South

2013 Summer Fellow: Anthony Sadler
Research Mentor: Dr. Brian Drake, Department of History

There are currently more than twenty dams and reservoirs proposed to be added to the more than four thousand already on Georgia’s rivers. Despite large sums of tax money allocated for such projects, dams are typically the culmination of grassroots campaigns by local leaders. Some of them are well-informed, focus on the best interest of their constituents, and take riverine development seriously. Some consider the long-term economic, social, and environmental consequences of their decisions. Others do not.

The development of the Savannah River in the early- to mid-twentieth century was due to the intense lobbying of a small but powerful group of individuals headed by a seemingly inconsequential civic leader. Lester Moody, the secretary of the Augusta Chamber of Commerce, was the head lobbyist for three dams, the Savannah River Plant, and the expansion of Camp Gordon into a Fort, all of which brought industries and an era of great prosperity to the city in the 1950s. The result of his work was a legacy of both environmental disruption and economic success, but his legacy is misleading. He promised protection from flooding and long-term economic prosperity to the people of Augusta, Congress, and three presidents, which he failed to fully deliver. Yet Moody is neither a hero nor villain. When leaders from across Georgia promise answers to economic and environmental woes in the form of dams and reservoirs, it is important to review history to gain perspective on the present. That history has not been written.

My research focuses on Lester Moody to create a model to scrutinize the grassroots leaders behind modern Southern environmental change. Moody’s actions were informed by a conservation ethic, a belief or theory behind his plans, but that ethic is unknown. How was he able to inspire so many to support his endeavors? How did he have such great influence on senators, congressmen, presidents, and the common man? What did he know about the ecological consequences of his plans? Did he knowingly mislead the public in order to accomplish his goals? These are questions that can only be answered through the disciplined and intense research I plan to do this summer. By using the breadth of archival evidence about Savannah River development, interdisciplinary research into the effects the development had on the river’s ecosystem, and personal accounts of Lester Moody and his allies through their papers, libraries, and interviews with those who knew them, I hope to build an interwoven story—a dual biography—of a man and a river in order to highlight the delicate and often deleterious relationship between humans and their natural resources. I will uncover the nature of leaders such as city attorneys, managers, chief executive officers, and leaders of the chamber of commerce and convention and visitors bureau, who were not elected, but held power over policies which affected a great number of people in the twentieth and twenty-first centuries.

I plan to spend the summer between various archives in Savannah, Augusta, Atlanta, Morrow, and South Carolina, as well as trips to interview individuals that knew Moody and his wife, and to be able to follow any leads the research provides.

The results of my research will add to the historiography of Southern environmental history by focusing on the grassroots aspect of his campaign to provide a model to use as a burden of proof for other reservoir lobbyists. The focus of scrutiny should be shifted, when looking at the past or present, from those at the top of the political pyramid to those at the bottom with little accountability and a broad range of power. Only then can we fully understand both our past and present relationship with our rivers.
Structure-Function Investigations of the Ste24p: A Metalloprotease Associated with Progeroid Disease

2013 Summer Fellow: Will Saunders
Research Mentor: Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology

Ste24p is a metalloprotease that is involved in the processing of prelamin A in humans (significant to progeria), the α-factor mating pheromone in yeast, and is hypothesized to have as yet unknown targets in other species. Collectively, these targets have in common that they are farnesylated as the result of having a C-terminal CAAX motif. The Schmidt lab is actively collaborating with a research group at UVA that was the first to determine the X-ray crystal structure of Ste24 (Science, 2013 – in press). Despite this information, the mechanism of Ste24p is unknown and much remains to be investigated about this important enzyme.

The most relevant human disease associated with Ste24p mutation is Hutchinson-Gilford Progeria Syndrome (HGPS). Unpublished studies from the Schmidt lab also indicate that Ste24p has the ability to protect against amyloid fibrils formed in association with the PSI+ prion of yeast. This is significant because similar amyloid fibrils in humans, including those derived from the Prion protein, cause neurodegenerative disease, including Creutzfeldt-Jakob disease and bovine spongiform encephalopathy (commonly known as Mad Cow Disease).

Much of what is known about Ste24p comes from its role in the α-factor processing pathway of yeast (Fujimara-Kamada 1997). The production of yeast α-factor involves a multistep post-translational modification pathway. The α-factor precursor is farnesylated, proteolytically cleaved, and carboxymethylated before it is released as an active signaling molecule to mediate sexual reproduction in yeast. Ste24p is involved in two distinct cleavage steps in this pathway. The proposed work associated with this application takes advantage of yeast α-factor as a reporter.

Ste24 is very well conserved across species. The structure of Ste24p is interesting because it is a membrane bound protein that resembles an oil drum embedded in the membrane bilayer with no apparent point of entry to a central cavity that contains the proteolytic active site. There is one small window within the transmembrane portion of Ste24 that has been proposed as the access point.

This project investigates the mechanism of Ste24 through structure-function studies of the proposed substrate access point. Specifically, mutations will be created that either constrict these access points or lock putative hinge points that interfere with gating of the access point.

The proposed order of events is as follows:

- Identify sites of mutations using structural information as a guide. This will be accomplished in collaboration with Dr. Zachary Wood (UGA Biochemistry & Molecular Biology) and our collaborator Dr. Michael Weiner (UVA Molecular Physiology and Biological Physics).
- Mutations in Ste24p will be created by molecular methods already in my skill set (e.g.PCR, Quikchange).
- The impact of the mutations will be tested using both in vivo and in vitro assays that are standard protocols used by the Schmidt lab.
  - In vivo assessments will involve genetic based assays related to α-factor production (conjugation tests, halo assays) and prion suppression. I am very familiar with the α-factor techniques, having used them continuously over the past three semesters.
  - In vitro assessments will involve the isolation of membranes and a dequenching assay that will allow for kinetic analysis of mutant enzymes. These assays will allow me to
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expand the breadth of my training in lab technique to include protein enrichment and other biochemical methods.

We expect to identify the structural region that serves as the access point to the Ste24p active site. Additionally, we will resolve whether mutations that affect α-factor also affect the clearance of yeast prions. The PSI+ prion is not a CaaX protein, so there is a possibility that we may uncover an additional mode of access to the Ste24 active site.

References:


Social Behavior and Vocal Repertoire of Wild Red and Green Macaws
2013 Summer Fellow: Natalie Schwob
Research Mentor: Dr. Dorothy Fragaszy, Department of Psychology

Red and Green macaws (Ara chloropterus) are large-bodied members of the parrot family Psittacidae. These macaws form long-term pair bonds, travelling and nesting together, and often flying almost wingtip to wingtip with their mate. Despite abiding interest in psittacids as highly encephalized, socially complex birds, studies of wild psittacids are rare, and virtually no studies have been done on wild macaws, especially those that live in the Cerrado (Brazilian savannah). Basic features of their behavioral biology have not yet been described. Dr. Fragaszy (Psychology department) and I plan to study the behavior of wild Red and Green macaws in Piauí, Brazil. The macaws produce frequent and variable vocalizations, perhaps associated with different social contexts. For the past six months I have reviewed published studies of bird vocalizations and the limited literature available on macaws to establish a foundational knowledge for this study. I hope to record the vocalizations and behavior of these uniquely social birds in May – July 2013 at the field site in Piauí, Brazil where Dr. Fragaszy has worked since 2005. We know the location of several nesting sites in cliff crevices within a few kilometers of the research lodge, and the birds are easy to see and hear near the nest sites. Thus this site offers a great opportunity to study wild macaws.

My main objectives are to describe social interactions of macaws, and to define the repertoire of calls they produce, with differentiation by functional contexts (e.g., “depart”, “return to the nest”) and by pairs. I am especially interested in describing the interactions of mated pairs and small groups that form transiently. I will also seek evidence that the birds develop pair-specific or individual-specific calls (signature calls), as have been described very recently in other wild psittacids, and that pairs duet and/or coordinate their vocalizations temporally (“call and respond”).

Dr. Fragaszy and I intend to observe the macaws from distances of 10 – 80 m as they depart and arrive back at their nests in our field site, including when “visitors” arrive at nest sites while the mated pair is resident. Often the larger group (pair plus visitors) fly off together after a period of vocalizing near the nest. The pairmates reliably leave together and return to the nest at dawn and dusk, respectively, and fly in the area during the day. We will note the behavior of the birds (events in temporal sequence, with notations of context) using digital data loggers. We will record vocalizations using a parabolic receiver and a directional microphone attached to a digital recorder. Following data collection, I will process the vocalizations to define their structure using RavenPro software. Then identified calls will be associated with their behavioral records, to build a picture of the functional context of specific calls. We will collaborate with two Brazilian ethologists in this project (Dr. Patricia Monticelli and Dr. Carlos Araujo), and will share the vocal processing tasks with them.

This study will provide new information about the virtually unknown lives of wild macaws, particularly their social behavior. To our knowledge, this will be the first study of these birds in a savannah habitat.
Ecology and Genetic Characteristics of Haemogregarines in Fresh Water Turtles

2013 Summer Fellows: Scarlett Sumner
Research Mentor: Dr. Michael Yabsley, Department of Wildlife Disease Ecology

Haemogregarines are common intracellular parasites of freshwater turtles and aquatic leeches (the vector). Rarely do haemogregarines cause disease, but they can during extreme circumstances (e.g., stress, heavy infections). Previous studies, including one conducted by a former CURO student, showed that prevalence varies by species and location. These differences could be related to leech abundance or behavior, such as basking behaviors, which could result in differential exposure to leeches. Also, differences in prevalence could be due to habitat, which could alter leech abundance or communities of turtles present. Because these parasites cannot be distinguished based on morphology seen on a blood smear, it is currently unknown if the different turtle species are infected with the same parasite or different parasites. Not knowing the diversity of parasites within these hosts has limited previous studies.

I have two aims for this proposed project including 1) expand on previous work and examine differences in prevalence among common turtle species from several different habitats (e.g., river, pond, lake, etc.) in Clarke County, Georgia to relate any differences to habitat or behavior of the turtles and 2) genetically characterize parasites from a diversity of hosts and geographic regions to determine species diversity and host range of haemogregarine parasites. During this summer, a diversity of water bodies in Clarke County will be sampled. The common species of turtles present at these sites include the common musk turtle (Sternotherus odoratus), pond sliders (Trachemys scripta), painted turtles (Chrysemys picta), and snapping turtles (Chelydra serpentina). Turtles will be trapped by standard methods and a blood sample collected for making a thin blood smear and whole blood for PCR and sequence analysis of partial 18SrRNA gene sequences. Various ecological variables (water body size, water depth, aquatic vegetation presence, tree cover, urbanization, etc.) will be collected. Thin blood smears will be stained and analyzed to determine the prevalence of haemogregarine parasites in each specimen and if present, the number of parasites/7,000 red blood cells will be determined to calculate an intensity of infection. Differences in prevalence and intensity between these groups will be assessed. We hypothesize that frequent basking may decrease parasite prevalence and/or intensity by either 1) heating the animal, which helps the immune system fight off infections or 2) decreasing contact with the vectors of haemogregarines, which are aquatic leeches. In addition, we will test for differences in parasite prevalence and intensity between individual turtle species from the different habitats. The geographical surroundings of the turtles may be important regarding the prevalence of haemogregarine parasites and perhaps the burdens due to pollutants or other unnatural or natural compromising factors. For example, turtles in more pristine environments may be less prone to haemogregarine infections or exhibit lower levels of infection than turtles in more impacted habitats. It is known that turtles are less stressed in a natural environment; therefore, their parasite burdens may be lower. Conversely, pristine environments may be more suitable for the leech vectors, which would result in higher prevalence. Because haemogregarines can cause disease when present in high numbers or during periods of stress, the greatest impacted turtles would be those with higher parasite burdens.

Finally, a subset of samples will be genetically characterized. Currently, experimental infections are the only way to distinguish between species, which isn’t practical or logistically possible in many cases. Haemogregarines are not necessarily host specific, so there is a possibility that multiple turtle species harbor the same parasite and that multiple parasite species are present in a single host. Recently, Dr. Yabsley developed a PCR test that can amplify the haemogregarine
parasite DNA. Using this PCR and subsequent sequence analysis of samples I will collect this summer as well as banked samples from other regions and turtle species, we will be able to determine how many species of haemogregarines are infecting turtles in the United States and if parasite species impacts prevalence and/or intensity of infections in various turtle species.
Jean-Jacques Rousseau and the Development of the Counter-Enlightenment
2013 Summer Fellow: Brian Underwood
Research Mentor: Dr. Jennifer Palmer, Department of History

Scholars often count Swiss philosopher Jean-Jacques Rousseau as a chief figure of the Enlightenment, a movement at the heart of western intellectual tradition. It is unusual, however, that they consider Rousseau a member of that movement when he himself explicitly challenged Enlightenment tenets at their most fundamental levels. I intend to demonstrate through this project that Jean-Jacques Rousseau was in fact an early figure in a burgeoning Counter-Enlightenment – a direct ideological confrontation of the strict rationalism of the Enlightenment that began in the eighteenth century and heavily influenced the dominant continental philosophies of the nineteenth century. Examining the philosophy of Rousseau in this context will offer insight into direct and immediate reactions to the Enlightenment while it was still in progress. In turn, the writings of Rousseau will exhibit that the Enlightenment itself was not a monolithic intellectual entity, but instead was a contentious movement even at its height.

Accepting Dorinda Outram’s standard definition of the Enlightenment and its values – including scientific inquiry, reason, and individualism – it is clear that Rousseau explicitly rejected the philosophy of the Enlightenment. Rousseau expressly introduced his antagonism to the philosophy of the Enlightenment in his *First Discourse* (1750): “Almighty God… deliver us from the enlightenment and fatal arts of our forefathers, and give back to us ignorance, innocence, and poverty, the only goods that can give us happiness and are precious in thy sight.” He continued this antagonism throughout the course of his writings on multiple subjects, from metaphysics to politics.

The purpose of this project is to identify those central ideas that make Rousseau’s ideology distinct from that of the Enlightenment as a whole, placing his ideology outside of that intellectual tradition, thus diminishing the notion of unquestioned Enlightenment hegemony over eighteenth century thought. I will research Rousseau’s intellectual and social relationships with his contemporaries such as Voltaire and Diderot. This will provide additional evidence of Rousseau’s ideological separation from and conflict with mainstream Enlightenment thinkers. Because of the intense role that Rousseau’s philosophy played in the French Revolution, I will also examine the ideology of writers in pre-revolutionary and revolutionary France. This will serve the twofold purpose of expanding my understanding of the scope of Rousseau's intellectual legacy and of allowing me to determine whether or not the French Revolution itself was fundamentally Counter-Enlightenment. Was the French Revolution primarily guided by the philosophy of the Enlightenment or that of Rousseau? If by the Enlightenment, then how does Rousseau fit into that movement? If by Rousseau, then should the French Revolution even be considered a result of the Enlightenment at all? Further, what made Rousseau’s writings and philosophy more appealing than those of Enlightenment writers to the French revolutionaries? Answering these questions will help develop a comprehensive picture of how Rousseau’s philosophy was accepted, adapted, and transmitted from the late eighteenth century to the early nineteenth century.

Research for this project will focus principally upon primary sources by Rousseau, Enlightenment philosophers, and French revolutionaries. To reaffirm Outram’s definition of the Enlightenment and to solidify Rousseau’s position as a Counter-Enlightenment figure, I will study writings from other “canon” figures of the Enlightenment, including Locke’s *Two Treatises of Government* (1689), Montesquieu’s *The Spirit of the Laws* (1748), and Voltaire’s *Letters concerning the English nation* (1733). I will also examine pamphlets from the French Revolution on record at UGA’s Special Collections Library, as well as the French Documents Collection at Emory University. I will also follow scholars such as Isaiah Berlin, Darrin McMahon, and Arthur Melzer to consider the
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central role of the Counter-Enlightenment to late eighteenth century thought and Rousseau’s place in that movement. \(^3,4,5,6\) Using that knowledge, I will go further in arguing that the Counter-Enlightenment, not the Enlightenment itself, produced the French Revolution.

References:


The Role of Cytochrome P450 Monooxygenase 2E1 in Bile Acid-induced Prostate Cancer Cell Death

2013 Summer Fellow: Stephanie Wilding
Research Mentor: Dr. Brian Cummings, Department of Pharmaceutical & Biomedical Sciences

Prostate cancer is the second leading cause of cancer-related death in men in the United States. Bile acids mediate the digestion and absorption of fats and fat-soluble vitamins; however, pathological increases are associated with choleostasis and cell death. Recent studies show that high concentrations of bile acids can induce apoptosis in several cells, including cancer cells, by mechanisms that are not fully understood. My previous work showed that treatment of three prostate cancer cell lines (PC-3, LNCaP, and DU-145) with bile acids (chenodeoxycholic acid, deoxycholic acid, and lithocholic acid) induced time- and concentration-dependent decreases in MTT staining, a marker of cytotoxicity, with IC50 values of 100-200 μM after 72 hours. In general, lithocholic acid was more potent than chenodeoxycholic acid, followed by deoxycholic acid. Further, LNCaP cells tended to be more susceptible to bile acid-induced toxicity than either DU-145 or PC-3 cells.

While the above data demonstrate the novel finding that bile acids can induce prostate cancer cell death, they do not tell us anything about the mechanisms of cell death. Recent studies show that bile acids may induce oxidative stress, but this study was not performed in prostate cancer cell lines. Based on these papers, I tested the effect of pretreatment of cells with diverse antioxidants (glutathione, N-acetyl cysteine, and ascorbic acid) on the ability of bile acids to induce cancer cell death. Dosing the cells with the antioxidants prior to bile acid exposure did not alter MTT staining. Thus, antioxidants did not appear to change the effects of bile acids suggesting that bile acid-induced prostate cancer cell death is not mediated by oxidative stress pathways.

Recent studies demonstrate that bile acids are metabolized by cytochrome P450 monooxygenase 2E1 (CYP2E1). CYP2E1 can metabolize compounds not naturally found in the body, such as acetaminophen and ethanol. This suggests that CYP2E1 can mediate bile acid toxicity. My current hypothesis is that treatment of prostate cancer cells with a CYP2E1 inhibitor, diallyl sulfide, will alter the effects of bile acid-induced cytotoxicity. Data showing that treatment of cells with diallyl sulfide causes a decrease in bile acid-induced cancer cell death would support the hypothesis that bile acids are acting through the CYP2E1 metabolism. To confirm this hypothesis, my summer project would be to assess CYP2E1 expression and activity in prostate cancer cells using immunoblot and quantitative PCR and then to determine the effect of bile acids on the expression of CYP2E1. I would then inhibit CYP2E1 expression using small inhibitor RNA (siRNA) and determine the effect of CYP2E1 inhibition on bile-acid induced toxicity in prostate cancer cells. If successful, this work could identify a novel therapeutic target (CYP2E1) for inhibition of prostate cancer cell growth.

References:


The Role of PAX6 in the Formation of Neural Rosettes in Induced Pluripotent Stem Cells

2013 Summer Fellow: Elizabeth Wilkins
Research Mentor: Dr. Steve Stice, Department of Animal & Dairy Science

Human pluripotent stem cells are key factors in solving many mysteries surrounding human development and diseases. Stem cells have the ability to develop into nearly any type of cell in the body. The differentiation of stem cells mimics the development of the human body, making them an excellent tool for research. Given the broad differentiation capabilities of stem cells, they are ideal for disease modeling (for diseases like Parkinson’s disease), cell replacement therapy, and drug screening. In 2006, Yamanaka first developed induced pluripotent stem cells. He was able to reprogram somatic cells back into stem cells. These cells eliminate the ethical dilemma of using embryonic stem cells, as well as allow for patient specific models and cell replacement therapies. Cells from a sick patient could be taken, reprogrammed into stem cells, and then differentiated to either study the disease in depth, or to treat the specific patient. In the Stice lab, we use both embryonic and induced pluripotent stem cells to study neural differentiation and, in particular, the generation of various central nervous system cell types. Neural rosettes are radially organized polarized cells organized around a central lumen. They are the first step in neural differentiation and mirror the process of neurulation in humans. We focus on three specific neural rosette markers: PAX6, SOX1, and ZO-1. PAX6 and SOX1 are transcription factors involved in neural development. PAX6 is a marker of neuroectodermal commitment. SOX1 is a neural stem cell marker. ZO-1 is an intracellular protein associated with cellular junctions. Previous work in the Stice lab shows that in human embryonic stem cells PAX6 is expressed first, followed by SOX1, and then the rosette is formed completely when ZO-1 becomes completely restricted to the lumen. We will focus on PAX6 as it is expressed before the rosettes form, and continues to be expressed after they develop.

To better understand the role of PAX6, we will create knockdown cell lines from a previously established induced pluripotent cell line created in the Stice lab. This will be accomplished by lentiviral transduction of constructs expressing small hairpin RNA (shRNA) specific to PAX6. We will compare the different cell lines with both nontransduced lines and each other. We plan to utilize quantitative RT-PCR, immunofluorescence, and flow cytometry in our analysis. We will characterize the expression of PAX6 mRNA in the cell lines we created using quantitative RT-PCR. We expect to see a range of PAX6 mRNA expression amongst the cell lines. Immunofluorescence will show the PAX6 protein expression spatially. It will be important to see the spatial arrangement of the PAX6 protein expression as it relates to rosette formation. Flow cytometry will show the temporal expression of the PAX6 protein. Each cell will be double labeled for PAX6 and SOX1. We expect that the flow cytometry will show that over a time period the cells will express PAX6, then PAX6 and SOX-1, and then just SOX-1. We hypothesize that rosettes are formed in a PAX6 dependent manner, which will be shown with concurrent studies with wild type and knockdown cell lines.

This experiment will help scientists to further understand the role PAX6 has in forming neural rosettes, and allow more insight into human development. This study is important to further understand neural differentiation, so that these cells can one day be used in drug therapy, disease modeling, and cell replacement therapy. Understanding the role of PAX6 in neural rosette development in the induced stem cells is an important step in understanding both human development and neural differentiation.
Using Metabolically Engineered \textit{E. coli} to Better Ferment Highly Industrially Processed Pectin-Rich Biomass

2013 Summer Fellow: Travis Williams

Research Mentor: Dr. Joy Doran Peterson, Department of Microbiology

With the USA’s energy demands being so high, it is becoming increasingly important to explore energy alternatives that can be produced within the country. It is important that we are aware of the renewable energy opportunities that exist around us and are able to communicate these opportunities to the rest of the country. No single solution will secure the energy independence of the USA, but rather a combination of techniques developed by scientists worldwide is needed.

One prospective sustainable energy opportunity is ethanol production by microbes through the fermentation of pectin-rich biomass. Pectin-rich biomass consists of food waste products that are no longer a food source, such as sugar beet pulp from sugar extraction or rotten peaches or apples. My recent project has focused on analyzing the effects industrial processing has on the carbohydrate composition of pectin-rich biomass and the ethanol production of this pectin-rich biomass via fermentation by two different microorganisms. Working with a PhD student in the Peterson laboratory, we found certain microorganisms are better suited for the fermentation of different pectin-rich biomass sources depending on their level of industrial processing. The unprocessed peaches are better fermented by industrial yeast, \textit{Saccharomyces cerevisiae} XR122N, and the highly processed sugar beet pulp is better fermented by the engineered bacterium, \textit{Escherichia coli} LY40A.

Yeast used for corn ethanol fermentations works well when there is an abundance of free sugars present, as is the case with rotten peaches. Although the sugar beet pulp was best fermented by \textit{E. coli} LY40A, the percentage of the maximum theoretical ethanol production from the sugar beet pulp was relatively low. This is a result of the \textit{E. coli} using multiple metabolic pathways to produce unwanted products (lactic acid, formic acid, and acetic acid) instead of ethanol. The challenge that now exists is improving ethanol production from the fermentation of higher processed pectin-rich biomass types using \textit{E. coli}. We are focusing on the engineered \textit{E. coli} for further studies because it consistently outperformed \textit{Saccharomyces cerevisiae} in highly industrially processed pectin-rich materials with little free sugar remaining.

Using a previously engineered strain of \textit{E. coli}, JP07, which produces a pectin-degrading enzyme, we will continue to knock out metabolic pathways in the organism that lead to unwanted products like lactic acid and acetic acid. Lactic acid is produced by lactic acid dehydrogenase (LdhA) and acetic acid is produced by the pathway beginning with pyruvate formate lyase (Pfl). If these pathways are knocked out and the remaining metabolic pathways are up-regulated in \textit{E. coli} JP07, there should be a significant increase in ethanol production from the fermentation of highly industrially processed pectin-rich biomass using this newly engineered strain of \textit{E. coli} JP07.

To test this new strain, sugar beet pulp fermentations will be conducted. To analyze the sugar beet pulp fermentations, samples will be taken every 24 hours during the fermentation and then gas chromatography will be used to determine the amount of ethanol that has been produced at each sample time. High pressure liquid chromatography will also be used to determine the amount of unwanted products that are forming during the fermentation as well as the amount of various sugars that remain in the fermentation.

It is not going to be easy for the USA and the world to create a sustainable energy future. The natural resources to do so exist. But it is going to take the creativity and persistence of many individuals who are devoted to finding ways to harvest energy from materials from which energy is not necessarily easy to extract. Using an engineered \textit{E. coli} strain capable of producing ethanol from...
Proposals

highly processed pectin-rich material provides a means of adding value to an existing industry for sugar processing, and could pave the way for fermentations of other pectin-rich materials such as peach and apple processing wastes.
A Geospatial Analysis of Fission-Fusion Dynamics in Bearded Capuchin Monkeys

2013 Summer Fellow: Leigh Anna Young
Research Mentor: Dr. Marguerite Madden, Department of Geography

Hans Kummer (1971) was the first primatologist to describe a primate social group, the hamadryas baboon, as a fission-fusion society. Since then many species/groups of primates have also been labeled as such, despite this social organization’s rarity among most other mammals (Smuts et al. 1987). Fission-fusion societies can be defined as societies in which group members merge together (fuse) and separate into smaller groups (fission) over time. Many researchers have detailed different factors that contribute to a group’s fission-fusion tendencies, including predator prevalence, foliage density, and resource availability, and have aimed to identify specific factors that lead a primate society to be either (a) fission-fusion or (b) cohesive (Koenig 2002; Mangel 1990; Stanford 2002). However, Aureli et al. (2008) suggest that rather than labeling each individual primate species in a binary fashion, as either fission-fusion or cohesive, we should begin to look at fission-fusion dynamics as a continuum on which individual groups of primates may fall. I find this change in outlook to be quite interesting! Aureli goes on to suggest that in order to begin to understand grouping patterns of the many species of primates, researchers should describe the features of the species’ habitat in a spatially explicit manner. I aim to follow Aureli’s suggestion by measuring the cohesion of a group of capuchin monkeys for which little is known regarding fission-fusion dynamics, and relating this cohesion to the spatial features in the group’s environment.

Aureli et al. (2008) define fission-fusion dynamics as a three-dimensional conceptual framework that includes variation in group composition, variation in spatial cohesion (i.e., the area covered by the primate group), and variation in group size. Under the direction of Marguerite Madden from the Department of Geography, I will investigate fission-fusion dynamics of a group of capuchin monkeys (Cebus (Sapajus) libidinosus) in the wild, by following them on their daily routes and recording their spatial spread, group composition, and group size at 15 minute intervals from dawn to dusk each day. I will accompany a group of senior research scientists to their research station in northeastern Brazil, Piauí State. In the field, a graduate student researcher and I will simultaneously record GPS points at the outer limits of the area encompassed by the monkey group. Using geospatial analysis techniques, these points will then be imported into Geographic Information Systems (GIS) software and related to spatial elements of the monkeys’ landscape. I will correlate group cohesion over space with land cover class in the monkeys’ home range to try to describe landscape features that affect group cohesion. By investigating correlations between the group’s cohesiveness and their environment, I hope to add to the growing body of work related to primate movement, as well as provide clues about the evolution of group cohesion among primates.

Coles et al. (2012) state in their study of fission-fusion in Southern Muriquis that, “broadening the range of primate groups studied is vital” if we hope to “understand the different evolutionary pathways to fission-fusion.” The research I propose would be beneficial to this field of study because the species of interest has never been studied in this way before. This project may lead to future comparisons between these results and other species and populations of capuchin monkeys with the ultimate goal of revealing the natural continuum of fission-fusion dynamics in primates. In addition, learning more about how these animals move and interact with their environment could ultimately contribute to the protection of these species in the event that their current environments are jeopardized.
Works Cited:


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Appendix A
2012 CURO Summer Research Fellows

William Austin
Dr. William Kisaalita, College of Engineering
Studies of Water Availability and Use in Tanzania

Conner Blackwell
Dr. Boris Striepen, Department of Cellular Biology
Striated Fiber Assemblin Protein Function in Tetrahymena

Stephen Bocarro
Dr. Jacek Gaertig, Department of Cellular Biology
The Characterization of Long Flagella Protein 4 in Tetrahymena thermophila

Hope Foskey
Dr. James Lauderdale, Department of Cellular Biology
Identification of GABA-Responsive Neurons in the Zebrafish Brain

Terese Gagnon
Dr. Virginia Nazarea, Department of Anthropology
Landscapes of the Interior: Ethnobotany and Senses of Palace among Karen Refugees

Devon Humphreys
Dr. Kelly Dyer, Department of Genetics
A Phylogenetic Approach to Investigating the Evolutionary History of the Quinaria Species Group of Drosophila

Emily Kopp
Dr. Chris Cornwell, Department of Economics
Immigration Law Reform and the Georgia Labor Market

Brittany McGrue
Prof. Sarah Zenti, Department of Furnishings and Interiors
The Need for Universal Design: An Environmental Assessment of Residential Interior Spaces and the Built Environment

Tuan Nguyen
Dr. Natrajan Kannan, Department of Biochemistry & Molecular Biology
Ca²⁺/Calmodulin Dependent Protein Kinase (CAMK) Group: Evolution of Dynamic Regulatory Modules

Phillip Ogea
Dr. Arthur Roberts, Department of Pharmaceutical & Biomedical Sciences
Classification of the Transport Protein MDR3 and Its Effects on Multi-Drug Resistance

Ronke Olowojesiku
Dr. Nicole Gottdenker, Department of Pathology
Effects of Anthropogenic Land Use on Reservoir Host Potential of the Common Opossum Didelphis marsupialis in Panama
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Babajide Oluwadare  
Dr. Duncan Krause, Department of Infectious Diseases  
Analysis of P1 Function in *Mycoplasma pneumoniae* Adherence and Gliding

Elliot Outland  
Dr. William Dennis, Department of Physics and Astronomy  
Finite-Difference Time-Domain Investigations of Metamaterials

David Parker  
Dr. Jennifer McDowell, Department of Psychology  
Neural-mechanisms Underlying the Gap Effect: Why is 200 the Magic Number?

Anakela Popp  
Dr. Dorothy Fragaszy, Department of Psychology  
Development of Nut Cracking Skills in Young Bearded Capuchin Monkeys

Cameron Prybol  
Dr. John Pickering, Odum School of Ecology  
Lepidoptera Survey of San Luis Valley, Monteverde, Costa Rica

Nicholas Richwagen  
Dr. K.C. Das, College of Engineering  
Comparative Study of Chemical Flocculation vs. Autoflocculation for Microalgae Harvesting, *Scenedesmus bijua*, *Chlorella minutissima* and *C. sorokiniana*

John Rodriguez  
Dr. Donald Nelson, Department of Anthropology  
Changing Food Security Strategies in Northeast Brazil: Fifteen Years of Development Policies on Household Ability to Buffer Drought Impacts

Cole Skinner  
Dr. Michael Terns & Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology  
Characterization of the Tneap Complex in the CRISPR-Cas Viral Defense System of Prokaryotes

Brittany Truitt  
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology  
Pharmacologic Rescue of Mutations That Affect Tissue-Specific Glycan Expression in *Drosophila melanogaster*

Stephanie Wilding  
Dr. Brian Cummings, Department of Pharmaceutical & Biomedical Sciences  
The Role of Secretory Phospholipase A2 in Bile Acid-Induced Prostate Cancer Cell Death

Anna Wilson  
Dr. William Kretzschmar, Department of English  
Defining the Latino Experience in Roswell, GA: A Study in Sociolinguistics
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Appendix B
2011 CURO Summer Research Fellows

Lauren Anderson
Dr. Amy Ross, Department of Geography
The Legacy of Truth Analyzing the Impact of the Truth and Reconciliation Commission on South Africa’s Millennial Generation

Joshua Trey Barnett
Dr. Corey W. Johnson, Department of Recreation & Leisure Studies
Drag’s Not a Drag: Narrative Inquiry of Serious Drag Performers

Brooke Bauer
Dr. Robert Vandenberg, Department of Management
Organizational Commitment in the Workplace

Melissa Brown
Dr. Kecia Thomas, Department of Psychology
Black Stereotypes in Reality Television and the Reinforcement of Prejudiced Attitudes

William Costanzo
Dr. K.C. Das, Department of Biological & Agricultural Engineering
Algae Biofuel Development Growth Efficiency

Dervin Cunningham
Dr. Kelley Moremen, Department of Biochemistry & Molecular Biology
The Recombinant Expression of Proteins in the Glycosylation of Mammalian Cells

Abid Fazal
Dr. Joy Peterson, Department of Microbiology
Characterization of Enzymes Produced by Genetically Engineered *Hypocrea jecorina* and Their Use in Fermentation by Recombinant *E. coli*.

Melanie Fratto
Dr. Vanessa Ezenwa, Odum School of Ecology
Testing Bacteria-Killing Ability in Songbirds with Two Approaches Before and After Acute Stress

Nisha George
Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology
The Role of Cysteine Residues in the Function of the Ras Converting Enzyme (Rcelp)

Erin Giglio
Dr. Kelly Dyer, Department of Genetics
Sensory Systems at Play in Drosophila Courtship

Osama Hashmi
Dr. Monica Gaughan, Department of Health Policy & Management
From Malpractice to Medicare: Addressing the Legal Needs of Primary Care Physicians
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Anna Beth Havenar  
Dr. Dawn Robinson, Department of Sociology  
Religion and Impression Change Dynamics: An Affect Control Theory Analysis of Christianity and Islam

Ransom Jackson  
Dr. John C. Inscoe, Department of History  
A Comparative Study of Feminism in Southern Literature: Uncle Tom, Beulah and Aunt Phillis's Cabin

Elena James  
Dr. Russell Karls, Department of Infectious Diseases  
Detection of Mycobacterial Genes Involved in Vitamin 1B12 Uptake

Kellie Laity  
Dr. Dorothy Fragazy, Department of Psychology  
Development of Nut Cracking Skills in Young Bearded Capuchin Monkeys

Marianne Ligon  
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology  
Characterization of the Tnep Complex in the CRISPR-Cas Viral Defense System of Prokaryotes

Katherine Manrodt  
Dr. Steven Lewis, Department of Physics & Astronomy  
The Molecular Dynamics of Atomic Sticking Coefficients

Lindsey Megow  
Dr. Kaori Sakamoto, Department of Pathology  
Intestinal Nematode Infection’s Inhibitory Effect on M. bovis

Tuiumkan Nishanova  
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology  
Assembly of High Density Lipoproteins via Retained N-terminal Signal Peptides

Farres Obeidin  
Dr. David Hall, Department of Genetics  
Modeling Subtelomeric Growth and the Adaptive Telomere Failure Hypothesis

Joshua Parker  
Dr. Richard Steet, Department of Biochemistry & Molecular Biology  
Identification and Characterization of a Novel Beta-Galactosidase Enzyme in Brain

Lea Rackley  
Dr. Katarzyna Jerzak, Department of Comparative Literature  
Finding the Child in Children’s Literature

Luben Raytchev  
Dr. Michael Yabsley, Department of Wildlife Disease Ecology  
Intracellular Blood Parasites of Common Freshwater Turtle Species in Georgia: Prevalence and Burden
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Mark Rolfsen
Dr. Jessica Muilenburg, Department of Health Promotion & Behavior
The Implementation of Effective Smoking Cessation Intervention for Drug and Alcohol Addicts in Substance Abuse Treatment

Dana Schroeder
Dr. Quint Newcomer, Director, UGA Costa Rica
An Applied Research Examination of Progress Toward Sustainability Goals at UGA's Costa Rica Campus in San Luis de Monteverde, Costa Rica

Daniel Sharbel
Dr. Timothy Dore, Department of Chemistry, and Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology
Assessing Reel-Protease Inhibition in a Cell-Based Fluorescence Ras Localization Assay

Daniel Smith
Dr. Michael Marshall, Lamar Dodd School of Art
Contemporary Interpretation of Dante Alighieri's Inferno Through Photographic Illustration

Justin Smith
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Characterization of a Putative Endonuclease-RNA Complex L Involved in CRISPR-Mediated Viral Defense

Theresa Stratmann
Dr. John Maerz, Warnell School of Forestry & Natural Resources
The Science of Monitoring Rare Species Developing Methods for Surveying and Monitoring Bog Turtles

Christopher Sudduth
Dr. Cathleen Brown, Department of Kinesiology
Establishing Clear Cut-Off Scores to Develop Classification Criteria for Subgroups of Individuals with CAI

Connor Sweetnam
Dr. Marcus Fechheimer, Department of Cellular Biology, and Dr. Ruth Furukawa, Department of Cellular Biology
The Involvement of Coenzyme Q (50) and Tau in the Formation of Hirano Bodies

Nakul Talathi
Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology
Determining the Effect of Oncogenic Mutations on EGFR Protein Kinase Activation and Phosphorylation

Korry Tauber
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology, and Dr. Lance Wells, Department of Biochemistry & Molecular Biology
Examining the Function of O-GlcNAc in Drosophila to Analyze Intercellular Signaling Pathways

Nathan Usselman
Dr. Jason Locklin, Department of Chemistry
Synthesis of Enzyme Functionalized Conjugated Polymers for Implantable Power Sources
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Star Ye
Dr. Jason Zastre, Department of Pharmaceutical & Biomedical Sciences
Measuring Lactate Production to Understand Transketolase and Its Isoforms in Breast Cancer Cells
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Appendix C
2010 CURO Summer Research Fellows

Jessica Alcorn
Dr. Audrey Haynes, Department of Political Science
The Validity of the News Marketing Hypothesis

Amarachi Anukam
Dr. Pamela Orpinas, Department of Health Promotion & Behavior
Healthy Teens: A Longitudinal Study of ‘At Risk’ Secondary Students

Thomas Bailey
Dr. William Kretzschmar, Department of English
Six Bodies: A Quantitative Analysis of Japanese Discourse Features

Michael Bray
Dr. Kelly Dyer, Department of Genetics
Genetic Analysis of Pigmentation in Drosophila tenerbrosa

Ebony Caldwell
Dr. Monica Gaughan, Department of Health Policy & Management
Influences on the Outlook of the Post-college Educational Opportunities and Choices of Undergraduate Science Majors

Caitlin Cassidy
Dr. William Kretzschmar, Department of English
The Art of Persuasion: How Small Business Owners Use Speech to Market Products in Roswell, GA

Meagan Cauble
Dr. Mike Adams, Department of Biochemistry & Molecular Biology
Mechanism of Plant Biomass Conversion Without Pre-treatment by Anaerobic Thermophilic Bacterium Caldicellulosiruptor bescii

Daniel Celluci
Dr. Steven Lewis, Department of Physics & Astronomy
Applications of Molecular Dynamics Simulations to Models of Gas-Grain Interactions in the Interstellar Medium

Jessica Fazio
Dr. Richard Hubbard, Department of Chemistry
Carvone Luche Reduction Followed by Optical Activity Determination

JoyEllen Freeman
Dr. Barbara McCaskill, Department of English
Georgia Slaves in Transatlantic Culture: Blind Tom and William and Ellen Craft

Debashis Ghose
Dr. Joy Doran-Peterson, Department of Microbiology
Engineering Saccharomyces Yeast Strains to Better Ferment Pine Wood Biomass to Ethanol
Camille Gregory  
Drs. Marcus Fechheimer and Ruth Furukawa, Department of Cellular Biology  
Creating a Transgenic Mouse to Study the Physiological Role of Hirano Bodies in the Progression of Alzheimer's Disease

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Dr. Michael Pierce, Department of Biochemistry & Molecular Biology  
Exercising Glycoproteomics Analyses to Discover New Breast Cancer

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Dr. Sonia Hernandez, Warnell School of Forestry and Natural Resources  
Bufo marinus Pathogen and Parasite Analysis as a Model for Ecosystem Change

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Dr. Brian Cummings, Department of Pharmaceutical & Biomedical Sciences  
Epigenetic Effects of Bromate on p21 and Histone-2AX Expression in HEK293 Cells

Rebecca Parker  
Dr. Kevin McCully, Department of Kiniseology  
Effects on Blood Flow Velocity and Arterial Diameter Produced by Compression Therapy in SCI Individuals

Jay Patel  
Dr. Boris Striepen, Department of Cellular Biology  
Characterization of Striated Fiber Assemblin Proteins in T. gondii

Rachel Perez  
Dr. J. Peter Brosius, Department of Anthropology  
Oil Palm Proliferation in Peru

Ryan Prior  
Dr. Katarzyna Jerzak, Department of Comparative Literature  
Foundations of Medical Philosophy in Ancient Civilizations

Malavika Rajeev  
Dr. Sonia Altizer, Odum School of Ecology  
The Effect of Parasite Infection on Monarch Butterfly Mating Behavior

Hope Rogers  
Dr. Jonathan Evans, Department of English  
Real-World Applications of Tolkien's Races and Cultures

Carla Rutherford  
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology  
Human Resistance to Infection by African Trypanosomes

Laura Smart  
Dr. Rheeda Walker-Obasi, Department of Psychology  
Dialectical Behavior Therapy and Distraction: Using the Cold Pressor Test to Determine Efficacy
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Stephen Thompson
Dr. George Majetich, Department of Chemistry
Application of Friedel-Crafts Annulations to Conjugated Dienones and Silyl Substituted Arene Rings for the Synthesis of Complex Tricycles

Jake Young
Professor George Contini, Department of Theatre & Film Studies
A Study of the Psycho-Physical Performance Technique of Michael Chekhov
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Appendix D
2009 CURO Summer Research Fellows

Christine Akoh, CURO-OVPR Summer Research Fellow
Dr. Joseph Frank, Department of Foods & Nutrition
Effect of Mono and Divalent Cations on Biofilm Formation in a Prolific Biofilm Forming Strain of Listeria Monocytogenes Cultured in a Chemically Defined Medium

Sambita Basu, CURO-Jane and Bill Young Scholarship Summer Fellow
Dr. Gerardo Alvarez-Manilla, Department of Biochemistry & Molecular Biology
Protein-linked Glycoconjugates as Biomarkers for Cancer of Other Physiological Processes

Chip Blackburn, CURO-OVPI Summer Fellow
Dr. Hugh Ruppersburg, Department of English
Harry Crews and the Tradition of Southern Fiction-Writing

Corbin Busby, CURO Research Fellow
Dr. Isabelle Wallace, Lamar Dodd School of Art
Imaging Masculinity in Contemporary Fashion Photography

Kelly Cummings, CURO-OVPR Summer Fellow
Dr. Scott Schatzberg, College of Veterinary Medicine
Differentiation of Natural and Post-vaccinal Canine Distemper Virus Encephalomyelitis

Charles Ginn, CURO Research Fellow
Dr. Hugh Ruppersburg, Department of English
Charting the Oppression of Minority Groups through Southern Gothic Literature

Erin Hansen, CURO Research Fellow
Dr. Jennifer McDowell, Department of Psychology
Effects of Daily Saccade Practice on Behavioral and Neural Plasticity in Schizophrenics

Dillon Horne, CURO-OVPI Summer Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
The Development and Implications of Predictive Modes of Thought from the Renaissance to Modernity

Tiffany Hu, CURO Research Fellow
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology
Re-examine Alternative Editing and Understanding the Protein Diversity in T. brucei

Whitney Ingram, CURO-OVPI Summer Fellow
Dr. Yiping Zhao, Department of Physics & Astronomy
Optimization and Analysis of Titanium Dioxide Nanorod Photodegradation

Daniel Jordan, CURO Research Fellow
Dr. Betty Jean Craige, Department of Comparative Literature
German Sustainable Farming as a Model for Resource Stewardship

Fahad Khan, CURO-ITP Summer Fellow
Dr. Jason Zastre, Department of Pharmaceutical & Biomedical Science
Highly Active Antiretroviral Therapy

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Max Klein, CURO-UGA Alumni Association Summer Fellow
Dr. Richard Steet, Department of Biochemistry & Molecular Biology
Gauging the Developmental Impact of Impaired Glycoprotein Breakdown in Zebrafish

Susan Klodnicki, CURO-OVPR Summer Fellow
Dr. Jim Lauderdale, Department of Cellular Biology, and Dr. Andrew Sornborger, Department of Mathematics and Engineering
PTZ and Other Chemoconvulsant Effects on Adult Zebrafish

Bridget Mailey, CURO Research Fellow
Dr. Amy Ross, Department of Geography
The ICC and the US: How Have the Actions of the US Affected the ICC in the Past and How Will They Affect the ICC in the Future?

Francisco Marrero, CURO Research Fellow
Dr. Leidong Mao, Department of Engineering
Development of Ferrofluid Based Platform for Particles and Cellular Manipulation

Amar Mirza, CURO Research Fellow
Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology
A Computational Study of the Crystalline Structure of Tyrosine Kinase Mutants

Cody Nichol, OVPR Research Fellow
Dr. Cynthia Suveg, Department of Psychology
Empirical Examination of Child Emotion Assessments: A Comparison of Child, Parent and Behavioral Observation Methods

Emily Pierce, CURO Summer Fellow
Dr. Wayne Parrot, Department of Crop & Soil Sciences
Genetic Alteration of the Soybean to Promote Astaxanthin Production

Akanksha Rajeurs, CURO Research Fellow
Dr. Russell Karls, Department of Infectious Diseases
Develop an Efficient Method to Create Marked and Unmarked Mutations in the Human Genome

Al Ray, III, OVPI Research Fellow
Dr. Susan Sanchez, Department of Infectious Diseases
Relationship between Epidemiology of Salmonella in Non-Domestic Avian Species and Humans in the Southeastern United States

Joe Reynolds, CURO Research Fellow
Dr. Frank Harrison, Department of Philosophy
Analysis of the Nature of the Individual and the Notion of His Happiness

Matthew Sellers, CURO Research Fellow
Dr. Hugh Ruppersburg, Department of English
Finding God in the Poetry of Robert Penn Warren

Michael Slade, CURO Research Fellow
Dr. Frank Harrison, Department of Philosophy
Implicit System of Rational Thought Analogous to Modern First-Order and Modal Logics in Plato’s Late Dialogues
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Alex Walker, OVPR Research Fellow
Dr. Timothy Dore, Department of Chemistry
Synthesis of BHQ-dithiol as a Photoremovable Protecting Group for Mifepristone

Shuyan Wei
Dr. Scott Schatzberg, College of Veterinary Medicine
Development of Consensus-Degererate Hybrid Oligonucleotide Primers (CODEHOPs) for Retroviral Discovery

2009 Howard Hughes Medical Institute EXORP Student

Valeriya Spektor
Dr. Sue Wessler, Department of Plant Biology
Designing Teaching Modules for Genome Analysis
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Appendix E
2008 CURO Summer Research Fellows

**Zachary Anderson**, CURO Summer Research Fellow
Dr. Peter Brosius, Department of Anthropology
Multicultural Perspectives on Landscape Change

**Matthew Belcher**, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Determinants in the Localization of Telomerase to Telomeres

**Mary Elizabeth Blume**, CURO-OVPR Summer Research Fellow
Dr. Stefaan Van Liefferinge, Department of Art History
Uncovering Traditions of the Gothic Style in the Architectural Plans of Saint Germain-des- Pres and Saint Martin-des-Champ in Paris, France

**Melissa Brody**, CURO-OVPR Summer Research Fellow
Dr. Ron Carroll, Odum School of Ecology
Interactions of Bees and Hummingbirds with Hamelia patens

**Carolyn Crist**, CURO-UGA Summer Research Fellow
Dr. John Greenman, Grady College of Journalism & Mass Communications
News in the Black Belt: Teaching Journalists How to Cover Poverty in Persistently Poor Counties

**M. Logan Davis**, CURO-BHSI Summer Fellow
Dr. James Franklin, Department of Pharmaceutical & Biomedical Sciences
Long-Range Retrograde Transduction of Trophic and Survival Signals in Mouse Sympathetic Neurons

**Marcus Hines**, CURO-BHSI Summer Research Fellow
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology, and Dr. Lance Wells, Department of Biochemistry & Molecular Biology
Analyzing the Function of O-GlcNAc in Drosophila

**Haylee Humes**, CURO Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
How AICD and Fe65 Are Recruited to Hirano Bodies

**Lindsay Jones**, CURO Summer Research Fellow
Drs. Michael Terns and Rebecca Terns, Department of Biochemistry & Molecular Biology
Identification and Characterization of a Nuclease That Functions in an RNA-Mediated Viral Defense Pathway (RNAi) in Prokaryotes

**Tyler Kelly**, CURO Summer Research Fellow
Dr. Elham Izadi, Department of Mathematics
Usage of Linear Subspaces with Varieties

**Jung Woong Kim**, CURO Summer Research Fellow
Dr. Andrew Sorenborger, Department of Mathematics, and Dr. James Lauderdale, Department of Cellular Biology
Imaging of Endogenous Ca2+ Waves in Developing Zebrafish
Jennifer Lee, CURO-BHSI Summer Research Fellow  
Dr. Ronald Blount, Department of Psychology  
Understanding Pediatric Symptoms

Sharon McCoy, CURO-OVPR Summer Research Fellow  
Dr. Chad Howe, Department of Romance Languages  
Dialect Perceptions of Spanish Speakers in Georgia

Katherine McGlamry, CURO-Jane and Bill Young Scholarship Summer Research Fellow  
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology  
Glycan Interactions and the Development and Spread of Cancer Cells

Alice Meagher, CURO-BHSI Summer Research Fellow  
Dr. Michael Adams, Department of Biochemistry & Molecular Biology  
Expression and Characterization of the Heterologously Expressed Soluble Hydrogenase I from Pyrococcus furiosus

Madison Moore, CURO-BHSI Summer Research Fellow  
Dr. Jennifer McDowell, Department of Psychology  
Behavioral and Neural Plasticity Following Daily Practice of Saccade Tasks in Schizophrenia

Emily Meyers, CURO-OVPR Summer Research Fellow  
Dr. Patricia Sullivan, Department of International Affairs  
The Advantage of Weakness: How Weak States Can Overcome Military Might of Strong States

Kelly Nielsen, CURO-OVPR Summer Research Fellow  
Prof. George Contini, Department of Theatre & Film Studies  
Augusto Boal’s Invisible Theatre: Political Play with an Unassuming Audience

Sean O’Rourke, CURO Summer Research Fellow  
Dr. Kathy Simpson, Department of Kinesiology  
Neuromuscular Activation and Movement Kinematics Exhibited During the Sit-to-Stand by Multiple Sclerosis Individuals

Julie Patel, CURO Summer Research Fellow  
Dr. Patricia Sullivan, Department of International Affairs  
Military Interventions by Powerful States

Neil Pfister, CURO-BHSI Summer Research Fellow  
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology  
Interactions That Define the Organization of RNA-Protein Complexes Involved in Prokaryotic RNA Interference

Stefann Plishka, CURO-Franklin College of Arts and Sciences Summer Research Fellow  
Dr. Asen Kirin, Department of Art History  
Imagining Constantinople: Imperial Houses of Worship as Symbols of State Ideology

Katie Pyne, CURO Summer Research Fellow  
Dr. Jerome Legge, Department of International Affairs  
Refugees and Internally Displaced People: How Effective Are the United Nations, Nongovernmental Organizations, and Subsequent Initiatives in Pacifying This Complex Humanitarian Crisis?
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**Joseph Rimando**, CURO-Interdisciplinary Toxicology Program Summer Research Fellow  
Dr. Ralph Tripp, Department of Infectious Diseases  
Understanding and Preventing the Interaction between RSV’s G Protein and the CX3CR1 Cell Receptor

**Aalok Sanjanwala**, CURO Summer Research Fellow  
Dr. Marcus Fechheimer, Department of Cellular Biology, and Dr. Ruth Furukawa, Department of Cellular Biology  
The Effect of Hirano Bodies on Mutated Tau Protein

**Neeraj Sriram**, CURO Summer Research Fellow  
Dr. Mark Eiteman, Department of Biological & Agricultural Engineering  
Solving the World’s Energy Crisis – Not One Sugar at a Time

**Giridhar Subramanian**, CURO Summer Research Fellow  
Dr. Brock Tessman, Department of International Affairs  
Power and Influence in Southeast Asia: A Study of the Methods Used by India, China, and the United States

**Aileen Thomas**, CURO Summer Research Fellow  
Dr. Nicole Lazar, Department of Statistics  
How Random is Pseudorandom

**Kathryn Turner**, CURO Summer Research Fellow  
Dr. Shelley Hooks, Department of Pharmaceutical & Biomedical Sciences  
Comparison of RGS Regulation of LPA Signaling in Prostate Cancer and Ovarian Cancer

**Manouela Valtcheva**, CURO Summer Research Fellow  
Dr. Jennifer McDowell, Department of Psychology  
Antisaccade Performance and Deficit Characteristics in a Normal Population

**Hunter Wilson**, CURO Summer Research Fellow  
Dr. Timothy Dore, Department of Chemistry  
8-Chloro-7-hydroxyquinoline as a Biologically Useful Photoremovable Protecting Group

**Laura Wynn**, CURO-OVPR Summer Research Fellow  
Dr. Martin Kagel, Department of Germanic & Slavic Languages  
Issues in Current Turkish-German Literature
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Appendix F
2007 CURO Summer Research Fellows

Caroline M. Anderson, CURO-OVPR Summer Research Fellow
Dr. John Turci-Escobar, Department of Music Theory, and Dr. Max Reinhart, Department of German
A Psychoanalytical Examination of Wolf and Mörike's Peregrina Songs

Joseph Burch, CURO Summer Research Fellow
Dr. Harry Dailey, Department of Microbiology and Biochemistry & Molecular Biology
Converting Ferrochelatase into a Cytochrome c-like Protein

Amy Burrell, CURO-BHSI Summer Research Fellow
Dr. Debra Mohnen, Department of Biochemistry & Molecular Biology
Analysis of the Transcriptional Expression of Arabidopsis GAUT Genes: 15 Proven and Putative Plant Cell Wall Biosynthetic Galacturonosyltransferases

Lee Ellen Carter, CURO-OVPR Summer Research Fellow
Dr. Fausto Sarmiento, Department of Geography
Ecoregional Conservation among Indigenous Communities in Cotacachi, Ecuador

Kimberly DeLisi, CURO-BHSI Summer Research Fellow
Dr. Ray Kaplan, Department of Infectious Diseases
Parameters Affecting Fecal Egg Count Data for Determining Drug Resistance in Nematode Parasites of Horses

Joshua Dunn, CURO-OVPR Summer Research Fellow
Dr. William Kretzschmar, Department of English
The Youth of Roswell Voices: A Linguistic Analysis

Katie Flake, CURO-BHSI Summer Research Fellow
Dr. Maor Bar-Peled, Complex Carbohydrate Research Center
The Arabinose Kinase Project

James Gordy, CURO Summer Research Fellow
Dr. Michael Adams, Department of Biochemistry & Molecular Biology
Developing Methodologies for the Study of Small ORFs in P. furiosus

Jana Hanchett, CURO Summer Research Fellow
Dr. David Schiller, Department of Musicology/Ethnomusicology
Latino and Hispanic Musical Influences on Athens-Clarke County

Laura Harrison, CURO-BHSI Summer Research Fellow
Dr. Corrie Brown, Department of Pathology
Campylobacter in the Crypts

Clare Hatfield, CURO-OVPR Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs
Democracy and the Choice of Law: The Intersections of Shari'a, Domestic and International Law

Anna Hudson, CURO Summer Research Fellow
Dr. Richard Dluhy, Department of Chemistry
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Using Surface Enhanced Raman Spectroscopy for the Detection of Pathogens

**Andy Kragor**, CURO-Jane & Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center, and Dr. Carl Bergmann, Complex Carbohydrate Research Center
Unbiased Isolation and Carbohydrate Mapping of Alpha-Dystroglycan

**Brian Laughlin**, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center
Functional Analysis of the Magnaporthe grisea Secretome

**James MacNamara**, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Biochemistry & Molecular Biology
Synthesis of Quinolinol-Based Inhibitors of Rec1p

**Prashant Monian**, CURO-Interdisciplinary Toxicology Program Summer Research Fellow
Dr. Brian Cummings, Pharmaceutical & Biomedical Sciences
Molecular Inhibition of Independent Phospholipase A2 and its Effect on Prostate Cancer Growth

**Neil Naik**, CURO-OVPR Summer Research Fellow
Dr. Ruth Harris, Department of Food & Nutrition
The Effect of Antagonizing Stress Receptors in Rats During Repeated Exposure to Restraint Stress

**Natalie Nesmith**, CURO-BHSI Summer Research Fellow
Dr. Mary Bedell, Department of Genetics
Genetic Studies on the Roles of KITL in Regulating the Proliferation and Apoptosis of Primordial Germ Cells in Mice

**Victor Orellana**, CURO Summer Research Fellow
Dr. Nicolás Lucero, Department of Romance Languages
Unsung Hero: A Literary and Historical Study of Lautaro

**Tulsi Patel**, CURO Summer Research Fellow
Dr. Scott Gold, Department of Plant Pathology
Developing a Biocontrol Agent for Chinese Privet, *Ligustrum sinense*

**Tomas Pickering**, CURO-OVPR Summer Research Fellow
Dr. Dorothy Fragaszy, Department of Psychology
Manner of Hammer Stone Use in Wild Capuchin Monkeys

**Cleveland Piggott**, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
The Formation of Hirano Bodies

**Purvi Sheth**, CURO Summer Research Fellow
Dr. Russell Karls, Department of Infectious Disease
Characterization of *Mycobacterium shottsii*

**Traci Tucker**, CURO Summer Research Fellow
Dr. Dawn Robinson, Department of Sociology
Gender and Role Meanings: A Cross-Cultural Comparison
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Jessica Van Parys, CURO-UGA Alumni Association Summer Research Fellow
Dr. David Mustard, Department of Economics
Does Writing Ability Signal Academic Excellence?: Evidence from the New Scholastic Aptitude Writing Section (SATW)

Delila Wilburn, CURO Summer Research Fellow
Dr. Barbara McCaskill, Departments of African American Studies and English
Beauty Imposed

Karen Wong, CURO Summer Research Fellow
Dr. Andrew Whitford, Department of Political Science
Political and Social Foundations for Environmental Sustainability, Transfer Pricing, and Social Entrepreneurship
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2006 CURO Summer Research Fellows

Sarah Breevoort, CURO-BHSI Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
Construction of Three Rcep Mutant Plasmids to Aid in the Characterization of Rcep Enzymatic Activity

Lauren Coffey, CURO Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Susan Fang, CURO Summer Research Fellow
Prof. Christopher Hocking, Studio Foundations

Courtney Grant, CURO-BHSI Summer Research Fellow
Dr. Julie Coffield, Department of Physiology and Pharmacology
An Investigation of Botulinum Neurotoxin Interactions on RhoA Activity Using In Vitro Assays

Erica Hall, CURO-BHSI Summer Research Fellow
Dr. Jessie Kissinger, Department of Genetics

Adele Handy, CURO-UGA Alumni Association Summer Research Fellow
Dr. Greg Robinson, Department of Chemistry

Celan Hardman, CURO Summer Research Fellow
Prof. Joe Norman, Drawing and Painting

Sana Hashmi, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center
Alteration of Alpha-Dystroglycan and Cancer Progression

Brian Levy, CURO Summer Research Fellow
Dr. Larry Nackerud, School of Social Work
Courrie – Not Email: Implications for Government Regulation of a Social Phenomenon. A Case Study of Language in France

Maggie Mills, CURO-NSF/SPIA Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Anna-Marieta Moise, CURO-BHSI Summer Research Fellow
Dr. Andrea Hohmann, Department of Psychology
Neurochemical Basis of Social Defeat in Syrian Hamsters: Role of Endogenous Cannabinoids

Lamar Moree, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center

Jesse Oakley, CURO Summer Research Fellow
Dr. Laurie Fowler, Department of Ecology
Economic Incentives for Private Land Conservation and Sustainable Development: Research into Environmental Policy in Costa Rica and Georgia
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**Katie Orlemanski**, CURO-OVPR Summer Research Fellow  
Dr. Patricia Richards, Department of Sociology  
Reclaiming “Development” within the Context of Low-Income Neighborhoods

**Danielle Pearl**, CURO-OVPR Summer Research Fellow  
Dr. Keith Langston, Germanic and Slavic Languages  
Press Freedom, E.U. Accession, and Democracy in Croatia

**Daniel Perry**, CURO Summer Research Fellow  
Dr. David Landau, Department of Physics and Astronomy

**Andrew Pierce**, CURO Summer Research Fellow  
Dr. Thomas McNulty, Department of Sociology

**Richard Piercy**, CURO-OVPR Summer Research Fellow  
Dr. Cory Momany, Department of Pharmaceutical and Biomedical Sciences

**Kurinji Pandiyan**, CURO Summer Research Fellow  
Dr. Steven Holloway, Department of Geography  
Understanding Public Space in a New Urbanist Development

**Mandy Redden**, CURO-BHSI Summer Research Fellow  
Dr. Robert Arnold, Department of Pharmaceutical and Biomedical Sciences  
Towards a More Effective Delivery System for Anti-Cancer Drugs

**Eva Bonney Reed**, CURO-BHSI Summer Research Fellow  
Dr. Ronald Blount, Department of Psychology

**Lisa Rivard**, CURO-Toxicology Summer Research Fellow  
Dr. Jeff Fisher, Toxicology

**Sonia Talathi**, CURO-OVPR Summer Research Fellow  
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences  
Effectiveness of Ca2+-Independent Phospholipase A2 Inhibitors in the Induction of Chemotherapeutic-Induced Cancer Cell Death

**Erika Vinson**, CURO Summer Research Fellow  
Dr. Richard Siegesmund, Art Education

**Joshua Watkins**, CURO Summer Research Fellow  
Dr. Patricia Sullivan, Department of International Affairs  
The Price of Victory: When Leaders Underestimate the Cost of War

**Daniel Weitz**, CURO-OVPR Summer Research Fellow  
Dr. Gary Bertsch, Department of International Affairs  
The Impact of a European Union Nuclear Weapons Free Zone on the International Non-Proliferation Regime

**Shannon Yu**, CURO-BHSI Summer Research Fellow  
Dr. Nancy Manley, Department of Genetics
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Appendix H
2005 CURO Summer Research Fellows

**Grace Anglin**, CURO-OVPR Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Family Focused Emotion Communication Training

**Ashley Beebe**, CURO Summer Research Fellow
Dr. James R. Holmes, Center for International Trade and Security
The Influence of Media on Economic Policy in Brazil and Argentina

**Ingrid Bloom**, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
Differentiation of Human Embryonic Stem Cells into Endothelial Progenitors

**Ian Lewis Campbell**, CURO Summer Research Fellow
Dr. Glenn Wallis, Department of Religion
Theories of Mythology and the Way That Myths Have Affected Social and Political Formation

**Kimberly Coveney**, CURO-CIT Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
Role of iPLA2 in Phospholipid Metabolism in Chemotherapeutic-Induced Cancer Cell Death

**William Collier**, CURO-OVPR Summer Research Fellow
Dr. Amy D. Rosemond, Institute of Ecology
Analysis of an Exotic Species’ Interactions with Native Aquatic Trophic Dynamics: Quantifying the Effects of the North American Beaver (Castor canadensis) on Sub-antarctic Stream Food Webs in the Cape Horn Archipelago, Chile

**John Crowe**, CURO Summer Research Fellow
Prof. Mark Callahan, Ideas for Creative Exploration
AUX Launch: Art, Representation, and Commerce on the Web

**Katie Griffith**, CURO Summer Research Fellow
Dr. Diana Ranson, Department of Romance Languages, and Dr. Judith Preissle, College of Education
Assessing Cultural Values and Political Beliefs in a Nicaraguan Classroom: A Participant Observation

**Matthew Haney**, CURO-CTEGD Summer Research Fellow
Dr. Rick Tarleton, Department of Cellular Biology
Antibody Depletion of Highly Abundant Proteins in *Trypanosoma cruzi* for the Fine-tuning of Proteomic Analysis

**Ned Hembree**, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
Rce1and Ste24 Inhibition by Dipeptidyl Acyloxymethyl Ketones: A Potential Target for Cancer Therapeutics

**Alicia Higginbotham**, CURO Summer Research Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
Christopher Logue's *Iliad*: A Work in Translation
Scott Jacques, CURO Summer Research Fellow  
Dr. Mark Cooney, Department of Sociology  
The Social Reality of Young, Middle Class Drug Dealers

Lisa Jordan, CURO Summer Research Fellow  
Dr. Ruth Harris, Department of Food and Nutrition  
The Effect of Leptin on Sympathetic Nerve Activity in White Adipose Tissue

Carey Kirk, CURO-OVPR Summer Research Fellow  
Dr. David Z. Saltz, Department of Theatre and Film Studies  
The Effectiveness of Drama Techniques in Treating People Suffering from Trauma

Andrew Leidner, CURO-CTEGD Summer Research Fellow  
Dr. Pejman Rohani, Institute of Ecology  
Coevolutionary Behavior and Interference between Fatal Diseases

Jon McGough, CURO-BHSI Summer Research Fellow  
Dr. Wyatt Anderson, Department of Genetics  
The Role of Female Choice in Sexual Selection of Drosophila pseudoobscura

Tatyana Nienow, CURO-BHSI Summer Research Fellow  
Dr. Walter K. Schmidt, Department of Genetics  
Adapting Yeast for the Study of Pitrilysin and Other M16A Enzymes

Erika Porter, CURO-BHSI Summer Research Fellow  
Dr. Charles H. Keith, Department of Cellular Biology  
Intrinsic Fluorimetric Imaging of Neural Activation in Cultured Cells and Zebrafish

Kurinji Pandiyan, CURO-CAES Summer Research Fellow  
Dr. Raj Rao, Department of Animal and Dairy Science, and Dr. Steven Stice, Department of Animal and Dairy Science  
Genomic Instability of Human Embryonic Stem Cells

Kelly Proctor, CURO-OVPR Summer Research Fellow  
Dr. Lee B. Becker, College of Journalism and Mass Communication  
Differences in Environmental Reporting: China and the United States

Rebecca Trupe, CURO Summer Research Fellow  
Dr. Kimberly Shipman, Department of Psychology  
Family Focused Emotion Communication Training

Russ Richardson, CURO Summer Research Fellow  
Dr. Ron Carroll, Institute of Ecology  
Sugarcane Processing Waste as a Soil Amendment on Organic, Shade-Grown Coffee under Simulated Drought Conditions for Control of Plant-Parasitic Nematodes

Dustin Williams, CURO-BHSI Summer Research Fellow  
Dr. Scott T. Dougan, Department of Cellular Biology  
Development of Transgenic Zebrafish to Understand How Activation of Hyal-2 Leads to Tumor Formation
Fei Yang, CURO Summer Research Fellow
Dr. Janet Westpheling, Department of Genetics
Regulation of Branched-Chain Amino Acid Catabolism in Streptomyces coelicor: Applications for Metabolic Engineering of Polyketide Antibiotic Biosynthesis

Stephanie Yarnell, CURO Summer Research Fellow
Dr. Carl Bergmann, Complex Carbohydrate Research Center
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Appendix I
2004 CURO Summer Research Fellows

Cara Altimus, CURO Summer Research Fellow
Dr. Jonathan Arnold, Department of Genetics
Isolation of a Light Receptor in the Biological Clock of N. crassa

Westin Amberge, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
Guided Differentiation of Human Embryonic Stem Cells into Endothelial Cells: Focusing on the Ulex Europaeus Agglutinin I Lectin

Namrata Asuri, CURO Summer Research Fellow
Dr. Sidney Kushner, Department of Genetics
Analysis of the Role of Ribosomal S1 in the Polyadenylation Pathway of Escherichia coli

Erin Bohan, CURO-OVPR Summer Research Fellow
Dr. Katarzyna Jerzak, Department of Comparative Literature
The Reconciliation of Selves: The Emigrant Experience in America

Rebecca Brantley, CURO-OVPR Summer Research Fellow
Ms. Ashley Callahan, Georgia Museum of Art
The Early Fashion Design of Mariska Karasz and the Influence of Her Native Hungary

Josef Broder, CURO Summer Research Fellow
Dr. Andrew Sornborger, Department of Mathematics
Techniques in High Noise Image Analysis

Beau Bryan, CURO-BHSI Summer Research Fellow
Dr. Michael Pierce, Department of Biochemistry and Molecular Biology
N-Cadherin Gl

Susannah Chapman, CURO Summer Research Fellow
Dr. Virginia Nazarea, Department of Anthropology
Designing Sui Generis Systems for Traditional Plants and Associated Local Knowledge

Clayton Griffith, CURO-OVPR Summer Research Fellow
Dr. Amy Rosemond, Institute of Ecology
The Effect of the North American Beaver (Castor Canadensis), an Exotic Herbivore, on the Composition, Structure, and Regeneration of the Riparian Vegetation of Sub-Antarctic Forested Streams in Chile

Christopher Hale, CURO-BHSI Summer Research Fellow
Dr. Thomas F. Murray, Department of Physiology and Pharmacology
Adolescence as a Distinct Period of Vulnerability to Nicotine Addiction

Catherine Hudson, CURO-BHSI Summer Research Fellow
Dr. Harry Dailey, Department of Microbiology and Biochemistry and Microbiology
Negatively Affecting the Heme Biosynthetic Pathway in “Escherichia coli”
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**Douglas Jackson**, CURO Summer Research Fellow
Dr. Nigel Adams, Department of Chemistry
Reactions of Protonated Carboxylic Acid Ions with Amines in the Interstellar Medium

**Andrew Leidner**, CURO-BHSI Summer Research Fellow
Dr. Pejman Rohani, Institute of Ecology
Parasitoid Behavior and Evolutionary Dynamics

**Janel Long**, CURO-OVPR Summer Research Fellow
Dr. Jean Martin-Williams, School of Music
The Partitas of Franz Krommer and Natural Horn Technique

**John McWhorter**, CURO-BHSI Summer Research Fellow
Dr. Daniel Colley, Department of Microbiology
Induction of the Regulatory Ligand PD-L2 and the Co-regulatory Receptor PD-1 on CD4 Lymphoctes During Early Experimental Schistosomiasis Mansoni

**William Parker**, CURO Summer Research Fellow
Dr. Marly Eidsness, Department of Chemistry
Trigger Factor

**Gehres Paschal**, CURO-OVPR Summer Research Fellow
Dr. J. David Puett, Department of Biochemistry and Molecular Biology
Activating Mutations of the Lutropin/Choriogonadotropin Receptor Associated with Familial Precocious Puberty, Male Pseudohermaphorditism, Hypogonadism, Amenorrhea, Leydig cell Hyperplasia, and Metastatic Thyroid Carcinoma

**Kevin Patrick**, CURO Summer Research Fellow
Dr. James Anderson, Department of Classics
Cicero and the Foundations of a Legal Education at Rome

**Katherine Price**, CURO Summer Research Fellow
Dr. Janet Westpheling, Department of Genetics
Site Specific Chromosomal Integration Mediated by Bacteriophage Integrase

**Matthew Rudy**, CURO Summer Research Fellow
Dr. Marly Eidsness, Department of Chemistry
Analysis of Cotranslational Protein Folding in E-coli and Determination of the Role of the Trigger Factor Gene in the Folding Process

**Desiree Smith**, CURO Summer Research Fellow
Dr. Roberta Fernandez, Department of Romance Languages
Projecting a Positive Educational Experience for Latina/os in the South

**Christopher Stokes**, CURO-OVPR Summer Research Fellow
Dr. Randy Kamphaus, School of Professional Studies
Family Health and Classroom Behavior: A Pilot Study

**Shana Strickland**, CURO-BHSI Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Emotional Regulation and Coping Skills in Maltreated Children
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**Adam Stroupe**, CURO Summer Research Fellow  
Dr. Boris Striepen, Department of Cellular Biology  
Drug and Nutrient Trafficking in the Human Pathogen *Cryptosporidium parvum*

**Teerawit Supakorndej**, CURO-BHSI Summer Research Fellow  
Dr. Michael Terns, Department of Biochemistry and Molecular Biology  

**Tendoh Timoh**, CURO Summer Research Fellow  
Dr. Marly Eidsness, Department of Chemistry  
Fluorophore-modified Nascent Polypeptides

**Jora Vaso**, CURO-OVPR Summer Research Fellow  
Dr. Katarzyna Jerzak, Department of Comparative Literature  
The Effect of Communism on the Works of Andric, Kadare, and Szymborska

**Leslie Wolcott**, CURO-OVPR Summer Research Fellow  
Dr. Betty Jean Craige, Center for Humanities and Arts  
The Environment in Georgia’s Literature, Past and Present
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Appendix J

2003 CURO Summer Research Fellows

Anthony Anfuso, CURO Summer Research Fellow
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
Developing a Fast Plant Expression System to Identify Biosynthetic Genes Involved in Pectin Synthesis

Tiffany Beal, CURO-BHSI Summer Research Fellow
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
Determining How Pectins Inhibit Cancer Growth and Metastasis

Robert Brady, CURO Summer Research Fellow
Dr. Nader Amir, Department of Psychology
Malleability of Interpretation Bias in Social Anxiety and General Anxiety

Josef Broder, CURO Summer Research Fellow
Dr. Chi N. Thai, Department of Biological and Agricultural Engineering
Operational Characteristics of a Mobile Spectral Imaging System for Plant Health Detection

Martha Rose Calamaras, CURO Summer Research Fellow
Dr. Kim Shipman, Department of Psychology
Emotional Understanding in Abused and Neglectful African-American Families

Daniel del Portal, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
The Physiological Role of Hirano Bodies

Dustin Dyer, CURO Summer Research Fellow
Dr. Guigen Zang, Department of Biological and Agricultural Engineering
Dr. Michael Geller, Department of Physics and Astronomy
Energy Dissipation in Nanomechanical Resonators

Sarah Fritts, CURO Summer Research Fellow
Dr. John P. Carroll, School of Forest Resources
An Inventory and Assessment of Medicinal Plants and Animals Used by Makuleke Traditional Healers on the Northern Boundary of the Kruger National Park, South Africa

Betsy Goodwin, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology
A Study of the Psychology of Pediatric Pain and Chronic Illness

Patrick Gosnell, CURO Summer Research Fellow
Prof. Ben Reynolds, Department of Photography
The Beautiful and the Absurd

Paulette Andrea Greene, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
Conspecific Sperm Precedence and Speciation in Drosophila pseudoobscura
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**Andrea Haltiner**, CURO-BHSI Summer Research Fellow  
Dr. Ruth Harris, Department of Foods and Nutrition  
The Effects of Leptin on Leptin Receptor Expression in High-Fat Fed Mice

**Luke Hoagland**, CURO-BHSI Summer Research Fellow  
Dr. Marcus Fechheimer, Department of Medical Cellular Biology  
The Role of Myosin II in Hirano Body Development and the Impact of Hirano Bodies on Cell Viability

**Christopher “Kit” Hughes**, CURO Summer Research Fellow  
Prof. Mark Callahan, School of Art  
Tagging

**Steven Jocoy**, CURO Summer Research Fellow  
Dr. Michael Bender, Department of Genetics

**Leena Kukkarni**, CURO Summer Research Fellow  
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology  
Identification Characterization of Enzymes and Gene Products Involved in the Synthesis of Pectic Polymers Using Mucilage as Acceptors

**Valerie Marshall**  
Dr. Ben Blount, Department of Anthropology

**Ashley Neary**  
Dr. Susan Sanchez, Department of Medical Microbiology and Parasitology  
Sensitive and Specific Detection of Fungal Keratitis in Horses

**Ngozi Ogbuehi**, CURO Summer Research Fellow  
Dr. Mary Alice Smith, Department of Environmental Health Science  
Comparing Apoptosis During Different Stages of Limb Development in Chick Embryos

**Melissa Payton**, CURO Summer Research Fellow  
Dr. Lillian Eby, Department of Psychology  
Antecedents and Consequences of Networking Behavior for Individuals Seeking Reemployment

**John Drew Prosser**, CURO Summer Research Fellow  
Dr. Wyatt Anderson, Department of Genetics  
Kin Recognition in *Drosophila paulistorum*

**Ryan Rhome**, CURO Summer Research Fellow  
Dr. Jan Westpheling, Department of Genetics  
Analysis of bkdR Protein Function in *Steptomyces coelicolor* and *S. avermitilis*

**Susan Ritger**, CURO-BHSI Summer Research Fellow  
Dr. Duncan C. Ferguson, Department of Physiology and Pharmacology  
Immunoreactivity and Bioactivity of Recombinant Thyrotropins (TSH)

**Ben Solomon**, CURO Summer Research Fellow  
Dr. Kevin McCully, Department of Exercise Science  
Measuring Age Related Changes in Muscle Compliance Using Ultrasound
Mary Tolcher, CURO Summer Research Fellow  
Dr. Tim Hoover, Department of Microbiology  
Identification of Developmentally Regulated Proteins in the Budding Bacterium Hyphomonas neptunium

Meghan Wilson, CURO-BHSI Summer Research Fellow  
Dr. James Lauderdale, Department of Cellular Biology  
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Ryan Wilson, CURO Summer Research Fellow  
Roger Moore, Department of Landscape Architecture

Thomas Wood, CURO Summer Research Fellow  
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology  
Analysis and Characterization of CAAX Proteases
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2002 CURO Summer Research Fellows

Nadia Behizadeh
Dr. Tricia Lootens, Department of English

Ashley D. Chadha
Dr. Michael McEachern, Department of Genetics
Characterization of stn-1 M1 mutant in K. lactis

Emily DeCrescenzo
Dr. Susan Sanchez, Department of Biochemistry and Molecular Biology
Development of a Detection Method for TSST-1 exotoxin from Staphylococcus aureus Associated with Toxic Shock Syndrome in Horses Directly from Clinical Samples

Ivy Forkner
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
Functional Expression of Putative Biosynthetic Genes for Pectin: A Plant Polysaccharide with Anti-Cancer Activity

Cory S. Gresham
Dr. James B. Stanton, Department of Pathology, and Dr. Corrie C. Brown, Department of Pathology
Development of a Reverse Transcriptase-Polymerase Chain Reaction Based Assay for the Detection and Differentiation of Dolphin Morbillivirus and Porpoise Morbillivirus

Nowell Hesse
Dr. Maor Bar-Peled, Department of Plant Biology
Identification of Nucleotide-Sugar Biosynthetic Genes Involved in Glycoconjugate Synthesis

Matt Hoffman
Dr. Will York, Department of Biochemistry and Molecular Biology
Comparative Structural Analysis of Xyloglucans from Plants in the Subclass Asteridae

Parker Hudson III
Dr. Mary Bedell, Department of Genetics

Britt Johnson
Dr. Janet Westpheling, Department of Genetics
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LeeAnn Jones
Dr. Massimo Palmarini, Department of Medical Microbiology
Mechanisms of JSRV-Induced Cell Transformation InVivo

Jenna Lee
Dr. Andrew Herod, Department of Geography
A Study of Sustainable Economic Development in Croatia

Judson A. Lewis
Dr. John F. McDonald, Department of Genetics
Evolutionary Contributions of Retrotransposon Elements in the Genome of D. melanogaster
Cheryl L. Maier  
Dr. Scott Pratt, Department of Animal and Dairy Science  
Comparative Analysis of Nuclear Proteins Present in Donor Cells Used for the Nuclear Transfer Process and Cloning

Julie Orlemanski  
Dr. Jed Rasula, Department of English  
Sounding and Silencing: Suspended States in the Works of Thomas Pynchon

Gautham Pandiyan  
Dr. Jacek Gaertig, Department of Cellular Biology  
Study of Cilial Growth Suppression Mechanism in *Tetrahymena Thermophila*

Joanne Shinpoch  
Dr. Daniel Dervartanian, Department of Biological Sciences  
Purification and Characterization of Nickel Protein(s) from Bovine Heart and Their Relationship to Heart Disease

John Stark  
Dr. Scott Atkinson, Department of Economics, and Dr. Michael Rauscher, Department of International Economics, Rostock University  
An Economic Labor Supply Analysis of Poland's Planned Entry into the European Union with Regard to the German Economy

Joshua Striker  
Dr. Thomas Cerbu, Department of Comparative Literature  
The Human Experience of Time: Literary and Philosophical Accounts/Representations

Nwakaso Umejiego  
Dr. Boris Striepen, Department of Cellular Biology  
IMPDH as a Potential Target of Drugs to Treat Cryptosporidiosis

Ben Walters  
Dr. Elizabeth Brient, Department of Philosophy  
The Aestheticization of Text

Lauren Watson  
Dr. Jeffery Berejikian, Department of Political Science

Katherine Williams  
Dr. Kojo Mensa-Wilmot, Department of Cellular Biology, and Dr. Anne Clark, Oxford University

Brad Wright  
Dr. Larry Nackerud, School of Social Work  
A Comparative Healthcare Policy Analysis of the United States and Sweden
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Appendix L
2001 CURO Summer Research Fellows

Siobahn Beaton
Dr. Debra Mohnen, Complex Carbohydrate Research Center
Progress toward the Partial Purification of a Pectin Biosynthetic Gene

David Cureton
Dr. Janet Westpheling, Department of Genetics
Development of an In Vitro Packaging System for a Streptomyces Bacteriophage

Jon E. Davis
Dr. Gary Bertsch, Department of Political Science
Identifying the Risks of China’s Nuclear Weapons Command-and-Control System in the Event of Political Crisis

Sayan De
Dr. Max Reinhart, Department of Germanic and Slavic Languages
The Progress and Modernization of Former East German Healthcare after Communism

Lawrence Dougherty
Dr. Daniel Promislow, Department of Genetics
Exploring Olfactory Response in Drosophila melanogaster and Evolutionary Theory of Aging

Matt Edwards
Dr. Gary Bertsch, Department of Political Science
Evaluating the Moscow Center for Export Control’s Role as a Non-Proliferation Epistemic Community Member

Ben Emanuel
Dr. Frances Teague, Department of English
Shakespeare on Screen: Henry in Hollywood

Jeff Halley
Dr. Sheng Cheng Wu, Department of Biochemistry and Molecular Biology
Cell Wall-degrading Enzymes from the Fungus That Causes the Devastating Rice Blast Disease

Peter Harri
Dr. Kojo Mensa-Wilcot, Department of Cellular Biology
Gene Expression in Leishmania: Control of Protein Synthesis in Leishmania 5’ Untranslated Regions

Amanda Hudson
Dr. Michael Terns, Department of Biochemistry and Molecular Biology
Screening Mutant Yeast Strains for Abnormalities in the Localization of snoRNA

Kenneth Miller
Dr. Timothy Dore, Department of Chemistry
Synthesis and Use of Caged Compounds to Explore Cellular Processes
Each morning I get up with one word in mind: plastik…
2014

CURO

Summer Research Fellowship

Book of Proposals

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203 Moore College
The University of Georgia
Athens, GA 30602
(706) 542-5871

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<tr>
<td><strong>Cover design:</strong></td>
<td>William Reeves, UGA Printing</td>
</tr>
<tr>
<td><strong>Published by:</strong></td>
<td>Honors Program, the University of Georgia</td>
</tr>
<tr>
<td><strong>Printed by:</strong></td>
<td>Central Duplicating, the University of Georgia</td>
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April 22, 2014

Dear UGA Faculty and Students,

We are delighted and honored to recognize this year’s CURO Summer Research Fellows, each of whom is featured here with a summary of his or her faculty-mentored research proposal. The goal of the CURO Summer Research Fellowship is to provide opportunities for intensive, immersive, faculty-mentored research experiences for academically talented undergraduates. The program advances the students’ knowledge and abilities to think critically, solve problems, and contribute to a greater understanding of the world.

We are proud of the accomplishments of present and past CURO Summer Fellows and with the mentorship provided by our exceptional faculty. The Summer Fellowship program has contributed to building a culture of undergraduate inquiry at the University of Georgia, and the CURO Summer Fellows serve as ambassadors, sharing their enthusiasm and expertise in a variety of professional forums on campus as well as at regional, national, and international meetings.

The 2014 CURO Summer Research Fellowship is funded through the Honors Program, the Office of the Senior Vice President for Academic Affairs and Provost, and the Alumni Association.

Please join us in congratulating these young scholars on the occasion of being awarded these prestigious fellowships. Please join us also in thanking the faculty research mentors whose support and guidance are crucial to the CURO Summer Fellows’ success.

Sincerely,

Dr. David S. Williams, ’79, ’82
Associate Provost and Director

Dr. Martin P. Rogers, ’01, ’11
Associate Director
Proposal for Research on the Old English Poem “Elene” by Cynewulf, with a Focus on the Figure and Propaganda of Constantine the Great

2014 Summer Fellow: Kaitlyn Beck
Research Mentor: Dr. Jonathan Evans, Department of English

Introduction

This research project will look at the Old English poem entitled “Elene,” which is Old English for Helena, the mother of Constantine the Great. The primary focus of the project will be Constantine the Great, one of the most important political and religious figures in history. The real question of the research project is what effect did the propaganda of Constantine the Great have in later portrayals of the Emperor? Much research has been done on the ways in which Constantine chose to be portrayed; this project would have the important role of determining how successful those portrayals were.

Historical Perspective

Scholars have already noted some of the striking similarities between Constantine’s version of Christianity and the cult of Sol Invictus. The Church in the Age of Constantine by Johannes Roldanus outlines the connections between Constantine and the worship of Apollo, establishing Constantine’s connection to Sol Invictus. Constantine viewed himself as a direct representative of the deity, and so worshipping the “Unconquered Sun,” a monotheistic religion, gave him a divine mandate to be the sole emperor of Rome. In The Iconography of Constantine the Great, Christopher Walter explores the connection that Constantine makes in his portrayal of Jesus and the Sun deity. The similarities actually made his conversion much easier. Just as Constantine believed himself the divine representative of Apollo, he also believed himself the representative of Christ. Therefore, the iconography of Constantine began to portray himself in a similar manner to Christ. This portrayal extended to his mother, Helena, whom he wanted to associate with the figure of Mary, the mother of Jesus.

This is the historical background for the poem “Elene.” Written almost 600 years after Constantine’s life, the poem chronicles the mythical journey of Helena to Jerusalem to locate the cross of Jesus Christ. The figure of Constantine plays a very important role in the poem, as discussed by E. Gordon Whatley. Dr. Whatley’s research focuses on the militarization of Christianity that was started by Constantine and considered standard by Cynewulf’s time. What I aim to look at is slightly more political. I will examine the portrayal of Constantine as a leader (both in the religious and secular sense) and see what traces of Constantine’s own iconography survive.

Research Methods

To examine the figure of Constantine in “Elene,” most of my work will make use of primary texts. I will be closely examining the language used by Cynewulf when describing Constantine, and see how it resembles or differ from the Latin words used to describe him by Eusebius and other contemporary historians. This will require an extensive look at the work of the Peterborough chronicles, an Old English translation of a Latin history, to see the most accurate translations of Latin words to Old English.

I will also be looking more into Constantine’s iconography. While I have already studied this in relation to his sun god worship, I will need to focus more on his propaganda relating to his
mother and to the Christian cross. These two themes are the focus of the poem by Cynewulf and will determine much of whether or not Constantine’s methods were successful.

I expect to find that Constantine’s efforts were largely successful in regards to his status as the representative of the Christian God. However, it is less likely that his affiliation with the sun god, and how he believed that connected to Christianity, remains.
The Forgotten Radical: Southern Women and the New Left Student Protests of the 1960s

2014 Summer Fellow: Brett Bennett
Research Mentor: Dr. Brian Drake, Department of History

The narrative of the 1960s student protests revolves around the major campuses of Kent State, Berkeley, Columbia, and other Northern and West Coast universities. However, this narrative fails to paint the national picture of college upheavals. The 1960s would not have had the same effect on society if protests were confined to a few liberal campuses. Across the nation, students fought against the Vietnam War, the policy of *in loco parentis*, and for their right to free speech on campus. While ignored in most histories of the decade, these protests reached the Deep South as well. Chapters of Students for a Democratic Society, and their Southern equivalent, the Southern Student Organizing Committee, formed on Georgia campuses. Georgia students, too, staged sit-ins and marches and desired to have their voices heard. Yet, even within these so-called ‘radical’ groups, women struggled to be allowed the same opportunities to speak and organize as their male peers. If the Southern radical is overlooked in historical narrative, the female radical is nearly forgotten, as she had to fight for her voice to be heard within even the New Left movement itself.

In 1968 the biggest protest on the UGA campus centered on making disciplinary rules equal for both male and female students. At the time, women were subject to stricter rules of curfew, visitation, and drinking. While the *Red and Black* ran op-eds from parents and students who supported this inequality on the basis of preserving a unique femininity and a female wholesomeness, 112 of the 300 students who occupied the Academic Building were women, all of whom were breaking traditional gender roles, and also their curfew. Yet, despite the participation of women and the protest being over a women’s issue, the leaders of the protests and the ones who became the spokespeople were all men.

UGA erupted in protest again in 1970 as it joined the nationwide student strike to protest the shootings at Kent State. What role were women able to play in this protest? What struggles and frustrations did they face? Female radicals existed on campus. In 1972 a chapter of the feminist group W.O.M.E.N (Women’s Oppression Must End Now) formed at UGA. As chairwoman Linda Chafin said, “I started out in the peace movement. It just riled me up the way the men acted toward women, even though we had the same concerns.”

This research aims not to address the feminist movements on the UGA campus, but rather the struggle within New Left groups that required separate women’s movements. At a time when even the president of the UGA Young Democrats denounced the campus SDS chapter as “radical,” why did some of the peace movement membership feel so restrained by traditional gender roles they had to form their own groups? What was the unique brand of Southern radicalism, and how did Georgia universities fit into the college protest narrative? Utilizing back issues of the *Red and Black* as well as the UGA archives at the Russell Special Collections Library, particularly the Fred Davison papers, as he was President of the University during these protests, I aim to explore the dual narrative of the radical Southern woman. How did the Southern student protests differ from, yet also mirror, the high-profile Northern ones? How did being a woman affect a student’s ability to be a radical? There is a national question here as well: how could a group or movement be truly radical if it enforced the traditional gender roles of the society it claimed to oppose?
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Photophysics of a Eumelanin Chromophore – Indole
2014 Summer Fellow: Michael Biddle
Research Mentor: Dr. Susanne Ullrich, Department of Physics & Astronomy

Skin cancer is the most widespread form of cancer in the United States and is possibly initiated by ultraviolet (UV) radiation damaging DNA contained in skin cells.\(^1\) Certain constituents within our skin, like the polymer eumelanin (see Figure), function as a built-in sunscreen, naturally protecting our bodies from DNA photodamage. However, the mechanism responsible for this UV-shielding is not yet fully understood. The focus of the proposed project is to study this mechanism in both the gas and condensed phases by employing a unique simple-to-complex approach. Beginning with building blocks of eumelanin, I will determine at a molecular level how these simpler molecules respond to UV radiation, and then extrapolate this information to larger polymeric systems to achieve a better understanding of eumelanin photodynamics.

The research objective of my proposed project is to understand the dynamics of the eumelanin precursor indole, using gas-phase and condensed-phase time-resolved spectroscopic techniques. We will photoexcite the indole molecule in the gas phase with UV radiation and monitor the evolution of the excited states, while also investigating possible fragmentation pathways. Our hypothesis is that the optically dark \(^1\pi\sigma^*\) state (i.e., the \(\pi\sigma^*\) state is not excited directly) provides efficient ultrafast deactivation back to the ground state. This process has been demonstrated in previous works on indole,\(^2,3\) yet many discrepancies still exist (e.g., the relaxation time associated with the \(\pi\sigma^*\) to ground state transition). The \(\pi\sigma^*\) state was proposed as a deactivation pathway in the theoretical work of Sobolewski and Domecke,\(^4\) and our hypothesis is based on the emergence of this state as a key candidate in the photoprotection mechanism of many biomolecules. We will conduct numerous gas-phase experiments on indole, utilizing various wavelengths across its UV absorption spectrum. Femtosecond time-resolved photoelectron spectroscopy (TR-PES) will be applied to directly observe the relaxation pathways of all excited states, including the \(\pi\sigma^*\) state. We will also use time-resolved total kinetic energy release (TR-TKER) to monitor the kinetic energy of emitted H-atoms, an indirect method of examining \(\pi\sigma^*\) state dynamics that lead to N-H bond fission, and time-resolved ion yield (TR-IY), a technique employed to observe fragmentation dynamics. Information gleaned from each method will afford the opportunity to inspect the involvement of the \(\pi\sigma^*\) state in the overall photoprotection mechanism itself.

To replicate a more biologically relevant environment, we will also study indole dynamics in different solvents with varying polarities, such as cyclohexane, ethanol, and water. Time-resolved transient absorption spectroscopy (TR-TAS) will be performed on indole to investigate the temporal evolution of the neutral, electronically excited states. Similar to the gas-phase studies, we will utilize a wide range of excitation wavelengths but will probe for the possible appearance of the indolyl radical with white light. Indolyl is the indole molecule with the H-atom located at site 1 (see Figure) removed and again an indication for \(\pi\sigma^*\) deactivation dynamics.
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Through these methods we expect to obtain a comprehensive understanding of the photochemical and photophysical processes in the eumelanin precursor indole, including energetic onsets (i.e., the minimum amount of energy required to access a specific relaxation pathway) and the significance of varying deactivation pathways, specifically the \(^1\pi\sigma^*\) state, as well as their respective timescales. The gas-phase results will be compared with theoretical models as well as the condensed-phase results to show the potentially significant role of a solvent in biomolecular photostability. This understanding will provide a foundation for the Ullrich Ultrafast Laser Group as they commence to understand the photophysics of eumelanin precursors, with the understanding of eumelanin itself being the ultimate goal.

References:


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Techno-economic Assessment of Co-producing Bioplastics with Algae Biofuels

2014 Summer Fellow: Charles Bond
Research Mentor: Dr. Sudhagar Mani, College of Engineering

Over the next century, the ever-increasing demand for energy, the volatile and decreasing supply of fossil fuels, and the environmental and health problems caused by burning them will force a shift towards renewable energy sources. At the University of Georgia and around the world, research has begun on the economical cultivation and conversion of biomass into drop-in fuels (equivalent to fossil fuels used today).\textsuperscript{1,2,3} Algae are a promising source of biomass because of their high areal productivity (50-100 dry tonne/ha/\text{y}) compared to that of terrestrial biomass (5-20 dry tonne/ha/\text{y}) and can be converted into a variety of biofuels and other products.\textsuperscript{1,4} Furthermore, considering that “algae are capable of producing in excess of 30 times more oil per acre than corn and soybean crops”\textsuperscript{4} without directly competing with food, one wonders why we still use petrol and corn in our cars. The reason is that advancements in algae cultivation and conversion are not happening fast enough for algae-based fuels to meet the lower costs of fossil fuels and federally subsidized industrial food crops,\textsuperscript{1} and potential environmental benefits such as carbon sequestration, waste treatment, and reduced pollution are difficult to factor into the value of the product.\textsuperscript{2} For this reason, I intend to research the coproduction of bioplastics as a potential offset to the costs of producing algal biofuels.

When producing fuels from algae, valuable coproducts can be produced alongside biomass for fuel simultaneously, and “this co-production is seen as an important option to break through the barrier of economic viability.”\textsuperscript{2} Potential algal coproducts are very diverse: “antiviral compounds, Immunomodulators,”\textsuperscript{5} complex silicon nanostructures,\textsuperscript{6} antibiotics, nutraceuticals, pigments and a wide variety of other bioactive molecules.\textsuperscript{5} Although the market values of such products are high,\textsuperscript{7} potentially hundreds of thousands of dollars per ton,\textsuperscript{5} their markets are small and elastic, meaning they are subject to a significant “decrease [in] price and also market value as higher production rates may possibly lead to market saturation.”\textsuperscript{8} Contrast that with fuels and plastics, commodities that are generally lower in value (biofuels worth 100-1000 $/ton, bioplastics worth 2000-5000 $/ton, roughly),\textsuperscript{5} but are inelastic and resistant to market saturation, as billions of people use them every day. Demand for energy and plastic grows with population, and since fuels and plastics are today derived from oil, their value will rise as oil becomes scarce, and the demand for alternatives will increase. Algae offer a 2-in-1 alternative, as bioplastics are derived from proteins, the biomass that is least suitable for fuel. This relationship seems very promising, and that is why I would like to research how the production costs of fossil plastics and fuels compare to those of algal plastics and fuels, how bioplastics will affect the economic feasibility of algal-fuel production, and how those relationships will change as oil prices rise.

Dr. Sudhagar Mani, who is researching the cultivation and conversion of algae into bio-crude oil and coproducts at the UGA College of Engineering, has invited me to work with his research group. I would study their work and factor it into an analysis of the costs and benefits of a variety of potential large-scale production scenarios, comparing the costs of producing algae-derived products to the current and predicted future costs of petroleum-derived products. With this information, I hope to find out the extent to which bioplastics can improve the economic viability of algal-fuels, how those improvements can be optimized, and finally, if and when the costs of oil will make algal plastics and fuels viable on a commercial scale.
References:


Health Behavior Change in Romantic Couples
2014 Summer Fellow: Jerica Bornstein
Research Mentor: Dr. Michelle vanDellen, Department of Psychology

People in relationships often try to change their partners’ behavior. Finding a balance between behavior change and relationship quality is challenging but very important for a healthy relationship. Past research has found that focusing on changing one’s partner is not a successful approach to help the partner change (Hira & Overall, 2011). Instead, relationship quality and development depends on whether or not the partner attempts to engage in effective change on his/her own (Hira & Overall, 2011). Furthermore, encouraging and supportive partners promote self-enhancement by giving their partners help to achieve their goals (Overall, Fletcher, & Simpson, 2010). Additionally, people who reported high marital satisfaction also reported giving extra support towards their spouses’ goals compared to those who reported low marital satisfaction (Brunstein, Dangelmaye, & Schultheiss, 1996). Likewise, further studies suggest that romantic partners may rely on each other for help with self-control, which may help conserve resources for other goal pursuits down the road as well as facilitate relationship commitment (Fitzsimons & Finkel, 2011). Additionally, social control is associated with an increase in health behavior and people in relationships tend to influence the health behaviors of their significant others (Craddock, vanDellen, Ranby, & Novak, 2014).

Although we know support, especially goal support, is important for overall relationship quality and satisfaction, we do not yet know how people go about recruiting support from their significant others for health behavior change. Nor do we know much about the extent to which people perceive their partners as obstacles to health behavior change. The major emphasis of this research will be to investigate communication about health behaviors in romantic relationships, including how people in relationships plan to change these health behaviors and how these conversations about health behaviors are related to their personalities, their partners’ personalities, and their relationship satisfaction.

The present study is an exploratory study where I will observe videos of sixty-six couples discussing health behavior change. My primary task for the summer will be to lead the coding and analyzing of these videos. I plan to develop a coding scheme for the videos with a focus on whether the dyads preferred collaborative versus independent plans for health behavior change (e.g., did the partners decide to exercise together or separately at different times) as well as features relating to the plans themselves (e.g., are they abstract vs. concrete; are they short-term vs. long-term). Additionally, we will code the extent to which couples spend an equal amount of time talking about health change versus the extent to which one partner does the majority of the talking. Once I have developed this coding scheme, I will train and lead a team of research assistants in the coding of the videos, ensuring that we maintain high inter-rater reliability.

When the data coding is complete, I will analyze the correlations and means, and prepare a manuscript for publication. I am particularly interested in why the couples decided to change a specific health behavior and the motivating factors for the change. I will explore whether personality, relationship characteristics, and self-control predict the kinds of health plans they develop and their intentions to pursue those plans after the conversation. These individual difference and dyad data have already been collected and have codes connecting them to the individuals and dyads in the videos. When the data coding is complete, I will analyze the correlations and means, and prepare a manuscript for publication. Additionally, I will use data from this project as the basis for a proposal for a poster presentation at the Society for Personality and Social
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Psychology, an international academic conference where researchers in my specialty of interest meet annually.

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Contemporary Artistic Approach toward Ancient Chinese Papermaking
2014 Summer Fellow: Jiacheng Chen
Research Mentor: Prof. Eileen Wallace, Lamar Dodd School of Art

In 105 AD, Cai Lun, a royal officer of craftsmanship in China, reported his method of making paper to the emperor. It is the first recorded proposal of papermaking, and Cai Lun is recognized as the inventor of papermaking. Today, after almost 2000 years, handmade paper art has established itself as an independent art form. This research will focus on creating paper sculpture using ancient Chinese paper material.

The quality of handmade paper remains true to its raw plant material. Its process of creation is transformative in physical form yet adhesive in fiber materiality, a key feature that distinguishes one piece of paper from another. In this research, I will study the old papermaking technique from ancient Chinese papermakers, to see what a piece of paper made from this earliest recipe would be like. I will also look into its texture, opacity, and malleability from a sculptural perspective, an art domain that has not been explored in ancient oriental art history. For paper sculpture, its shape formation cooperates with nature. Different from traditional sculptors, paper sculptors don’t dominate the entire creative process. Once an initial structure is made, the paper reacts with the structure and transforms into natural shapes as it dries. An artist’s position becomes secondary behind the idea of “let nature finish the job.”

I plan to divide this research into two parts. First, I will travel in China and read an original text Tian Gong Kai Wu (The Exploitation of the Works of Nature, by Song Yingxing, 1637). I will take field trips to local paper workshops to learn the recipe and visit the Cailun Paper Culture Museum in Shaanxi Province. When I return to the United States in early June, I will continue my studies in papermaking in the Hargrett Rare Book and Manuscript Library. To start the second part of this research, I will actually make Chinese paper in the papermaking department, using what I learnt from a papermaking course. Meanwhile, in the studio I will adopt a research method from the architecture laboratories, where researchers study shape formation by experimenting with many models with a single variable. Similarly, I will explore paper’s drying mechanism through the variation of structural setup and document groups of accumulative visual outcomes in photographs. I will conclude my research and expand the reaction mechanism to paper installations of a large scale. The final project will be a large paper installation of Chinese papermaking which will combine ancient oriental paper materiality and spontaneous visual appearance.

I am interested in exploring a traditional medium using a modern approach and creating innovative yet nostalgic aesthetics. Last year I created a CURO research course entitled “Modern Re-creation of Ancient Chinese Architecture.” Guided by two professors, I studied historical texts about ancient Chinese architecture and its specific bracket system craftsmanship. I designed new bracket styles and a minimalist wooden pavilion. This study, “Contemporary Artistic Approach toward Ancient Chinese Papermaking,” will be similar in character and re-create an ancient craft in a contemporary artistic format. Additionally, it will also serve as inspiration to future architecture design for its methodology. I look forward to studying paper’s drying-motivated shape formation and seeing how its unpredictable curling will allow nature to participate in a creative process. Ultimately, this research will not only bring together two historical periods, but will also be interdisciplinary, mixing visual art and design.
Influence of Mating Behavior on Germline Stem Cell Reproduction in Three Species of *Drosophila*

2014 Summer Fellow: Blair Christensen
Research Mentor: Dr. Patricia Moore, Department of Entomology

Insect pest management is arguably the most important area in modern entomology, determining the success or failure of large-scale agriculture across the globe. Essential to understanding pests is a clear picture of their life history and reproductive strategies. Tailoring pest management to specific reproductive patterns yields more efficient and often more effective control. The fruit fly species of the genus *Drosophila* are models for studying evolutionary biology and life history, but up to now have not been known to be pest species (Ashburner et al., 2005). However, a new invasive pest species of *Drosophila*, *D. suzukii*, has recently arrived in the USA and is causing significant losses, including in Georgia (Lee et al., 2011). Our goal is to determine whether innate reproductive mechanisms can be manipulated by external conditions; this could lead to a non-chemical pest solution to the recent influx of *D. suzukii*.

An essential component of fertility is the production of gametes by germline stem cells (GSCs). The regulation of GSCs is not yet entirely understood, although the effect of diet and age is being explored in *D. melanogaster* (Hsu & Drummond-Barbosa, 2009). However, other factors, particularly the role of mating, are not well understood. It is unknown whether or not individuals of the same species and environment will exhibit different rates of GSC division when exposed to different reproductive conditions (Tu & Tatar, 2003). Some earlier studies have shown that increased rates of mating will result in a higher turnover rate in the GSCs (Schultz lab preliminary data). We believe that this supports the idea that virgin male fruit flies will have less division activity in their GSC hub than a fruit fly that has been able to mate in a limited context, and that that male will have less than a fruit fly that has been allowed to mate an unlimited amount of times.

Three different species of *Drosophila* will be used: *D. melanogaster*, *D. suzukii*, and *D. pseudoobscura*. *Drosophila melanogaster* is a common model organism, with established staining techniques and a completely mapped genome. *Drosophila suzukii* is an important emerging pest species, but nothing is known about its reproductive physiology. *Drosophila pseudoobscura* is very different from the other two species, both in appearance and in some aspects of physiology, including teste shape and size (Mayr, 1946). The previous two semesters have been devoted to developing a staining procedure that will work on all three species. In my previous work I have established a protocol that utilizes a blocking step to reduce non-specific binding which is essential for labeling testes for both structure and GSC division rates.

Division rate is determined by counting GSCs in either the synthetic or mitotic phase, by *ex vivo* labeling of the testes. Testes from males at the same age, but under three different reproductive conditions (unmated virgins, a single mating, and unlimited mating) will be analyzed for GSC division rate. Testes will be dissected. One testis from each male will be labeled for BrdU incorporation and actin filaments. The other testis from each male will be labeled with anti-phosphohistone H3 to label M-phase nuclei as a control for changes in cell cycle length. I will test the hypothesis that the rate of GSC division increases with increasing number of matings. The results from this summer of study will be not only applicable to the life history model of the organisms, but also to pest management utilization, possibly impacting entire agricultural industries.
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The Politicization of Soccer and the Effects of the 2014 World Cup on Brazilian Politics

2014 Summer Fellow: Aaron Conley
Research Mentor: Dr. Barry Hollander, Grady College of Journalism & Mass Communication

The summer of 2014 will be extremely significant in terms of political and social issues in Brazil. Those actions will focus on a range of topics including public health and education, high tax rates, corruption, multi-billion dollar projects for the World Cup and Olympics, and social injustice for the poor in the favelas in major cities such as Sao Paulo and Rio de Janeiro. The catalyst for all of this comes in the form of the 2014 World Cup, hosted by Brazil and played out in twelve major cities around the country. The political action that will take place during the month-long tournament can have an immediate effect when Brazilian president Dilma Rousseff seeks re-election in November.

My research has begun by analyzing the political revolts that occurred during the 2013 Confederations Cup, which served as a dry-run for the World Cup, allowing Brazil to practice hosting games in the new stadiums. The uprisings staged during the tournament set a precedent that is all but assured to be upheld at the 2014 World Cup. These protests and the issues inspiring them form the basis of my research.

One major issue comes in the form of extreme government spending and rampant corruption. To date, the Brazilian government has already spent more on its own World Cup than South Africa, Germany, and South Korea (the most recent three hosts) combined. Brazil is also notorious for its extremely high citizen tax rates but very poor public education and public health.

Also significant is the nature of the protests themselves. The ways in which the protests are carried out and the use of media by which they spread are both extremely telling about the current state of Brazil. Also, the way that the government responds to them holds significant political implications. Dilma Rousseff was actually part of the leftist guerrilla movement in the 1980s. This has left her in a balance between trying to quell the dangerous rebellions without reneging on the values that can win her re-election.

The immediate future of Brazil will be entirely determined by the events that will unfold from June 12th to July 13th of this year. The way that the World Cup changes the political nature of Brazil will have major ramifications on the 2014 presidential election and the 2016 Rio Olympics, and ultimately determine if Brazil, one of the fastest growing nations in terms of both population and economics, will become a global power on par with the United States and China, as some believe it is capable of doing. A scholar from the University of Espirito Santo said: “Brazilians are mixing soccer and politics in a way that is new.” This unique mixing of sport and politics will unfold on the world stage this summer and will determine the future of a nation, a continent, and ultimately the world.

Looking at this summer, the 2014 CURO Summer Fellowship will serve as a research stipend affording me the opportunity to gather information about the 2014 World Cup and the social and political actions surrounding it in real time. I will see and understand exactly what is happening in one of the fastest growing nations in the world, and what the World Cup is doing to adjust a political system which already finds itself in an unstable state, especially heading into a major election season in the Fall of 2014. Ultimately, with this fellowship, I will find myself at the beginning of the fall 2014 term with all of my information gathered, allowing me to begin writing and preparing for hopeful publication in 2015.
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Exploring the Relationship between Oxytocin and the Tendency to Trust
2014 Summer Fellow: Lydia Denison
Research Mentor: Dr. Brian Haas, Department of Psychology

The neuromodulating hormone oxytocin is the focus of many studies in the field of neuroscience and social behavior. Abnormalities within the oxytocin system play a large role in psychopathology, specifically social disorders such as autism. Recently, oxytocin has been linked to the regulation of the specific social-behavioral constructs that include trust, empathy, and altruism. My goal is to better understand the relationship between oxytocin and the tendency to trust, utilizing a combined genetic analysis and neuroimaging approach.

Interpersonal trust is defined as “the psychological status of being willing to accept frangibility, based on the expectation of the other party’s positive intentions or behaviors (Yan & Zhu, 2013).” Interpersonal trust is associated with positive social interactions, cooperation, and altruism. To study the effects of oxytocin on social-behavioral phenotypes, researchers have used the method of intranasal administration of oxytocin. Results of this research show that intranasal administration of oxytocin increases trust behavior during the Prisoner’s Dilemma Task. The Prisoner’s Dilemma Task involves two players, and a hypothetical situation in which cooperation is required from both players. The group that received intranasal oxytocin displayed enhanced mutual cooperation and trust, relative to the placebo control group (Declerck, Boone, & Kiyonari, 2013). One limitation of this study, however, is the uncertainty of the precise amount of oxytocin that actually reaches and affects oxytocin receptor sites through nasal administration (Churchland & Winkielman, 2012). Another limitation of intranasal administration of oxytocin is that it is difficult to determine the individual variability of the uptake because of differences in genotypes of the receptor.

An alternative method used to understand the association between oxytocin and trust is to investigate how genes within the oxytocin system may be related to individual differences in the tendency to trust. Abnormalities of the oxytocin receptor gene (OXTR) occur in many psychological conditions. This proposed study is designed to examine the association of the OXTR and the structure and function of the amygdala and furthermore, how these biological factors correlate with the tendency to trust. In order to conduct this research I will be working under Dr. Brian Haas in the Gene-Brain-Social Behavior Lab. In this multi-disciplinary lab I will be collaborating with the Georgia Genomic Facility as well as the UGA Bio-Imaging Research Center (BIRC). Participants will complete the Trust Inventory (a well-known measure of trust), a series of Trust Tasks during the collection of the fMRI data, and saliva will be collected for genetic analysis. The first session will be a collection of behavioral data. The first Trust Task is made up of different faces, and participants are asked to rank on a scale of 1 to 7 the trustworthiness of the faces. During the second session fMRI data will be acquired. The participants will be placed in the Tesla 3 Functional Magnetic Imaging Scanner (at the UGA Bio-Imaging Research Center) and the BOLD signal will be collected. While in the scanner each participant will see the same series of faces from the previous session (several weeks prior) and they will be instructed to either trust, distrust, or evaluate the age of the person. Age will serve as a control. Immediately following the fMRI scan the participants will then be asked to rate the trustworthiness of the same faces. This task will be a measure of conscious control of trust.

I have narrowed the focus in my correlational study in hopes of better understanding the association between certain alleles within the OXTR gene, structural and functional neuroanatomy, and social behavior. I believe that as a result of this research, the fields of psychology and biology will progress towards a greater understanding of human social interaction.
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Production of a Monoclonal Antibody Epitope Expressed on Pancreatic Adenocarcinoma

2014 Summer Fellow: Sarah Evans
Research Mentor: Dr. Michael Pierce, Department of Biochemistry & Molecular Biology

Improvements in early detection and monitoring of pancreatic cancer are necessary to reduce the low survival rate associated with this disease. Based on data from the Surveillance, Epidemiology, and End Results Program of the National Cancer Institute, only 6% of people diagnosed with pancreatic cancer survive five years or more. Pancreatic ductal adenocarcinoma is by far the most common form of cancer in the pancreas, and not much is currently known about signals indicating the initiation of this oncogenic process.

Aberrations in cell-surface glycans can be seen in various cancers, leading to their potential in serving as biomarkers of cancer. CEACAM6 is a GPI-anchored protein in the carcinoembryonic antigen family involved in cell adhesion and contains immunoglobulin domains and N-linked glycan sites. CEA production stops before birth, but research has shown elevated CEA levels associated with various cancers, particularly adenocarcinomas. Therefore, antibodies to CEA can be used to identify cells expressing this glycoprotein and narrow down the cancer type affecting the individual.

A monoclonal antibody epitope, expressed on CEACAM6 made in pancreatic ductal adenocarcinoma, has been identified by the Pierce lab and is an N-linked glycan expressed only on CEACAM6 on these cells and on CEACAM6 released by these cells. The C6f1 fragment of CEACAM6 has been expressed in HEK-293T cells as a fusion protein with the IgG Fc sequence. After this fragment was secreted and purified, the monoclonal antibody (MAb 3.3) glycoepitope was found on only one peptide. Research in the lab has already taken steps to confirm the chemical structure of this glycan epitope. The C6f1 fragment was also expressed in a Lec1 HEK-293R cell line that lacked GnT-I activity in order to simplify its N-linked glycans. The MAb 3.3 epitope was resistant to cleavage by endoglycosidase H, while the rest of the N-linked glycans were not. By treating the sample with endo H, the N-linked glycans could be released while the glycans expressing the epitope remained intact. Analysis by MSn has narrowed the possible structures of the epitope. Analysis by NMR spectroscopy is currently underway to verify this simplified structure.

Under the guidance of Dr. Michael Pierce, my primary goal will be to elucidate the structure of the native glycans that express the epitope in a pancreatic adenocarcinoma cell line, BxPC3, that contains the CEACAM6 native GPI-anchored glycoprotein. Revealing the features of these endogenous glycans may open up new possibilities that may not be apparent in the simplified secreted epitope produced in the Lec1 HEK cells. I will isolate these glycans expressing the epitope and determine their structures by expressing the C6f1 fragment in BxPC3 cells. Data has also shown detection of the MAb 3.3 epitope in pancreatic cancer ductal fluid after SDS-PAGE and immunoblotting. Identification of features of the glycan epitopes and the proteins that express them can thus be extended to ductal fluid. A better understanding of these endogenous glycans and their antibodies may enable us to develop antibodies with greater specificity that will aid in detecting if there are antibodies against this epitope, or fragments of CEACAM6 containing the epitope, circulating in sera within patients with pancreatic cancer. The analysis of the endogenous glycans that express the epitope will provide more information regarding their potential as biomarkers for pancreatic ductal adenocarcinoma and potential therapeutic targets, as well. This research will likely lead to innovative methods for diagnosing and monitoring the disease and could also lead to new therapies for its treatment.
Proposals

References:


The Reign of Terror through the Lens of Revolutionary Culture
2014 Summer Fellow: Emily Francis
Research Mentor: Dr. Jennifer Palmer, Department of History

Alexis de Tocqueville once remarked that the French Revolution was “so inevitable yet so completely unforeseen.” The statement is remarkable for what it says, and even more so for what it does not say: for Tocqueville might have said that the Reign of Terror was inevitable, that the Reign of Terror might have been foreseen. Was he correct in his omission? Who can tell? To this day, the historiography of the Terror is unsettled. The facts are clear: that the years of the Terror constituted the most violent of the Revolution; that the heady days of 1789, when all was “Liberté, Egalité, Fraternité,” seemed from another world. Rather, it is the interpretation of the facts that is contested. On the one hand, the liberal school maintains that the Terror was a radical departure from the ideals set forth in 1789; on the other, historian François Furet, among others, argues that the events of 1793 were consistent with those ideals. I propose to study the problem through the lens of two important symbols of the Terror: the guillotine and the mountain. The centrality of the guillotine to the events of the Terror is well-known. Nearly 17,000 people were executed at its blade. The mountain is perhaps less-appreciated as a symbol of the Terror. The nickname for the radical political faction headed by Robespierre, it evoked the ideal city on a hill the revolutionaries strove to create. My goal is to study the significance of the guillotine and the mountain as revolutionary symbols, and, through them, to come to a deeper understanding of the problems confronting the historiography of the Terror.

Many revolutionaries endorsed the use of the guillotine to execute counter-revolutionaries. Robespierre himself said that revolutionary government “owes nothing to the Enemies of the people but their death.” The Jacobins unleashed the Reign of Terror to eliminate people who opposed the revolutionary cause. That the guillotine also dispensed with Louis XVI and Marie Antoinette only intensified its power as a revolutionary symbol. At the onset of the Terror, the guillotine was viewed as a humane innovation, suited to its purpose: a symbol of the progress of the Revolution. But as blood began to flow more heavily in the streets of Paris, everyday people referred to it by euphemisms, such as the “national razor.” This suggests a level of discomfort that was not present only months before. How did the meaning of the symbol change so rapidly? What does the changing popular mindset tell us about the people’s view of the Terror?

Just as political culture changed during the Terror, so did visual culture. The deep interaction between the two has been explicated by historian Lynn Hunt. For example, while Marianne initially symbolized the triumph of the Revolution, her appearance during the Terror gave way to that of the more radical Hercules. Additionally, the style of Jacques-Louis David, arguably the most prominent artist of the Revolution, changed drastically throughout the Revolution and, specifically, through the Terror. Before long, David himself began incorporating mountains into his art. Mountains signified a connection to the Montagnards, the radical faction of the Jacobins who were responsible for implementing the Terror. What other close ties existed between the artistic and political elites? What do the ties say about the professedly democratic ideals of the Revolution?

In conclusion, I wish to return to the question raised at the beginning of this paper. Were the seeds of the Terror present in 1789, or did the Terror occur unexpectedly, like a thunderbolt from the sky? I believe that by examining the Terror in a different light – that of the symbols of the guillotine and the mountain, through the study of pamphlets, newspapers, prints, festival plans, and paintings – I will contribute to answering this all-important question.
References:


Proposals

Development of Robots for Weed Control in Organic Farming

2014 Summer Fellow: Delmaries González
Research Mentor: Dr. Changying Li, College of Engineering

In agriculture, herbicides are utilized in large farms as a method for effective weed control. These chemicals have widely variable toxicity, so the dangers of acute toxicity from high exposure levels for the user are possible. According to some studies, there is also concern for birth defects in babies because of chlorophenoxy herbicides, which are widely used in the United States (Schreinemachers, 2003). Even so, it is necessary to get rid of weeds in our crops. Weeds reduce crop yield by competing for water, light, soil nutrients, and space. They reduce crop quality by contaminating the commodity, interfering with harvest, limiting the choice of crop rotation sequences and cultural practices, and producing chemical substances which are toxic to crop plants, animals, or humans (Ligenfelter, 2014).

Weed control is the number one problem facing organic farmers. In addition, conventional growers are interested in improving sustainability. This project could reduce the need for labor and/or chemical herbicides. As organic agriculture grows, weed control will continue to be a drag on expansion, especially where unskilled labor is limited or unavailable.

Robotic technology may provide a means of reducing agriculture’s current dependency on herbicides, improving its sustainability, and reducing its environmental impact (Slaughter et al., 2007). Societal benefits would include the reduction in the use of chemical herbicides that may pose a danger to the environment, farm workers, and their families. This would also reduce the amount of chemicals in our food supply. Reducing the need for low paid, unskilled labor would help reduce the need for immigrant labor and reduce the potential exploitation of such populations.

This project will use off-the-shelf robot chassis (NI LabVIEW Robotics Starter Kit for Prototyping) and the graphical programming language LabVIEW to develop a weeding robot for applications in organic and sustainable vegetable production. The idea is to develop a weeding robot that can autonomously navigate between the rows of organic vegetables and remove weeds between two rows. There are three objectives that I will pursue in this research program: 1) develop a GPS-based or vision-based navigation system so the robot will follow a certain path in the field; 2) integrate sensors onboard to avoid obstacles (such as plastic munch); 3) develop an actuator that can remove the weeds effectively. The control of this robot will utilize the onboard inertial measurement unit (IMU) to determine robot motion and direction, which will be used in conjunction with touch sensors to determine robot action and control the activation of the weeding brushes. The way this will be achieved is with a function of the onboard GPS, accelerometer, gyrometer, and magnetic compass. The mechanism of weed control, which I will be designing and building, will use rotating brushes to stir the soil to keep weed seedlings under control. The brush control will be integrated with the robot’s movement, starting and stopping as deemed appropriate. There are three different mechanisms of locomotion that will be evaluated: wheeled, tractor treads, and multiple tractor treads.

The project will be conducted in the Bio-Sensing and Instrumentation Laboratory in the College of Engineering. The lab is well equipped with the necessary sensors, hardware, testing instruments, robot platform, and software.

To test the robot, several experiments will be conducted both in the lab and in the UGA Horticultural Farm. The robot’s navigation, method of locomotion, and weeding performance will be evaluated based on the ability of the robot to operate autonomously. The robot will also be tested in different soils that can vary between sandy loams and clay in the Horticultural Farm. Both between-row and stale seedbed weed control will be evaluated. Evaluation will include assessing degree of weed control and weed populations. The statistical data analysis will be performed using SAS.
References:


Natural Epigenetic Variation of the SVP Locus in Arabidopsis thaliana is Associated with an Early-flowering Phenotype

2014 Summer Fellow: Patrick Griffin
Research Mentor: Dr. Robert Schmitz, Department of Genetics

With the advent of high-throughput sequencing technologies, the identification of genetic variants and their association with phenotypic diversity is actively being pursued. Largely absent from these efforts is the identification of natural epigenetic alleles (epialleles). Epigenetics (e.g. a Latin prefix meaning over) is the study of mitotically and/or meiotically heritable changes in phenotype that arise independently from sequence-level genetic variation. As a result, attention has recently shifted to non-DNA-sequence heritable factors such as DNA methylation to better understand the variation leading to phenotypic diversity (Schmitz & Ecker, 2012). The identification of an epiallele requires the preclusion of a solely genetic basis and evidence of multigenerational inheritance.

To begin the task of identifying epialleles, the Schmitz Laboratory is sequencing DNA methylomes to reveal candidate epialleles that exist in natural populations of a model plant species, Arabidopsis thaliana. Arabidopsis is found throughout the Northern Hemisphere as it has locally adapted to numerous ecological niches, which makes it a superb model for the study of natural phenotypic variation. From previous experiments, a candidate epiallele was identified in the SVP (SHORT VEGETATIVE PHASE) gene of the strain Dja-1, which is a natural strain of Arabidopsis thaliana from Kyrgyzstan that displays an early-flowering phenotype. SVP influences the floral transition in Arabidopsis thaliana, and mutant alleles of this locus lead to an early flowering phenotype (Mendez-Vigo et al., 2013). Interestingly, the SVP alleles are methylated in Dja-1 (hereafter referred SVP epi) compared to all other surveyed Arabidopsis strains, which leads to the following hypothesis: The methylated alleles of SVP in the Dja-1 strain are causative for the early-flowering phenotype observed in nature.

To address this hypothesis, the following experiments will be performed – many of which will occur in parallel instead of a stepwise manner. First, the expression levels of SVP in Dja-1 in comparison to wild-type loci will be quantified using RT-PCR (reverse transcriptase-PCR). DNA methylation is often associated with gene silencing, and therefore the SVP epi expression levels are hypothesized to be lower than the unmethylated alleles in wild-type strains (Law & Jacobsen, 2010). Second, classic genetic complementation analysis will be utilized to test if the early-flowering phenotype that is present in sdp mutants and SVP epi is due to the same locus. If the F1 progeny of Dja-1 with an sdp mutant display an early-flowering phenotype (measure in days to flowering) we will conclude that SVP epi is causative for the early-flowering phenotype of Dja-1. Third, for SVP epi to be a true epiallele, a genetic variant (mutation) needs to be ruled out as causative for the observed phenotypes. Therefore, to determine the genetic composition of SVP epi, Sanger sequencing will be done to uncover variants of SVP epi in Dja-1. Mutations are expected, and to test if any of these identified genetic variants are causative for the early-flowering phenotype of Dja-1, SVP epi will be transformed into wild-type Arabidopsis thaliana and mutant sdp to determine if the early-flowering phenotype can be rescued to late flowering. If a late-flowering phenotype is observed after transgenic complementation, then we will conclude that none of the identified genetic variants identified within SVP epi are causal for the observed phenotypes.

Exploring potential epialleles is an enormous opportunity for biologists to have a more comprehensive knowledge of how diversity arises in populations of organisms. The development of whole-genome bisulfite sequencing (Cokus et al., 2008; Lister et al., 2008) and its application to natural populations is revealing widespread evidence for natural epigenetic variation. The current major challenge in this field is demonstrating causation for these newly identified epialleles. With these outlined experiments, I will be able to present strong evidence for or against the presence of a
natural epiallele at the promising candidate locus $SVP^{Dja-1}$ and determine if it affects the flowering time of this strain.

References:


Computers are now the best architects. Or, more correctly, the most imaginative ones. As a result of recent advancements in digital modeling and animation programs, architects are now allowing their computers to design previously inconceivable forms and structures. One such architect is Sterling Prize winner Patrik Schumacher, Senior Designer at Zaha Hadid Architects (ZHA), who in 2008 wrote, “[T]here is a global convergence in recent avant-garde architecture that justifies the enunciation of a new style: Parametricism. This style is rooted in digital animation techniques... Parametricism is the great new style after modernism.” But what exactly is Parametricism?

Parametric design relies on computer modeling programs that use algorithms in order to generate endless variations of complex non-rectilinear, organic-shaped forms. The practice of parametric architecture necessitates inherently adaptive spaces and forms that eschew conventional planar modeling, and is exemplified by buildings and master-plans by ZHA and their reconfigurations of various urbanscapes, such as the Heydar Aliyev Cultural Centre in Baku, Azerbaijan. The theory of Parametricism is most thoroughly explored through the writings and lectures of Schumacher, notably, his seminal essay “Parametricism: A New Global Style for Architecture and Urban Design,” and his book in which he details a comprehensive theory of architecture, *The Autopoiesis of Architecture: A New Framework for Architecture*.

I will explore the relationship between digital modeling technology and Parametricism. Studying the historical relationship between technology and architecture will illuminate how recent advancements in technology have radically changed the ways in which we envision and interact with urban systems and society writ large. The aforementioned Heydar Aliyev Cultural Centre is known for its structural fluidity and astounding continuity with the topography, as well as its cultural import. It, along with buildings by prominent architects Frank Gehry and Daniel Libeskind, will be examined as case studies because they exemplify the preeminence of parametric architecture to construct transformative urban networks. ZHA’s Heydar Aliyev Cultural Centre, Gehry’s Bilbao Guggenheim, Libeskind’s One World Trade Center, and the writings of Schumacher will illustrate the political, social, historical, environmental, and spatial elements of parametric architecture.

The research I plan to conduct through the CURO Summer Fellowship augments my current investigation with Mr. Mark Callahan on the impact of the internet and digital technology on the fine arts. The importance of my planned research is twofold: it introduces an area of scholarship mostly absent on campus (architecture) and, more importantly, allows me to investigate our shared future of increasingly networked and complex societies vis-à-vis parametric articulations of urbanism. My mentor is Professor Amitabh Verma of the College of Environment & Design. An architect who has worked in India and the U.S., Professor Verma is uniquely positioned to critically guide and provoke my interdisciplinary exploration, which will integrate design and art research methodologies with traditional inquiry of scholarly material, including essays, lectures, articles, as well as master plans and architectural reviews.

References:

  <http://www.argenia.it/papers.html>
Proposals

The “Sublimated Essence of America” and the History of Coca-Cola in the Middle East

2014 Summer Fellow: Andrew Jarnagin
Research Mentor: Dr. Shane Hamilton, Department of History

In *A History of the World in Six Glasses*, Tom Standage claims that in the post-World War II world, Coca-Cola has come to represent globalization in a bottle – either a symbol of “freedom, democracy, and free-market capitalism” or cultural and economic imperialism, charmingly termed “Coca-Colonization.” This belief is not new: the May 15, 1950, edition of *Time* featured a cover graphic of Earth drinking from a Coca-Cola bottle with a story entitled “The Sun Never Sets on CaCoola.”

Complementing the commonly accepted notion of Coca-Cola as a stand-in for Americanization writ large is a significant amount of academic research into globalization as a macroeconomic phenomenon, as well as several case studies in the political economy of Coca-Cola at the communal and national levels. However, no work has attempted to tie these disparate veins of study together to interpret the company's actions in the Arab world. In my research, I will explore Coca-Cola's role as a political actor (whether wittingly or not) in American-led globalization in the post-war Middle East.

Though Standage's work allots a mere two pages to the history of Coca-Cola in the Middle East, there exists a wealth of political and economic intrigue. The company was embroiled in a scandal in 1966 after an Israeli businessman claimed that it was avoiding the Israeli market in order to escape the Arab League boycott of companies doing business with Israel. With no viable counter-argument and mounting boycotts by Jewish groups in the U.S., Coca-Cola opened a plant in Tel Aviv and was officially blacklisted by Arab countries, thus aligning itself, in practical terms, with American foreign policy. In the early 2000s, as anti-Western sentiment grew in the wake of the Second Intifada and the Iraq War, “native” soda companies, such as Zam Zam Cola, Mecca Cola, and Qibla Cola, gained market share through “dollar votes” against American policy abroad. And Coca-Cola once enlisted the help of the grand mufti of Egypt to issue a fatwa dispelling a rumor that the drink's label, read backward in Arabic, spells “No Muhammad, No Mecca.”

There are many such stories, but without a cohesive framework to tie them together, they remain only anecdotal.

I plan to build on a growing body of research by economic historians into the rise of modern consumerism in the Middle East, led by Nancy Reynolds and Relli Schechter, among others. Schechter's monograph of the reciprocal evolutions of the tobacco industry and Egyptian culture from Ottoman times to the present, in particular, may serve as a model, though much broader in scope, for my own work. The sources for my research will be primarily drawn from the Robert Winship Woodruff papers at Emory University, which include correspondence on Coca-Cola's expansion into the Middle East and the Arab League's economic boycott, newspaper clippings related to the company, and archived advertising materials from around the world. The direction of my research will in large part be determined by the material available in this archive. I will also explore the representation of Coca-Cola in Arab fiction, including Alexandra Chreiteh's *Da'iman Coca-Cola* (the name of a 1990s marketing slogan) and Sun 'Allah Ibrahim's *The Committee*. Further, I will travel to Atlanta to attend the annual meeting of the Organization of American Historians in April, to attend a panel entitled “How Coca-Cola Conquered the World,” and to speak with academics – in particular, Dr. Bart Elmore of the University of Alabama – studying the company's global expansion.

A successful research project will provide a nuanced account that counters monolithic conceptions of globalization as simply a symbol of exceptionalism or imperialism.
References:


Factors Influencing the Development of Extractive Foraging Skills in Juvenile Bearded Capuchins

2014 Summer Fellow: Thomas Johnston
Research Mentor: Dr. Dorothy Fragaszy, Department of Psychology

Mobile animals search for their food. There is a tradeoff between the search for food and the exploitation of resources, but it’s still not known how animals discover the optimal point of tradeoff or its effects on reproductive success. Therefore, behavioral ecologists have enduring interest in the foraging and extraction of foods. Although the optimal foraging theory has modeled the energy intake rate of foraging, the behavioral mechanisms by which animals achieve this optimal energy intake rate are still unknown, especially when faced with a new environment (Zhang et al., 2014). For primates, animal prey, nuts, grains, and seeds are rich sources of nutrients, but they can be challenging to find and to process. For example, bearded capuchin monkeys extract the edible kernels of seeds and nuts from tough husks and shells. One of the more well-known extraction methods of bearded capuchins is the use of stone hammers to crack palm nuts, but young monkeys cannot do this until they are more than 3 years old. Yet, they must feed themselves from about 1.5 years of age, when they are still very small. I’m interested in how the young capuchins develop the skill of extraction, specifically in how they learn socially, whether through experience or by watching adults.

Dr. Fragaszy studies a group of 22 wild capuchins in the northeast of Brazil; the exact location of the field site is 9 degrees South and 45 degrees West. I propose to accompany her for the 2014 field season (mid-May through mid-July). The goals of the 2014 project in Dr. Fragaszy’s field lab are to document how individuals vary in their foraging actions (especially extractive actions) and diet; how the monkeys’ age, body size, and effectiveness at extractive foraging affect their diets, and in what ways extractive techniques and/or food preferences reflect social learning.

Our field project will consist of four subprojects: a) to record foraging, feeding, and social interactions of individual monkeys over time, b) to video record in detail the manual actions used in foraging, c) to document the spatial location of all monkeys in the group at frequent intervals to create a picture of the distribution of individuals in the group, and d) to collect body weights for all animals in the group. Each subproject will involve its own data collection procedures, some of which have been used before by Dr. Fragaszy’s team and some of which are new this year. The new methods include, for (b), individual monkeys’ foraging actions will be recorded at high frame rates using a special video camera. In playback, hand motions will be coded. For (c), a team of 3 people using iPad tablets loaded with a high-resolution satellite image of the site will walk through the group for 5 minutes at 15 minute intervals, recording the visual location of each monkey on the image. These data will be downloaded, examined for quality, and later processed using arcGIS analysis techniques to calculate interanimal distances, etc.

Initially I will work in all of the data collection tasks wherever I’m needed, but eventually I will specialize in one technique and will assume more responsibility in that subproject. Following data collection, I will process the data back in Athens, where I will analyze it using statistical software R or SAS and assume responsibility for my own research project. Because I am a statistics major pursuing a position in the bachelor’s/master’s combined degree program and will be using R and SAS frequently in future grad school projects, becoming familiar in R and SAS through CURO will be highly beneficial.

References:
Proposals

Determining the Role of RGS10 in Microglia, Neuroinflammation, and the Progression of Multiple Sclerosis

2014 Summer Fellow: Mugdha Joshi
Research Mentor: Dr. Shelley Hooks, Department of Pharmaceutical & Biomedical Sciences

I am seeking the support of the CURO Summer Fellowship to continue my research on the role of the regulator of G-protein signaling RGS10 in neuroinflammation and Multiple Sclerosis (MS). RGS proteins are important regulators of receptor signaling pathways, but their roles in human disease are poorly understood. G-protein coupled receptors (GPCR) play an indispensable role in cell signaling, allowing the cell to respond to extracellular signals. The GPCR relays external signals to its corresponding G-protein, which activates the appropriate cellular response. The activity of the G-protein is inhibited by RGS proteins. My protein of interest, RGS10, is highly expressed in the immune and nervous systems, and regulates multiple G protein signaling pathways. In microglia, the macrophages of the nervous system, activation of G-protein pathways enhances chronic neuroinflammation, which is a critical feature of several neurodegenerative diseases including MS. MS is an autoimmune condition where the overactive immune system attacks the myelin sheaths on axons interrupting the ability of neural signals to travel. Enhanced microglial activation and increased neuroinflammation has been observed in mice lacking RGS10 expression, suggesting that RGS10 normally suppresses neuroinflammation. Further, our preliminary data show that RGS10 expression is suppressed when microglia are activated. The goal of this project is to define changes in RGS10 microglial expression in MS. We hypothesize that microglial activation that occurs during MS progression will correlate with suppressed RGS10 expression.

In order to test our hypothesis, I will complete two sets of experiments:

1. Define differences in RGS10 expression in neural tissue from normal mice and MS model mice. Our working hypothesis is that RGS10 expression will be suppressed in microglia in the brain and spinal cord of advanced MS.

   1a. Determine the difference in magnitude of RGS10 expression between healthy control tissues and tissues from MS models. Brain and spinal cord tissue slices from control animals and animals with the Experimental Autoimmune Encephalomyelitis (EAE) model of MS will be obtained from a collaborator. I will use immunofluorescence staining techniques to visualize RGS10 proteins and analyze the difference in magnitude of expression between the healthy and diseased tissues. The expectation is that RGS10 will be under-expressed in tissue from MS (EAE) animals.

   1b. Define which cell types in the tissue exhibit RGS10 expression. My hypothesis is that RGS10 is expressed in the microglia of the brain and spinal cord tissues. I will evaluate my hypothesis using a specific microglial marker in my staining and analyzing the overlap between expression of RGS10 and the microglial marker.

2. Define sub-cellular expression of RGS10. This part of my project will explore an anomaly in the observed expression of RGS10. In general, activity of RGS proteins has been observed at the plasma membrane, where G-proteins are localized. In contrast, immunocytchemistry has shown RGS10 activity to be predominantly in the nucleus of microglia, but these results have not been confirmed biochemically. I will use nuclear fractionation to determine the primary location of RGS10 expression in resting microglia and in microglia activated by lipopolysaccharide (LPS). In this process I will separate the nuclear and cytoplasmic proteins of the BV-2 microglial cell line and primary microglial cells.
isolated from mouse embryos. I will then use western blotting to determine the localization of RGS10 in the cell. These biochemical results will be compared with results obtained from immunocytochemistry.

The long-term goal of these studies is to define the role of RGS10 in neuroinflammation and to understand the regulation of RGS10 expression in microglia. This work will improve our understanding of the molecular regulation of neuroinflammation and could lead to novel strategies to treat MS and other neurodegenerative diseases.

References:


Mechanism of Developmental Regulation of Base J Synthesis in *Trypanosoma brucei*

2014 Summer Fellow: Megha Kalia

Research Mentor: Dr. Robert Sabatini, Department of Biochemistry & Molecular Biology

Parasitic African trypanosomes have adapted a unique response to avoid detection by their host's immune system. By altering the proteins on their outer coat, they can escape being attacked because the host is unable to recognize the surreptitious changes. A component of the organism's ability to change its outer (VSG) coat has been found to be base J. The majority of base J is found near telomeric repeats, or repeats in DNA at the end of a chromosome. The tendency for base J to locate here has been an intense area of study. The unicellular protozoa in which base J is found infects the bloodstream of animals and humans across thirty-six countries in Africa.\(^1\) The biosynthesis of base J occurs in two steps. First, a thymidine (DNA base pair) is converted into another molecule by two proteins, JBP1 and JBP2. Secondly, a glucose molecule is added onto the complex. The understanding of the expression of base J is central to understanding how the parasites evade the immune system, as well as developing potential vaccines.\(^2\)

During the summer, I will use *Trypanosoma brucei* as my model to understand the biosynthesis of base J in a different life cycle stage. Previous research has studied why base J is preferred and how it is made in the bloodstream form; however, little is known about it when it is found in the mid-gut of mammals in an alternate stage. The general hypothesis is that base J is not produced because of decreased levels of both JBP enzymes. We can increase levels of enzymes and look at corresponding changes in the amount of J found in the trypanosome. Over this past semester, work was done in the lab on the bloodstream form of *T. brucei* to produce double and single knockouts of the gene to understand what happens to base J levels when one or both copies of the gene are removed. Removing one gene out of the two caused reduced levels of base J, but taking out the second copy prevented any production of base J. However, several other questions remain. What makes base J so important in gene repression? Are there any similarly functioning molecules? By blocking its function, we will understand exactly what role this protein can play.

By clearly understanding the role of base J in trypanosomes, future research can be dedicated towards manipulating it for a vaccine against the diseases caused by trypanosomes. These include sleeping sickness and Chagas’ disease from *Trypanosoma cruzi*.\(^2\) Additionally, we can understand the specificity of base J as to where it binds and when it causes transcription of genes to stop.\(^1\) If we can understand how these protozoa are invading mammalian host systems, we can develop new treatments for these devastating diseases.

References:


In order to understand the complex dynamics within the modern Republican Party, its ideological core, and the platform on which its base of voters is built, it is necessary to evaluate the full scope of its development. Throughout American history, South Carolina’s national profile has outsized its geographic territory, its significance consistently overshadowing the state’s long median-sized population. From 1878 to 1980, more than 85% of the 46 senators and 124 members of the South Carolina House of Representatives caucused with the Democratic Party. Measured Republican electoral growth began in the 1960’s, driven by a multitude of factors that parallel South Carolina’s development as a state. In the past 115 years, Republicans in South Carolina have accounted for five governors, four U.S. Senators, nineteen members of the U.S. House of Representatives, two majority leaders of the state Senate, and two speakers of the House. Although seemingly dominant, the Republican Party is relatively new in establishment in South Carolina, and projects a growing identity of republicanism that is visible across the nation.

This summer I am proposing a course of research in which I intend to live in South Carolina for two months to conduct an evaluation of the modern Republican Party. Because of the relative recency in the political development of the state party, and the contrasting strength by which it has succeeded in competition with a Democratic Party that once held a much stronger electoral position, South Carolina serves as an extraordinary model for researching partisan growth. From June 1st through the close of the 2014 election cycle, I will complete a comprehensive survey by interviewing elected Republicans, party leaders, and operatives who have been instrumental in directing campaigns within their state. My analysis will be presented in the context of two fundamentally important questions: Why does today’s elected Republican majority exist? What has driven voters’ allegiance to the party amid a continually expanded electorate?

As references are increasingly made to a division between the Republican establishment and outside candidates, South Carolina’s party presents a particularly interesting question because it did not exist as a majority in any area of governance before 1994. I will provide historical context and statistical analysis developed with extensive archival research; however, the focus of this study is based upon personal interviews. To analyze the core of modern republicanism, national partisan trends, and the ideology driving voter support of Republican candidates in the context of changing demographics, my case study will focus in all 46 counties across South Carolina’s four regions, capturing the Republican Party and representatives in every level of government.
Use of a Breath-hold Paradigm to Remove FMRI Variability Due to Vascular Factors in Older Adults with Cardiovascular Disease

2014 Summer Fellow: Joshua Lukemire
Research Mentor: Dr. Lawrence Sweet, Department of Psychology

As a result of modern medicine and healthcare, people are living longer than ever. The population of older adults is on the rise, and with aging comes cognitive decline in domains such as working memory, leading to a decrease in quality of life. As more and more individuals reach old age, an understanding of what causes these losses in cognitive function becomes even more important and may give insight into how cognitive decline may be prevented. Functional magnetic resonance imaging (FMRI) is an important tool used by researchers to study the neural correlates of cognitive function and is often used in the investigation of working memory. One commonly used type of FMRI focuses on the blood-oxygen-level-dependent (BOLD) signal, which is influenced by cerebral blood flow (CBF) and cerebral blood volume (CBV). Local variations in CBF and CBV are associated with local changes in neural activity that are related to cognitive activity. However, factors other than neural activity, such as age-related alterations in the cerebrovasculature, can influence CBF and CBV. The effects of age-related changes in cerebrovasculature on the BOLD signal and ultimately the neural correlates of cognitive function in older adults are not well understood. This is an important topic to study, especially in those with cardiovascular disease, because altered vascular integrity represents a source of variance that is rarely controlled in FMRI research. The current literature in this area is limited, and further investigation into the contribution of alterations in cerebrovasculature to the BOLD signal is essential.

There are a few novel techniques that allow researchers to estimate and remove cerebrovascular effects in the BOLD signal; this CURO project will focus on one such method (Biswal, 2007). We will use FMRI data collected from 2 groups of older adults, a healthy group and a group with cardiovascular disease, during their performance of a breath-hold paradigm and a working memory paradigm in the magnetic resonance scanner. The breath-hold FMRI data will be used to quantify the potentially confounding effects of cerebrovascular integrity in order to more accurately calibrate the FMRI response during the working memory paradigm. The specific contribution of this CURO project will be to define a control region in the white matter of the brain as it has little cerebrovasculature. I hypothesize that using the breath-hold FMRI data to reduce cerebrovasculature contributions will have little effect in white matter compared to brain regions rich in cerebrovasculature. Confirmation of this hypothesis would provide evidence validating the use of the breath-hold technique. This is an important contribution because the breath-hold paradigm is both simple for the participant to perform and does not require much time in the scanner, making it an easy, valuable, and perhaps even necessary addition to FMRI investigations of cognitive decline in older adults and participants with compromised cerebrovasculature.

References:

Assessment of Proteomic and Glycomic Profiling of Medaka (*Ogyzias latipes*) to Further the Understanding of the Physiological Response to Low-level Ionizing Radiation

2014 Summer Fellow: Jason Moraczewski

Research Mentor: Dr. Carl Bergmann, Department of Biochemistry & Molecular Biology

Over 1000 United States locations, ranging from small laboratories to massive nuclear weapon facilities, are contaminated with radiation. Sites throughout human history associated with nuclear proliferation and disasters, such as Fukushima, Three Mile Island, or Chernobyl are becoming identified as sources of radio-nucleotide contamination. These radio-nucleotide emissions constitute ionizing radiation (IR). The effect of any doses of IR result in alterations in morphology, cellular and system level functional activity, and protein expression. However, little is known about how chronic low-range exposure to IR can affect biological responses. By performing proteomic and glycomic analyses, advancements can be made in the understanding of how certain organisms respond and adapt in the presence of a low-level IR environment. The results of these studies could have a significant impact on the explanation of past evolutionary events as well as the future evolutionary potential of organisms.

Through various scientific studies, it is well known that IR can have detrimental effects on aquatic organisms. Some of these changes include double strand breaks in DNA, oxidative damage to DNA, alterations in RNA, and transgenerational effects. It remains uncertain, however, how these changes relate to the metabolic adaptations that underlie the evolutionary change of a species. Ionizing radiation results in altering the expression of specific proteins and post-translational modification of certain proteins in cells. Depending on the amount of exposure, IR results in tissue and organic fluid (serum, urine, or plasma) modifications that can be detected as biomarkers when protein expression profiling is performed. However, it is very important to have an alternative to transcript analysis because there are several cases in which a poor correlation between changes in transcript level and protein expression can exist. Protein expression profiling can be used to identify radiation-associated proteins in biological samples.

Since the mid 1990’s, the University of Georgia’s Savannah River Ecology Laboratory (SREL) has been conducting research that focuses on the effects of low-dose ionization radiation. Research conducted at the SREL’s Low Dose Irradiation Facility has contributed to uncovering the role that IR can have on aquatic organisms. Studies from this facility have characterized that when IR exposure is a little as 2.4 mGy/day, the result is an accumulation of unrepaired DNA damage and radiation-induced activation of DNA repair. While these studies focus on the mechanism surrounding IR damage, they focus on specific organ systems and do not consider the entire organism.

To analyze the effect of low-level ionizing radiation on aquatic organisms, medaka (*Ogyzias latipes*) will be used as the fish model species. Whole organism protein extractions will be performed on homogenized specimens. Medaka are an ideal vertebrate model species to use because of their readily available genome sequence database of approximately 800 Mb. In order to detect the physiological changes in the IR treated species, the proteome of an untreated (control) group will be first analyzed. Comparative proteomic and glycomic studies will be performed using protein extractions of the entire organism. These studies will be paired with mass spectrometry and ProteolQ protein software. These methods will enable the quantification of physiological responses to differing levels of chronic low doses of IR. Performing the studies at the proteomic and glycomic level on medaka will augment the insight of the proteomic pathways operating across the multiple organ systems of the organism. Thus, this research will advance the understanding of the role that chronic exposure to low doses of IR can have on the metabolic pathways of the entire organism.
References:


Within five years of her emancipation, Aggy Mills of Athens, Georgia, wrote a distressed message to her former mistress: "please mam [sic] send me that money if you have it to spare…and I shall work just as long as you wants [sic] me. [P]lease excuse me as I am in need." She was, remarkably, a literate freedwoman, illicitly taught by her master's family. During her bondage, she served the family of Howell Cobb as a nursemaid and Mary Ann Cobb’s most trusted servant. She did not write to Mary Ann in need of money because of capricious and frivolous spending. This was a myth perpetuated by Southerners unwilling to relinquish their paternalistic control of African-American lives. Instead, Aggy needed money because her former mistress was unwilling to pay her former chattel for services she got through compulsion only years before. Aggy’s story of freedom, social conflict, and difficulties getting by was not unique. Across Athens – and indeed the postbellum South – African-Americans struggled to delimit the terms of their freedom in a landscape shared with and controlled by their former masters.

By 1860, 5,660 slaves lived in Clarke County. In 1865, these thousands of freedmen immediately sought what they thought defined freedom: education, a family life, free labor, and a voting voice in their community. To achieve these goals, African-Americans had to remove themselves from the constant presence and influence of their former masters. Although threads of a black sense of community certainly existed in antebellum times, particularly through slave churches and networks of friends and family, a more defined sense of community developed in freedom. Black neighborhoods quickly emerged, and freedmen separated their churches from the white supervision of slavery. Education and voting rights became prevalent issues, and black churches were oftentimes venues of public outcry and action.

Yet, development of the postbellum black community was not one of racial unity leading to unfettered success. White Southerners resisted the growing power of a race that they had for so long controlled. Federal law might have made African-Americans free, but local measures ensured it was never more than a subordinate freedom. This was reflected not only in society but also exemplified through the labor market and political realm. Freedmen’s Bureau policies sometimes undermined individual black efforts at agency in labor negotiations. Some black Athenians feared that their race’s political leadership, namely Madison Davis of the Georgia Assembly, put white interests above their own. Yet, despite these setbacks, the Reconstruction years in Athens saw the emergence of black political and social societies, the exercising of free labor rights, and an enduring system of education managed by black educators.

Tracing the life of Aggy Mills and her life in slavery and freedom has been the focus of my work in previous semesters, but she did not exist in a vacuum. This research will focus on examining the entire black community: the Mills family’s neighbors, friends, colleagues, and fellow church-goers. This community was an intricate network of multiple institutions including political affiliations, churches, schools, societies, private homes, and the Freedmen’s Bureau. Its history is still accessible through the records of those organizations and resources like WPA Ex-Slave Narratives, letters from Athenians in the Hargrett Library and the Athens-Clarke County Heritage Room, property deeds at the courthouse, census records, and various other local sources. Weaving these sources together will help to tell a cohesive narrative of how the first generation of Athenians freed from slavery resisted white resistance to redefine what it meant to be members of their own community.
References:

1. Howell Cobb to Mary Ann Cobb, September 15, 1865. Howell Cobb family papers, MS 1376. Hargrett Rare Book and Manuscript Library, University of Georgia Libraries.


Pregnant and Parenting Adolescents’ Use of Space for Stress Relief
2014 Summer Fellow: Ijeoma Okoye
Research Mentor: Dr. Neale Chumbler, Department of Health Policy & Management

Statement of Purpose:
Adolescent mothers receive social support mainly from their mothers, partners, and community agencies (Devereux, 2009). The benefits of the formal and informal social support that adolescent mothers receive (e.g., how to manage stress) have been thoroughly studied (Devereux, 2009; Letourneau et al., 2004); however, there are unanswered questions concerning the means by which pregnant and parenting adolescents reduce their stress levels when social support is unavailable. There are ways they can cope with stress on their own. It is important to examine these methods because some of these teens live under circumstances with limited access to support (Coppola & Spector, 2009). These adolescents will need to find other avenues when coping with stress. Of particular importance to me is the use of their space. Space is defined as the physical living space as well as financial independence from the mother and father. It is acquired with autonomy and operates differently as a function of the various contexts in which adolescents live, as marked by race/ethnicity and risk (Niolon, 2006). This study aims to focus on the ways in which pregnant and parenting adolescent mothers utilize their space in order to reduce their stress levels.

Background:
In 2008, the US rate of pregnancy among girls ages 15-19 was 39.5 per 1000; the rate for girls ages 18-19 was 114.2 per 1000 (Ventura et al., 2012). The collection of adversities adolescent mothers have to endure in the transition to parenthood creates a great amount of stress on the mother (Birkeland et al., 2005). Although many teen mothers live with their own mother or other close family member, for some teens, part of the transition to parenthood is moving out or being cast out of their parents’ house and into their own space (Beers & Hollo, 2009). For these mothers, methods for stress relief that are more centered around the individual exist. Exercise, reading, and multiple forms of meditation are just a few ways a young mother can utilize her space to relieve stress (Coppola & Spector, 2009). Other methods of coping will be explored and discovered throughout the duration of the study.

Research Methods:
Twenty hand-written journals of day-to-day accounts from pregnant and parenting adolescents will be selected and analyzed using NVivo software. The journals were obtained from a previous study that Dr. Chumbler, Department Head of the Department of Health Policy and Management in the College of Public Health, participated in at the University of Indiana. There were 52 total adolescent participants who utilized journals and wrote about their experiences – 40% Hispanic, 33% non-Hispanic black, and 25% non-Hispanic white. To begin, the journals will be assessed, looking for words such as stress and worry. Then, those relevant journals will be transcribed in Microsoft Word. A coding system will be developed with the methods outlined in Ryan and Bernard’s “Techniques to Identify Themes” (2003). By coding with key words and phrases, the journals will be categorized based on information pertaining specifically to the adolescents’ stress levels and coping mechanisms. Each individual journal containing each adolescent’s experiences will then be reconsidered in order to find a connection between their use of space and their relief of stress.
Proposals

Significance:
The results from this study will provide an increased understanding of the experiences of pregnant and parenting adolescents. It will also answer important questions concerning how they alleviate stress when there is limited access to support. This study is unique in that the data comes from hand-written journals that give pregnant and parenting adolescents a voice through a medium that few other studies have employed.

References:


The Effects of Lutein and Zeaxanthin on Cognitive Function and Neural Efficiency in Older Adults with and without Cognitive Impairment

2014 Summer Fellow: Meredith Osborne
Research Mentor: Dr. Lisa Renzi, Department of Psychology

Lutein (L) is a carotenoid found in green leafy vegetables and brightly pigmented fruits. Lutein cannot be synthesized de novo and must be obtained from the diet. L and its isomer, zeaxanthin (Z), densely accumulate in the central nervous system (CNS), specifically in the center of the retina (macula), where those pigments are known as macular pigment (MP). L is also densely concentrated in the major cortices of the brain. In nervous system tissue, L and Z have antioxidant properties and can absorb highly energetic short-wave light. In retina, these properties lead to beneficial functional changes, such as improved optical quality and visual function, as well as a reduced risk for diseases that arise from oxidative stress, such as age-related macular degeneration, the leading cause of blindness in developed countries. In cortex, which is not exposed to light, antioxidant properties likely lead to reduced risk of neurodegenerative diseases such as dementia, a hypothesis currently being tested in this project. An additional hypothesis, the neural efficiency hypothesis, suggests that L influences cellular morphology by promoting lateral communication between neighboring cells, and, as a result, reduces neural noise and improves processing speed.

The properties and resulting functions of L and Z listed above are well established in neural retina and largely hypothetical in cortex. Preliminary evidence is supportive, but randomized controlled trials are needed to determine whether or not increasing L levels can lead to measurable neurological and functional changes. The purpose of this investigation is to determine whether or not lutein supplementation improves cognitive function and neural efficiency in older, healthy adults and in older adults with mild cognitive impairment. A second arm of the trial is investigating the same hypotheses in young, healthy adults. This is a randomized, double-masked experiment conducted over the course of a year, with visits every four months, as well as bi-weekly compliance calls to monitor the participants’ health.

To assess visual function, macular pigment optical density (MPOD) and temporal contrast sensitivity (tCS) are being measured by novel equipment. MPOD measures retinal L and Z levels, which correlate with cortical L and Z levels with a coefficient of $r = 0.90$, and, consequently, can serve as a biomarker of cortical L and Z. While MPOD is a measure of supplementation status, tCS function is a measure of an individual’s ability to process changes in a high frequency stimulus. One of the major hallmarks of age is a general “slowing” of the CNS, which manifests as reduced ability to, in this case, perceive a rapidly moving stimulus. tCS testing will serve as a marker of neural efficiency.

CNS Vital Signs program includes eight tasks that measure memory (verbal, working, visual), motor control, and information processing speed to assess cognitive function. Neuroimaging techniques, functional magnetic resonance imaging, and electroencephalography also measure cognitive function. These high-resolution scans show increased blood-oxygen levels, which indicate high metabolic demand and suggest increased neural processing.

To gauge compliance and track L and Z status, blood samples are collected every four months. Serum is analyzed via high-performance liquid chromatography (HPLC) to measure L and Z concentrations. Plasma erythrocytes are analyzed for fatty acid concentration.

Our goal is to determine whether or not L and Z supplementation improves cognitive function and reduces risk for age-related cognitive decline, as it does for age-related macular degeneration. There are no cures and no long-term efficacious treatments for acquired dementias, such as Alzheimer’s disease, and the economic and emotional burden on families is extremely high. L
Proposals

and Z supplementation may serve as a long-term prophylaxis that can be safely taken for years, especially when started at a young age.
Background: The Red-and-green Macaw (*Ara chloropterus*, Psittacidae) ranges from Panama to northern Argentina, including much of the Amazon Basin. These macaws are usually observed in pairs or small flocks. Red-and-green Macaws often nest in large trees with cavities or crevices on rock faces. Little is known about the behavioral biology of wild macaws, especially those found in the Brazilian savannah (the Cerrado), and their vocalizations are virtually unstudied. In the summer of 2013, Dr. Fragaszy and Natalie Schwob (UGA Psychology Department) began studying the behavior and vocalizations of Red-and-green Macaws at two nest sites on cliff faces in their field site in Piauí, Brazil, where Dr. Fragaszy has conducted research on the local monkeys since 2005. Because the nests are close to the research lodge, the field site offers excellent opportunities to observe wild macaws. There are additional nests located within a few kilometers of the field site. The previous work confirmed that it is possible to record the vocalizations of the macaws at this site and so began the task of documenting the vocal repertoire of birds in one region of the site.

Specific Objectives: Our objectives are to document the repertoire of macaw vocalizations, including variation in calls between the resident pairs in two locations 6 km apart, and to identify and analyze call structure and sequence. As possible, we plan to match vocalizations with behavioral patterns to gain insight into the functions of different calls. Our final objective is to compare the calls of this species with those of the Yellow-faced Parrot (*Alipiopsitta xanthops*), which is in the same subfamily (Arinae) (Faria et al., 2009).

Methods: We plan to observe and audio record the macaws as they depart and return to their nests and in places where they gather. Based on data from last summer, the macaws often leave and return in pairs, occasionally venturing alone. We will record vocalizations with a directional Sennheiser ME67 microphone attached to a TASCAM digital recorder. We will process these vocalizations using Avisoft and/or RavenPro software. New calls will be added to the existing repertoire of calls to enhance the vocalization “alphabet.” All vocalizations from 2013 and 2014 will be analyzed for structure and sequence patterns using SongSeq software (Daou, 2012). We will collaborate with Dr. Carlos Araújo (Bioacoustician, Universidade Federal da Paraíba) to compare calls between our species and the Yellow-faced parrot (Araújo et al., 2011).

Significance: This study will add new information to the scant literature about the behavior and communication of Red-and-green Macaws. In fact, to our knowledge, the only other study performed on this species in the Cerrado of Brazil was the aforementioned project in the summer of 2013. I am a wildlife major, and avian biology and population dynamics are my intended focus for graduate school, so this study is directly relevant to my academic interests. It will be valuable to use my previous lab experiences in a research setting and to use my background knowledge of biology to understand new species. This project will give me the opportunity to improve my field skills and to learn vocal analysis techniques, which will prepare me for my graduate project with Canada warblers in the Appalachian Mountains of North Georgia. Also, I will learn about avifauna of a completely different biome (the Cerrado), an exceptional opportunity for an ornithologist from the northern hemisphere. Moreover, I will have the opportunity to collaborate with an international research team and learn the logistics of working in the field in a remote area.
References:


Proposals

Using the Chemical Reporter Strategy to Analyze Glycoproteins in Pompe Disease
2014 Summer Fellow: Sora Park
Research Mentor: Dr. Richard Steet, Department of Biochemistry & Molecular Biology

Lysosomes are organelles within cells that help degrade macromolecules so that precursors such as amino acids and sugars can be recycled and reused by the cell. Mutations in genes that encode lysosomal enzymes cause rare inherited diseases in humans known as lysosomal storage disorders or LSDs (Wenger, 2013). Collectively, LSDs occur in approximately 1 in 8,000 live births. When the missing enzymes fail to degrade or transport molecules, abnormal storage of molecules occurs within cells, causing debilitating symptoms in patients affected by LSDs. Although symptoms vary with each specific mutation, they generally include neurodegeneration and skeletomuscular defects, and the most severe forms result in death within the first year after birth (Schultz, 2011). How exactly lysosomal storage causes these symptoms remains a mystery. Currently, there are only a few viable treatments for LSDs. Almost all are based on replacing the missing enzyme with enzyme replacement therapy (ERT). Unfortunately, ERT is not feasible for many LSDs (Platt, 2012). In order to develop new treatments, it is crucial to learn more about the mechanisms whereby storage affects the cell and eventually causes disease.

Niemann-Pick type C (NPC) disease is a lysosomal disease characterized by the accumulation of cholesterol in lysosomes. Patients with NPC are missing one of two proteins that normally act to shuttle cholesterol out of the lysosome. When cholesterol accumulates inside lysosomes, it disrupts the movement of other molecules through the cell. The Steet lab recently investigated the storage and trafficking of glycoproteins in NPC cells using a chemical reporter strategy for labeling these glycoproteins. In this strategy, a unique chemical group (reporter) is incorporated into glycoproteins by feeding cells an azide modified sugar precursor. The azide “handle” can then be reacted with a complementary functional group, which is linked to a fluorescent probe (Boons, 2010). Using this strategy, the lab was able to discover that glycoproteins, normally present on the surface of the cell, accumulate instead within intracellular vesicles in NPC cells. Glycoproteins are known to be essential to many cell activities, including cell-to-cell communication and survival. The Steet lab has proposed that the altered recycling and intracellular accumulation of cell surface glycoproteins in NPC disease may be responsible for some of the symptoms associated with this disease (Mbua, 2013).

Since all LSDs have some type of lysosomal storage, it is likely that this storage causes altered storage or recycling of glycoproteins in diseases other than NPC. Using the same chemical reporter strategy employed for NPC, we will test this possibility by studying Pompe disease (PD), an LSD characterized by the storage of glycogen within lysosomes (Fukuda, 2007). Our initial experiments will focus on the visualization of glycoprotein storage using microscopy- and biochemistry-based methods. We will then develop technology that will allow us to isolate and identify the glycoproteins that accumulate inside the cell. This technology will rely on the same chemical reporter strategy as above but be adapted so that the tagged glycoproteins can be captured and enriched prior to detection using mass spectrometric-based methods. Discovering the identity of the stored glycoproteins would be greatly insightful to their pathological roles in LSDs. These glycoproteins might be key protein receptors or ion channels that must be present at the surface of the cell in order for the cell to survive. This work could potentially lead to a clarification of the pathophysiology of not only Pompe disease and Niemann-Pick disease, but of LSDs in general. A better understanding of how storage leads to impaired movement of other molecules in the cell will hopefully lead to the development of more effective therapies.
Proposals

References:


Understanding Floral Trait Evolution in Wild Sunflowers

2014 Summer Fellow: Hiral Patel
Research Mentor: Dr. Lisa Donovan, Department of Plant Biology

Agricultural productivity and ecological function are under assault from the twin forces of ongoing climate change and an epidemic of pollinator decline. In order to predict both crop and wild species’ reproductive success and persistence under looming environmental changes, we must understand how floral traits are currently adapted to specific climates and pollinator regimes. Sunflowers are an excellent system in which to study plant evolution. The genus *Helianthus* is extremely diverse, consisting of 51 species of annuals and perennials occupying a wide range of habitats such as forests, deserts, wetlands, prairies, and rock outcrops (Heiser et al., 1969).

Significant variation exists in floral morphology across the genus. Some species of *Helianthus* appear to invest more biomass in pollinator attraction, as evident by the production of larger and more numerous showy (but sterile) petal-bearing ray florets at the expense of fertile disc florets. This contrasts with other species that appear to invest more in seed production, as evident by fewer, smaller petals and more numerous and massive fertile disc florets. This project seeks to investigate the underlying ecological and evolutionary causes of variation in floral traits across the genus *Helianthus*. Because members of the genus are self-incompatible (genetically incapable of self-pollination), reproduction is entirely dependent on pollinator visitation. This results in a situation where investment in seed production is literally fruitless unless pollination occurs, which is in turn dependent on the level of investment in pollinator attraction. However, if pollinators are abundant, high investment in attraction is wasteful, and higher investment in seed production will be favored. It is therefore hypothesized that dependence on pollinators results in an evolutionary trade-off between investment in pollinator attraction and seed production. The evolutionary strategy adopted by specific species under this trade-off is hypothesized to be affected by differences in life history and pollinator density in native habitats. First, I predict that annuals will invest more heavily in attraction as they only get one chance to reproduce, compared to perennials which will be expected to invest relatively less in attraction because they have many opportunities to reproduce over their multi-year lifespan. Second, I predict that species found in habitats known to have higher densities of pollinators (e.g., forests and prairies) will invest relatively less in attraction and more in seed production than species from habitats known to have lower densities of pollinators (e.g., deserts and rock outcrops), based on previous research (Zulian et al., 2013).

I have been working in the University of Georgia Plant Biology greenhouses for almost a year now to collect data on floral traits in thirty species across the genus, including floral morphological measurements and biomass allocation among floral parts. I will have all data collected by the midpoint of the summer of 2014, after which I will perform evolutionary statistical analyses in order to test my hypotheses, using the most recently published phylogeny of the genus (Timme et al., 2007). These will include ancestral state reconstruction, phylogenetically independent contrasts, and tests of phylogenetic signal to determine which traits are evolutionarily conserved and which are labile and potentially adaptive.

Understanding trade-offs in floral biomass allocation has broad ecological consequences. Species adapted to specific pollinator densities may be unable to adapt to changing conditions under the short time scales of current climate change and pollinator declines, resulting in an inability to attract pollinators and failures in seed set that reduce population size and threaten species persistence. In a crop setting, understanding the trade-off in floral investment is key to understanding the balance between achieving sunflower pollination in the field for self-incompatible varieties and obtaining maximum seed yield.
Proposals

References:


A Study of the Lamu-South Sudan-Ethiopia Transport (LAPSSET) Corridor on the Northern Rangelands Communities in Laikipia, Kenya

2014 Summer Fellow: Paola Rivera
Research Mentor: Dr. Laura German, Department of Anthropology

The 2008-2009 food price spike brought what has been termed a 'land rush' phenomenon to a head, inspiring increased media and academic coverage alike of the large-scale land acquisitions in developing countries by foreign investors [1, 2, 3]. The land rush is changing relations between humans and the environment (e.g. scale of carbon in ecosystems), between the Global South and the Global North, and between the state and rural communities [2, 4, 6]. Because of the economic incentives associated with low land cost, resource wealth, and generous fiscal incentives, investors have targeted Africa more than any other region, with 754 land deals announced in 2009 alone covering 56.2 million ha [1]. Furthermore, the region targeted most within Africa is East Africa, including Mozambique, Sudan, Ethiopia, and Kenya [1, 2, 3].

A 'new regionalism' trend in Africa has caused land acquisition in some areas to take the form of spatial development initiatives (SDI), which are designed to target areas with high potential for growth through 'development' and investment [1, 10]. In Kenya, an SDI entitled the Lamu-South Sudan-Ethiopian Transport (LAPSSET) Corridor is planned as a major component of the Government of Kenya's Vision 2030 development plan [9]. While project proponents justify the LAPSSET Corridor for its anticipated benefits to the domestic economy, social pillars (education/training, health, housing, etc.), and political pillars (new constitution, electoral processes, transparency) [9], it also raises questions related to land appropriation [4, 5] and its socio-ecological implications in light of the 'land rush' trend. What's concerning is the discourse of the LAPSSET Corridor not speaking in terms of the 7.5 million project-affected persons [9] but focusing on larger macro-economic benefits, as promulgated by the World Bank and similar interest groups [1, 2]. With production underway, some LAPSSET projects have already ignored key environmental impact assessment requirements such as consultation of affected communities, even with provisions for consent and community participation in the Government of Kenya's policy documents [9, 11]. Some scholarship in Africa has been done on early SDIs in South Africa and Mozambique in the late 1990s and early 2000s. This work showed the SDIs having negative effects in the areas of job creation and food security because of a lack of linkage between the incoming investment and the local economy [10]. Other problems SDIs face are lack of public consultation, capacity deficiencies at various levels of government, unresolved land claims, and poor respect and understanding of local practices [10]. Since the LAPSSET Corridor and Vision 2030 are still in their early stages, a similar analysis needs to be made early on in order to highlight issues not consistent with the project goals before they are too late to amend or mitigate.

The groups most likely to be affected are those in the new 'special economic zones' and areas deemed 'high potential' like the arid and semi-arid lands (ASL). For example, pastoralists have a particularly fragile land use system in ASLs [7]. Pastoralists rely on extensive movement over large areas in order to access productive rangeland and water in an uncertain environment, a system supported by extensive social networks and nested governance systems. Climate change and land tenure changes (e.g. from group ranch establishment, SDIs) further fragment their grazing areas and livelihood security [7, 8].

My research will focus on the northern rangelands in Laikipia District, a site of a UGA NSF project on the Vulnerability of Pastoralist Systems in Transition led by Dr. Elizabeth King (Ecology) and Dr. Laura German (Anthropology). The LAPSSET and Vision 2030 projects announced in the district include the Crocodile Jaws dam on the Ewaso Nyiro river for the planned resort city, large-scale infrastructure for transportation, livestock commercialization initiatives (e.g. disease-free zones),
and private agricultural investment initiatives for commercialization [9]. I am interested in the levels of awareness, community consultation, and the perception of these projects, likely adaptive responses for pastoral communities and households, and in exploring wider implications for adaptive governance of rangeland socio-ecological systems, a field lacking research in the context of the land rush. “Adaptive governance” is the ability of groups and individuals to tolerate and respond to changes through adaptive management strategies, which pastoralists historically have adopted [7, 8].

In order to analyze these different themes, I will be conducting a case study of the Koija Group Ranch in Laikipia through semi-structured interviews with pastoralists likely to be directly affected by these projects. I will also undergo a discourse analysis of the projects from government officials, other project proponents, and key project critics.

References:


Many aspects of the global methane (CH₄) cycle are controlled by biological activities, including the oxidation of methane in marine sediments. The conversion of methane to CO₂ under anaerobic conditions is thought to be mediated by microbial consortia consisting of archaea and bacteria (e.g. Boetius et al., 2000). The exact nature of their interaction is still unknown or has been only cursorily identified.

The goal of this research is to compare empirical datasets, which are currently being acquired by our collaborators, with predictive models of microbial activity. The consortia are thought to face thermodynamic challenges, which may impact the process rates as well as the spatial organization of the syntrophic anaerobic oxidation of methane (AOM) consortia. We will use reactive transport models including thermodynamic constraints to study the magnitude of methane oxidation. We will use the software COMSOL and MATLAB to numerically solve the governing differential equations. We will build on an idealized mechanistic, process-based model analysis (Orcutt & Meile, 2008), where through comparison of model results to rates measured in laboratory incubations, it was shown that reaction kinetics, transport intensities, and energetic considerations all decisively impact the overall rate of methane consumption. We will apply the model to different environmental settings and spatial distribution patterns of archaea and bacteria in consortia. For example, in some cases archaea and bacteria separately form their own groups, while in some other cases they are well mixed with each other. Also, we will investigate newly proposed potential reaction pathways (Miluka et al., 2012) and study the effectiveness of various potential chemical species being exchanged between the archaea and bacteria.

During the summer, we will first work on attaining a basic understanding of AOM consortia from a literature review. Then, we will use existing models as a starting point to implement descriptions that expand beyond the simplified geometrical approximations made in Orcutt and Meile (2008), which continues the work that we have done since Fall 2013. Then, I plan to travel to Caltech to discuss the environmental settings of the model, the comparison of predicted results in the model, and the laboratory data to obtain and improve our model, which may provide new perspectives of understanding the interaction between archaea and bacteria in anaerobic oxidation of methane consortia. Leading up to, as well as during my visit in Prof. Orphan’s group at Caltech, I will also work with Dr. C. Kempes, a postdoctoral associate in Control and Dynamics Systems at Caltech, who is currently developing complementary models of ANME-SRB consortia that explore the effect of different types of interactions (synergistic, antagonistic etc.), complementing our mechanistic process-driven approach.

References:


investigating genotype-phenotype correlations in pomgt1 gene
2014 summer fellow: danish singh
research mentor: dr. lance wells, department of biochemistry & molecular biology

Congenital muscular dystrophy (CMD) is a genetic disorder that affects millions of people every year. Research has shown this disease has been linked to malfunctions in enzymes in the dystrophin-glycoprotein complex. Appropriately, many CMD’s are termed dystroglycanopathies. This complex is responsible for linking the actin cytoskeleton to the extracellular matrix. Thus its function is vital for cell movement and contraction, especially in muscle cells – something lacking in patients with CMD. Research in recent years has thus far focused on relating how mutations in the genes affect the function and structure of proteins in this complex with the aim of explaining how mutations in different proteins in this complex relate to different cases of CMD. A protein involved in this complex of particular interest is dystroglycan, since it interacts with dystrophin (a cytoplasmic protein) and a multitude of extracellular matrix proteins. In particular, mutations in α dystroglycan (subunit of dystroglycan) relate to many forms of CMD because this subunit of dystroglycan is responsible for binding to numerous extracellular matrix proteins, an important functional aspect of the dystrophin-glycoprotein complex. When these extracellular proteins bind to α dystroglycan, they bind to unique glycan structures on α dystroglycan, thus the correct glycosylation of α dystroglycan is necessary. While α dystroglycan is n-linked (nitrogen atom in an amino acid residue is bonded to a sugar molecule) and o-linked (oxygen in an amino acid residue is bonded to a sugar molecule) it has been shown by recent research that it is the o-linked structures of α dystroglycan that are responsible for binding to these extracellular proteins. Multiple studies also show that it is O-mannosylated structures (a mannose-sugar-residue is transferred from mannose-p-dolichol to a serine/threonine residue in o-mannosylation) that are the specific sites to which these extracellular matrix proteins bind. In particular, on α dystroglycan a phosphodiester extention on the 6-position of the mannose is a site responsible for binding to these proteins. Thus, for these proteins to bind correctly to α dystroglycan, this structure must be correctly attached to α dystroglycan which relies open the functionality of other proteins that are responsible for attaching glycan structures using o-mannosylation.

This research project will investigate a specific gene, Pomgt1, which is responsible for extending the O-mannose initiated structure of α dystroglycan with a GlcNAc (N-Acetylglucosamine) by producing UDP-GlcNAc:O-Linked Mannose β1,2-N-Acetylglucosaminyltransferase. This gene is being studied because mutations in this gene have been observed in patients with multiple forms of dystroglycanopathies. The action of this enzyme is essential for not only 2-extension but also 6-branching of the O-mannose structure containing GlcNAc. 6-Branching of the O-mannose is catalyzed by UDP-GlcNAc:mannose β1,6-N-acetylglucosaminyltransferase, GnT-Vb (GnT-IX), and studies with mice have shown that a lack of GnT-Vb alone or in combination with GnT-Va did not produce any brain abnormalities or muscular dystrophies. This implies that GnT-Vb and GnT-Va cannot account for all O-mannose branching. Recent findings showing the 6-phosphomannose structure that was extended by a LARGE dependent glycan was extended with β4-GlcNAc instead of β2-GlcNAc, and thus this begs the question which GlcNAc is used for extending the O-mannose structure. There will then be three major aims of this research project: i) to determine whether the β4-GlcNAc structure that was observed in the study is a result of overexpression of the gene responsible for the production of α dystroglycan, ii) which GlcNAc transferase is responsible for the addition of β4-GlcNAc onto O-mannose and iii) identify other genotype-phenotype correlations for the Pomgt1 gene.
References:

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Appendix A
2013 CURO Summer Research Fellows

Meg Adams
Dr. William Miller, Department of Marine Sciences
Photochemical Production of Reactive Oxygen Species in the North Pacific

Tiffany Brown
Dr. Nicolás Lucero, Department of Romance Languages
The Importance of Local Grassroots Organizations in the Reshaping of Afro-Argentine Consciousness

Stanislav Bushik
Dr. Debra Mohnen, Department of Biochemistry & Molecular Biology
Exploring the Content and Structure of Proteoglycans in Rice Suspension Culture Cells

Anne Chen
Dr. Christopher Cornwell, Department of Economics
Sex Ratio and Risky Behavior on College Campuses in the United States

Megan Chesne
Drs. Michael and Rebecca Terns, Department of Biochemistry & Molecular Biology
Investigation of CRISPR/Cas Viral Defense System in Streptococcus thermophiles

Mary Douthit
Dr. Allen Moore, Department of Genetics
Influence of Octopamine in Parental Behaviors of Nicrophorus vespilloides

Allison Doyle
Dr. Julie Moore, Department of Infectious Disease
Exploring the Clinical Association between Placental Malaria and Preeclampsia: Assessing the Possibility of a Parasite-induced Imbalance in Tissue Factor and Angioregulatory Protein Production

Jane Egbosiuba
Dr. Zheng-Hua Ye, Department of Plant Biology
The Preliminary Investigation of Whether Switchgrass SND1 Orthologs Can Activate the Secondary Wall Biosynthesis

Barry Ervin
Dr. Jennifer Smith, Department of Telecommunications
The Use of Motion Picture Narrative to Capture the Relationship between Gender Identity and Expression

Seth Euster
Christopher Lawton, Department of History
The Heritage of Slavery on the Shields-Ethridge Farm

Emily Fawcett
Dr. Kelly Dyer, Department of Genetics
Investigating Female Re-mating Rates in Wild Drosophila neotestacea and Their Association with Sex-ratio Drive
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Austin Garner
Dr. Andrea Sweigart, Department of Genetics
Investigating the Genetic Factors Responsible for Postzygotic Isolation between Two *Mimulus* Species

Elizabeth Guarisco
Dr. Carl Bergmann, Department of Biochemistry & Molecular Biology
The Connection between Glycosaminoglycans and Pectins

Joseph Hopkins
Dr. Alexander Sager, Department of Germanic and Slavic Studies
Norse Mythology in Modern Popular Culture

Courtland Hyatt
Dr. Amos Zeichner, Department of Psychology
Effects of Music on Male Aggression: Do Lyrics Really Matter?

Mathew Joseph
Dr. Julie Moore, Department of Infectious Diseases
The Effects of Autophagy and Necroptosis in the Murine Model of Placental Malaria

Lara Mengak
Dr. Nathan Nibbelink, Warnell School of Forestry and Natural Resources
Assessing Potential Range Shifts of the American Alligator with Sea Level Rise

Kelly Murray
Dr. Catherine Pringle, Odum School of Ecology

Anish Narayanan
Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology
Analysis of Cancer Mutations in Protein Kinases using Semantic Web Technologies

Jennifer Pallansch
Dr. David Hall, Department of Genetics
Characterization of the Light Signaling System in Fireflies

Katie Partrick
Dr. Laurie Reitsema, Department of Anthropology
Exploring Effects of Stress and Dominance on the Weaning Strategies of Female Rhesus Macaques

Anthony Sadler
Dr. Brian Drake, Department of History
Lester Moody: A Man, a River, and a Quest for Industry in the Twentieth Century South

Will Saunders
Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology
Structure-Function Investigations of the Ste24p: A Metalloprotease Associated with Progeroid Disease

Natalie Schwob
Dr. Dorothy Fragaszy, Department of Psychology
Social Behavior and Vocal Repertoire of Wild Red and Green Macaws
Scarlett Sumner
Dr. Michael Yabsley, Department of Wildlife Disease Ecology
Ecology and Genetic Characteristics of Haemogregarines in Fresh Water Turtles

Brian Underwood
Dr. Jennifer Palmer, Department of History
Jean-Jacques Rousseau and the Development of the Counter-Enlightenment

Stephanie Wilding
Dr. Brian Cummings, Department of Pharmaceutical & Biomedical Sciences
The Role of Cytochrome P450 Monooxygenase 2E1 in Bile Acid-induced Prostate Cancer Cell Death

Elizabeth Wilkins
Dr. Steve Stice, Department of Animal & Dairy Science
The Role of PAX6 in the Formation of Neural Rosettes in Induced Pluripotent Stem Cells

Travis Williams
Dr. Joy Doran Peterson, Department of Microbiology
Using Metabolically Engineered *E. coli* to Better Ferment Highly Industrially Processed Pectin-Rich Biomass

Leigh Anna Young
Dr. Marguerite Madden, Department of Geography
A Geospatial Analysis of Fission-Fusion Dynamics in Bearded Capuchin Monkeys
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Appendix B
2012 CURO Summer Research Fellows

**William Austin**
Dr. William Kisaalita, College of Engineering
Studies of Water Availability and Use in Tanzania

**Conner Blackwell**
Dr. Boris Striepen, Department of Cellular Biology
Striated Fiber Assemblin Protein Function in *Tetrahymena*

**Stephen Bocarro**
Dr. Jacek Gaertig, Department of Cellular Biology
The Characterization of Long Flagella Protein 4 in *Tetrahymena thermophila*

**Hope Foskey**
Dr. James Lauderdale, Department of Cellular Biology
Identification of GABA-Responsive Neurons in the Zebrafish Brain

**Terese Gagnon**
Dr. Virginia Nazarea, Department of Anthropology
Landscapes of the Interior: Ethnobotany and Senses of Palace among Karen Refugees

**Devon Humphreys**
Dr. Kelly Dyer, Department of Genetics
A Phylogenetic Approach to Investigating the Evolutionary History of the Quinaria Species Group of *Drosophila*

**Emily Kopp**
Dr. Chris Cornwell, Department of Economics
Immigration Law Reform and the Georgia Labor Market

**Brittany McGrue**
Prof. Sarah Zenti, Department of Furnishings and Interiors
The Need for Universal Design: An Environmental Assessment of Residential Interior Spaces and the Built Environment

**Tuan Nguyen**
Dr. Natraj Kannan, Department of Biochemistry & Molecular Biology
Ca\(^{2+}\)/Calmodulin Dependent Protein Kinase (CAMK) Group: Evolution of Dynamic Regulatory Modules

**Phillip Ogea**
Dr. Arthur Roberts, Department of Pharmaceutical & Biomedical Sciences
Classification of the Transport Protein MDR3 and Its Effects on Multi-Drug Resistance

**Ronke Olowojesiku**
Dr. Nicole Gottdenker, Department of Pathology
Effects of Anthropogenic Land Use on Reservoir Host Potential of the Common Opossum *Didelphis marsupialis* in Panama
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Babajide Oluwadare
Dr. Duncan Krause, Department of Infectious Diseases
Analysis of P1 Function in *Mycoplasma pneumoniae* Adherence and Gliding

Elliot Outland
Dr. William Dennis, Department of Physics and Astronomy
Finite-Difference Time-Domain Investigations of Metamaterials

David Parker
Dr. Jennifer McDowell, Department of Psychology
Neural-mechanisms Underlying the Gap Effect: Why is 200 the Magic Number?

Anakela Popp
Dr. Dorothy Fragaszy, Department of Psychology
Development of Nut Cracking Skills in Young Bearded Capuchin Monkeys

Cameron Prybol
Dr. John Pickering, Odum School of Ecology
Lepidoptera Survey of San Luis Valley, Monteverde, Costa Rica

Nicholas Richwagen
Dr. K.C. Das, College of Engineering
Comparative Study of Chemical Flocculation vs. Autoflocculation for Microalgae Harvesting, *Scenedesmus bijuga*, *Chlorella minutissima* and *C. sorokiniana*

John Rodriguez
Dr. Donald Nelson, Department of Anthropology
Changing Food Security Strategies in Northeast Brazil: Fifteen Years of Development Policies on Household Ability to Buffer Drought Impacts

Cole Skinner
Dr. Michael Terns & Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Characterization of the Tneap Complex in the CRISPR-Cas Viral Defense System of Prokaryotes

Brittany Truitt
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology
Pharmacologic Rescue of Mutations That Affect Tissue-Specific Glycan Expression in *Drosophila melanogaster*

Stephanie Wilding
Dr. Brian Cummings, Department of Pharmaceutical & Biomedical Sciences
The Role of Secretory Phospholipase A2 in Bile Acid-Induced Prostate Cancer Cell Death

Anna Wilson
Dr. William Kretzschmar, Department of English
Defining the Latino Experience in Roswell, GA: A Study in Sociolinguistics
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Appendix C
2011 CURO Summer Research Fellows

Lauren Anderson
Dr. Amy Ross, Department of Geography
The Legacy of Truth Analyzing the Impact of the Truth and Reconciliation Commission on South Africa’s Millennial Generation

Joshua Trey Barnett
Dr. Corey W. Johnson, Department of Recreation & Leisure Studies
Drag’s Not a Drag: Narrative Inquiry of Serious Drag Performers

Brooke Bauer
Dr. Robert Vandenberg, Department of Management
Organizational Commitment in the Workplace

Melissa Brown
Dr. Kecia Thomas, Department of Psychology
Black Stereotypes in Reality Television and the Reinforcement of Prejudiced Attitudes

William Costanzo
Dr. K.C. Das, Department of Biological & Agricultural Engineering
Algae Biofuel Development Growth Efficiency

Dervin Cunningham
Dr. Kelley Moremen, Department of Biochemistry & Molecular Biology
The Recombinant Expression of Proteins in the Glycosylation of Mammalian Cells

Abid Fazal
Dr. Joy Peterson, Department of Microbiology
Characterization of Enzymes Produced by Genetically Engineered *Hypocrea jecorina* and Their Use in Fermentation by Recombinant *E. coli*.

Melanie Fratto
Dr. Vanessa Ezenwa, Odum School of Ecology
Testing Bacteria-Killing Ability in Songbirds with Two Approaches Before and After Acute Stress

Nisha George
Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology
The Role of Cysteine Residues in the Function of the Ras Converting Enzyme (Rcelp)

Erin Giglio
Dr. Kelly Dyer, Department of Genetics
Sensory Systems at Play in Drosophila Courtship

Osama Hashmi
Dr. Monica Gaughan, Department of Health Policy & Management
From Malpractice to Medicare: Addressing the Legal Needs of Primary Care Physicians
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Anna Beth Havenar
Dr. Dawn Robinson, Department of Sociology
Religion and Impression Change Dynamics: An Affect Control Theory Analysis of Christianity and Islam

Ransom Jackson
Dr. John C. Inscoe, Department of History
A Comparative Study of Feminism in Southern Literature: Uncle Tom, Beulah and Aunt Phillis’s Cabin

Elena James
Dr. Russell Karls, Department of Infectious Diseases
Detection of Mycobacterial Genes Involved in Vitamin 1B12 Uptake

Kellie Laity
Dr. Dorothy Fragazy, Department of Psychology
Development of Nut Cracking Skills in Young Bearded Capuchin Monkeys

Marianne Ligon
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Characterization of the Tnep Complex in the CRISPR-Cas Viral Defense System of Prokaryotes

Katherine Manrodt
Dr. Steven Lewis, Department of Physics & Astronomy
The Molecular Dynamics of Atomic Sticking Coefficients

Lindsey Megow
Dr. Kaori Sakamoto, Department of Pathology
Intestinal Nematode Infection’s Inhibitory Effect on M. bovis

Tuiumkan Nishanova
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology
Assembly of High Density Lipoproteins via Retained N-terminal Signal Peptides

Farres Obeidin
Dr. David Hall, Department of Genetics
Modeling Subtelomeric Growth and the Adaptive Telomere Failure Hypothesis

Joshua Parker
Dr. Richard Steet, Department of Biochemistry & Molecular Biology
Identification and Characterization of a Novel Beta-Galactosidase Enzyme in Brain

Lea Rackley
Dr. Katarzyna Jerzak, Department of Comparative Literature
Finding the Child in Children’s Literature

Luben Raytchev
Dr. Michael Yabsley, Department of Wildlife Disease Ecology
Intracellular Blood Parasites of Common Freshwater Turtle Species in Georgia: Prevalence and Burden
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Mark Rolfsen
Dr. Jessica Muilenburg, Department of Health Promotion & Behavior
The Implementation of Effective Smoking Cessation Intervention for Drug and Alcohol Addicts in Substance Abuse Treatment

Dana Schroeder
Dr. Quint Newcomer, Director, UGA Costa Rica
An Applied Research Examination of Progress Toward Sustainability Goals at UGA's Costa Rica Campus in San Luis de Monteverde, Costa Rica

Daniel Sharbel
Dr. Timothy Dore, Department of Chemistry, and Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology
Assessing Rce1-Protease Inhibition in a Cell-Based Fluorescence Ras Localization Assay

Daniel Smith
Dr. Michael Marshall, Lamar Dodd School of Art
Contemporary Interpretation of Dante Alighieri's Inferno Through Photographic Illustration

Justin Smith
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Characterization of a Putative Endonuclease-RNA Complex Involved in CRISPR-Mediated Viral Defense

Theresa Stratmann
Dr. John Maerz, Warnell School of Forestry & Natural Resources
The Science of Monitoring Rare Species Developing Methods for Surveying and Monitoring Bog Turtles

Christopher Sudduth
Dr. Cathleen Brown, Department of Kinesiology
Establishing Clear Cut-Off Scores to Develop Classification Criteria for Subgroups of Individuals with CAI

Connor Sweetnam
Dr. Marcus Fechheimer, Department of Cellular Biology, and Dr. Ruth Furukawa, Department of Cellular Biology
The Involvement of Coenzyme Q (50) and Tau in the Formation of Hirano Bodies

Nakul Talathi
Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology
Determining the Effect of Oncogenic Mutations on EGFR Protein Kinase Activation and Phosphorylation

Korry Tauber
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology, and Dr. Lance Wells, Department of Biochemistry & Molecular Biology
Examining the Function of O-GlcNAc in Drosophila to Analyze Intercellular Signaling Pathways

Nathan Usselman
Dr. Jason Locklin, Department of Chemistry
Synthesis of Enzyme Functionalized Conjugated Polymers for Implantable Power Sources
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Star Ye
Dr. Jason Zastre, Department of Pharmaceutical & Biomedical Sciences
Measuring Lactate Production to Understand Transketolase and Its Isoforms in Breast Cancer Cells
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Appendix D
2010 CURO Summer Research Fellows

Jessica Alcorn
Dr. Audrey Haynes, Department of Political Science
The Validity of the News Marketing Hypothesis

Amarachi Anukam
Dr. Pamela Orpinas, Department of Health Promotion & Behavior
Healthy Teens: A Longitudinal Study of ‘At Risk’ Secondary Students

Thomas Bailey
Dr. William Kretzschmar, Department of English
Six Bodies: A Quantitative Analysis of Japanese Discourse Features

Michael Bray
Dr. Kelly Dyer, Department of Genetics
Genetic Analysis of Pigmentation in Drosophila tennebrosa

Ebony Caldwell
Dr. Monica Gaughan, Department of Health Policy & Management
Influences on the Outlook of the Post-college Educational Opportunities and Choices of Undergraduate Science Majors

Caitlin Cassidy
Dr. William Kretzschmar, Department of English
The Art of Persuasion: How Small Business Owners Use Speech to Market Products in Roswell, GA

Meagan Cauble
Dr. Mike Adams, Department of Biochemistry & Molecular Biology
Mechanism of Plant Biomass Conversion Without Pre-treatment by Anaerobic Thermophilic Bacterium Caldicellulosiruptor bescii

Daniel Celluci
Dr. Steven Lewis, Department of Physics & Astronomy
Applications of Molecular Dynamics Simulations to Models of Gas-Grain Interactions in the Interstellar Medium

Jessica Fazio
Dr. Richard Hubbard, Department of Chemistry
Carvone Luche Reduction Followed by Optical Activity Determination

JoyEllen Freeman
Dr. Barbara McCaskill, Department of English
Georgia Slaves in Transatlantic Culture: Blind Tom and William and Ellen Craft

Debashis Ghose
Dr. Joy Doran-Peterson, Department of Microbiology
Engineering Saccharomyces Yeast Strains to Better Ferment Pine Wood Biomass to Ethanol
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Camille Gregory  
Drs. Marcus Fechheimer and Ruth Furukawa, Department of Cellular Biology  
Creating a Transgenic Mouse to Study the Physiological Role of Hirano Bodies in the Progression of Alzheimer’s Disease

Shanterian Hester  
Dr. Michael Pierce, Department of Biochemistry & Molecular Biology  
Exercising Glycoproteomics Analyses to Discover New Breast Cancer

Georgianna Mann  
Dr. Sonia Hernandez, Warnell School of Forestry and Natural Resources  
Bufo marinus Pathogen and Parasite Analysis as a Model for Ecosystem Change

Krelin Naidu  
Dr. Brian Cummings, Department of Pharmaceutical & Biomedical Sciences  
Epigenetic Effects of Bromate on p21 and Histone-2AX Expression in HEK293 Cells

Rebecca Parker  
Dr. Kevin McCully, Department of Kiniseology  
Effects on Blood Flow Velocity and Arterial Diameter Produced by Compression Therapy in SCI Individuals

Jay Patel  
Dr. Boris Striepen, Department of Cellular Biology  
Characterization of Striated Fiber Assemblin Proteins in T. gondii

Rachel Perez  
Dr. J. Peter Brosius, Department of Anthropology  
Oil Palm Proliferation in Peru

Ryan Prior  
Dr. Katarzyna Jerzak, Department of Comparative Literature  
Foundations of Medical Philosophy in Ancient Civilizations

Malavika Rajeev  
Dr. Sonia Altizer, Odum School of Ecology  
The Effect of Parasite Infection on Monarch Butterfly Mating Behavior

Hope Rogers  
Dr. Jonathan Evans, Department of English  
Real-World Applications of Tolkien’s Races and Cultures

Carla Rutherford  
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology  
Human Resistance to Infection by African Trypanosomes

Laura Smart  
Dr. Rheeda Walker-Obasi, Department of Psychology  
Dialectical Behavior Therapy and Distraction: Using the Cold Pressor Test to Determine Efficacy
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Stephen Thompson
Dr. George Majetich, Department of Chemistry
Application of Friedel-Crafts Annulations to Conjugated Dienones and Silyl Substituted Arene Rings for the Synthesis of Complex Tricycles

Jake Young
Professor George Contini, Department of Theatre & Film Studies
A Study of the Psycho-Physical Performance Technique of Michael Chekhov
Appendix E
2009 CURO Summer Research Fellows

Christine Akoh, CURO-OVPR Summer Research Fellow
Dr. Joseph Frank, Department of Foods & Nutrition
Effect of Mono and Divalent Cations on Biofilm Formation in a Prolific Biofilm Forming Strain of Listeria Monocytogenes Cultured in a Chemically Defined Medium

Sambita Basu, CURO-Jane and Bill Young Scholarship Summer Fellow
Dr. Gerardo Alvarez-Manilla, Department of Biochemistry & Molecular Biology
Protein-linked Glycoconjugates as Biomarkers for Cancer of Other Physiological Processes

Chip Blackburn, CURO-OVPI Summer Fellow
Dr. Hugh Ruppersburg, Department of English
Harry Crews and the Tradition of Southern Fiction-Writing

Corbin Busby, CURO Research Fellow
Dr. Isabelle Wallace, Lamar Dodd School of Art
Imaging Masculinity in Contemporary Fashion Photography

Kelly Cummings, CURO-OVPR Summer Fellow
Dr. Scott Schatzberg, College of Veterinary Medicine
Differentiation of Natural and Post-vaccinal Canine Distemper Virus Encephalomyelitis

Charles Ginn, CURO Research Fellow
Dr. Hugh Ruppersburg, Department of English
Charting the Oppression of Minority Groups through Southern Gothic Literature

Erin Hansen, CURO Research Fellow
Dr. Jennifer McDowell, Department of Psychology
Effects of Daily Saccade Practice on Behavioral and Neural Plasticity in Schizophrenics

Dillon Horne, CURO-OVPI Summer Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
The Development and Implications of Predictive Modes of Thought from the Renaissance to Modernity

Tiffany Hu, CURO Research Fellow
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology
Re-examine Alternative Editing and Understanding the Protein Diversity in T. brucei

Whitney Ingram, CURO-OVPI Summer Fellow
Dr. Yiping Zhao, Department of Physics & Astronomy
Optimization and Analysis of Titanium Dioxide Nanorod Photodegradation

Daniel Jordan, CURO Research Fellow
Dr. Betty Jean Craige, Department of Comparative Literature
German Sustainable Farming as a Model for Resource Stewardship

Fahad Khan, CURO-ITP Summer Fellow
Dr. Jason Zastre, Department of Pharmaceutical & Biomedical Science
Highly Active Antiretroviral Therapy
Max Klein, CURO-UGA Alumni Association Summer Fellow
Dr. Richard Steet, Department of Biochemistry & Molecular Biology
Gauging the Developmental Impact of Impaired Glycoprotein Breakdown in Zebrafish

Susan Klodnicki, CURO-OVPR Summer Fellow
Dr. Jim Lauderdale, Department of Cellular Biology, and Dr. Andrew Sornborger, Department of Mathematics and Engineering
PTZ and Other Chemoconvulsant Effects on Adult Zebrafish

Bridget Mailey, CURO Research Fellow
Dr. Amy Ross, Department of Geography
The ICC and the US: How Have the Actions of the US Affected the ICC in the Past and How Will They Affect the ICC in the Future?

Francisco Marrero, CURO Research Fellow
Dr. Leidong Mao, Department of Engineering
Development of Ferrofluid Based Platform for Particles and Cellular Manipulation

Amar Mirza, CURO Research Fellow
Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology
A Computational Study of the Crystalline Structure of Tyrosine Kinase Mutants

Cody Nichol, OVPR Research Fellow
Dr. Cynthia Suveg, Department of Psychology
Empirical Examination of Child Emotion Assessments: A Comparison of Child, Parent and Behavioral Observation Methods

Emily Pierce, CURO Summer Fellow
Dr. Wayne Parrot, Department of Crop & Soil Sciences
Genetic Alteration of the Soybean to Promote Astaxanthin Production

Akanksha Rajeurs, CURO Research Fellow
Dr. Russell Karls, Department of Infectious Diseases
Develop an Efficient Method to Create Marked and Unmarked Mutations in the Human Genome

Al Ray, III, OVPI Research Fellow
Dr. Susan Sanchez, Department of Infectious Diseases
Relationship between Epidemiology of Salmonella in Non-Domestic Avian Species and Humans in the Southeastern United States

Joe Reynolds, CURO Research Fellow
Dr. Frank Harrison, Department of Philosophy
Analysis of the Nature of the Individual and the Notion of His Happiness

Matthew Sellers, CURO Research Fellow
Dr. Hugh Ruppersburg, Department of English
Finding God in the Poetry of Robert Penn Warren

Michael Slade, CURO Research Fellow
Dr. Frank Harrison, Department of Philosophy
Implicit System of Rational Thought Analogous to Modern First-Order and Modal Logics in Plato’s Late Dialogues
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Alex Walker, OVPR Research Fellow
Dr. Timothy Dore, Department of Chemistry
Synthesis of BHQ-dithiol as a Photoremovable Protecting Group for Mifepristone

Shuyan Wei
Dr. Scott Schatzberg, College of Veterinary Medicine
Development of Consensus-Degenerate Hybrid Oligonucleotide Primers (CODEHOPs) for Retroviral Discovery

2009 Howard Hughes Medical Institute EXORP Student

Valeriya Spektor
Dr. Sue Wessler, Department of Plant Biology
Designing Teaching Modules for Genome Analysis
Appendix F
2008 CURO Summer Research Fellows

Zachary Anderson, CURO Summer Research Fellow
Dr. Peter Brosius, Department of Anthropology
Multicultural Perspectives on Landscape Change

Matthew Belcher, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Determinants in the Localization of Telomerase to Telomeres

Mary Elizabeth Blume, CURO-OVPR Summer Research Fellow
Dr. Stefaan Van Liefferinge, Department of Art History
Uncovering Traditions of the Gothic Style in the Architectural Plans of Saint Germain-des-Pres and Saint Martin-des-Champ in Paris, France

Melissa Brody, CURO-OVPR Summer Research Fellow
Dr. Ron Carroll, Odum School of Ecology
Interactions of Bees and Hummingbirds with Hamelia patens

Carolyn Crist, CURO-UGA Summer Research Fellow
Dr. John Greenman, Grady College of Journalism & Mass Communications
News in the Black Belt: Teaching Journalists How to Cover Poverty in Persistently Poor Counties

M. Logan Davis, CURO-BHSI Summer Fellow
Dr. James Franklin, Department of Pharmaceutical & Biomedical Sciences
Long-Range Retrograde Transduction of Trophic and Survival Signals in Mouse Sympathetic Neurons

Marcus Hines, CURO-BHSI Summer Research Fellow
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology, and Dr. Lance Wells, Department of Biochemistry & Molecular Biology
Analyzing the Function of O-GlcNAc in Drosophila

Haylee Humes, CURO Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
How AICD and Fe65 Are Recruited to Hirano Bodies

Lindsay Jones, CURO Summer Research Fellow
Drs. Michael Terns and Rebecca Terns, Department of Biochemistry & Molecular Biology
Identification and Characterization of a Nuclease That Functions in an RNA-Mediated Viral Defense Pathway (RNAi) in Prokaryotes

Tyler Kelly, CURO Summer Research Fellow
Dr. Elham Izadi, Department of Mathematics
Usage of Linear Subspaces with Varieties

Jung Woong Kim, CURO Summer Research Fellow
Dr. Andrew Sorenborger, Department of Mathematics, and Dr. James Lauderdale, Department of Cellular Biology
Imaging of Endogenous Ca2+ Waves in Developing Zebrafish
Jennifer Lee, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology
Understanding Pediatric Symptoms

Sharon McCoy, CURO-OVPR Summer Research Fellow
Dr. Chad Howe, Department of Romance Languages
Dialect Perceptions of Spanish Speakers in Georgia

Katherine McGlamry, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology
Glycan Interactions and the Development and Spread of Cancer Cells

Alice Meagher, CURO-BHSI Summer Research Fellow
Dr. Michael Adams, Department of Biochemistry & Molecular Biology
Expression and Characterization of the Heterologously Expressed Soluble Hydrogenase I from Pyrococcus furiosus

Madison Moore, CURO-BHSI Summer Research Fellow
Dr. Jennifer McDowell, Department of Psychology
Behavioral and Neural Plasticity Following Daily Practice of Saccade Tasks in Schizophrenia

Emily Meyers, CURO-OVPR Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
The Advantage of Weakness: How Weak States Can Overcome Military Might of Strong States

Kelly Nielsen, CURO-OVPR Summer Research Fellow
Prof. George Contini, Department of Theatre & Film Studies
Augusto Boal’s Invisible Theatre: Political Play with an Unassuming Audience

Sean O’Rourke, CURO Summer Research Fellow
Dr. Kathy Simpson, Department of Kinesiology
Neuromuscular Activation and Movement Kinematics Exhibited During the Sit-to-Stand by Multiple Sclerosis Individuals

Julie Patel, CURO Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
Military Interventions by Powerful States

Neil Pfister, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Interactions That Define the Organization of RNA-Protein Complexes Involved in Prokaryotic RNA Interference

Stefann Plishka, CURO-Franklin College of Arts and Sciences Summer Research Fellow
Dr. Asen Kirin, Department of Art History
Imagining Constantinople: Imperial Houses of Worship as Symbols of State Ideology

Katie Pyne, CURO Summer Research Fellow
Dr. Jerome Legge, Department of International Affairs
Refugees and Internally Displaced People: How Effective Are the United Nations, Nongovernmental Organizations, and Subsequent Initiatives in Pacifying This Complex Humanitarian Crisis?
Appendices A-M

Joseph Rimando, CURO-Interdisciplinary Toxicology Program Summer Research Fellow
Dr. Ralph Tripp, Department of Infectious Diseases
Understanding and Preventing the Interaction between RSV’s G Protein and the CX3CR1 Cell Receptor

Aalok Sanjanwala, CURO Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology, and Dr. Ruth Furukawa, Department of Cellular Biology
The Effect of Hirano Bodies on Mutated Tau Protein

Neeraj Sriram, CURO Summer Research Fellow
Dr. Mark Eiteman, Department of Biological & Agricultural Engineering
Solving the World’s Energy Crisis – Not One Sugar at a Time

Giridhar Subramanian, CURO Summer Research Fellow
Dr. Brock Tessman, Department of International Affairs
Power and Influence in Southeast Asia: A Study of the Methods Used by India, China, and the United States

Aileen Thomas, CURO Summer Research Fellow
Dr. Nicole Lazar, Department of Statistics
How Random is Pseudorandom

Kathryn Turner, CURO Summer Research Fellow
Dr. Shelley Hooks, Department of Pharmaceutical & Biomedical Sciences
Comparison of RGS Regulation of LPA Signaling in Prostate Cancer and Ovarian Cancer

Manouela Valtcheva, CURO Summer Research Fellow
Dr. Jennifer McDowell, Department of Psychology
Antisaccade Performance and Deficit Characteristics in a Normal Population

Hunter Wilson, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
8-Chloro-7-hydroxyquinoline as a Biologically Useful Photoremovable Protecting Group

Laura Wynn, CURO-OVPR Summer Research Fellow
Dr. Martin Kagel, Department of Germanic & Slavic Languages
Issues in Current Turkish-German Literature
Appendices A-M

Appendix G
2007 CURO Summer Research Fellows

**Caroline M. Anderson**, CURO-OVPR Summer Research Fellow  
Dr. John Turci-Escobar, Department of Music Theory, and Dr. Max Reinhart, Department of German  
A Psychoanalytical Examination of Wolf and Mörike’s Peregrina Songs

**Joseph Burch**, CURO Summer Research Fellow  
Dr. Harry Dailey, Department of Microbiology and Biochemistry & Molecular Biology  
Converting Ferrochelatase into a Cytochrome c-like Protein

**Amy Burrell**, CURO-BHSI Summer Research Fellow  
Dr. Debra Mohnen, Department of Biochemistry & Molecular Biology  
Analysis of the Transcriptional Expression of Arabidopsis GAUT Genes: 15 Proven and Putative Plant Cell Wall Biosynthetic Galacturonosyltransferases

**Lee Ellen Carter**, CURO-OVPR Summer Research Fellow  
Dr. Fausto Sarmiento, Department of Geography  
Ecoregional Conservation among Indigenous Communities in Cotacachi, Ecuador

**Kimberly DeLisi**, CURO-BHSI Summer Research Fellow  
Dr. Ray Kaplan, Department of Infectious Diseases  
Parameters Affecting Fecal Egg Count Data for Determining Drug Resistance in Nematode Parasites of Horses

**Joshua Dunn**, CURO-OVPR Summer Research Fellow  
Dr. William Kretzschmar, Department of English  
The Youth of Roswell Voices: A Linguistic Analysis

**Katie Flake**, CURO-BHSI Summer Research Fellow  
Dr. Maor Bar-Peled, Complex Carbohydrate Research Center  
The Arabinose Kinase Project

**James Gordy**, CURO Summer Research Fellow  
Dr. Michael Adams, Department of Biochemistry & Molecular Biology  
Developing Methodologies for the Study of Small ORFs in *P. furiosus*

**Jana Hanchett**, CURO Summer Research Fellow  
Dr. David Schiller, Department of Musicology/ Ethnomusicology  
Latino and Hispanic Musical Influences on Athens-Clarke County

**Laura Harrison** CURO-BHSI Summer Research Fellow  
Dr. Corrie Brown, Department of Pathology  
Campylobacter in the Crypts

**Clare Hatfield**, CURO-OVPR Summer Research Fellow  
Dr. Stephen Shellman, Department of International Affairs  
Democracy and the Choice of Law: The Intersections of Shari’a, Domestic and International Law
Appendices A-M

Anna Hudson, CURO Summer Research Fellow
Dr. Richard Dluhy, Department of Chemistry
Using Surface Enhanced Raman Spectroscopy for the Detection of Pathogens

Andy Kragor, CURO-Jane & Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center, and Dr. Carl Bergmann, Complex Carbohydrate Research Center
Unbiased Isolation and Carbohydrate Mapping of Alpha-Dystroglycan

Brian Laughlin, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center
Functional Analysis of the Magnaporthe grisea Secretome

James MacNamara, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Biochemistry & Molecular Biology
Synthesis of Quinolinol-Based Inhibitors of Rce1p

Prashant Monian, CURO-Interdisciplinary Toxicology Program Summer Research Fellow
Dr. Brian Cummings, Pharmaceutical & Biomedical Sciences
Molecular Inhibition of Independent Phospholipase A2 and its Effect on Prostate Cancer Growth

Neil Naik, CURO-OVPR Summer Research Fellow
Dr. Ruth Harris, Department of Food & Nutrition
The Effect of Antagonizing Stress Receptors in Rats During Repeated Exposure to Restraint Stress

Natalie Nesmith, CURO-BHSI Summer Research Fellow
Dr. Mary Bedell, Department of Genetics
Genetic Studies on the Roles of KITL in Regulating the Proliferation and Apoptosis of Primordial Germ Cells in Mice

Victor Orellana, CURO Summer Research Fellow
Dr. Nicolás Lucero, Department of Romance Languages
Unsung Hero: A Literary and Historical Study of Lautaro

Tulsi Patel, CURO Summer Research Fellow
Dr. Scott Gold, Department of Plant Pathology
Developing a Biocontrol Agent for Chinese Privet, Ligustrum sinense

Tomas Pickering, CURO-OVPR Summer Research Fellow
Dr. Dorothy Fragaszy, Department of Psychology
Manner of Hammer Stone Use in Wild Capuchin Monkeys

Cleveland Piggott, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
The Formation of Hirano Bodies

Purvi Sheth, CURO Summer Research Fellow
Dr. Russell Karls, Department of Infectious Disease
Characterization of Mycobacterium shottsii
Appendices A-M

**Traci Tucker**, CURO Summer Research Fellow
Dr. Dawn Robinson, Department of Sociology
Gender and Role Meanings: A Cross-Cultural Comparison

**Jessica Van Parys**, CURO-UGA Alumni Association Summer Research Fellow
Dr. David Mustard, Department of Economics
Does Writing Ability Signal Academic Excellence?: Evidence from the New Scholastic Aptitude Writing Section (SATW)

**Delila Wilburn**, CURO Summer Research Fellow
Dr. Barbara McCaskill, Departments of African American Studies and English
Beauty Imposed

**Karen Wong**, CURO Summer Research Fellow
Dr. Andrew Whitford, Department of Political Science
Political and Social Foundations for Environmental Sustainability, Transfer Pricing, and Social Entrepreneurship
Appendices A-M

Appendix H
2006 CURO Summer Research Fellows

Sarah Breevoort, CURO-BHSI Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
Construction of Three Reelp Mutant Plasmids to Aid in the Characterization of Reelp Enzymatic Activity

Lauren Coffey, CURO Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Susan Fang, CURO Summer Research Fellow
Prof. Christopher Hocking, Studio Foundations

Courtney Grant, CURO-BHSI Summer Research Fellow
Dr. Julie Coffield, Department of Physiology and Pharmacology
An Investigation of Botulinum Neurotoxin Interactions on RhoA Activity Using In Vitro Assays

Erica Hall, CURO-BHSI Summer Research Fellow
Dr. Jessie Kissinger, Department of Genetics

Adele Handy, CURO-UGA Alumni Association Summer Research Fellow
Dr. Greg Robinson, Department of Chemistry

Celan Hardman, CURO Summer Research Fellow
Prof. Joe Norman, Drawing and Painting

Sana Hashmi, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center
Alteration of Alpha-Dystroglycan and Cancer Progression

Brian Levy, CURO Summer Research Fellow
Dr. Larry Nackerud, School of Social Work
Courrie – Not Email: Implications for Government Regulation of a Social Phenomenon. A Case Study of Language in France

Maggie Mills, CURO-NSF/SPIA Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Anna-Marieta Moise, CURO-BHSI Summer Research Fellow
Dr. Andrea Hohmann, Department of Psychology
Neurochemical Basis of Social Defeat in Syrian Hamsters: Role of Endogenous Cannabinoids

Lamar Moree, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center

Jesse Oakley, CURO Summer Research Fellow
Dr. Laurie Fowler, Department of Ecology
Economic Incentives for Private Land Conservation and Sustainable Development: Research into Environmental Policy in Costa Rica and Georgia
Appendices A-M

Katie Orelmansi, CURO-OVPR Summer Research Fellow
Dr. Patricia Richards, Department of Sociology
Reclaiming “Development” within the Context of Low-Income Neighborhoods

Danielle Pearl, CURO-OVPR Summer Research Fellow
Dr. Keith Langston, Germanic and Slavic Languages
Press Freedom, E.U. Accession, and Democracy in Croatia

Daniel Perry, CURO Summer Research Fellow
Dr. David Landau, Department of Physics and Astronomy

Andrew Pierce, CURO Summer Research Fellow
Dr. Thomas McNulty, Department of Sociology

Richard Piercy, CURO-OVPR Summer Research Fellow
Dr. Cory Momany, Department of Pharmaceutical and Biomedical Sciences

Kurinji Pandiyan, CURO Summer Research Fellow
Dr. Steven Holloway, Department of Geography
Understanding Public Space in a New Urbanist Development

Mandy Redden, CURO-BHSI Summer Research Fellow
Dr. Robert Arnold, Department of Pharmaceutical and Biomedical Sciences
Towards a More Effective Delivery System for Anti-Cancer Drugs

Eva Bonney Reed, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology

Lisa Rivard, CURO-Toxicology Summer Research Fellow
Dr. Jeff Fisher, Toxicology

Sonia Talathi, CURO-OVPR Summer Research Fellow
Dr. Brian Cunningham, Department of Pharmaceutical and Biomedical Sciences
Effectiveness of Ca2+-Independent Phospholipase A2 Inhibitors in the Induction of Chemotherapeutic-Induced Cancer Cell Death

Erika Vinson, CURO Summer Research Fellow
Dr. Richard Siegesmund, Art Education

Joshua Watkins, CURO Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
The Price of Victory: When Leaders Underestimate the Cost of War

Daniel Weitz, CURO-OVPR Summer Research Fellow
Dr. Gary Bertsch, Department of International Affairs
The Impact of a European Union Nuclear Weapons Free Zone on the International Non-Proliferation Regime

Shannon Yu, CURO-BHSI Summer Research Fellow
Dr. Nancy Manley, Department of Genetics
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Appendix I
2005 CURO Summer Research Fellows

Grace Anglin, CURO-OVPR Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Family Focused Emotion Communication Training

Ashley Beebe, CURO Summer Research Fellow
Dr. James R. Holmes, Center for International Trade and Security
The Influence of Media on Economic Policy in Brazil and Argentina

Ingrid Bloom, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
Differentiation of Human Embryonic Stem Cells into Endothelial Progenitors

Ian Lewis Campbell, CURO Summer Research Fellow
Dr. Glenn Wallis, Department of Religion
Theories of Mythology and the Way That Myths Have Affected Social and Political Formation

Kimberly Coveney, CURO-CIT Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
Role of iPLA2 in Phospholipid Metabolism in Chemotherapeutic-Induced Cancer Cell Death

William Collier, CURO-OVPR Summer Research Fellow
Dr. Amy D. Rosemond, Institute of Ecology
Analysis of an Exotic Species’ Interactions with Native Aquatic Trophic Dynamics: Quantifying the Effects of the North American Beaver (Castor canadensis) on Sub-antarctic Stream Food Webs in the Cape Horn Archipelago, Chile

John Crowe, CURO Summer Research Fellow
Prof. Mark Callahan, Ideas for Creative Exploration
AUX Launch: Art, Representation, and Commerce on the Web

Katie Griffith, CURO Summer Research Fellow
Dr. Diana Ranson, Department of Romance Languages, and Dr. Judith Preissle, College of Education
Assessing Cultural Values and Political Beliefs in a Nicaraguan Classroom: A Participant Observation

Matthew Haney, CURO-CTEGD Summer Research Fellow
Dr. Rick Tarleton, Department of Cellular Biology
Antibody Depletion of Highly Abundant Proteins in *Trypanosoma cruzi* for the Fine-tuning of Proteomic Analysis

Ned Hembree, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
Rce1 and Ste24 Inhibition by Dipeptidyl Acyloxymethyl Ketones: A Potential Target for Cancer Therapeutics

Alicia Higginbotham, CURO Summer Research Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
Christopher Logue's *Iliad*: A Work in Translation
Appendices A-M

Scott Jacques, CURO Summer Research Fellow
Dr. Mark Cooney, Department of Sociology
The Social Reality of Young, Middle Class Drug Dealers

Lisa Jordan, CURO Summer Research Fellow
Dr. Ruth Harris, Department of Food and Nutrition
The Effect of Leptin on Sympathetic Nerve Activity in White Adipose Tissue

Carey Kirk, CURO-OVPR Summer Research Fellow
Dr. David Z. Saltz, Department of Theatre and Film Studies
The Effectiveness of Drama Techniques in Treating People Suffering from Trauma

Andrew Leidner, CURO-CTEGD Summer Research Fellow
Dr. Pejman Rohani, Institute of Ecology
Coevolutionary Behavior and Interference between Fatal Diseases

Jon McGough, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
The Role of Female Choice in Sexual Selection of Drosophila pseudoobscura

Tatyana Nienow, CURO-BHSI Summer Research Fellow
Dr. Walter K. Schmidt, Department of Genetics
Adapting Yeast for the Study of Pitrilysin and Other M16A Enzymes

Erika Porter, CURO-BHSI Summer Research Fellow
Dr. Charles H. Keith, Department of Cellular Biology
Intrinsic Fluorimetric Imaging of Neural Activation in Cultured Cells and Zebrafish

Kurinji Pandiyan, CURO-CAES Summer Research Fellow
Dr. Raj Rao, Department of Animal and Dairy Science, and Dr. Steven Stice, Department of Animal and Dairy Science
Genomic Instability of Human Embryonic Stem Cells

Kelly Proctor, CURO-OVPR Summer Research Fellow
Dr. Lee B. Becker, College of Journalism and Mass Communication
Differences in Environmental Reporting: China and the United States

Rebecca Trupe, CURO Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Family Focused Emotion Communication Training

Russ Richardson, CURO Summer Research Fellow
Dr. Ron Carroll, Institute of Ecology
Sugarcane Processing Waste as a Soil Amendment on Organic, Shade-Grown Coffee under Simulated Drought Conditions for Control of Plant-Parasitic Nematodes

Dustin Williams, CURO-BHSI Summer Research Fellow
Dr. Scott T. Dougan, Department of Cellular Biology
Development of Transgenic Zebrafish to Understand How Activation of Hyal-2 Leads to Tumor Formation
Fei Yang, CURO Summer Research Fellow
Dr. Janet Westpheling, Department of Genetics
Regulation of Branched-Chain Amino Acid Catabolism in Streptomyces coelicor: Applications for Metabolic Engineering of Polyketide Antibiotic Biosynthesis

Stephanie Yarnell, CURO Summer Research Fellow
Dr. Carl Bergmann, Complex Carbohydrate Research Center
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Appendix J
2004 CURO Summer Research Fellows

Cara Altimus, CURO Summer Research Fellow
Dr. Jonathan Arnold, Department of Genetics
Isolation of a Light Receptor in the Biological Clock of N. crassa

Westin Amberge, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
Guided Differentiation of Human Embryonic Stem Cells into Endothelial Cells: Focusing on the Ulex Europaeus Agglutin I Lectin

Namrata Asuri, CURO Summer Research Fellow
Dr. Sidney Kushner, Department of Genetics
Analysis of the Role of Ribosomal S1 in the Polyadenylation Pathway of Eschericia coli

Erin Bohan, CURO-OVPR Summer Research Fellow
Dr. Katarzyna Jerzak, Department of Comparative Literature
The Reconciliation of Selves: The Emigrant Experience in America

Rebecca Brantley, CURO-OVPR Summer Research Fellow
Ms. Ashley Callahan, Georgia Museum of Art
The Early Fashion Design of Mariska Karasz and the Influence of Her Native Hungary

Josef Broder, CURO Summer Research Fellow
Dr. Andrew Sornborger, Department of Mathematics
Techniques in High Noise Image Analysis

Beau Bryan, CURO-BHSI Summer Research Fellow
Dr. Michael Pierce, Department of Biochemistry and Molecular Biology
N-Cadherin Gl

Susannah Chapman, CURO Summer Research Fellow
Dr. Virginia Nazarea, Department of Anthropology
Designing Sui Generis Systems for Traditional Plants and Associated Local Knowledge

Clayton Griffith, CURO-OVPR Summer Research Fellow
Dr. Amy Rosemond, Institute of Ecology
The Effect of the North American Beaver (Castor Canadensis), an Exotic Herbivore, on the Composition, Structure, and Regeneration of the Riparian Vegetation of Sub-Antarctic Forested Streams in Chile

Christopher Hale, CURO-BHSI Summer Research Fellow
Dr. Thomas F. Murray, Department of Physiology and Pharmacology
Adolescence as a Distinct Period of Vulnerability to Nicotine Addiction

Catherine Hudson, CURO-BHSI Summer Research Fellow
Dr. Harry Dalley, Department of Microbiology and Biochemistry and Microbiology
Negatively Affecting the Heme Biosynthetic Pathway in “Escherichia coli”
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Douglas Jackson, CURO Summer Research Fellow  
Dr. Nigel Adams, Department of Chemistry  
Reactions of Protonated Carboxylic Acid Ions with Amines in the Interstellar Medium

Andrew Leidner, CURO-BHSI Summer Research Fellow  
Dr. Pejman Rohani, Institute of Ecology  
Parasitoid Behavior and Evolutionary Dynamics

Janel Long, CURO-OVPR Summer Research Fellow  
Dr. Jean Martin-Williams, School of Music  
The Partitas of Franz Krommer and Natural Horn Technique

John McWhorter, CURO-BHSI Summer Research Fellow  
Dr. Daniel Colley, Department of Microbiology  
Induction of the Regulatory Ligand PD-L2 and the Co-regulatory Receptor PD-1 on CD4 Lymphocytes During Early Experimental Schistosomiasis Mansoni

William Parker, CURO Summer Research Fellow  
Dr. Marly Eidsness, Department of Chemistry  
Trigger Factor

Gehres Paschal, CURO-OVPR Summer Research Fellow  
Dr. J. David Puett, Department of Biochemistry and Molecular Biology  
Activating Mutations of the Lutropin/Chorionic Gonadotropin Receptor Associated with Familial Precocious Puberty, Male Pseudohermaphroditism, Hypogonadism, Amenorrhea, Leydig cell Hyperplasia, and Metastatic Thyroid Carcinoma

Kevin Patrick, CURO Summer Research Fellow  
Dr. James Anderson, Department of Classics  
Cicero and the Foundations of a Legal Education at Rome

Katherine Price, CURO Summer Research Fellow  
Dr. Janet Westpheling, Department of Genetics  
Site Specific Chromosomal Integration Mediated by Bacteriophage Integrase

Matthew Rudy, CURO Summer Research Fellow  
Dr. Marly Eidsness, Department of Chemistry  
Analysis of Cotranslational Protein Folding in E-coli and Determination of the Role of the Trigger Factor Gene in the Folding Process

Desiree Smith, CURO Summer Research Fellow  
Dr. Roberta Fernandez, Department of Romance Languages  
Projecting a Positive Educational Experience for Latina/os in the South

Christopher Stokes, CURO-OVPR Summer Research Fellow  
Dr. Randy Kamphaus, School of Professional Studies  
Family Health and Classroom Behavior: A Pilot Study

Shana Strickland, CURO-BHSI Summer Research Fellow  
Dr. Kimberly Shipman, Department of Psychology  
Emotional Regulation and Coping Skills in Maltreated Children
Appendices A-M

Adam Stroupe, CURO Summer Research Fellow
Dr. Boris Striepen, Department of Cellular Biology
Drug and Nutrient Trafficking in the Human Pathogen Cryptosporidium parvum

Teerawit Supakorndej, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry and Molecular Biology

Tendoh Timoh, CURO Summer Research Fellow
Dr. Marly Eidsness, Department of Chemistry
Fluorophore-modified Nascent Polypeptides

Jora Vaso, CURO-OVPR Summer Research Fellow
Dr. Katarzyna Jerzak, Department of Comparative Literature
The Effect of Communism on the Works of Andric, Kadare, and Szymborska

Leslie Wolcott, CURO-OVPR Summer Research Fellow
Dr. Betty Jean Craige, Center for Humanities and Arts
The Environment in Georgia’s Literature, Past and Present
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Appendix K
2003 CURO Summer Research Fellows

Anthony Anfuso, CURO Summer Research Fellow
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
Developing a Fast Plant Expression System to Identify Biosynthetic Genes Involved in Pectin Synthesis

Tiffany Beal, CURO-BHSI Summer Research Fellow
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
Determining How Pectins Inhibit Cancer Growth and Metastasis

Robert Brady, CURO Summer Research Fellow
Dr. Nader Amir, Department of Psychology
Malleability of Interpretation Bias in Social Anxiety and General Anxiety

Josef Broder, CURO Summer Research Fellow
Dr. Chi N. Thai, Department of Biological and Agricultural Engineering
Operational Characteristics of a Mobile Spectral Imaging System for Plant Health Detection

Martha Rose Calamaras, CURO Summer Research Fellow
Dr. Kim Shipman, Department of Psychology
Emotional Understanding in Abused and Neglectful African-American Families

Daniel del Portal, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
The Physiological Role of Hirano Bodies

Dustin Dyer, CURO Summer Research Fellow
Dr. Guigen Zang, Department of Biological and Agricultural Engineering
Dr. Michael Geller, Department of Physics and Astronomy
Energy Dissipation in Nanomechanical Resonators

Sarah Fritts, CURO Summer Research Fellow
Dr. John P. Carroll, School of Forest Resources
An Inventory and Assessment of Medicinal Plants and Animals Used by Makuleke Traditional Healers on the Northern Boundary of the Kruger National Park, South Africa

Betsy Goodwin, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology
A Study of the Psychology of Pediatric Pain and Chronic Illness

Patrick Gosnell, CURO Summer Research Fellow
Prof. Ben Reynolds, Department of Photography
The Beautiful and the Absurd

Paulette Andrea Greene, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
Conspecific Sperm Precedence and Speciation in Dro sophila pseudoobscura
Appendices A-M

**Andrea Haltiner**, CURO-BHSI Summer Research Fellow  
Dr. Ruth Harris, Department of Foods and Nutrition  
The Effects of Leptin on Leptin Receptor Expression in High-Fat Fed Mice

**Luke Hoagland**, CURO-BHSI Summer Research Fellow  
Dr. Marcus Fechheimer, Department of Medical Cellular Biology  
The Role of Myosin II in Hirano Body Development and the Impact of Hirano Bodies on Cell Viability

**Christopher “Kit” Hughes**, CURO Summer Research Fellow  
Prof. Mark Callahan, School of Art  
Tagging

**Steven Jocoy**, CURO Summer Research Fellow  
Dr. Michael Bender, Department of Genetics

**Leena Kukkarni**, CURO Summer Research Fellow  
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology  
Identification Characterization of Enzymes and Gene Products Involved in the Synthesis of Pectic Polymers Using Mucilage as Acceptors

**Valerie Marshall**  
Dr. Ben Blount, Department of Anthropology

**Ashley Neary**  
Dr. Susan Sanchez, Department of Medical Microbiology and Parasitology  
Sensitive and Specific Detection of Fungal Keratitis in Horses

**Ngozi Ogbuehi**, CURO Summer Research Fellow  
Dr. Mary Alice Smith, Department of Environmental Health Science  
Comparing Apoptosis During Different Stages of Limb Development in Chick Embryos

**Melissa Payton**, CURO Summer Research Fellow  
Dr. Lillian Eby, Department of Psychology  
Antecedents and Consequences of Networking Behavior for Individuals Seeking Reemployment

**John Drew Prosser**, CURO Summer Research Fellow  
Dr. Wyatt Anderson, Department of Genetics  
Kin Recognition in *Drosophila paulistorum*

**Ryan Rhome**, CURO Summer Research Fellow  
Dr. Jan Westpheling, Department of Genetics  
Analysis of bkdR Protein Function in *Stephomyces coelicolor* and *S. avermitilis*

**Susan Ritger**, CURO-BHSI Summer Research Fellow  
Dr. Duncan C. Ferguson, Department of Physiology and Pharmacology  
Immunoreactivity and Bioactivity of Recombinant Thyrotropins (TSH)

**Ben Solomon**, CURO Summer Research Fellow  
Dr. Kevin McCully, Department of Exercise Science  
Measuring Age Related Changes in Muscle Compliance Using Ultrasound
Appendices A-M

Mary Tolcher, CURO Summer Research Fellow
Dr. Tim Hoover, Department of Microbiology
Identification of Developmentally Regulated Proteins in the Budding Bacterium *Hyphomonas neptunium*

Meghan Wilson, CURO-BHSI Summer Research Fellow
Dr. James Lauderdale, Department of Cellular Biology
Pax 6b

Ryan Wilson, CURO Summer Research Fellow
Roger Moore, Department of Landscape Architecture

Thomas Wood, CURO Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
Analysis and Characterization of CAAX Proteases
Appendices A-M

Appendix L
2002 CURO Summer Research Fellows

Nadia Behizadeh
Dr. Tricia Lootens, Department of English

Ashley D. Chadha
Dr. Michael McEachern, Department of Genetics
Characterization of stn-1 M1 mutant in K. lactis

Emily DeCrescenzo
Dr. Susan Sanchez, Department of Biochemistry and Molecular Biology
Development of a Detection Method for TSST-1 exotoxin from Staphylococcus aureus Associated with Toxic Shock Syndrome in Horses Directly from Clinical Samples

Ivy Forkner
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
Functional Expression of Putative Biosynthetic Genes for Pectin: A Plant Polysaccharide with Anti-Cancer Activity

Cory S. Gresham
Dr. James B. Stanton, Department of Pathology, and Dr. Corrie C. Brown, Department of Pathology
Development of a Reverse Transcriptase-Polymerase Chain Reaction Based Assay for the Detection and Differentiation of Dolphin Morbillivirus and Porpoise Morbillivirus

Nowell Hesse
Dr. Maor Bar-Peled, Department of Plant Biology
Identification of Nucleotide-Sugar Biosynthetic Genes Involved in Glycoconjugate Synthesis

Matt Hoffman
Dr. Will York, Department of Biochemistry and Molecular Biology
Comparative Structural Analysis of Xyloglucans from Plants in the Subclass Asteridea

Parker Hudson III
Dr. Mary Bedell, Department of Genetics

Britt Johnson
Dr. Janet Westpheling, Department of Genetics
The Use of Generalized Transduction for Combinatorial Biosynthesis of Novel Antibiotics

LeeAnn Jones
Dr. Massimo Palmarini, Department of Medical Microbiology
Mechanisms of JSRV-Induced Cell Transformation InVivo

Jenna Lee
Dr. Andrew Herod, Department of Geography
A Study of Sustainable Economic Development in Croatia

Judson A. Lewis
Dr. John F. McDonald, Department of Genetics
Evolutionary Contributions of Retrotransposon Elements in the Genome of D. melanogaster
Appendices A-M

Cheryl L. Maier
Dr. Scott Pratt, Department of Animal and Dairy Science
Comparative Analysis of Nuclear Proteins Present in Donor Cells Used for the Nuclear Transfer Process and Cloning

Julie Orlemanski
Dr. Jed Rasula, Department of English
Sounding and Silencing: Suspended States in the Works of Thomas Pynchon

Gautham Pandiyan
Dr. Jacek Gaertig, Department of Cellular Biology
Study of Cilial Growth Suppression Mechanism in Tetrahymena Thermophila

Joanne Shinpoch
Dr. Daniel Dervartanian, Department of Biological Sciences
Purification and Characterization of Nickel Protein(s) from Bovine Heart and Their Relationship to Heart Disease

John Stark
Dr. Scott Atkinson, Department of Economics, and Dr. Michael Rauscher, Department of International Economics, Rostock University
An Economic Labor Supply Analysis of Poland’s Planned Entry into the European Union with Regard to the German Economy

Joshua Striker
Dr. Thomas Cerbu, Department of Comparative Literature
The Human Experience of Time: Literary and Philosophical Accounts/Representations

Nwakaso Umejiego
Dr. Boris Striepen, Department of Cellular Biology
IMPDH as a Potential Target of Drugs to Treat Cryptosporidiosis

Ben Walters
Dr. Elizabeth Brient, Department of Philosophy
The Aestheticization of Text

Lauren Watson
Dr. Jeffrey Berejikian, Department of Political Science

Katherine Williams
Dr. Kojo Mensa-Wilmot, Department of Cellular Biology, and Dr. Anne Clark, Oxford University

Brad Wright
Dr. Larry Nackerud, School of Social Work
A Comparative Healthcare Policy Analysis of the United States and Sweden
Appendices A-M

Appendix M
2001 CURO Summer Research Fellows

Siobahn Beaton
Dr. Debra Mohnen, Complex Carbohydrate Research Center
Progress toward the Partial Purification of a Pectin Biosynthetic Gene

David Cureton
Dr. Janet Westpheling, Department of Genetics
Development of an In Vitro Packaging System for a Streptomyces Bacteriophage

Jon E. Davis
Dr. Gary Bertsch, Department of Political Science
Identifying the Risks of China’s Nuclear Weapons Command-and-Control System in the Event of Political Crisis

Sayan De
Dr. Max Reinhart, Department of Germanic and Slavic Languages
The Progress and Modernization of Former East German Healthcare after Communism

Lawrence Dougherty
Dr. Daniel Promislow, Department of Genetics
Exploring Olfactory Response in Drosophila melanogaster and Evolutionary Theory of Aging

Matt Edwards
Dr. Gary Bertsch, Department of Political Science
Evaluating the Moscow Center for Export Control’s Role as a Non-Proliferation Epistemic Community Member

Ben Emanuel
Dr. Frances Teague, Department of English
Shakespeare on Screen: Henry in Hollywood

Jeff Halley
Dr. Sheng Cheng Wu, Department of Biochemistry and Molecular Biology
Cell Wall-degrading Enzymes from the Fungus That Causes the Devastating Rice Blast Disease

Peter Harri
Dr. Kojo Mensa-Wilcot, Department of Cellular Biology
Gene Expression in Leishmania: Control of Protein Synthesis in Leishmania 5' Untranslated Regions

Amanda Hudson
Dr. Michael Terns, Department of Biochemistry and Molecular Biology
Screening Mutant Yeast Strains for Abnormalities in the Localization of snoRNA

Kenneth Miller
Dr. Timothy Dore, Department of Chemistry
Synthesis and Use of Caged Compounds to Explore Cellular Processes
Appendices A-M

Lorina Naci
Professor William Paul, Jr., School of Art
Each morning I get up with one word in mind: plastik…

Lynn Nguyen
Dr. Mark Wheeler, Department of Dance
Chinese Classical Dance

Cori Pelletier
Dr. Roy Grant, Department of Music Therapy
Music Therapy with Premature Infants

Kate Smith
Dr. Kenneth S. Latimer, Department of Pathology
Immunohistochemical (IHC) Detection of Natural Killer Cells in Fish

Buudoan V. Tran
Dr. Karl N. Kirschner, Complex Carbohydrate Research Center, and Dr. Robert J. Woods, Complex Carbohydrate Research Center
Parameter Development and Application of the Glycam Force Field for Sialic Acid Derivatives

John Woodruff
Dr. Harry Dailey, Department of Microbiology
The Generation of Mutations in the n-Terminal Region of the Protoporphyrinogen Oxidase of Bacillus subtilis to Create a Protein Capable of Mitochondrial Targeting in Mammalian Cells
2015

CURO
Summer Research Fellowship

Book of Proposals

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Edited and proofread by: Eleana Whyte, Elizabeth Sears

Cover design: Sam Pittard, UGA Printing

Published by: Honors Program, the University of Georgia

Printed by: Central Duplicating, the University of Georgia

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Welcome

April 21, 2015

Dear UGA Faculty and Students,

We are delighted and honored to recognize this year’s CURO Summer Research Fellows, each of whom is featured here with a summary of his or her faculty-mentored research proposal. The goal of the CURO Summer Research Fellowship is to provide opportunities for intensive, immersive, faculty-mentored research experiences for academically talented undergraduates. The program advances the students’ knowledge and abilities to think critically, solve problems, and contribute to a greater understanding of the world.

We are proud of the accomplishments of present and past CURO Summer Fellows and with the mentorship provided by our exceptional faculty. The Summer Fellowship program has contributed to building a culture of undergraduate inquiry at the University of Georgia, and the CURO Summer Fellows serve as ambassadors, sharing their enthusiasm and expertise in a variety of professional forums on campus as well as at regional, national, and international meetings.

The 2015 CURO Summer Research Fellowship is funded through the Honors Program, the Office of the Senior Vice President for Academic Affairs and Provost, and the Alumni Association.

Please join us in congratulating these young scholars on the occasion of being awarded these prestigious fellowships. Please join us also in thanking the faculty research mentors whose support and guidance are crucial to the CURO Summer Fellows’ success.

Sincerely,

Dr. David S. Williams, ’79, ’82  Dr. Martin P. Rogers, ’01, ’11
Associate Provost and Director  Associate Director
Localization of an Essential Regulator of Transferrin Endocytosis in Trypanosoma brucei

2015 Summer Fellow: Bryan Aguanta
Research Mentor: Dr. Kojo Mensa-Wilmot, Department of Cellular Biology

Human African Trypanosomiasis (HAT), also known as sleeping sickness, is a neglected disease endemic to rural communities in Sub-Saharan Africa, and is caused by the protozoan parasite, Trypanosoma brucei. Infection is mainly spread by the bite of the tsetse fly, a large species of fly which feeds on mammalian blood and harbors the parasite in its midgut.1, 2 The disease is characterized by an initial onset of non-specific symptoms, such as fever, headache, itching at the initial infection site, and swelling of the lymph nodes, with more acute symptoms manifesting after the parasite has crossed the victim's blood-brain barrier.1 At this point, patients experience tremors, limb paralysis, behavioral changes, and severely disrupted sleep patterns, eventually leading to death.1 At present, only four drugs are used to treat the disease, all of which must be administered via intramuscular or intravenous injection, and all of which carry high potential for adverse reactions in patients.1 Given the environment in which HAT is endemic, this illustrates the need for the development of new drugs which can be administered outside of a hospital and do not possess the deleterious side effects of current treatment methods. In order for this to occur, new cellular signaling pathways must be studied and characterized in the parasite, to reveal new targets for drug discovery efforts.

T. brucei proliferates in the bloodstream of a mammalian host and utilizes endocytosis to uptake host transferrin, an iron-binding protein which normally serves to transport iron to the host’s tissues, as an essential source of iron for the growth of the parasite. 3 Preliminary laboratory findings suggest that the enzyme glycogen synthase kinase-3, beta isoform (GSK3β), is an essential regulator of transferrin endocytosis in T. brucei. Because of this, we hypothesize that GSK3β localizes to organelles in the parasite’s endocytic pathway, such as the endocytic vesicles and endosomes. To evaluate this hypothesis, we will use endogenous protein tagging constructs, followed by immunofluorescence assays, which will allow us to visualize the distribution of the protein of interest in relation to proteins in known cellular structures. We will also use protein tags as a tool to identify other proteins with which GSK3β may interact. In doing this, my goal is to aid future drug discovery endeavors by defining the localization and protein interaction network of an important signal transduction component.
References:


Movements and Habitat Use of *Crotalus horridus* and *Terrapene carolina* in a Fragmented Landscape

2015 Summer Fellow: Katherine Bentley

Research Mentor: Dr. John Maerz, Warnell School of Forestry & Natural Resources

Increasing suburban development creates significant challenges for the conservation and management of wildlife. Developed landscapes have dense roads and increasingly fragmented areas of smaller, degraded habitat. Fragmented landscapes are challenging for wildlife that move over large distances to access the different kinds of habitats required to complete their life cycles (Andrews & Gibbons, 2005). Information on habitat use and species movement within suburban landscapes is needed to identify threats and inform effective management.

Fragmented landscapes create barriers to reptile movement, which can result in high mortality and population isolation or declines (Andrews & Gibbons, 2005). The majority of research on habitat loss and fragmentation effects on reptiles is concentrated in mountains or coastal plains, with little study of the Piedmont. The Piedmont region is experiencing one of the highest rates of urban growth and development in the Southeast, resulting in rapid forest and wetland loss and habitat fragmentation (Burton & Samuelson, 2008).

This study focuses on two species of reptile that have relatively little known about their movement ecology within the southeastern Piedmont region. In northern parts of their range, timber rattlesnakes (*Crotalus horridus*) move long distances and have declined due to habitat loss and fragmentation (Brown, 1993). Information on movement of timber rattlesnakes is desirable to understand the potential for human-snake conflicts in suburban areas and is a high priority for conservation and public welfare. The second focal species is the eastern box turtle (*Terrapene carolina*), which is common throughout the eastern United States. Like timber rattlesnakes, box turtles are known to move large distances and have shown declines in areas of increased suburbanization and forest fragmentation.

My study site is the Warnell School of Forestry and Natural Resources’ Whitehall Experimental Forest, located in Clarke County, GA. The forest spans ~480 acres and includes planted pine and deciduous forest fragments, as well as wetlands along the Middle Oconee and North Oconee Rivers. This site is ideal for this study because I can measure whether animals prefer particular types of forest patches, how often and far animals move among patches, and whether animals occur disproportionately close to the few wetlands on the property.

I will use two approaches to study animal movements and habitat use. I will use radio telemetry to track at least five individuals of each species. I will affix external radiotransmitters to turtles and surgically implant transmitters into rattlesnakes. Using GIS software, I will analyze whether animal home ranges and movements are biased toward deciduous forest patches or patches that include wetlands, and I will determine whether certain features (e.g., roads or open areas) affect animal movements within the landscape. I will also use georeferenced “citizen science” data of reptiles encountered during student surveys to determine whether reptile encounter probabilities are associated with particular types or sizes of forest fragments or landscape features.

My project has significant broader impacts beyond its contributions to the ecology and conservation of these species. My project is a collaboration with the Orianne Society, an international reptile conservation organization collaborating with UGA. I will also work with Dr. Stephen Divers at the UGA Veterinary Hospital to surgically implant transmitters. My project is creating citizen science opportunities to engage students in native reptile ecology and the challenges those animals face in developed landscapes.
References:


The Action of a Hemipteran-Active *Bacillus thuringiensis* Toxin in a Plant Bug, *Lygus lineolaris*

2015 Summer Fellow: Darcie Bruce

Research Mentor: Dr. Michael Adang, Department of Entomology

Phytophagous bugs, including the tarnished plant bug *Lygus lineolaris*, have emerged as major global crop pests. These insects in the order Hemiptera have piercing-sucking mouth parts, stylets that puncture plant cells and remove cellular contents. These species are cosmopolitan pests of high value crops. During the early bud and bloom stage, feeding by these insects causes bud and flower loss, reducing yield on stone fruits and a number of agricultural crops including cotton. As a result of the boll weevil eradication project in the U.S. and genetically modified Bt cotton, *Lygus* plant bugs have become serious economic pests of cotton. *Lygus* feed on developing flower buds of cotton, and plants respond by abscising damaged buds, causing crop yield loss. According to cotton insect loss estimates for 2013, *Lygus* was the top pest nationally, infesting about 37% of the acres in the U.S. (Michael Williams, MSU).

Current *Lygus* management relies on scouting and control with chemical insecticides. Need has developed for genetically modified plants that are tolerant to the *Lygus*-stink bug complex. *Bacillus thuringiensis* (Bt) Cry proteins have become vital tools for pest management, yet often their usage is challenged by resistance or low susceptibility in pest species. Unfortunately, *Lygus* are, at best, marginally susceptible to Bt toxins. Recently, BtCry51Aa was determined to have insecticidal activity against *Lygus* (Baum et al., 2012).

The Cry51Aa *Lygus*-active protein has been investigated in the Adang laboratory. Through collaboration with a visiting scholar in the Adang laboratory (Chengchen Xu), Dr. B.C. Wang (Professor at UGA), and a team of Chinese scientists, they solved the complete structure of this hemipteran-specific toxin by X-ray crystallography (Xu et al., submitted). Their work will be the first report of a Bt insecticidal toxin with high structural similarity to aerolysin-type β-pore forming toxins. Their study provides insights into the mechanism of action of this type of toxin, and the information will be useful in my project investigating Cry51Aa action in *Lygus*.

Under the guidance of Dr. Michael Adang my goals are to 1) Image BtCry movement and binding in *Lygus* nymphs. The Cry51Aa toxin will be labeled with Alexa fluor and Quantum dots for tracking toxins in nymphs of *Lygus* by confocal microscopy and near infrared (NIR) imaging. QDots are semiconductor nanocrystals that recently have become powerful tools for imaging molecular interactions in biological systems, including the imaging of BtCry movement and gut binding in silkworms. Nymphs of *Lygus* will be fed Alexa-Cry and QDot-Cry through a sachet feeding system and movement followed by confocal microscopy, and NIR fluorescent imaging for nymphs fed QDot-Cry using a Cri Maestro In-Vivo imaging system. Knowledge of the timing and locations of Cry in the guts of nymphs will guide proteomic analyses in the following objective. 2) BtCry51Aa processing and stability in *Lygus* gut will be monitored by LC-MS/MS mass spectrometry. Groups of *Lygus* will be fed buffer control or Cry51Aa. Guts from fed larvae will be dissected and total protein extracted. Protein will be resolved by SDS-PAGE, and then after staining the gel, twenty equal gel sections will be excised and processed for analysis by LC-MS/MS at the UGA proteomics resource facility. This approach has been used recently by scientists in the Adang laboratory. The data will be used to assess the quantities of intact and digested BtCry toxin in the gut tissue from the insects. The proposed research will provide fundamental information about the fate of this important Bt toxin in the gut of *Lygus* that will allow for strategic optimization of the Bt toxin for enhanced activity against *Lygus* and other hemipteran pests.
Proposals

References:


Various ocular diseases such as glaucoma, age-related macular degeneration, diabetic retinopathy, and retinitis pigmentosa require lifelong treatment with either daily eye drops or monthly injections of medication into the eye to avoid blindness [1]. Ocular diseases are prevalent throughout society, especially affecting adults over the age of 50. An estimated 1.6 million adults suffer from age-related macular degeneration in the U.S. alone, and approximately 500,000 cases are diagnosed annually worldwide [2]. Age-related macular degeneration is treated through monthly ocular injections of medication costing time and money in doctor visits. In addition, the repeated ocular injections run the risks of intraocular infections, intraocular hemorrhages, and retinal detachment [3]. Developing an implantable ocular drug delivery micro device would reduce costs, save time in doctor visits, and reduce the hazards from frequent injections.

The proposed device would be surgically implanted in the eye and last up to two years. The device will consist of a reservoir where the drug will be stored and attached to a refillable ring. The refill ring will allow for the device to hold up to six months’ worth of medication at a time. This will allow the device to only need to be refilled every six months. In addition to decreasing the amount of doctor visits for a patient, the device will allow for a more consistent rate of drug delivery to the eye. When drugs are first injected into the eye, the eye receives a large burst of drug at the beginning of the month followed by less than ideal dosages toward the end of the month [4]. Due to the hassle of monthly doctor visits, some patients only get injections every three months. Less frequent injections result in less than ideal eyesight, whereas those who receive monthly injections have improved results [5]. The proposed device will allow for even diffusion of the drug throughout the six-month period.

The device will be made out of PDMS material and will contain a reservoir to store the drug while it is diffused to the eye at a constant rate through hydrophilic nano-channels. The nano-channels will replicate patterns of the blood vessels in the eye and be designed with specified lengths and widths to create a precise diffusion rate. Ideally, the device would be surgically attached to the sclera of the eye and be practically unnoticeable.

I am currently in the process of researching design ideas under the guidance of Dr. Ramana Pidaparti. We have begun narrowing down our designs for the device and soon we will be defining the appropriate dimensions for the proposed device. Once we have determined the design and dimensions, I will create the device on AutoCAD. Our goal is to have the device designed and dimensioned on AutoCAD by the end of May 2015. This summer, we plan to create the device with a 3D printer and perform experiments on the device to measure the diffusion rate of the drug from the device. By measuring the diffusion rate over short periods of time, we will predict the approximate rate of diffusion for the drug throughout a six-month period.
Proposals

Proposed Research Time Table:

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References:


During the Medieval times, the process of enameling – fusing powdered glass onto metal – was adapted to imitate precious stones. While enameling had been used before by ancient cultures throughout the world, its uses had been rudimentary and its techniques undeveloped. As the process of cloisonné enameling, where cells of wire enclose sectors of enamel, became more and more widespread by the Byzantines, the art of enameling became more and more prevalent, and a heretofore neglected practice gained a resurgence in popularity. The widespread usage of enamel led to further developments, rediscovering lost techniques, and higher refinements.

Enameling hit its peak during the Art Nouveau time period, which ran from 1890-1910. As jewelers rejected popular techniques and materials and the mass-produced commercialization of art that came with the Industrial Revolution, new and forgotten processes came to the forefront of jewelry design. Enamels became the most important and widely used of these, and the excellence in craft, technique, and design found in the enameled jewelry of the time is unparalleled.

My research deals with tracing the developments and refinements of enameling from the 5th to 20th century in order to better understand enameling and to aid in my own production of enameled jewelry. Throughout the spring semester, I will begin researching the history of enamels in Europe to chart innovation, usage, styles, and production. While Art Nouveau featured the most prestigious, refined, and well-executed enamels throughout history, this would not have been possible without the developments that happened in the Byzantine Empire, through the Middle Ages, and up to the 20th century. After gaining an understanding of the rise of enameling, I will begin studying the specifics of Art Nouveau enamels, focusing on the techniques, designs, and the technical approach to enameling and enameled jewelry from this time. This historical research will give me the knowledge base necessary for my active, creative research during the summer.

My exploration of enameling will begin with the recreation of Medieval and Art Nouveau techniques. Using what I studied during the spring semester, I will be creating new pieces of enameled jewelry using historical, rather than modern, techniques. I will briefly work in the Byzantine style, then in the style of Limoges, where grisaille (enamel painting done using black and white enamels to create a monochrome, greyscale image) and other enamel painting techniques were developed and perfected. The main focus, however, will be on the techniques of the Art Nouveau jeweler René Lalique, who revolutionized jewelry and heavily employed enamel in his work. To that end, I will create plique-à-jour (enamel without a backing, so that it gives the effect of stained glass) and basse taille (transparent enamel over an etched, engraved, or otherwise textured surface) jewelry using the methods that would have been employed in Lalique’s studio. Stylizations and designs will follow the Art Nouveau aesthetic, and modern electric kilns, binders, and tools will be eschewed in favor of more historically appropriate materials.

After achieving a level of virtuosity in this manner, I will begin incorporating more modern conveniences into my enameling work, while still retaining the sensibilities and sensitivity of Art Nouveau jewelry. By moving away from strict recreation to a more personal subject matter and style, I not only will realize personal and artistic growth, but can also bring to light how understanding the previous developments, techniques, and styles of enameling can aid modern enamelists in their search for higher art and craft.
Bulgaria was communist from 1944 until 1990, when free elections were held for the first time due to the growing internal protests and the transition to democratization and privatization began. Nonetheless, the transformation has been unstable and continues to result in political unrest in Bulgaria and in other Eastern European countries. In early 2013, protests against corruption and political non-transparency forced the resignation of the Bulgarian government, and there has also been a recent resurgence of communist parties that nostalgically idealize the security and stability of the pre-1990 era. Although this year marks the twenty-fifth anniversary of the end of communism, the continuing presence of political and economic instability and protests in Bulgaria suggests that the transition is ongoing and still relevant.

I want to explore how modern Bulgarians of different generations remember the post-communist transition period, and if how and what they remember informs their response to and involvement in current events. Anthropologists and oral historians have already begun to research people’s remembrances of life both during communism and after communism. Additionally, the book "Twenty Years After Communism: The politics of memory and commemoration" examines the creation of “memory regimes” through organized political and institutional practices, designed to frame or reframe the commemoration of the communist past. I am interested in taking this study of memory a step further by analyzing the effectiveness of these memory regimes in terms of contextualizing them within individual memories.

Thus, my research is driven by the complementary impulses of documenting the experiences of people who lived through the transition period and examining the effect of post-transition practices of memory-making on the way that people remember that time. The proposed project will rely on oral history methodology. Oral history serves as an alternative to traditional written history by privileging the lived experiences of ordinary people whose personal narratives allow for a more complex contextualization of the relationship between past and present.

I will record ten in-depth oral history interviews with people representing two generations—one which experienced the transition as young adults and the other which was very young or was born during the transition. I want to compare the perspectives of these generations to document differences in what is remembered. I will use this comparison to examine the process of memory-making: understanding how interviewees came to remember certain things and looking at what influences have shaped their interpretation of the past.

I will conduct archival research and the recording and transcription of the interviews during May-July in Bulgaria. Upon returning to the U.S. in August, I will translate the interviews, host a select few in the Oral History Archive at the Russell Special Collections Library, and create an online interactive interface that will connect the recorded interviews with supplementary sources, including photographs, reference materials, historic documents, and links to relevant organizations. I hope to make my research process visible and accessible to people beyond the scope of my individual project and also contribute a new, comparative focus to the research on remembering communism.
References:


CRISPR (Clustered, Regularly Interspaced, Short Palindromic Repeats) loci and their associated genes (Cas) comprise an adaptive defense system in bacteria and archaea (1). This immune system protects the organism against viruses/phages and other foreign genetic elements (1). Immunity is conferred via the acquisition and incorporation of invader DNA into the CRISPR locus (1). The locus is then transcribed to produce an RNA complement or (crRNA), which guides Cas nucleases in targeted invader DNA or RNA destruction (1). In the archaeon *Pyrococcus furiosus*, our lab has recently obtained genetic evidence linking four CRISPR associated (Cas) proteins (Cas 1, Cas 2, and Cas4-1 and 4-2) to the function of integration of new invader sequences in a process called CRISPR adaptation. However, the individual roles of each protein in the process are unknown and will be an area of exploration in my research. To examine how each of these proteins functions in the cell, a number of experiments will be performed in order to test whether or not each protein is a member of a larger functional complex. Additionally, the ability of each protein to bind, recognize, or capture CRISPR and invader DNA will be tested.

The four Cas proteins found to be involved in adaptation will be isolated using immunoprecipitation, a process that uses complementary antibodies to bind specific proteins that may further isolate potential protein partners (antibodies specific to Cas1, Cas2, and Cas4 have already been generated in the lab and are available for my research). Moreover, the same immunoprecipitation approach may also function to isolate protein bound nucleic acids of functional interest to CRISPR adaptation. These nucleic acids will need to be separated from the proteins via phenol chloroform extraction. Polyacrylamide gel electrophoresis will then separate the nucleic acids by size, and stains can be used to detect where the nucleic acids are. We have some data suggesting Cas 1 is associated with unique RNAs, but nothing definitive yet. Moving forward, testing of whether or not these isolated nucleic acids from each protein contain any relevant CRISPR or invader based sequences will be explored. This can be achieved by sequencing as well as PCR, northern and Southern blotting.

My previous western blot data of immunoprecipitation samples from *Pyrococcus furiosus* extracts strongly suggest that Cas 1 and Cas 4 form a complex and that Cas 1 and Cas 2 may also form a complex. Recently, however, one of my colleagues identified a Cas protein, Cas 4-2, which is not found in the CRISPR locus itself, but its presence significantly increases adaptation rates. Cas 4-1, on the other hand, seems to inhibit adaptation when overexpressed, and its deletion facilitates adaptation. Thus, my project will include not only figuring out what protein-protein interactions this new Cas 4-2 is capable of, but also continuing to try to isolate nucleic acids from these proteins.

A CRISPR locus sequence called the leader is required for adaptation (1). As Cas 1, Cas 2, Cas 4-1, and Cas 4-2 are believed to have some role in adaptation, the leader along with invader DNA is expected to be found when these proteins are immunoprecipitated. If such sequences are found bound to one or more of the Cas proteins under investigation, this finding would provide substantial insight into the adaptation mechanism. Given the emergence of Cas 4-2 as a major part of this process, a new strain has been created with Cas 4-2, Cas 1, and Cas 2 enriched, but Cas 4-1 is deleted. This strain in theory should encourage the greatest amount of adaptation in our cultures, thus increasing the likelihood that harvested proteins will have bound nucleic acids in detectable quantities.
Proposals

Reference:

Evaluating Diagnostic and Early Intervention Research Methodology in the United States and Ireland

2015 Summer Fellow: Allison Fialkowski
Research Mentor: Dr. David Gast, Department of Communication Sciences & Special Education

Based on data released from the Centers for Disease Control and Prevention, one in 68 children are diagnosed by age eight as being on the autism spectrum. In order to ensure these individuals have the highest possible quality of life, early diagnosis and intervention is critical and will be the focus of my career path. As I work towards a doctoral degree in nursing to both serve and research those on the autism spectrum, I have used research through the CURO Honors Scholar Program as a way to take control of my education and ensure that I am highly knowledgeable in the quickly evolving field of autism studies. With the support of the Summer Undergraduate Research Fellowship, contacts and mentorship from Dr. David Gast, and the flexibility of a summer schedule, I will continue creating a foundation for my career through a cross-cultural examination of the early diagnostic and intervention methodology in the United States and Ireland.

In May, I will utilize resources at Emory University to research present and emerging diagnostic and early intervention methodology in the United States. As one of only three Autism Centers of Excellence in the country, researchers collaborate between Children’s Healthcare of Atlanta, Marcus Autism Center, the Department of Pediatrics in Emory University School of Medicine, and Yerkes National Primate Research Center at Emory with a special focus on risk factors for autism and resilience for those diagnosed. Utilizing contacts that Dr. Gast has as the director of the Collaborative Personnel Preparation in Autism Project at Emory University, I will study what policies are put in place by school systems, healthcare facilities, and the government in the United States that either support or delay diagnoses and early intervention.

As part of a study abroad trip focusing on developmental disabilities to Cork, Ireland, I will continue studying policies surrounding diagnosing and treating autism spectrum disorders. Dr. Gast leads this trip and has planned meetings for me with leading researchers at the Cope Foundation and the University College of Cork. In this setting, I will be able to analyze what effect culture, economy, government, school structure, etc. have on the diagnosing and treatment of autism spectrum disorders. One of a few schools in the world to offer a diploma in Autism Studies and Intellectual Disabilities Nursing, University College Cork leads Ireland in autism research paralleling Emory’s work in the United States.

With Dr. Gast retiring at the end of the summer, I am planning to transition to work with Dr. Ashley Harrison who researches the methodology used to diagnose autism in Tanzania. Her project looks at how differences in culture, healthcare, etc. change diagnostic and treatment methodology. In creating this foundation of cross-cultural examination of a common neurological disorder, I will be better prepared for my research with Dr. Harrison.

While the frequency of diagnoses and treatment of autism is highly variable, autism is a global disorder that has a similar prevalence across countries, races, and cultures. By researching across countries and cultures about the best methodology to help those with autism spectrum disorders, I will be able to aid not only in the earliest intervention for children in the United States but also internationally. By aiding in travel funds, supporting my research, and allowing me to publicize my findings at the end of the summer, I am certain that the Summer Undergraduate Research Fellowship is the best foundation for my goals.
Proposals

Increasing Sustainability in Industrial Aquaculture in the European Union through the IDREEM Initiative
2015 Summer Fellow: Shreya Ganeshan
Research Mentor: Dr. Jennifer Rice, Department of Geography

Resource efficiency is a flagship goal of the EU towards achieving sustainable growth. The IDREEM\(^1\) (Increasing Resource Efficiency in European Mariculture) EU FP7 Project is a research initiative launched in October 2012 to increase the sustainability of aquaculture in the EU, under pressure by the rising demand for seafood products and the falling number of traditional fisheries. Currently, in the fish farming industry there is an overreliance on raw materials on fish stock, which emits a significant amount of waste into marine environments. The project aims to implement efficient practices through a new production technology, Integrated Multi-Trophic Aquaculture (IMTA),\(^2\) where fish are farmed with species from different levels of the food chain so that nutrients otherwise lost in fish farming can symbiotically be absorbed by additional organisms such as algae, seaweed, mussels, etc.

Demonstrating and assessing the environmental performance of IMTA through commercial-scale research, testing, and modeling will offer insight into the interdisciplinary constraints of sustainability in aquaculture. The IDREEM consortium encompasses the Scottish Association for Marine Science and fourteen industrial and research collaborators across Europe, of which CML-Leiden is a partner. The four-year plan of this project includes developing modeling tools to quantitatively assess the economic, technical, social, and regulatory practices of commercial aquaculture. One such tool, Life Cycle Assessments (LCAs) and Life Cycle Sustainability Assessments (LCSA) allow the benchmarking of the environmental performance of IMTA production in comparison to classic monoculture production. Through LCA software, background production processes directly responsible for negative environmental externalities can be detected, allowing researchers to quantitatively identify transformative opportunities. Some identified processes include agricultural production of components of animal (fish) feed and countries’ energy mixes. Integrated Assessment Models (IAMs) also generate scenarios and future pathways depending on key driving forces of the natural and human systems. Analyzing land-use and energy dynamics and modeling different political targets for climate, ecosystem conservation, energy, and agriculture demand and supply, this mechanism offers an interdisciplinary perspective that applies to both researchers and industrial executives. And in the long run, implementation of IMTA across the European and global aquaculture market will expand the market competition for seafood products as employment and production opportunities increase.

This two-month research performed at Leiden University’s Institute for Environmental Sciences will focus on identifying IMTA background production processes of industrial aquaculture that carry environmental externalities through the use of LCA software and IAM models of potential land-use scenarios. Though this research will operate within the existing policy framework of the EU, its findings should provide possibilities for commercial policy reform. My role as research assistant would be to become acquainted with LCA software and literature on traditional monoculture and alternative production practices, and to apply data/conclusions from IAM and LCA analyses to relevant research protocols.
Proposals

References:


Pneumococcal diseases such as pneumonia and meningitis are currently a major global health issue. Caused by *Streptococcus pneumoniae* (*S. pneumoniae*) bacteria, these diseases are responsible for up to 1.6 million annual global deaths according to the World Health Organization.[3][6] In particular, *S. pneumoniae* serotype III (Pn3) has increasingly victimized children under the age of five, who represent more than half of global victims.[2] The worldwide proliferation of microbial resistance to antibiotics accentuates the need for increasingly immunogenic, or effective, pneumococcal vaccines.[3] Glycoconjugate vaccines, vaccines composed of carbohydrates that are covalently linked, or conjugated, to carrier proteins, can be utilized to accomplish this task. Since serotype is determined by capsule structure, the carbohydrate of interest of Pn3 is the capsular polysaccharide (CPS) – a high molecular weight coating found on the microbial surface that is expressed by pathogenic bacteria.[1] The Pn3 CPS must be degraded without compromising its antigenic portions, or fragments of the CPS that are recognized by T cells as foreign bodies during an immune response, in order to create an effective glycoconjugate vaccine against Pn3.[1] In 1931, a bacillus, a rod shaped bacterium, named *Bacillus circulans* (*B. circulans*) was discovered in soil; it secretes a highly specific depolymerase enzyme capable of targeting and degrading the CPS of Pn3.[5] The effectiveness of this depolymerase in digesting the Pn3 CPS without damaging the Pn3 CPS antigenic components is unknown and thus comprises an ongoing investigation for potential utility in the preparation of glycoconjugate vaccines against Pn3.

The first step of the investigation is to purify then characterize the depolymerase enzyme through a variety of techniques. Following purification, characterization of the enzyme involves developing an understanding of the structure of the enzyme and its mechanism – how the enzyme utilizes its structure to interact with its environment (i.e., how the structure influences degradation of Pn3 CPS).[4] The Pn3 polysaccharide must also be characterized through different techniques to determine the mechanism and physical properties of Pn3 CPS. An understanding of the Pn3 CPS structure and properties helps determine, for example, where the Pn3 CPS is cleaved during degradation by the enzyme.

After purification of the enzyme, characterization of the enzyme and Pn3 CPS, and degradation of Pn3 by the enzyme, the final steps are to conjugate the degraded Pn3 capsular polysaccharide to a carrier protein and determine the glycoconjugate’s immunogenicity.[1] Following conjugation, mice are primed via initial exposure to the glycoconjugate vaccine and boosted with additional exposure to the vaccine after fourteen days. Serum is then collected from the mice and a test is run to determine the immunogenicity of the glycoconjugate vaccine by measuring the concentration of IgG antibodies in the serum sample. IgG antibody concentration is chosen over that of other types of antibodies for determining immunogenicity because upon second exposure to an antigen (in this case Pn3 CPS), the IgG antibody activates a strong humoral response which utilizes the memory of previous exposure to combat Pn3 pathogens.[1]

Overall, the primary goal of this research is to develop an immunogenic glycoconjugate vaccine which effectively counters Pn3 and reduces its prevalence. A secondary goal of this research is to understand the mechanisms and structures of both the depolymerase enzyme and Pn3 CPS. By producing an opportunity to save the lives of young children and opening the door to understanding
and applying mechanisms, the results of this research effort can initiate a successful counterattack against other deadly diseases.

References:


Influence of Supplemental Folic Acid Dose on Maternal Folate Status and Infant Outcomes: A Clinical Intervention Trial

2015 Summer Fellow: Jenissa Gordon
Research Mentor: Dr. Dorothy Hausman, Department of Foods & Nutrition

Background:
Folate is a naturally occurring B vitamin found in dark leafy green vegetables such as spinach, other fruits and vegetables such as oranges and avocados, and nuts and legumes. Folic acid is the synthetic form used to fortify grain products and found in dietary supplements. As folic acid is more bioavailable than natural food folate, folate recommendations are expressed as dietary folate equivalents (DFEs) which account for this difference (1 µg DFE = .6 µg folic acid).

Folate plays a role in one-carbon transfer reactions involved in DNA synthesis, DNA methylation, and amino acid metabolism. Folate is essential for normal development, growth, and maintenance of optimal health. Adequate folate status is especially important during physiological stages of rapid growth.

The current Recommended Dietary Allowance (RDA) set by the Institute of Medicine (IOM) is 400 µg DFEs per day for adult men and women, with higher recommendations for the physiologically demanding periods of pregnancy (600 µg DFE) and lactation (500 µg DFE). These recommendations were established in the late 1990's, based on the best available scientific evidence (IOM, 1998), with the recommendations for pregnancy based on the intake needed to maintain normal folate status in pregnant women (Bailey, 2000). Nonetheless, most commercially available prenatal supplements contain 800 µg or more of folic acid, amounts exceeding the recommended level of intake. The short and long term impact of increased folic acid supplementation on pregnancy and infant growth and development are unknown.

On-Going Intervention Study:
The UGA Folate and Maternal Health Research Team under the direction of Dr. Lynn B. Bailey, is conducting an ongoing double-blind randomized controlled intervention study in collaboration with the Athens Regional Midwifery Clinic (ARMC). The purpose of this study is to determine the effect of two doses of supplemental folic acid throughout the pregnancy on maternal folate status, infant folate status, and other infant outcomes. Healthy pregnant women, recruited through ARMC at their initial prenatal visit were randomly assigned to receive one of two doses of folic acid supplementation, either 400 µg (approximately equivalent to the RDA) or 800 µg as commonly found in commercially available prenatal vitamins. Blood samples are taken at the initial visit, 28 weeks and 36 weeks gestation, and from the mother and cord blood at delivery for measurement of folate biomarkers. Placenta samples are collected at delivery for subsequent determination of gene expression and DNA methylation. Two maternal dietary recalls are performed during pregnancy (during 24 and 32 weeks gestation) to assess folate and folic acid intake. Recruitment into the study began in mid-July 2014, and deliveries are expected from February through August 2015.

Methods:
I have been involved with the Folate Team for the past year through attendance at lab meetings and journal clubs. This summer research fellowship would allow more direct involvement and hands-on experience with the many aspects of clinical research. My specific responsibility for the project would be in preparing folic acid supplement packages, setting up for blood sample collection, and assisting in processing the diet recall data. At delivery, I will assist with the collection, processing,
and storage of blood and placenta samples. In addition, I will assist in the statistical analysis of maternal and cord blood folate data as well as infant growth outcomes including height, weight, and Apgar score, including adjustment for potential confounders.

**Conclusion:**
In addition to providing invaluable clinical research experience for students such as myself, it is anticipated that this study will contribute to the evidence on which revised folic acid recommendations and prenatal vitamin folic acid dosages can be based.

**References:**


Proposals

An Examination of Roll Call Voting and Amendment Proposals in Congress and Their Effects on Electoral Politics

2015 Summer Fellow: Casey Grippando
Research Mentors: Dr. Michael Lynch & Dr. Anthony Madonna, Department of Political Science

The modern American Congress prides itself on being a completely transparent entity, with every piece of legislation, word of debate, and vote cast readily and easily available to those willing to seek it out. What most do not realize is that this transparency allows all actors in the political system, including special interest groups, political action committees, and the representatives themselves a great degree of leverage over the public. Given that Congress was crafted to provide representation to this public, it is logical to assert that the American constituencies should be more aware of this leverage and the means through which it is applied in order to then elect a representative body that is more responsive to public desires.

The roll call voting record provides the clearest window to the inner workings of Congress. From this information one can determine the policy preferences, most controversial issues, and levels of political polarization that exist amongst the members. The decision for members to put themselves on the record with a vote seems to be becoming a more difficult one year after year, with political advertisements unafraid to claim that certain members have voted with an unpopular leader or member of the opposing party hundreds of times.

The aim of this research is to determine how roll call procedures in Congress have changed over time and the implications of these changes – specifically, whether an increase in the number of roll call votes requested is mainly for political purposes in order to force uncomfortable votes for members of the opposing party to utilize in the next election. The proposition of amendments by the minority party, even when those amendments will surely fail, is what I hypothesize to be an indication of voting being requested along partisan lines as opposed to strictly for the purposes of policy.

Utilizing the Congressional Record, I will be compiling voting and procedural data using a coding process on amendments from significant pieces of legislation, combining my own findings with existing research that examines earlier Congresses. The data will then be amassed statistically, and from this I hope to uncover certain trends surrounding a correlation between the party of the sponsoring member of the amendment and the probability that a roll call vote was requested.

It is my hope that these findings will indicate that a change in roll call voting has indeed occurred over time, and that an increase in the request for roll call votes in more recent Congresses demonstrates the larger partisan trends popular in current evaluations of American politics. In an era where polarization amongst political parties is claimed to be at an all-time-high, research that delves into that trend and uncovers statistical evidence regarding it is more valuable than ever.

More knowledge of Congressional procedure will result in a public more aware of the political environment that its representatives operate in, and thus a public perhaps less swayed by misleading data provided by the voting record.
Carbon Encapsulated and Magnesiothermically Reduced Diatoms as a Lithium-Ion Battery Anode

2015 Summer Fellow: Bryan Grommersch
Research Mentor: Dr. Ramaraja Ramasamy, College of Engineering

Lithium-ion batteries are an integral part of the portable electronics industry. Whether they are powering a smartphone or concealed within a cauterizing tool, lithium batteries are the workhorses of a high-tech society. Despite this, the chemical technology inherent in these batteries has not kept pace with the portable electronics and automobiles that depend on them. Simply put, a battery is a collection of electrochemical cells that provides an electronic device with the necessary voltage and capacity. Each cell features a positive and negative electrode, cathode and anode respectively, separated by an electrolyte solution of dissociated salts. During operation, lithium ions and electrons are liberated from the cathode material. The lithium ions travel through an electrolyte and the electrons travel through a circuit before the two are reunited at the anode. Current lithium-ion batteries lose their charge quickly and stop functioning altogether after just a few years. We endeavor to improve lithium-ion battery technology through the synthesis of novel shape and morphology controlled silicon and carbon microparticles.

One of the most important metrics used to quantify a battery’s viability is known as theoretical specific capacity, defined as the idealized amount of electric charge delivered by a battery at a particular voltage per unit mass. Currently, graphite is the anode material of choice because of its affordability and abundance. However, graphite’s capacity is far inferior to that of silicon, the second most abundant element on Earth, which boasts a specific capacity of 4200 mA·h/g, ten times that of graphite. Therefore, developing a novel anode material from silicon will produce more dependable, longer lasting batteries.

Apart from the chemical composition of the anode, the morphology of the material is of equal concern when evaluating battery viability. During battery operation, the insertion and removal of lithium ions leads to expansions and contractions that degrade the anode over time. Unique material shapes can mitigate these deleterious effects by providing intricate pores and channels through which lithium ions can travel. Fossilized silica (SiO$_2$) frustules, or shells, of the fresh-water diatom *Aulacoseira* average only 10 microns and feature just such elaborate shapes, providing the perfect anode template (see figure). The central goal of our research project is to retain the intricacies of these diatom shells while altering their chemical identity to silicon and carbon, thus enriching battery technology.

To accomplish this, fossilized diatom shells will be magnesiothermically reduced at 650°C. A magnesiothermic reduction is a chemical reaction utilizing magnesium to reduce the number of silicon-oxygen bonds. Upon successful silica reduction, hydrochloric and hydrofluoric acid treatments will etch away undesired MgO and unreacted SiO$_2$ from the reduced diatom frustules, leaving silicon microparticles in the shape of diatom shells. The silicon particles will then be encapsulated in a hollow sphere of carbon to increase material surface area and leave room for material expansion and contraction. Upon successful development, this anode material has the potential to transform the field of energy storage, rendering lithium-ion batteries more viable in the automobile, medical, and electronic industries.
Proposals

References:


Over two thousand years ago, the mathematician Euclid defined a function for what was known as a perfect number: a number whose proper divisors, when added together, constitute that number. The first example, with which Euclid was well acquainted, is six. Its proper divisors are one, two, and three. One plus two plus three is six, making it perfect. His method of constructing them requires a Mersenne prime, or a prime number that can be written as one less than a power of two. The first Mersenne prime is three because two squared is four, one less than that is three, and three is prime. Euclid’s formula says two times three should be a perfect number, and it is. There was a lot his formula could not see though. It was not until about four hundred years ago that anyone even proved Euclid’s method successfully finds all even perfect numbers. This means if a number is both perfect and even, there is a corresponding Mersenne prime that can be multiplied by a power of two to create a perfect number. By that time, René Descartes had already asked whether any of them are odd. This question has proven so stubborn the following centuries have found only shadows of the ultimate answer.

When investigating the issues related to perfect numbers today we usually use a slightly different definition. Euclid considered the proper divisors of a number. A proper divisor of a number can be multiplied by another divisor, resulting in the number, but that number is excluded from being one of its own proper divisors. From the modern perspective, it makes more sense to consider all divisors of a number, including itself. The function which adds together all divisors of a number is called the sum-of-divisors function, often represented with a lowercase sigma. Because we consider all divisors with sigma, the sigma of a number should be twice the number rather than equal to it; sigma of six is twelve, which is twice six. Dividing a number by its sigma results in what is called the abundancy of a number, which is equal to two exactly when the number is perfect.

Defining abundancy in this way gives an extremely convenient property in answering questions about perfect numbers and related topics. It is multiplicative, which means that if two numbers share no divisors (apart from one, the universal divisor), then the abundancy of their product is the product of their abundancies. Because abundancy is multiplicative, we have some hope at drawing a number of conclusions about it. I would like to investigate this property of abundancy to find evidence in the case of the existence of odd perfect numbers using a theoretical approach—pencil, paper, chalkboard, ideas. If any exist, I would like to spend my time adding more conditions that such a number would have to meet, meaning not as many numbers need to be checked. If it does not exist, I would like to add to the number of conditions that it would have to meet, so that the web closes off and we can know for sure.
This project will examine the economic and political climate in the early years of English settlement in the Caribbean, from the 1580s through the early 18th century. Traditional scholarship has characterized this period as one of “mercantilist consensus” in both domestic and inter-imperial politics, which gradually gave way to modern industrial capitalism. Recently, historians have begun to reexamine the politics of empire in the context of the Atlantic world as a whole, shifting away from a metro-centric view in order to recognize the importance of dialogue across the Atlantic. An important component of this reevaluation has been an exploration of the roles of merchants in the development of commerce and empire, an investigation which this project will continue.

Mercantilism was a policy – traditionally attributed to all major European powers – of government-directed trade, which was used as a method of imperialist expansion. Mercantilism was tightly bound up with imperial expansion; often, colonies were both conquered and controlled by merchant companies. England was prolific in its utilization of crown-chartered merchant companies as colonizers. The companies were granted monopolies, which represented both political and economic tools for the monarchy; since the crown controlled the granting of charters they also, by extension, controlled the land and profits that resulted. “City” merchants, who made up the first generation of merchant companies, often sought short term investments in the export trade, or through the circulation of minerals and spices. However, in the volatile new Caribbean settlements, new merchants were willing to provide the long-term investment colonies needed to survive. These new merchants – some part of chartered companies, others working together informally – challenged the paradigm of government-controlled commerce and were essential to the development of modern industrialized trade.

The early modern Atlantic was composite in a profound sense, “neither a static nor coherent system of interests… but rather an ever changing approach” towards trade, which encompassed the needs of planters, merchants and artisans, as well as politicians. Ultimately, this project will provide a more complete understanding of the development of the English merchant community as it relates to unfolding imperialist policy in the Atlantic world. Conflicts between Parliament and the monarchy, as well as clashes between various political parties, were crucial to the development of free trade. However, this project is primarily concerned with the progress on the ground: how did the merchant community change? Why and how were these changes important to the creation of industrialized capitalist trade? How did participants in Atlantic trade view their own role? Records of colonial and imperial governments, the correspondence, contracts, and account books of merchants, as well as materials concerning the daily life of colonists in the Caribbean will be the most important tools in addressing these questions. Merchants are key components in the larger context of the Atlantic world. The study of their evolution is critical to a more complete understanding of the dialogue between metropole and periphery as it concerns mercantilism, free trade, the role of colonial spaces in imperial policy, and the development of the British Empire.
References:


Social Form Discrimination in the Tropical Fire Ant
2015 Summer Fellow: Kip Lacy
Research Mentor: Dr. Kenneth Ross, Department of Entomology

Elucidating the genetic component of animal social behavior continues to be a biological holy grail. Eusocial insects, including many species of ants, exist in socially complex, caste-based societies. They are also small, easy to manipulate in the laboratory, and reproduce quickly, making them ideal subjects for research. The Red Imported Fire Ant, *Solenopsis invicta*, has become a model biological system for eusocial insect behavioral research. Though much is known about *S. invicta* colonies and behavior, it is unknown how relevant their social biology is to other species of their genus and to eusocial insects as a whole.

*Solenopsis invicta* has two social forms that exist in sympatry throughout the American southeast (1). The monogyne form has one reproductive queen per colony, while the polygyne form has multiple reproductive queens per colony, sometimes more than one hundred (1)(2). Social form is under control of a single Mendelian factor in this species, marked by the *Gp-9* gene (1)(2). Monogyne queens are always homozygous for the *b* allele of *Gp-9*, while reproductive polygyne queens are invariably heterozygous. Colonies practice discrimination based on this factor—monogyne colonies will not accept queens with a heterozygous genotype at the locus, and polygyne colonies will not accept homozygotes. In fact, homozygous queens are killed upon reaching maturity in polygyne colonies (1).

This behavior has been well characterized, and the close relatives of *S. invicta* (all of which, like *S. invicta*, are native to South America) exhibit a similar social polymorphism linked to the same Mendelian factor (3). A more distant relative is *Solenopsis geminata* (the Tropical Fire Ant), which also exhibits social polymorphism sympatrically throughout its introduced range in Florida and native range in Central America (4). However, the specific nature of the polymorphism has not been as well studied in *S. geminata* as in *S. invicta*. The genetic basis for colony social form in *S. geminata* remains unknown, although it is known that the two forms do not differ in their DNA sequences at the *Gp-9* gene (4). It is also unknown whether workers from *S. geminata* colonies discriminate among queens based on their social form of origin.

To address this gap in knowledge I will conduct behavioral assays on field-collected colonies of *S. geminata* to determine whether or not colonies discriminate between queens based on social form. These assays will be choice experiments for assay colonies. I will place two queens (one from a polygyne colony and one from a monogyne colony) in the plastic enclosure containing an assay colony. I will hold the assay colony queenless for several days in advance to ensure that they would be willing to accept any foreign queen. The behavior of the colony towards the two introduced queens will be scored using the same scoring system used to determine queen acceptance/rejection in *S. invicta*.

Further study will follow, the form of which depends on the results of these experiments. If the colonies do indeed discriminate this would strongly implicate a genetic component similar to that of *S. invicta*, which would inform further genetic study. This would also lead to investigation of what cues allow them to discriminate. Insects communicate using chemical signals called pheromones, which are often present on the cuticle. Conducting the same assay, but with pieces of paper coated with chemicals extracted from the queens’ cuticles, will reveal if chemical communication is indeed inciting the behavioral response. The results of this study will pave the way for further natural history study on social polymorphism in *S. geminata* and lay the groundwork for studies investigating the genetic basis of social form.
References:


In the year 2010, 2.5 million people suffered from a traumatic brain injury (TBI) [3]. In the United States alone, approximately 50,000 deaths result from TBIs annually, with toddler age children being the most affected demographic [4]. At this time, there is no adequate TBI treatment available. Recently, the West Laboratory developed induced pluripotent stem cell-derived neural stem cells (iPSC-NSCs). These iPSC-NSCs may potentially serve as a regenerative cell replacement therapy, as they are capable of differentiating into neurons, astrocytes, and oligodendrocytes while also producing regenerative factors such as VEGF. These cells have been shown to lead to significant structural and functional improvement in rodent models that have suffered similar neural injuries. However, treatments that have been developed in rodent models have regularly failed in clinical trials and thus, more predictive large animal models are needed. The pig serves as an excellent large animal model, with a large gyrencephalic brain that has gray-white matter composition similar to humans, unlike rodent models.

In this study, we propose to develop a novel piglet concussive TBI and iPSC-NSC treatment module. We have developed a model with four treatment groups; 2 m/s and 4 m/s at 6 mm impact depth, as well as 4 m/s at 12 mm and 15 mm depth. In the study, piglets receiving a cortical impact will develop brain lesions and show changes in inflammatory response, macrophage infiltration, and glial scaring, as well as changes in motor function deficits ranging from mild to severe based on impact speed. We hypothesize that iPSC-NSC engraftment in this model will reduce the effects of both primary and secondary injury listed above, resulting in a reduction of functional deficits.

After the induction of TBIs and the injection of iPSC-NSCs into affected brain tissue of porcine subjects, changes in functional deficits will be quantified through biomechanical analysis of the piglets. Biomechanical data prior to TBI, post-TBI, and post-iPSC-NSC injection will be compiled and analyzed for differences in individual subjects throughout the study, as well as differences between control and test subject treatment groups. Biomechanical analysis will enable the study to verify functional deficits caused by concussive TBI in porcine subjects, as well as the effectiveness of the iPSC-NSC treatment from a behavioral standpoint in the future.

Histological analysis will also be used to determine the severity of primary and secondary injury after TBI in porcine subjects, as well as differences between the control group and the iPSC-NSC treatment group. Lesion size will be measured as an indication of primary injury, such as mechanical tissue deformation and necrotic cell death, and secondary injury, such as edema and brain atrophy. GFAP and Olig2 markers will also be used to count astrocytes and oligodendrocytes, respectively. GFAP will also be utilized to see glial scarring, a product of astrocyte reactivity. These cell markers will enable differences in neuronal cell death to be noted between the control and treatment group, as well as the survival and possible proliferation of iPSC-NSCs. Magnetic Resonance Imaging [2] will also be used to collect data on the subjects’ brain tissue throughout the experiment. Apparent diffusion coefficient [1] and diffusion-weighted imaging (DWI) will be used for the quantification of lesion size and edema after TBI as well as iPSC-NSC injection.

Development of this model and novel iPSC-NSC treatment allows for the testing of efficacy and safety of novel stem cell therapies as well as traditional pharmacological and device approaches. This project has the potential to become an excellent platform for further large animal TBI treatment studies and future clinical trials on stem cell therapy treatments for neuronal injuries.
References:


Proposals

Spatial Interactions of Two Ecosystem Engineers across an Estuarine Gradient
2015 Summer Fellow: Lucas Montouchet
Research Mentor: Dr. Jeb Byers, Odum School of Ecology

Introduction:

Ecosystem engineers are species which have large effects on their environment, creating habitat and altering physical properties on which many other species depend.\(^1\)\(^2\) In estuaries of the southeastern USA, two ecosystem engineers are dominant – the reef forming oyster *Crassostrea virginica* and the Smooth Cordgrass *Spartina alterniflora*.\(^3\) These species collectively form the aboveground structure in estuarine ecosystems upon which numerous species depend.\(^1\) How these two species interact spatially is largely unexamined. Their distributions border each other, yet there is little understanding of what mechanisms set the boundary between these species, how these mechanisms may vary over environmental gradients, and how they might change with globally changing climate conditions, including sea level rise.

Methods:

I will quantify spatial relationships between *C. virginica* and *S. alterniflora* and how they vary across estuarine gradients by constructing high resolution maps. These maps will permit analysis of the spatial relationship between the two species and how their borders vary across areas of different flow, salinity, and compass orientation. At each of three regions in Georgia (Savannah, St. Catharine’s Island, and Jekyll Island) I will delineate three estuarine habitat types (tidal creek, brackish water river, and sound). Three 500m\(^2\) sites will be picked for each habitat at each region. A quad-copter drone will be used to take high resolution aerial images of the coastal marsh at low tide, focused on the border of *C. virginica* and *S. alterniflora*. The drone will take several photographs of the marsh at lower altitude which I will patch together using Photoscan, an imaging software that stitches together images to create an orthophoto. I will use ArcGIS to analyze the images and create a high resolution map of each site. Afterwards I will digitize both species within the images to calculate their area and quantify the size of overlap at their boundary.

Specifically, I will conduct 4 spatial analyses:

- **Analyses 1** will focus on *C. virginica* characteristics as a function of habitat type and latitude.
  - Analysis 1A will characterize reef shape by dividing reef perimeter by reef area. I predict reefs in sounds will have the largest value, and river reefs to be slightly smaller. I expect reefs in creek heads to have the smallest value as their shapes are usually circular.
  - Analysis 1B will characterize the reef length. I predict that rivers will be longest and sounds to be shorter, and creeks to be the shortest.

- **Analyses 2** will focus on *C. virginica - S. alterniflora* patterns and their variations.
  - Analysis 2A will examine the distance between reefs and closest *S. alterniflora* patches. I expect to see reefs in sounds to be the farthest away from *S. alterniflora* patches followed by creeks and rivers to be closest to *S. alterniflora* patches.
  - Analysis 2B explores area of *S. alterniflora* patches in relation to *C. virginica* reefs. I predict creeks and rivers will have similar size *S. alterniflora* patches and sounds will have patches of smaller area.

Conclusion:

Interactions among ecosystem engineers have the potential to affect entire ecosystems.\(^4\) Thus, understanding the factors that influence their distributions is of key importance, especially as
environmental factors are changing at a global scale. This research project is the first step in understanding how the relationship between *S. alterniflora* and *C. virginica* may change in the future as a result of climate change and sea level rise. It is possible creeks and rivers will become more isolated as a consequence. This project is part of a larger study examining the effects of these natural phenomena in relations to marine ecosystems.

**References:**


Proposals

Age-Related Trajectories of Neural White Matter in Schizophrenia and Healthy Controls
2015 Summer Fellow: Megan Murphy
Research Mentor: Dr. Jennifer McDowell, Department of Psychology

Background:
White matter (WM) supports cognition in the brain. WM structures are composed of densely packed bundles of myelinated axons. These bundles, fiber tracts, serve as conduits for the transmission of neural signals across the brain. Various tracts have been associated with specific cognitive functions, with greater WM integrity (i.e., more densely packed axons) related to higher scores on cognitive tasks (Genova et al., 2013). This proposal focuses on the effects of aging in WM structures controlling a specific subset of cognitive functions, broadly referred to as cognitive control (CC). CC refers to the management of processes including working memory, attention, and task flexibility that guide behavior (Cooper, 2010).

Cognitive control ability varies between people with schizophrenia (SZ) and healthy adults; SZ generally shows lower CC scores than healthy subjects of similar ages (Gómez-Benito et al., 2014). However, some otherwise healthy subsets of the general population show similar CC performance to people with SZ (Luna et al., 2007). As part of my CURO research in neural white matter alterations in schizophrenia, we demonstrated that adults with low cognitive control (LCC) and patients with SZ have comparable structural integrity in the superior longitudinal fasciculus (SLF). While SLF integrity did not differ between LCC and SZ, it was significantly lower in these groups as compared to people with high cognitive control (HCC).

To extend my work on this project, I plan to explore differences in two other CC-related tracts: inferior longitudinal fasciculus (ILF) and uncinate fasciculus (UF). Greater WM integrity in these tracts is related to better performance on CC tasks (Benedetti et al., 2011). Age will be included as an additional factor in the analysis. In adulthood, after the brain is fully developed, CC and structural integrity decrease with age (Kopp et al., 2014). Few studies, however, have compared how these decreasing rates (in both WM integrity and CC) compare between SZ and healthy individuals. My project primarily aims to examine how age-related changes in WM integrity of these tracts differ between HCC, LCC, and SZ.

Hypotheses:
Given the similarities in SLF integrity between LCC and SZ patients identified in our previous project, we expect similar patterns of degradation in LCC and SZ patients, beginning from a point of lower integrity and occurring more progressively than HCC. HCC is expected to maintain an initially greater WM integrity across adulthood (Cabeza et al., 2002).

Method:
This study will examine WM integrity in structures involved in CC (SLF, ILF, and UF) in HCC, LCC, and SZ groups. Participants will be divided into HCC and LCC groups based on their performance on complex span tasks (OSPAN, RST, and SST; Unsworth et. al., 2005). Participants will then undergo diffusion tensor imaging (DTI) scans. DTI assesses WM integrity by quantifying the directionality of water diffusion in the brain – water diffuses in a more organized manner (with greater anisotropy) in WM than in other brain tissues. The DTI data will be analyzed using fiber tracing software, allowing for isolation of the CC-related tracts (SLF, ILF, and UF). Values of diffusivity will be compared between groups as a function of age.
Summary:
This study aims to examine how age affects neural WM structure in healthy adults with varied levels of CC and patients with SZ. This study serves to extend the results of my data analysis this past fall by including additional CC-related fiber tracts (ILF and UF) and an additional factor, age. By providing insight into the pattern of WM integrity degeneration in these groups, we may be able to make better distinctions between relationships specific to SZ and those that are associated with cognitive control.

References:


Transcriptional Regulation of Energy Systems That Are Essential to Salmonella Typhimurium Virulence

2015 Summer Fellow: Selin Odman
Research Mentor: Dr. Anna Karls, Department of Microbiology

Salmonellosis is one of the most prevalent foodborne diseases in the world, with tens of millions of cases and more than one hundred thousand deaths each year. Salmonella enterica subspecies enterica serovar Typhimurium (SalTy) is the most common serotype of Salmonella associated with gastrointestinal disease in humans and has been extensively studied to reveal the virulence factors that lead to morbidity and mortality. As a model system, SalTy has led to definition of novel mechanisms of bacterial transmission and virulence,¹²³ and identification of new targets for vaccines.⁴ The emergence of pathogens with resistance to multiple antimicrobials has led to the search for new antimicrobials that have different targets in bacterial cells, including energy systems that are essential for survival in the infected host. In this proposed research, I will employ the SalTy system to characterize expression regulation of the hydrogenase energy systems Hyb, Hya, Hyd, and Hyc, which allow pathogens of the gastrointestinal system to utilize hydrogen for energy production in the aerobic small intestine or in the anaerobic large intestine of the infected host.⁵ These systems are potential targets for the development of new antimicrobials.

Initiation of bacterial transcription requires a sigma factor to interact with core RNA polymerase for identification of promoters and opening the double stranded DNA. Sigma54 (encoded by rpoN) is a highly conserved, widely distributed sigma factor that interacts with unique promoter sequences and atypically requires the presence of DNA-bound activator capable of hydrolyzing ATP to initiate transcription. Recent microarray and ChIP-chip (Chromatin Immunoprecipitation linked to microarray analysis) assays to detect sigma54-regulated genes and sigma54-holoenzyme DNA binding sites (performed by the Karls laboratory) identified an antisense sigma54-dependent promoter located between two annotated transcription start sites and the translation start site for the hyb hydrogenase operon whose activation appears to be associated with decreased transcription of this operon. This sigma54-dependent promoter was identified in the presence of a constitutive, promiscuous activator of sigma54-dependent transcription,⁶ so the focus of my work in the Karls lab this Spring 2015 semester is to define the physiologically relevant conditions that activate expression of this newly identified sigma54-dependent promoter.

Two of the four hydrogenase operons, hyc and hyd, are known to be transcribed from sigma54-dependent promoters in E. coli and controlled by the activator FhlA. FhlA becomes activated during anaerobic growth in the presence of formate and stimulates transcription from promoters that have an associated DNA binding site for FhlA. I am currently evaluating transcript levels, using quantitative reverse transcriptase polymerase chain reactions (qRT-PCR), of the hyb operon, the antisense sigma54-dependent transcript, and fdhF, a known FhlA-dependent gene in SalTy, for cells grown in FhlA-activating and non-activating conditions. This work is predicted to establish the native activation conditions for the antisense sigma54-dependent promoter indicated to interfere with transcription from the sigma70-dependent promoters for the hyb operon in assays that have been performed with the constitutive, promiscuous activator.

The goal for my research during the Summer 2015 semester is to see how this sigma54-dependent transcriptional interference of the hyb operon is linked to the regulation of the other hydrogenase operons whose activity can determine survival of Salmonella in the intestines.⁷ This provides more insight into the complex mechanisms of regulating expression of bacterial genes. I will compare the expression of all four hydrogenase operons in the absence and presence of sigma54 (we already have a rpoN mutant for SalTy) using qRT-PCR. I will then create a mutation in the antisense
sigma54-dependent promoter associated with the hyb operon using the lambda red-recombination system and determine whether the loss of sigma54-regulation of the hyb operon alters expression of the other hydrogenase operons.

References:

1. [http://www.who.int](http://www.who.int)


Understanding the Implications of International Intellectual Property Law on India-U.S. Relations

2015 Summer Fellow: Ashka Patel
Research Mentor: Dr. John Dayton, Department of Lifelong Education, Administration, and Policy

The necessity to reform intellectual property laws in the international realm in order to accommodate for treatable but expensive diseases in developing countries has recently sparked a global discussion about the intersection of biotechnology and intellectual property. There is international concern that patents should not be used as vehicles for healthcare monopolies. For instance, pharmaceutical patents may risk putting essential medicines beyond the reach of many people in need of treatment (Usha & Annadurai, 2469). Intellectual property policy is a critical component of substantial and continued price reductions. Valuing the human right to lifesaving medicines is vital in saving the lives of the millions of people without access to treatment. India is one such example where millions of citizens do not have access to lifesaving drugs.

One of the most contentious debates in international law in the past decade has been the issue of India safeguarding its intellectual property rights (IPRs) against Western developed nations with strict intellectual property law, particularly the U.S. (Forum, 87). In light of recent improvements in India-U.S. relations, the legal tug-of-war between large pharmaceutical companies in the U.S. and India’s relaxed interpretation of the Trade-Related Aspects of Intellectual Property Law (TRIPS) agreement could have negative impacts on trade between the two countries as well as further implications on international intellectual property law. Access to essential medicines is challenging for developing nations, and in many cases high prices of pharmaceutical drugs tend to be a barrier to distribution of these treatments (Halydier, 1486). The TRIPS agreement was created as a means to standardize IPRs to prevent patent protection from being violated internationally; however, a large part of the current discussion is on how it affects the current barriers to essential medicine access in developing countries. The Doha Declaration was created as an answer to this issue, as it gave priority to public health over private IPRs (Sahu, 189). Still, problems remain in international intellectual property law, and the India-U.S. debate is one of the most controversial. Big Pharma in the United States has been increasingly putting pressure on Congress to impose trade sanctions against India, the perpetrator of what large pharmaceutical companies maintain are violations of international intellectual property standards (Mrudula, 199). Part of the Indian Patents Act sets a much narrower standard for patentability than developed markets such as the U.S. and European nations. This is a growing concern for developed countries, as more developing countries are struggling to meet the needs of the ill and impoverished within their borders. Emerging issues in global health policy and disputes over intellectual property law inform the international legal landscape, including and especially regarding human rights.

This research aims to compare and analyze India’s participation in the World Trade Organization and the signing of the TRIPS agreement with prior international agreements that now influence intellectual property law as it applies to the distribution of and access to essential medicines in developing countries. It also seeks to explore the further implications on the relationship between global development and intellectual property rights based on the current issue of India-U.S. relations as affected by the biotechnical intellectual property rights debate. Using several key documents and sources for international intellectual property law, such as the DOHA Declaration 2001, the WTO General Council Decision 2003, and the TRIPS Agreement 1994, this research aims to answer the question of how past intellectual property concessions on the part of multinational corporations and states have affected access to medication for serious illnesses in developing markets and how those may...
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affect current and future negotiations, especially between the U.S. and India, about intellectual property law and standardization.

References:


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Approaches to Reducing the Cost of Algal Biomass Production
2015 Summer Fellow: Grace Power
Research Mentor: Dr. K. C. Das, College of Engineering

Algae biofuels offer a sustainable fuel for the future. Large-scale algae production can both lower atmospheric carbon and provide renewable biomass feedstock for biofuel production. The most prominent hurdle facing algae biofuels currently is the cost. These biofuels are currently not economically viable because large-scale algae production is delicate. Because lower-cost cultivation is done in open outdoor raceways, populations are commonly lost or reduced in productivity due to algal grazers such as ciliates and rotifers or environmental factors such as temperature swings. Increasing biomass at a low cost is the primary goal of algae biofuel research. The goal of this work is to determine whether synthetic auxin 1-Napthaleneacetic acid (NAA), a photosynthetic enhancer, will successfully increase algae biomass in a large scale environment.

Algae populations will be grown in 500-L raceways. Algal growth will be monitored by Total Suspended Solid (mg/L) and Optical Density measurements. Raceway temperature and pH will be measured multiple times daily. Weather data will be used to indicate low periods of photosynthesis due to cloud cover or high rates of photosynthesis due to cloudless days.

The algal strains used in the experiment will be determined after examining results from a current study on seven algal strains grown in 250-mL flasks in three different concentrations of NAA. This experiment will be used to screen for the two or three most productive, optimal algal strains to scale up into a 500-L pond. It will also indicate the optimal concentration of NAA to use in the summer project (2.5, 5, or 10 mg/L).

Literature Review:
NAA, a synthetic phytohormone, increases growth in certain strains of algae. In *Chlorella vulgaris*, treatment with NAA caused increased concentration of photosynthetic pigment, monosaccharides, and soluble protein. The optimum concentration of NAA for growth in *C. vulgaris* was found to be 1µM (Bajguz & Piotrowska-Niczyporuk, 2014). In a study of *Chlorella sorokiniana*, the optimal dosage of NAA was found to be in EtOH (500 mg/L) + NAA (5 mg/L) over a growth period of 10 days. This study predicted that if this process is scalable, it has the potential to lower biofuel production costs significantly (Hunt et al., 2011).

Methods:
Selected strains of algae will be inoculated in separate 250-mL flasks with 90 mL of BG-11 media. A certain concentration of NAA will be solubilized in ethanol and added to the experimental flasks. Control flasks will be given equal volumes of a 50:50 deionized water-ethanol-mixture. Cell density will be measured using Optical Density and Total Suspended Solids tests, and purity of the culture will be monitored with microscopy. When the algae shows satisfactory density, it will be transferred to a 500-mL flask, and media will be added to bring the solution to 300 mL. When this solution reaches satisfactory density, the algae will be transferred to a 2-L flask, and BG-11 media will be added to bring the solution to 1.5 L. The algae will be scaled up in this manner until it reaches proper density in 500-L raceways.

A 20 mL sample of algae will be taken from each raceway daily to test for total suspended solids and optimal density. Temperature and pH will be measured 3 times during the day: morning, afternoon, and late afternoon, to account for changes in algal productivity throughout the day.
Expected Results/Outcome:

Based on previous studies with phyto-hormones, we anticipate the algal productivity relative to controls to increase. This work will quantify the increase and determine the cost-benefit of this approach, along with the impacts of NAA on composition of the algal biomass produced.

References:


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Behavioral Economic Analysis of Relative Reinforcing Value as a Predictor of Smoking Cessation Treatment Outcomes

2015 Summer Fellow: Marie Rapoport
Research Mentor: Dr. Lawrence Sweet, Department of Psychology

Cigarette smoking is the leading cause of preventable death in the United States. Approximately 8.6 million people in the United States suffer from smoking-related illnesses, and smoking accounts for $75 billion of direct medical costs annually. Even so, about 20% of the US population are smokers. More than two thirds (70%) of adult smokers express a desire to quit, and approximately 40% make a serious attempt to quit each year. Relapse rates are exceptionally high, with fewer than 10% of smokers being able to succeed in quitting. Craving is one of the most influential constructs within addiction research, but researchers have found it challenging to consistently define and measure craving. Research on the ability of craving to predict relapse has been mixed and recent clinical models of addiction do not require craving to be present for relapse to occur.

Behavioral economics is a hybrid discipline of operant psychology and microeconomics that attempts to provide a more quantitative and objective approach to evaluating an individual’s motivation to use drugs. Using behavioral economic measures to assess the relative reinforcing value of a substance to an individual, or the amount an individual values a drug relative to other reinforcers, is an alternative to craving that does not rely on an individual’s subjective report of craving. Behavioral economic models of substance dependence consider addiction to be a state in which the relative reinforcing value of the substance is perceived to be higher than other reinforcers available in the individual’s environment, despite the consequences. One behavioral economic measure that is used is the cigarette purchase task (CPT), which is designed to assess the relative reinforcing value of nicotine in smokers by deriving demand curves that model how variability in price influences cigarette purchase patterns and indices of demand that describe that demand curve. These curves can then be translated into indices of demand, which each describe a different aspect of an individual's demand for a substance.

Purchase tasks can be useful in characterizing the progression of drug use and abuse. In smokers greater demand on the cigarette purchase task has been associated with higher levels of smoking and nicotine dependence. However, while a similar purchase task using alcohol was able to predict treatment outcomes in a study examining alcohol dependence in college students, the Cigarette Purchase Task has not yet been studied in relation to smoking cessation treatment outcome. Our population will consist of approximately sixty nicotine dependent smokers (10+ cigarettes a day) who will undergo eight weeks of Cognitive Behavioral Therapy and Nicotine Replacement Therapy in an attempt to help them reach and maintain smoking abstinence. The Cigarette Purchase Task will be administered before treatment begins. In this project, I would examine the following four indices of demand to determine if they are predictive of smoking cessation outcome in and their relationship to treatment outcome in nicotine dependent heavy smokers: (a) breakpoint (i.e., the first price at which consumption is zero), (b) intensity of demand (i.e., consumption at the lowest price), (c) elasticity of demand (i.e., sensitivity of cigarette consumption to increases in cost) (9), and (d) $O_{\text{max}}$ (maximum expenditure for cigarettes). We predict that the indices of demand generated in the Cigarette Purchase Task will be significant predictors of treatment outcome. It is our hope that this research will help us understand motivation for nicotine consumption and barriers to abstinence and contribute to the development of more effective prevention and intervention strategies for nicotine dependence.
References:


Hemorrhagic Disease and Blue Tongue Virus as a Case Study for Traditional and Machine-Learning Modeling Methods

2015 Summer Fellow: John Roquet
Research Mentor: Dr. Andrew Park, Odum School of Ecology

The world of statistical and mathematical modeling is being revolutionized by advances in machine-learning. This approach turns the world of traditional modeling on its head by eliminating the need for parametric assumptions of data and minimal data cleaning. One technique that has been recently adopted into the ecological realm is Boosted Regression Trees, which we have recently applied to an extensive data set concerning the *Culicoides* genus of midges, which vectors many arboviruses including Hemorrhagic Disease (HD) and Blue Tongue Virus (BTV) (Elith et al., 2008). This data set is large enough to serve as a basis for many methods of both traditional and machine-learning modeling techniques.

This project so far has developed predictors for the occurrence of several species of *Culicoides* and, therefore, for the spatially unequal risk of HD and BTV. These maps used 19 environmental, remotely-sensed covariates as predictors for the presence or absence of vector species. These findings provide a proof of concept for the application of machine-learning to infectious disease ecology, as well as an assessment of the impact of individual predictors in statistical models. The fact that there is variance among the models' most predictive variables warrants an in-depth analysis of both the biology of each species and the models themselves. A study in optimizing the explanatory variables will greatly improve the robustness of models used to predict vector-borne disease outbreaks.

Following an optimization of the BRT model, I will generate alternative models through the traditional methods of logistical regression and \( R_0 \) mapping (Hartemink et al., 2009). Then, I will utilize machine-learning techniques including neural-networks and random forests to predict disease outbreak probabilities. These techniques have been used in limited bioscience fields but rarely in ecology, and a comparison of all methods will allow insight into which of these new tools performs optimally. In other bioscience disciplines, these machine-learning techniques have been used to generate a variety of outputs (lab paper). This is well suited to studying infectious disease ecology, which employs a wide range of metrics with varying degrees of mathematical merit and, in most cases, extensive assumptions. If a new technique can be used to create a scoring function for disease risk, or a ranking of vector species with sound reasoning, the field could make great strides in the consistency of its metrics and, in a short time, apply the resulting functions and models to a wide variety of diseases (Durrant et al., 2015).

The final stage of my project is to apply the best techniques to new disease data and to confirm that the methods are highly effective and versatile. The Park Lab has extensive data on many diseases and these methods may be sufficient to apply to several existing, large data sets. These methods, while applicable to ecology, need sufficient investigation, testing, and understanding. This project will serve as a stepping stone to the illumination of these techniques as well as a guide to determining which techniques are most applicable to a given project or inquiry.
References:


Proposals

Immune Defense and Pathogen Resistance of Monarch and Queen Butterflies

2015 Summer Fellow: Hayley Schroeder
Research Mentor: Dr. Sonia Altizer, Odum School of Ecology

Most pathogens are generalists that can infect more than one host species, with host species that are biologically similar and that overlap in range being more likely to share pathogens in common. Yet in some cases, even closely related and ecologically similar hosts can differ in their susceptibility to infection by a shared parasite. Monarch butterflies (*Danaus plexippus*) and their close relatives, queen butterflies (*D. gilippus*), are similar in appearance, overlap in geographic range, and share the same milkweed host plant species. Their caterpillars can even be found feeding side by side on the same plants. Both butterfly species can be infected by the protozoan pathogen *Ophryocystis elektroschirra* (OE), transmitted when caterpillars ingest spores scattered on eggs and leaves by infected adult butterflies. With so much ecological overlap, queens and monarchs likely experience similar levels of exposure to this pathogen, but the prevalence of infection among queens is lower than observed for monarchs when sampled in the field. Past cross-infection studies with pathogens in the Altizer laboratory also showed that queens appear to be more resistant to infection than monarchs. This study will reexamine cross-infection between monarchs and queens by adding measures of butterfly development rate, lifespan, and parasite spore load. I will also measure two measures of immunity to understand if the differences in parasite prevalence between these two species stem from differences in their immune response.

To carry out this study, both infected and uninfected monarchs and queens will be collected from two locations in Savannah, GA. Infection status of adults will be determined non-destructively by examining abdominal scales for the presence of OE spores. Parasite strains from infected monarchs and queens will be propagated in the lab. Butterfly eggs will be collected from uninfected females of both species and caterpillars will be reared on greenhouse-grown milkweed in the lab. I will experimentally infect caterpillars with precise numbers of spores from either their own host species or from the alternate host species in a cross-infection design. A control group of caterpillars will remain healthy. Infected and control animals will be raised to adulthood. I will measure development rate, body size, OE spore load to determine the severity of infection, and adult lifespan. Immune defense metrics will be performed in caterpillars because they have abundant hemolymph (insect blood). I will use standard lab protocols to estimate hemocyte concentrations (insect immune cells), and will measure phenoloxidase activity (an immune enzyme that catalyzes the production of melanin).

I expect that monarchs will show greater tolerance (maintenance of higher fitness metrics for a given spore load) to infection by their native strain of OE than to the queen’s strain of OE. I predict that queens will have significantly higher immune defense measures than monarchs and will be more resistant (have a lower final spore load) to both strains of OE. I predict that caterpillars, in both queens and monarchs, with high hemocyte and phenoloxidase activity will have lower spore loads and greater longevity as adults than individuals with lower levels.

This study expands on knowledge gained from cross-infection experiments by exploring different immune strategies (tolerance vs. resistance) that could have evolved in two closely related butterfly species in response to a shared pathogen. Monarchs are experiencing increasing levels of OE infection in recent years, and understanding the role of immune defense in disease dynamics will provide a broader view of interacting factors affecting monarch population reduction.
Proposals

References:


Formation of Mitochondria-Targeted Blood Brain Barrier Penetrating Biodegradable Nanoparticles for Stroke Treatment

2015 Summer Fellow: Nivita Sharma
Research Mentor: Dr. Shanta Dhar, Department of Chemistry

As the third leading cause of death in the United States, stroke affects 800,000 people and takes the lives of 140,000 people every year.[1] When a patient suffers from stroke, the brain experiences tissue loss and damage due to inflammation and oxidative stress. Consequently, the patient loses some functions of the brain. Therefore, treatments are being developed to restore neural impulses to stimulate brain function.[2]

Adult stem cells (ASCs) have been used in studies to regenerate neural impulses. However, ASCs cannot survive long enough in such an environment in the brain, and therefore cannot integrate and replace lost cells.[2] Induced pluripotent stem cell derived neural stem cells (iNSCs) have been shown to be able to differentiate into neurons, astrocytes, and oligodendrocytes.[3] However, the success of regeneration of new cells from iNSCs varies because of the cytotoxic environment which results from inflammation and high oxidative stress from the brain injury.[4] As a result, it would be advantageous to treat the injured area of the brain with anti-inflammatory drugs, such as aspirin, to reduce the cytotoxic effect caused by inflammation.[5]

The objective of this project is to develop a targeted nanoparticle that can deliver aspirin across the blood brain barrier to reduce inflammation and oxidative stress in the brain so that iNSCs are able to differentiate and integrate into damaged cell tissue more successfully. We are trying to use our biodegradable nanoparticles to specifically target the mitochondria in the white matter of the brain. We want to target the white matter of the brain because inflammation and oxidative stress are diffused in the white matter after injury.[6]

We are synthesizing PLGA (poly(lactic-co-glycolic acid)-b-PEG nanoparticles that are appropriate to deliver substances to the brain because they have controlled drug release times, are easily biodegradable, can travel a variety of routes within the body, and can encapsulate a variety of drugs.[7] We use a combination of polylactic acid polymer and polyglycolylic acid polymer (PLGA) to create our nanoparticles because these combined polymers are highly biodegradable and nontoxic.[8] Polyethylene glycol (PEG) is also used to synthesize our nanoparticles because this polymer is hydrophilic in nature to allow the nanoparticle to survive and circulate throughout the body for longer.[9] Additionally, we attach triphenylphosphonium (TPP) cation to the polymer to create a highly lipophilic delocalized positively charged surface on targeted nanoparticles for mitochondria targeting properties.[10] My role in this project is to synthesize non-targeted (PLGA-PEG-OH) and targeted (PLGA-PEG-TPP) polymers that will be used to make the nanoparticles that will deliver the drugs to the brain. After successfully synthesizing these polymers, I will be involved in the process of synthesizing the nanoparticles that will be used to deliver aspirin to the damaged areas of the brain. The nanoparticles will then be used to perform cell studies to monitor the reduction of inflammation and oxidative stress in particular cell lines. Once the data shows that the drug delivery system effectively reduces inflammation and oxidative stress in the injured area of the brain, the iNSCs can be used to regenerate neural stimuli in a patient after a traumatic brain injury or stroke event. The development of this novel drug treatment can be used to save the lives of thousands of people who are affected by stroke each year by renewing brain function.
References:


Controversial African-American figures made impressions on history that constantly remain overlooked and that are abandoned partly due to racism and fear. As a result, the lives of black leaders who supported radical views become targets of hate and disgrace. Malcolm X stands as one of the most controversial black figures of the 20th century with his fiery style and fearless attitude in confronting white supremacy. His autobiography is an American classic, a guide for many individuals nationally and internationally. Yet, this classic limits our perception of such a complex being. So I ask, can personal written works change the public perception of a complicated black leader? Can Malcolm X be better understood through the unpublished works that contain his personal expressions, particularly his diaries and journals?

With the guidance of Dr. Carolyn Medine, I will explore the remnants of Malcolm X’s life that he chose to write on paper. My research will focus on his journals that remain at the Schomburg Center for Research in Black Culture in New York. I will compare these with *The Autobiography of Malcolm X* and Manning Marable’s *Malcolm X: A Life of Reinvention*. I desire to gain more insight into the evolution of his thought in relation to race in order to decipher the new philosophies that he developed. His travels to the Middle East and Africa in the 1960s changed many of his viewpoints, but we cannot fully grasp the impact of his exposure to places other than America. We simply do not have access to the individual that contributed to world history as a self-educated revolutionary (1). He expressed new ideologies concerning race relations along with the progression of society, but the press continued to identify him as a violent hate teacher before his death. His assassination also played a role in stunting a chance for his redemption in the public arena. Indeed, he could not avoid being labeled as a result of his affiliation with the Black Muslims and his powerful demeanor, which commanded much attention. I want to pick up where he left off in telling his story to the world in order to reveal the humanity of a black leader that fought for civil rights for all oppressed people.

Malcolm X left pieces of his expression of ideas that have yet to be explored through a literary and analytical lens. Indeed, these works may contain truths that must be revealed in order for us to reassess him as a historical American. His autobiography ends with deep regret and hope for his life along with the lives of all people in the world (2). These sentiments may be recorded with ample explanation in his unpublished journals and papers. The thoughts that he could not express in his autobiography may lie within unexplored material that may unveil unknown truths concerning his character.

The CURO Summer Research Fellowship will give me the chance to explore, in depth, dimensions of Malcolm X’s awakening abroad. The world deserves clarification in order to recollect not only the negativity associated with his name, but the enlightening aspects of his philosophy which remain buried within reflective material he authored. Race continues to dictate the paths of lives to this day. The content of Malcolm X’s diaries could reveal ways to recover from its overpowering impact. This fellowship will allow me to contribute to the scholarship on Malcolm X and on his visions of race in America as well as African American consciousness.
Proposals

References:


Expanding beyond Native Habitats: How Do Mangrove Crab Food Preferences Shift When They Outpace their Associated Habitat?

2015 Summer Fellow: Jessica Story
Research Mentor: Dr. Jeb Byers, Odum School of Ecology

Climate change is driving range expansions of species worldwide [1], and warming temperatures are causing global shifts in species distributions to higher latitudes and elevations [2]. In Florida, mangrove forests are advancing their northern limit in response to declines in the frequency of annual freezes [3]. In this case, climate-driven range expansion is not just changing mangrove distributions, but associated species such as the mangrove tree crab, *Aratus pisonii*, are also expanding northward. Historically, *A. pisonii* has been tightly associated with its habitat-provisioning species, the mangrove. However, the crab has recently been observed more than 109km ahead of its associate, as far north as the Little Satilla River in Georgia, where it is found in salt marsh habitat [4]. Because *A. pisonii* is expanding faster than its associated habitat provisioning species, it is unclear how the crab may be adapting to a completely novel habitat. Specifically, the crab may change its resource acquisition strategies in this new habitat. In its native range, *A. aratus* has a diet that consists of 84% mangrove leaf tissue [5]; however, when this essential food resource is not available in saltmarsh habitat, how does the crab manage to persist?

The object of this study is to understand the mechanisms that allow differential range expansion by associated species. I will examine how *A. pisonii* survives in novel saltmarsh habitat without its historically associated food- and habitat-provisioning species. I hypothesize that *A. pisonii* alters its diet and food preferences as it expands its range out of mangrove habitat. I will perform a mensurative survey and experimental feeding trials to examine how *A. pisonii* feeding habits vary across mangrove, saltmarsh-mangrove ecotone (range expansion front), and saltmarsh environments. I predict that *A. pisonii* will feed primarily on mangrove leaves in mangrove and ecotone habitats. *A. pisonii* from the ecotone will have a slightly more diverse diet than crabs from mangrove habitat, and crabs collected from saltmarsh habitat will be more general in their food preferences. Regardless of habitat source, I hypothesize that *A. pisonii* will always prefer mangrove leaves in feeding trials relative to saltmarsh vegetation due to the historical association of *A. pisonii* with its mangrove partner.

For the survey, I will determine crab diets by collecting *A. pisonii* from 9 sites along the mangrove gradient (3 saltmarsh, 3 saltmarsh-mangrove ecotone, 3 mangrove) from St. Augustine to Fort Pierce, Florida. 15 crabs each will be collected from saltmarsh and mangrove sites, and 30 crabs collected from the ecotone-15 from mangrove and 15 from saltmarsh vegetation. *A. pisonii* will be dissected to analyze their gut contents. To complement the dissections, muscle tissue from each crab will be processed for stable isotope concentrations. I will also collect vegetation, sediment, and animal samples from each site for isotope analysis so that I can ascertain dietary links for crabs from all potential sources. To experimentally analyze diet choices for crabs from each location, I will conduct feeding trials, with 15 crabs collected from the same sites as the survey (30 from ecotone sites). Feeding trials will be performed at the Whitney Marine Lab in Marineland, Florida. Equal numbers of crabs from each source habitat will be randomly assigned to a food treatment – mangrove leaves, marsh cordgrass, or a choice between mangrove and cordgrass. The experiment will run for two weeks, and I will measure vegetation biomass at the beginning and end of the trial. Biomass loss over time represents the response variable and will quantify crab food preference based on habitat source.
References:


Response of Heterotrophic Biofilms to Urbanization in Athens-Clarke County

2015 Summer Fellow: Rachel Usher

Research Mentor: Dr. Amy Rosemond, Odum School of Ecology

Background:

As urban areas increase globally, it is critical to understand the impact urbanization has on watersheds to inform management and conservation strategies. Termed the urban stream syndrome, aquatic ecosystems frequently experience similar cascading effects of urban land use. These alterations in the natural system are characterized by “flashier hydrograph, elevated concentrations of nutrients and contaminants, altered channel morphology and stability, and reduced biotic richness, with increased dominance of tolerant species” (Walsh et al., 2005). Treated and untreated forms of wastewater also change the water chemistry by increasing available nutrients and toxicants (Wenger et al., 2009).

Biofilm is an active biological surface on stream bottoms comprised of algae, bacteria, fungi, enzymes, and organic matter. With both autotrophic and heterotrophic components, biofilm forms the base of aquatic food webs and plays a role in primary production, organic matter decomposition, and nutrient spiraling. Heterotrophic biofilms specifically use carbon inputs, such as leaf litter and woody detritus, for growth and biosynthesis (Johnson et al., 2009). These biofilms make up the carbon base of streams and are extremely important for stream function by taking up pollutants and providing a basis for productive organisms (Webster et al., 2000; Wallace et al., 1997). My study will examine how the processing rates of these materials change with urbanization.

Research Description:

I will test how processing rates of particulate carbon are affected by watershed urbanization by conducting a study across several streams in Athens-Clarke County that differ in impervious surface cover in their watersheds.

Research Plan:

This project will assess the respiration rates of heterotrophic biofilms in six urbanized streams in Athens-Clarke County. Since the growth of heterotrophic biofilms is regulated by the substrate it adheres to, wood veneers will be placed in each stream and left for a period of time to allow for biofilm growth on the wood surface. These veneers will be contained within apparatuses that allow for water flow and exclude invertebrates. Once biofilm has established on the veneers, the heterotrophic biofilm will be analyzed in the lab for respiration and breakdown rates. There are two primary objectives for this study: 1) examine if urbanized areas are stimulating the respiration rates of heterotrophic biofilms; 2) analyze the data collected in conjunction with previous and ongoing watershed studies in Athens-Clarke County. This summer, a researcher in UGA’s River Basin Center will be collecting abiotic and invertebrate diversity data at the same experimental sites as my project. This will allow for collaboration both during and after the summer to create a more complete prospective on the health of local streams. The samples collected during the course of the project will be analyzed in the Odum School of Ecology and the Odum School of Ecology Analytical Chemistry Lab.

Ultimately, this project will contribute to ongoing research in a partnership between Athens-Clarke County and the Rosemond Laboratory with the goal of assessing the state of local streams in order to inform management decisions in the county.
Proposals

References:


2015 Summer Fellow: Jacob Young
Research Mentor: Dr. Michelle vanDellen, Department of Psychology

Research has shown that when people are exposed to weapons, their behavior changes significantly; specifically, they tend to become more aggressive (Berkowitz & LePage, 1967). Whether the stimulus is a gun or a club, physically present or represented by a picture, this tendency towards increased aggressiveness remains (Anderson et al., 2003). Referred to as the weapons effect, such findings have very real and dangerous implications, particularly with the increase in violence in the media (Bushman et al., 2013). Though the link between weapons priming and aggression has been studied extensively, the link between weapons priming and cognition has been a peripheral locus of study until recently. When cognition and weapons have been studied explicitly in the past, it was typically to show the effect of pre-existing racial bias on whether or not a person was perceived to have a weapon (Payne, 2001). A more generalized view on the effect of weapons priming on cognition is needed.

Dr. Michelle vanDellen’s lab, which I am a part of, ran a study in the fall of 2014 investigating whether being primed by a weapon (i.e., pictures of handguns) increased participants’ belief that the world is threatening. Our line of thinking was that if a person thought the world was more threatening, they would be more predisposed to acting aggressively, ostensibly in defense against the dangerous world they perceived themselves to be living in. Though seeing handguns did not increase belief in a threatening world overall, we found that participants who identified as politically liberal viewed the world as more threatening when they were primed to think of guns while those who identified as politically conservative viewed the world as less threatening, compared to not being primed to think of guns. We speculate that this is because conservatives, being more likely to own a gun, were more likely to think of the gun as one they might have while liberals, being less likely to own a gun, were more likely to think of this gun as one someone else might have. It is also possible that conservatives might feel more competent with a gun and liberals feel ill-equipped to use a gun in self-defense. With these results, we are planning to run another study in the fall in an attempt to determine the reason differences were found between these two groups. This will involve a replication of the previous study with the addition of questions about gun ownership, gun use competency, and interest in guns.

In addition to preparing this study, during the summer I will conduct a meta-analysis on studies relating weapons priming and cognition. Though meta-analyses have been conducted relating weapons priming and aggression, as well as racial bias and weapons perception, no meta-analysis has directly looked at the effect of weapons priming on cognition generally. The closest is a meta-analysis on studies investigating the “weapon focus effect,” which is unrelated to aggression (Steblay, 1992). The present study will begin with a review of the extant literature relating weapons to changes in cognition over the last 50 years. With the studies that are found, I will conduct a meta-analysis to determine whether there are regional differences in the effect of weapons priming on cognition, or if this effect has changed over time. Then, I will analyze the data and prepare a manuscript for publication on the results. Additionally, we will conduct our second study in the fall of 2015 to investigate whether familiarity and interest in guns results in a similar effect as our initial study on weapons priming and political beliefs.
Proposals

References:


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Appendix A
2014 CURO Summer Research Fellows

Kaitlyn Beck
Dr. Jonathan Evans, Department of English
Proposal for Research on the Old English Poem “Elene” by Cynewulf, with a Focus on the Figure and Propaganda of Constantine the Great

Brett Bennett
Dr. Brian Drake, Department of History
The Forgotten Radical: Southern Women and the New Left Student Protests of the 1960s

Michael Biddle
Dr. Susanne Ullrich, Department of Physics & Astronomy
Photophysics of a Eumelanin Chromophore – Indole

Charles Bond
Dr. Sudhagar Mani, College of Engineering
Techno-economic Assessment of Co-producing Bioplastics with Algae Biofuels

Jerica Bornstein
Dr. Michelle vanDellen, Department of Psychology
Health Behavior Change in Romantic Couples

Jiacheng Chen
Prof. Eileen Wallace, Lamar Dodd School of Art
Contemporary Artistic Approach toward Ancient Chinese Papermaking

Blair Christensen
Dr. Patricia Moore, Department of Entomology
Influence of Mating Behavior on Germline Stem Cell Reproduction in Three Species of Drosophila

Aaron Conley
Dr. Barry Hollander, Grady College of Journalism & Mass Communication
The Politicization of Soccer and the Effects of the 2014 World Cup on Brazilian Politics

Lydia Denison
Dr. Brian Haas, Department of Psychology
Exploring the Relationship between Oxytocin and the Tendency to Trust

Sarah Evans
Dr. Michael Pierce, Department of Biochemistry & Molecular Biology
Production of a Monoclonal Antibody Epitope Expressed on Pancreatic Adenocarcinoma

Emily Francis
Dr. Jennifer Palmer, Department of History
The Reign of Terror through the Lens of Revolutionary Culture

Delmaries González
Dr. Changying Li, College of Engineering
Development of Robots for Weed Control in Organic Farming
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Patrick Griffin
Dr. Robert Schmitz, Department of Genetics
Natural Epigenetic Variation of the SVP Locus in *Arabidopsis thaliana* is Associated with an Early-flowering Phenotype

Connor Hamm
Dr. Amitabh Verma, College of Environment & Design
Digital Cities: How Technology Is Building Parametric Structures and Societies

Andrew Jarnagin
Dr. Shane Hamilton, Department of History
The “Sublimated Essence of America” and the History of Coca-Cola in the Middle East

Thomas Johnston
Dr. Dorothy Fragaszy, Department of Psychology
Factors Influencing the Development of Extractive Foraging Skills in Juvenile Bearded Capuchins

Mugdha Joshi
Dr. Shelley Hooks, Department of Pharmaceutical & Biomedical Sciences
Determining the Role of RGS10 in Microglia, Neuroinflammation, and the Progression of Multiple Sclerosis

Megha Kalia
Dr. Robert Sabatini, Department of Biochemistry & Molecular Biology
Mechanism of Developmental Regulation of Base J Synthesis in *Trypanosoma brucei*

Danny Kanso
Dr. Charles Bullock, Department of Political Science
From Strom Thurmond to Lindsey Graham: Republicanism in the American South

Joshua Lukemire
Dr. Lawrence Sweet, Department of Psychology
Use of a Breath-hold Paradigm to Remove FMRI Variability Due to Vascular Factors in Older Adults with Cardiovascular Disease

Jason Moraczewski
Dr. Carl Bergmann, Department of Biochemistry & Molecular Biology
Assessment of Proteomic and Glycomic Profiling of Medaka (*Oryzias latipes*) to further the Understanding of the Physiological Response to Low-level Ionizing Radiation

Laura Nelson
Dr. Christopher Lawton, Department of History
“What It Is to Be Free:” Freedom and Black Community Development in Reconstruction Athens

Ijeoma Okoye
Dr. Neale Chumbler, Department of Health Policy & Management
Pregnant and Parenting Adolescents’ Use of Space for Stress Relief

Meredith Osborne
Dr. Lisa Renzi, Department of Psychology
The Effects of Lutein and Zeaxanthin on Cognitive Function and Neural Efficiency in Older Adults with and without Cognitive Impairment
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Joel Owen  
Dr. Dorothy Fragaszy, Department of Psychology  
Vocal Repertoire and Call Structure of Red-and-Green Macaws (Ara chloropterus)

Sora Park  
Dr. Richard Steet, Department of Biochemistry & Molecular Biology  
Using the Chemical Reporter Strategy to Analyze Glycoproteins in Pompe Disease

Hiral Patel  
Dr. Lisa Donovan, Department of Plant Biology  
Understanding Floral Trait Evolution in Wild Sunflowers

Paola Rivera  
Dr. Laura German, Department of Anthropology  
A Study of the Lamu-South Sudan-Ethiopia Transport (LAPSSET) Corridor on the Northern Rangelands Communities in Laikipia, Kenya

Yimeng Shi  
Dr. Christof Meile, Department of Marine Sciences  
Investigation of Intermediate Species with Different Geometry Settings between ANME Archaea and Sulfate Reducing Bacteria by Process-based Modeling

Danish Singh  
Dr. Lance Wells, Department of Biochemistry & Molecular Biology  
Investigating Genotype-phenotype Correlations in POMGnT1 Gene
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Appendix B
2013 CURO Summer Research Fellows

Meg Adams
Dr. William Miller, Department of Marine Sciences
Photochemical Production of Reactive Oxygen Species in the North Pacific

Tiffany Brown
Dr. Nicolás Lucero, Department of Romance Languages
The Importance of Local Grassroots Organizations in the Reshaping of Afro-Argentine Consciousness

Stanislav Bushik
Dr. Debra Mohnen, Department of Biochemistry & Molecular Biology
Exploring the Content and Structure of Proteoglycans in Rice Suspension Culture Cells

Anne Chen
Dr. Christopher Cornwell, Department of Economics
Sex Ratio and Risky Behavior on College Campuses in the United States

Megan Chesne
Drs. Michael and Rebecca Terns, Department of Biochemistry & Molecular Biology
Investigation of CRISPR/Cas Viral Defense System in Streptococcus thermophiles

Mary Douthit
Dr. Allen Moore, Department of Genetics
Influence of Octopamine in Parental Behaviors of Nicrophorus vespilloides

Allison Doyle
Dr. Julie Moore, Department of Infectious Disease
Exploring the Clinical Association between Placental Malaria and Preeclampsia: Assessing the Possibility of a Parasite-induced Imbalance in Tissue Factor and Angioregulatory Protein Production

Jane Egbosiuba
Dr. Zheng-Hua Ye, Department of Plant Biology
The Preliminary Investigation of Whether Switchgrass SND1 Orthologs Can Activate the Secondary Wall Biosynthesis

Barry Ervin
Dr. Jennifer Smith, Department of Telecommunications
The Use of Motion Picture Narrative to Capture the Relationship between Gender Identity and Expression

Seth Euster
Christopher Lawton, Department of History
The Heritage of Slavery on the Shields-Ethridge Farm

Emily Fawcett
Dr. Kelly Dyer, Department of Genetics
Investigating Female Re-mating Rates in Wild Drosophila neotestacea and Their Association with Sex-ratio Drive
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Austin Garner  
Dr. Andrea Sweigart, Department of Genetics  
Investigating the Genetic Factors Responsible for Postzygotic Isolation between Two *Mimulus* Species

Elizabeth Guarisco  
Dr. Carl Bergmann, Department of Biochemistry & Molecular Biology  
The Connection between Glycosaminoglycans and Pectins

Joseph Hopkins  
Dr. Alexander Sager, Department of Germanic and Slavic Studies  
Norse Mythology in Modern Popular Culture

Courtland Hyatt  
Dr. Amos Zeichner, Department of Psychology  
Effects of Music on Male Aggression: Do Lyrics Really Matter?

Mathew Joseph  
Dr. Julie Moore, Department of Infectious Diseases  
The Effects of Autophagy and Necroptosis in the Murine Model of Placental Malaria

Lara Mengak  
Dr. Nathan Nibbelink, Warnell School of Forestry and Natural Resources  
Assessing Potential Range Shifts of the American Alligator with Sea Level Rise

Kelly Murray  
Dr. Catherine Pringle, Odum School of Ecology  

Anish Narayanan  
Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology  
Analysis of Cancer Mutations in Protein Kinases using Semantic Web Technologies

Jennifer Pallansch  
Dr. David Hall, Department of Genetics  
Characterization of the Light Signaling System in Fireflies

Katie Partrick  
Dr. Laurie Reitsema, Department of Anthropology  
Exploring Effects of Stress and Dominance on the Weaning Strategies of Female Rhesus Macaques

Anthony Sadler  
Dr. Brian Drake, Department of History  
Lester Moody: A Man, a River, and a Quest for Industry in the Twentieth Century South

Will Saunders  
Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology  
Structure-Function Investigations of the Ste24p: A Metalloprotease Associated with Progeroid Disease

Natalie Schwob  
Dr. Dorothy Fragaszy, Department of Psychology  
Social Behavior and Vocal Repertoire of Wild Red and Green Macaws
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Scarlett Sumner
Dr. Michael Yabsley, Department of Wildlife Disease Ecology
Ecology and Genetic Characteristics of Haemogregarines in Fresh Water Turtles

Brian Underwood
Dr. Jennifer Palmer, Department of History
Jean-Jacques Rousseau and the Development of the Counter-Enlightenment

Stephanie Wilding
Dr. Brian Cummings, Department of Pharmaceutical & Biomedical Sciences
The Role of Cytochrome P450 Monooxygenase 2E1 in Bile Acid-induced Prostate Cancer Cell Death

Elizabeth Wilkins
Dr. Steve Stice, Department of Animal & Dairy Science
The Role of PAX6 in the Formation of Neural Rosettes in Induced Pluripotent Stem Cells

Travis Williams
Dr. Joy Doran Peterson, Department of Microbiology
Using Metabolically Engineered E. coli to Better Ferment Highly Industrially Processed Pectin-Rich Biomass

Leigh Anna Young
Dr. Marguerite Madden, Department of Geography
A Geospatial Analysis of Fission-Fusion Dynamics in Bearded Capuchin Monkeys
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Appendix C
2012 CURO Summer Research Fellows

William Austin
Dr. William Kisaalita, College of Engineering
Studies of Water Availability and Use in Tanzania

Conner Blackwell
Dr. Boris Striepen, Department of Cellular Biology
Striated Fiber Assemblin Protein Function in Tetrahymena

Stephen Bocarro
Dr. Jacek Gaertig, Department of Cellular Biology
The Characterization of Long Flagella Protein 4 in Tetrahymena thermophila

Hope Foskey
Dr. James Lauderdale, Department of Cellular Biology
Identification of GABA-Responsive Neurons in the Zebrafish Brain

Terese Gagnon
Dr. Virginia Nazarea, Department of Anthropology
Landscapes of the Interior: Ethnobotany and Senses of Palace among Karen Refugees

Devon Humphreys
Dr. Kelly Dyer, Department of Genetics
A Phylogenetic Approach to Investigating the Evolutionary History of the Quinaria Species Group of Drosophila

Emily Kopp
Dr. Chris Cornwell, Department of Economics
Immigration Law Reform and the Georgia Labor Market

Brittany McGrue
Prof. Sarah Zenti, Department of Furnishings and Interiors
The Need for Universal Design: An Environmental Assessment of Residential Interior Spaces and the Built Environment

Tuan Nguyen
Dr. Natrajan Kannan, Department of Biochemistry & Molecular Biology
Ca\(^2+\)/Calmodulin Dependent Protein Kinase (CAMK) Group: Evolution of Dynamic Regulatory Modules

Phillip Ogea
Dr. Arthur Roberts, Department of Pharmaceutical & Biomedical Sciences
Classification of the Transport Protein MDR3 and Its Effects on Multi-Drug Resistance

Ronke Olowojesiku
Dr. Nicole Gottdenker, Department of Pathology
Effects of Anthropogenic Land Use on Reservoir Host Potential of the Common Opossum *Didelphis marsupialis* in Panama
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Babajide Oluwadare
Dr. Duncan Krause, Department of Infectious Diseases
Analysis of P1 Function in *Mycoplasma pneumoniae* Adherence and Gliding

Elliot Outland
Dr. William Dennis, Department of Physics and Astronomy
Finite-Difference Time-Domain Investigations of Metamaterials

David Parker
Dr. Jennifer McDowell, Department of Psychology
Neural-mechanisms Underlying the Gap Effect: Why is 200 the Magic Number?

Anakela Popp
Dr. Dorothy Fragaszy, Department of Psychology
Development of Nut Cracking Skills in Young Bearded Capuchin Monkeys

Cameron Prybol
Dr. John Pickering, Odum School of Ecology
Lepidoptera Survey of San Luis Valley, Monteverde, Costa Rica

Nicholas Richwagen
Dr. K.C. Das, College of Engineering
Comparative Study of Chemical Flocculation vs. Autoflocculation for Microalgae Harvesting, *Scenedesmus bijuga, Chlorella minutissima* and *C. sorokiniana*

John Rodriguez
Dr. Donald Nelson, Department of Anthropology
Changing Food Security Strategies in Northeast Brazil: Fifteen Years of Development Policies on Household Ability to Buffer Drought Impacts

Cole Skinner
Dr. Michael Terns & Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Characterization of the Tneap Complex in the CRISPR-Cas Viral Defense System of Prokaryotes

Brittany Truitt
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology
Pharmacologic Rescue of Mutations That Affect Tissue-Specific Glycan Expression in *Drosophila melanogaster*

Stephanie Wilding
Dr. Brian Cummings, Department of Pharmaceutical & Biomedical Sciences
The Role of Secretory Phospholipase A2 in Bile Acid-Induced Prostate Cancer Cell Death

Anna Wilson
Dr. William Kretschmar, Department of English
Defining the Latino Experience in Roswell, GA: A Study in Sociolinguistics
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Appendix D
2011 CURO Summer Research Fellows

Lauren Anderson
Dr. Amy Ross, Department of Geography
The Legacy of Truth Analyzing the Impact of the Truth and Reconciliation Commission on South Africa’s Millennial Generation

Joshua Trey Barnett
Dr. Corey W. Johnson, Department of Recreation & Leisure Studies
Drag’s Not a Drag: Narrative Inquiry of Serious Drag Performers

Brooke Bauer
Dr. Robert Vandenberg, Department of Management
Organizational Commitment in the Workplace

Melissa Brown
Dr. Kecia Thomas, Department of Psychology
Black Stereotypes in Reality Television and the Reinforcement of Prejudiced Attitudes

William Costanzo
Dr. K.C. Das, Department of Biological & Agricultural Engineering
Algae Biofuel Development Growth Efficiency

Dervin Cunningham
Dr. Kelley Moremen, Department of Biochemistry & Molecular Biology
The Recombinant Expression of Proteins in the Glycosylation of Mammalian Cells

Abid Fazal
Dr. Joy Peterson, Department of Microbiology
Characterization of Enzymes Produced by Genetically Engineered Hypocrea jecorina and Their Use in Fermentation by Recombinant E. coli.

Melanie Fratto
Dr. Vanessa Ezenwa, Odum School of Ecology
Testing Bacteria-Killing Ability in Songbirds with Two Approaches Before and After Acute Stress

Nisha George
Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology
The Role of Cysteine Residues in the Function of the Ras Converting Enzyme (Rcelp)

Erin Giglio
Dr. Kelly Dyer, Department of Genetics
Sensory Systems at Play in Drosophila Courtship

Osama Hashmi
Dr. Monica Gaughan, Department of Health Policy & Management
From Malpractice to Medicare: Addressing the Legal Needs of Primary Care Physicians
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Anna Beth Havenar  
Dr. Dawn Robinson, Department of Sociology  
Religion and Impression Change Dynamics: An Affect Control Theory Analysis of Christianity and Islam

Ransom Jackson  
Dr. John C. Inscoe, Department of History  
A Comparative Study of Feminism in Southern Literature: Uncle Tom, Beulah and Aunt Phillis's Cabin

Elena James  
Dr. Russell Karls, Department of Infectious Diseases  
Detection of Mycobacterial Genes Involved in Vitamin 1B12 Uptake

Kellie Laity  
Dr. Dorothy Fragazy, Department of Psychology  
Development of Nut Cracking Skills in Young Bearded Capuchin Monkeys

Marianne Ligon  
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology  
Characterization of the Tnep Complex in the CRISPR-Cas Viral Defense System of Prokaryotes

Katherine Manrodt  
Dr. Steven Lewis, Department of Physics & Astronomy  
The Molecular Dynamics of Atomic Sticking Coefficients

Lindsey Megow  
Dr. Kaori Sakamoto, Department of Pathology  
Intestinal Nematode Infection’s Inhibitory Effect on M. bovis

Tuiumkan Nishanova  
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology  
Assembly of High Density Lipoproteins via Retained N-terminal Signal Peptides

Farres Obeidin  
Dr. David Hall, Department of Genetics  
Modeling Subtelomeric Growth and the Adaptive Telomere Failure Hypothesis

Joshua Parker  
Dr. Richard Steet, Department of Biochemistry & Molecular Biology  
Identification and Characterization of a Novel Beta-Galactosidase Enzyme in Brain

Lea Rackley  
Dr. Katarzyna Jerzak, Department of Comparative Literature  
Finding the Child in Children’s Literature

Luben Raytchev  
Dr. Michael Yabsley, Department of Wildlife Disease Ecology  
Intracellular Blood Parasites of Common Freshwater Turtle Species in Georgia: Prevalence and Burden
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Mark Rolfsen  
Dr. Jessica Muilenburg, Department of Health Promotion & Behavior  
The Implementation of Effective Smoking Cessation Intervention for Drug and Alcohol Addicts in Substance Abuse Treatment

Dana Schroeder  
Dr. Quint Newcomer, Director, UGA Costa Rica  
An Applied Research Examination of Progress Toward Sustainability Goals at UGA's Costa Rica Campus in San Luis de Monteverde, Costa Rica

Daniel Sharbel  
Dr. Timothy Dore, Department of Chemistry, and Dr. Walter Schmidt, Department of Biochemistry & Molecular Biology  
Assessing Reel-Protease Inhibition in a Cell-Based Fluorescence Ras Localization Assay

Daniel Smith  
Dr. Michael Marshall, Lamar Dodd School of Art  
Contemporary Interpretation of Dante Alighieri's Inferno Through Photographic Illustration

Justin Smith  
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology  
Characterization of a Putative Endonuclease-RNA Complex Involved in CRISPR-Mediated Viral Defense

Theresa Stratmann  
Dr. John Maerz, Warnell School of Forestry & Natural Resources  
The Science of Monitoring Rare Species Developing Methods for Surveying and Monitoring Bog Turtles

Christopher Sudduth  
Dr. Cathleen Brown, Department of Kinesiology  
Establishing Clear Cut-Off Scores to Develop Classification Criteria for Subgroups of Individuals with CAI

Connor Sweetnam  
Dr. Marcus Fechheimer, Department of Cellular Biology, and Dr. Ruth Furukawa, Department of Cellular Biology  
The Involvement of Coenzyme Q (50) and Tau in the Formation of Hirano Bodies

Nakul Talathi  
Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology  
Determining the Effect of Oncogenic Mutations on EGFR Protein Kinase Activation and Phosphorylation

Korry Tauber  
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology, and Dr. Lance Wells, Department of Biochemistry & Molecular Biology  
Examining the Function of O-GlcNAc in Drosophila to Analyze Intercellular Signaling Pathways

Nathan Usselman  
Dr. Jason Locklin, Department of Chemistry  
Synthesis of Enzyme Functionalized Conjugated Polymers for Implantable Power Sources
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Star Ye
Dr. Jason Zastre, Department of Pharmaceutical & Biomedical Sciences
Measuring Lactate Production to Understand Transketolase and Its Isoforms in Breast Cancer Cells
Appendices A-N

Appendix E
2010 CURO Summer Research Fellows

Jessica Alcorn
Dr. Audrey Haynes, Department of Political Science
The Validity of the News Marketing Hypothesis

Amarachi Anukam
Dr. Pamela Orpinas, Department of Health Promotion & Behavior
Healthy Teens: A Longitudinal Study of ‘At Risk’ Secondary Students

Thomas Bailey
Dr. William Kretzschmar, Department of English
Six Bodies: A Quantitative Analysis of Japanese Discourse Features

Michael Bray
Dr. Kelly Dyer, Department of Genetics
Genetic Analysis of Pigmentation in Drosophila tenebrosa

Ebony Caldwell
Dr. Monica Gaughan, Department of Health Policy & Management
Influences on the Outlook of the Post-college Educational Opportunities and Choices of Undergraduate Science Majors

Caitlin Cassidy
Dr. William Kretzschmar, Department of English
The Art of Persuasion: How Small Business Owners Use Speech to Market Products in Roswell, GA

Meagan Cauble
Dr. Mike Adams, Department of Biochemistry & Molecular Biology
Mechanism of Plant Biomass Conversion Without Pre-treatment by Anaerobic Thermophilic Bacterium *Caldicellulosiruptor bescii*

Daniel Celluci
Dr. Steven Lewis, Department of Physics & Astronomy
Applications of Molecular Dynamics Simulations to Models of Gas-Grain Interactions in the Interstellar Medium

Jessica Fazio
Dr. Richard Hubbard, Department of Chemistry
Carvone Luche Reduction Followed by Optical Activity Determination

JoyEllen Freeman
Dr. Barbara McCaskill, Department of English
Georgia Slaves in Transatlantic Culture: Blind Tom and William and Ellen Craft

Debashis Ghose
Dr. Joy Doran-Peterson, Department of Microbiology
Engineering Saccharomyces Yeast Strains to Better Ferment Pine Wood Biomass to Ethanol
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Camille Gregory
Drs. Marcus Fechheimer and Ruth Furukawa, Department of Cellular Biology
Creating a Transgenic Mouse to Study the Physiological Role of Hirano Bodies in the Progression of Alzheimer’s Disease

Shanterian Hester
Dr. Michael Pierce, Department of Biochemistry & Molecular Biology
Exercising Glycoproteomics Analyses to Discover New Breast Cancer

Georgianna Mann
Dr. Sonia Hernandez, Warnell School of Forestry and Natural Resources
Bufo marinus Pathogen and Parasite Analysis as a Model for Ecosystem Change

Krelin Naidu
Dr. Brian Cummings, Department of Pharmaceutical & Biomedical Sciences
Epigenetic Effects of Bromate on p21 and Histone-2AX Expression in HEK293 Cells

Rebecca Parker
Dr. Kevin McCully, Department of Kinesiology
Effects on Blood Flow Velocity and Arterial Diameter Produced by Compression Therapy in SCI Individuals

Jay Patel
Dr. Boris Striepen, Department of Cellular Biology
Characterization of Striated Fiber Assemblin Proteins in T. gondii

Rachel Perez
Dr. J. Peter Brosius, Department of Anthropology
Oil Palm Proliferation in Peru

Ryan Prior
Dr. Katarzyna Jerzak, Department of Comparative Literature
Foundations of Medical Philosophy in Ancient Civilizations

Malavika Rajeev
Dr. Sonia Altizer, Odum School of Ecology
The Effect of Parasite Infection on Monarch Butterfly Mating Behavior

Hope Rogers
Dr. Jonathan Evans, Department of English
Real-World Applications of Tolkien’s Races and Cultures

Carla Rutherford
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology
Human Resistance to Infection by African Trypanosomes

Laura Smart
Dr. Rheeda Walker-Obasi, Department of Psychology
Dialectical Behavior Therapy and Distraction: Using the Cold Pressor Test to Determine Efficacy
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Stephen Thompson
Dr. George Majetich, Department of Chemistry
Application of Friedel-Crafts Annulations to Conjugated Dienones and Silyl Substituted Arene Rings for the Synthesis of Complex Tricycles

Jake Young
Professor George Contini, Department of Theatre & Film Studies
A Study of the Psycho-Physical Performance Technique of Michael Chekhov
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Appendix F
2009 CURO Summer Research Fellows

Christine Akoh, CURO-OVPR Summer Research Fellow
Dr. Joseph Frank, Department of Foods & Nutrition
Effect of Mono and Divalent Cations on Biofilm Formation in a Prolific Biofilm Forming Strain of Listeria Monocytogenes Cultured in a Chemically Defined Medium

Sambita Basu, CURO-Jane and Bill Young Scholarship Summer Fellow
Dr. Gerardo Alvarez-Manilla, Department of Biochemistry & Molecular Biology
Protein-linked Glycoconjugates as Biomarkers for Cancer of Other Physiological Processes

Chip Blackburn, CURO-OVPI Summer Fellow
Dr. Hugh Ruppersburg, Department of English
Harry Crews and the Tradition of Southern Fiction-Writing

Corbin Busby, CURO Research Fellow
Dr. Isabelle Wallace, Lamar Dodd School of Art
Imaging Masculinity in Contemporary Fashion Photography

Kelly Cummings, CURO-OVPR Summer Fellow
Dr. Scott Schatzberg, College of Veterinary Medicine
Differentiation of Natural and Post-vaccinal Canine Distemper Virus Encephalomyelitis

Charles Ginn, CURO Research Fellow
Dr. Hugh Ruppersburg, Department of English
Charting the Oppression of Minority Groups through Southern Gothic Literature

Erin Hansen, CURO Research Fellow
Dr. Jennifer McDowell, Department of Psychology
Effects of Daily Saccade Practice on Behavioral and Neural Plasticity in Schizophrenics

Dillon Horne, CURO-OVPI Summer Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
The Development and Implications of Predictive Modes of Thought from the Renaissance to Modernity

Tiffany Hu, CURO Research Fellow
Dr. Stephen Hajduk, Department of Biochemistry & Molecular Biology
Re-examine Alternative Editing and Understanding the Protein Diversity in T. brucei

Whitney Ingram, CURO-OVPI Summer Fellow
Dr. Yiping Zhao, Department of Physics & Astronomy
Optimization and Analysis of Titanium Dioxide Nanorod Photodegradation

Daniel Jordan, CURO Research Fellow
Dr. Betty Jean Craig, Department of Comparative Literature
German Sustainable Farming as a Model for Resource Stewardship

Fahad Khan, CURO-ITP Summer Fellow
Dr. Jason Zastre, Department of Pharmaceutical & Biomedical Science
Highly Active Antiretroviral Therapy
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Max Klein, CURO-UGA Alumni Association Summer Fellow
Dr. Richard Steet, Department of Biochemistry & Molecular Biology
Gauging the Developmental Impact of Impaired Glycoprotein Breakdown in Zebrafish

Susan Klodnicki, CURO-OVPR Summer Fellow
Dr. Jim Lauderdale, Department of Cellular Biology, and Dr. Andrew Sornborger, Department of Mathematics and Engineering
PTZ and Other Chemoconvulsant Effects on Adult Zebrafish

Bridget Mailey, CURO Research Fellow
Dr. Amy Ross, Department of Geography
The ICC and the US: How Have the Actions of the US Affected the ICC in the Past and How Will They Affect the ICC in the Future?

Francisco Marrero, CURO Research Fellow
Dr. Leidong Mao, Department of Engineering
Development of Ferrofluid Based Platform for Particles and Cellular Manipulation

Amar Mirza, CURO Research Fellow
Dr. Natarajan Kannan, Department of Biochemistry & Molecular Biology
A Computational Study of the Crystalline Structure of Tyrosine Kinase Mutants

Cody Nichol, OVPR Research Fellow
Dr. Cynthia Suveg, Department of Psychology
Empirical Examination of Child Emotion Assessments: A Comparison of Child, Parent and Behavioral Observation Methods

Emily Pierce, CURO Summer Fellow
Dr. Wayne Parrot, Department of Crop & Soil Sciences
Genetic Alteration of the Soybean to Promote Astaxanthin Production

Akanksha Rajeurs, CURO Research Fellow
Dr. Russell Karls, Department of Infectious Diseases
Develop an Efficient Method to Create Marked and Unmarked Mutations in the Human Genome

Al Ray, III, OVPI Research Fellow
Dr. Susan Sanchez, Department of Infectious Diseases
Relationship between Epidemiology of Salmonella in Non-Domestic Avian Species and Humans in the Southeastern United States

Joe Reynolds, CURO Research Fellow
Dr. Frank Harrison, Department of Philosophy
Analysis of the Nature of the Individual and the Notion of His Happiness

Matthew Sellers, CURO Research Fellow
Dr. Hugh Ruppersburg, Department of English
Finding God in the Poetry of Robert Penn Warren

Michael Slade, CURO Research Fellow
Dr. Frank Harrison, Department of Philosophy
Implicit System of Rational Thought Analogous to Modern First-Order and Modal Logics in Plato’s Late Dialogues
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Alex Walker, OVPR Research Fellow
Dr. Timothy Dore, Department of Chemistry
Synthesis of BHQ-dithiol as a Photoremovable Protecting Group for Mifepristone

Shuyan Wei
Dr. Scott Schatzberg, College of Veterinary Medicine
Development of Consensus-Degenerate Hybrid Oligonucleotide Primers (CODEHOPs) for Retroviral Discovery

2009 Howard Hughes Medical Institute EXORP Student

Valeriya Spektor
Dr. Sue Wessler, Department of Plant Biology
Designing Teaching Modules for Genome Analysis
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Appendix G
2008 CURO Summer Research Fellows

Zachary Anderson, CURO Summer Research Fellow
Dr. Peter Brosius, Department of Anthropology
Multicultural Perspectives on Landscape Change

Matthew Belcher, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology
Determinants in the Localization of Telomerase to Telomeres

Mary Elizabeth Blume, CURO-OVPR Summer Research Fellow
Dr. Stefaan Van Liefferinge, Department of Art History
Uncovering Traditions of the Gothic Style in the Architectural Plans of Saint Germain-des-Pres and Saint Martin-des-Champ in Paris, France

Melissa Brody, CURO-OVPR Summer Research Fellow
Dr. Ron Carroll, Odum School of Ecology
Interactions of Bees and Hummingbirds with Hamelia patens

Carolyn Crist, CURO-UGA Summer Research Fellow
Dr. John Greenman, Grady College of Journalism & Mass Communications
News in the Black Belt: Teaching Journalists How to Cover Poverty in Persistently Poor Counties

M. Logan Davis, CURO-BHSI Summer Fellow
Dr. James Franklin, Department of Pharmaceutical & Biomedical Sciences
Long-Range Retrograde Transduction of Trophic and Survival Signals in Mouse Sympathetic Neurons

Marcus Hines, CURO-BHSI Summer Research Fellow
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology, and Dr. Lance Wells, Department of Biochemistry & Molecular Biology
Analyzing the Function of O-GlcNAc in Drosophila

Haylee Humes, CURO Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
How AICD and Fe65 Are Recruited to Hirano Bodies

Lindsay Jones, CURO Summer Research Fellow
Drs. Michael Terns and Rebecca Terns, Department of Biochemistry & Molecular Biology
Identification and Characterization of a Nuclease That Functions in an RNA-Mediated Viral Defense Pathway (RNAi) in Prokaryotes

Tyler Kelly, CURO Summer Research Fellow
Dr. Elham Izadi, Department of Mathematics
Usage of Linear Subspaces with Varieties

Jung Woong Kim, CURO Summer Research Fellow
Dr. Andrew Sorenborger, Department of Mathematics, and Dr. James Lauderdale, Department of Cellular Biology
Imaging of Endogenous Ca2+ Waves in Developing Zebrafish
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Jennifer Lee, CURO-BHSI Summer Research Fellow  
Dr. Ronald Blount, Department of Psychology  
Understanding Pediatric Symptoms

Sharon McCoy, CURO-OVPR Summer Research Fellow  
Dr. Chad Howe, Department of Romance Languages  
Dialect Perceptions of Spanish Speakers in Georgia

Katherine McGlamry, CURO-Jane and Bill Young Scholarship Summer Research Fellow  
Dr. Michael Tiemeyer, Department of Biochemistry & Molecular Biology  
Glycan Interactions and the Development and Spread of Cancer Cells

Alice Meagher, CURO-BHSI Summer Research Fellow  
Dr. Michael Adams, Department of Biochemistry & Molecular Biology  
Expression and Characterization of the Heterologously Expressed Soluble Hydrogenase I from Pyrococcus furiosus

Madison Moore, CURO-BHSI Summer Research Fellow  
Dr. Jennifer McDowell, Department of Psychology  
Behavioral and Neural Plasticity Following Daily Practice of Saccade Tasks in Schizophrenia

Emily Meyers, CURO-OVPR Summer Research Fellow  
Dr. Patricia Sullivan, Department of International Affairs  
The Advantage of Weakness: How Weak States Can Overcome Military Might of Strong States

Kelly Nielsen, CURO-OVPR Summer Research Fellow  
Prof. George Contini, Department of Theatre & Film Studies  
Augusto Boal's Invisible Theatre: Political Play with an Unassuming Audience

Sean O'Rourke, CURO Summer Research Fellow  
Dr. Kathy Simpson, Department of Kinesiology  
Neuromuscular Activation and Movement Kinematics Exhibited During the Sit-to-Stand by Multiple Sclerosis Individuals

Julie Patel, CURO Summer Research Fellow  
Dr. Patricia Sullivan, Department of International Affairs  
Military Interventions by Powerful States

Neil Pfister, CURO-BHSI Summer Research Fellow  
Dr. Michael Terns, Department of Biochemistry & Molecular Biology, and Dr. Rebecca Terns, Department of Biochemistry & Molecular Biology  
Interactions That Define the Organization of RNA-Protein Complexes Involved in Prokaryotic RNA Interference

Stefann Plishka, CURO-Franklin College of Arts and Sciences Summer Research Fellow  
Dr. Asen Kirin, Department of Art History  
Imagining Constantinople: Imperial Houses of Worship as Symbols of State Ideology

Katie Pyne, CURO Summer Research Fellow  
Dr. Jerome Legge, Department of International Affairs  
Refugees and Internally Displaced People: How Effective Are the United Nations, Nongovernmental Organizations, and Subsequent Initiatives in Pacifying This Complex Humanitarian Crisis?
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Joseph Rimando, CURO-Interdiciplinary Toxicology Program Summer Research Fellow
Dr. Ralph Tripp, Department of Infectious Diseases
Understanding and Preventing the Interaction between RSV’s G Protein and the CX3CR1 Cell Receptor

Aalok Sanjanwala, CURO Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology, and Dr. Ruth Furukawa, Department of Cellular Biology
The Effect of Hirano Bodies on Mutated Tau Protein

Neeraj Sriram, CURO Summer Research Fellow
Dr. Mark Eiteman, Department of Biological & Agricultural Engineering
Solving the World’s Energy Crisis – Not One Sugar at a Time

Giridhar Subramanian, CURO Summer Research Fellow
Dr. Brock Tessman, Department of International Affairs
Power and Influence in Southeast Asia: A Study of the Methods Used by India, China, and the United States

Aileen Thomas, CURO Summer Research Fellow
Dr. Nicole Lazar, Department of Statistics
How Random is Pseudorandom

Kathryn Turner, CURO Summer Research Fellow
Dr. Shelley Hooks, Department of Pharmaceutical & Biomedical Sciences
Comparison of RGS Regulation of LPA Signaling in Prostate Cancer and Ovarian Cancer

Manouela Valtcheva, CURO Summer Research Fellow
Dr. Jennifer McDowell, Department of Psychology
Antisaccade Performance and Deficit Characteristics in a Normal Population

Hunter Wilson, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
8-Chloro-7-hydroxyquinoline as a Bilogically Useful Photoremovable Protecting Group

Laura Wynn, CURO-OVPR Summer Research Fellow
Dr. Martin Kagel, Department of Germanic & Slavic Languages
Issues in Current Turkish-German Literature
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Appendix H
2007 CURO Summer Research Fellows

Caroline M. Anderson, CURO-OVPR Summer Research Fellow
Dr. John Turci-Escobar, Department of Music Theory, and Dr. Max Reinhart, Department of German
A Psychoanalytical Examination of Wolf and Mörike's Peregrina Songs

Joseph Burch, CURO Summer Research Fellow
Dr. Harry Daley, Department of Microbiology and Biochemistry & Molecular Biology
Converting Ferrochelatase into a Cytochrome c-like Protein

Amy Burrell, CURO-BHSI Summer Research Fellow
Dr. Debra Mohnen, Department of Biochemistry & Molecular Biology
Analysis of the Transcriptional Expression of Arabidopsis GAUT Genes: 15 Proven and Putative Plant Cell Wall Biosynthetic Galacturonosyltransferases

Lee Ellen Carter, CURO-OVPR Summer Research Fellow
Dr. Fausto Sarmiento, Department of Geography
Ecoregional Conservation among Indigenous Communities in Cotacachi, Ecuador

Kimberly DeLisi, CURO-BHSI Summer Research Fellow
Dr. Ray Kaplan, Department of Infectious Diseases
Parameters Affecting Fecal Egg Count Data for Determining Drug Resistance in Nematode Parasites of Horses

Joshua Dunn, CURO-OVPR Summer Research Fellow
Dr. William Kretzschmar, Department of English
The Youth of Roswell Voices: A Linguistic Analysis

Katie Flake, CURO-BHSI Summer Research Fellow
Dr. Maor Bar-Peled, Complex Carbohydrate Research Center
The Arabinose Kinase Project

James Gordy, CURO Summer Research Fellow
Dr. Michael Adams, Department of Biochemistry & Molecular Biology
Developing Methodologies for the Study of Small ORFs in \textit{P. furiosus}

Jana Hanchett, CURO Summer Research Fellow
Dr. David Schiller, Department of Musicology/Ethnomusicology
Latino and Hispanic Musical Influences on Athens-Clarke County

Laura Harrison, CURO-BHSI Summer Research Fellow
Dr. Corrie Brown, Department of Pathology
Campylobacter in the Crypts

Clare Hatfield, CURO-OVPR Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs
Democracy and the Choice of Law: The Intersections of Shari’a, Domestic and International Law
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**Anna Hudson**, CURO Summer Research Fellow  
Dr. Richard Dluhy, Department of Chemistry  
Using Surface Enhanced Raman Spectroscopy for the Detection of Pathogens

**Andy Kragor**, CURO-Jane & Bill Young Scholarship Summer Research Fellow  
Dr. Lance Wells, Complex Carbohydrate Research Center, and Dr. Carl Bergmann, Complex Carbohydrate Research Center  
Unbiased Isolation and Carbohydrate Mapping of Alpha-Dystroglycan

**Brian Laughlin**, CURO-BHSI Summer Research Fellow  
Dr. Alan Darvill, Complex Carbohydrate Research Center  
Functional Analysis of the Magnaporthe grisea Secretome

**James MacNamara**, CURO Summer Research Fellow  
Dr. Timothy Dore, Department of Biochemistry & Molecular Biology  
Synthesis of Quinolinol-Based Inhibitors of Rce1p

**Prashant Monian**, CURO-Interdisciplinary Toxicology Program Summer Research Fellow  
Dr. Brian Cummings, Pharmaceutical & Biomedical Sciences  
Molecular Inhibition of Independent Phospholipase A2 and its Effect on Prostate Cancer Growth

**Neil Naik**, CURO-OVPR Summer Research Fellow  
Dr. Ruth Harris, Department of Food & Nutrition  
The Effect of Antagonizing Stress Receptors in Rats During Repeated Exposure to Restraint Stress

**Natalie Nesmith**, CURO-BHSI Summer Research Fellow  
Dr. Mary Bedell, Department of Genetics  
Genetic Studies on the Roles of KITL in Regulating the Proliferation and Apoptosis of Primordial Germ Cells in Mice

**Victor Orellana**, CURO Summer Research Fellow  
Dr. Nicolás Lucero, Department of Romance Languages  
Unsung Hero: A Literary and Historical Study of Lautaro

**Tulsi Patel**, CURO Summer Research Fellow  
Dr. Scott Gold, Department of Plant Pathology  
Developing a Biocontrol Agent for Chinese Privet, *Ligustrum sinense*

**Tomas Pickering**, CURO-OVPR Summer Research Fellow  
Dr. Dorothy Fragaszy, Department of Psychology  
Manner of Hammer Stone Use in Wild Capuchin Monkeys

**Cleveland Piggott**, CURO-BHSI Summer Research Fellow  
Dr. Marcus Fechheimer, Department of Cellular Biology  
The Formation of Hirano Bodies

**Purvi Sheth**, CURO Summer Research Fellow  
Dr. Russell Karls, Department of Infectious Disease  
Characterization of *Mycobacterium shottsii*
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**Traci Tucker**, CURO Summer Research Fellow  
Dr. Dawn Robinson, Department of Sociology  
Gender and Role Meanings: A Cross-Cultural Comparison

**Jessica Van Parys**, CURO-UGA Alumni Association Summer Research Fellow  
Dr. David Mustard, Department of Economics  
Does Writing Ability Signal Academic Excellence?: Evidence from the New Scholastic Aptitude Writing Section (SATW)

**Delila Wilburn**, CURO Summer Research Fellow  
Dr. Barbara McCaskill, Departments of African American Studies and English  
Beauty Imposed

**Karen Wong**, CURO Summer Research Fellow  
Dr. Andrew Whitford, Department of Political Science  
Political and Social Foundations for Environmental Sustainability, Transfer Pricing, and Social Entrepreneurship
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Appendix I
2006 CURO Summer Research Fellows

Sarah Breevoort, CURO-BHSI Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
Construction of Three Reelp Mutant Plasmids to Aid in the Characterization of Reelp Enzymatic Activity

Lauren Coffey, CURO Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Susan Fang, CURO Summer Research Fellow
Prof. Christopher Hocking, Studio Foundations

Courtney Grant, CURO-BHSI Summer Research Fellow
Dr. Julie Coffield, Department of Physiology and Pharmacology
An Investigation of Botulinum Neurotoxin Interactions on RhoA Activity Using In Vitro Assays

Erica Hall, CURO-BHSI Summer Research Fellow
Dr. Jessie Kissinger, Department of Genetics

Adele Handy, CURO-UGA Alumni Association Summer Research Fellow
Dr. Greg Robinson, Department of Chemistry

Celan Hardman, CURO Summer Research Fellow
Prof. Joe Norman, Drawing and Painting

Sana Hashmi, CURO-Jane and Bill Young Scholarship Summer Research Fellow
Dr. Lance Wells, Complex Carbohydrate Research Center
Alteration of Alpha-Dystroglycan and Cancer Progression

Brian Levy, CURO Summer Research Fellow
Dr. Larry Nackerud, School of Social Work
Courrie – Not Email: Implications for Government Regulation of a Social Phenomenon. A Case Study of Language in France

Maggie Mills, CURO-NSF/SPiA Summer Research Fellow
Dr. Stephen Shellman, Department of International Affairs

Anna-Marieta Moise, CURO-BHSI Summer Research Fellow
Dr. Andrea Hohmann, Department of Psychology
Neurochemical Basis of Social Defeat in Syrian Hamsters: Role of Endogenous Cannabinoids

Lamar Moree, CURO-BHSI Summer Research Fellow
Dr. Alan Darvill, Complex Carbohydrate Research Center

Jesse Oakley, CURO Summer Research Fellow
Dr. Laurie Fowler, Department of Ecology
Economic Incentives for Private Land Conservation and Sustainable Development: Research into Environmental Policy in Costa Rica and Georgia
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Katie Orlemanski, CURO-OVPR Summer Research Fellow
Dr. Patricia Richards, Department of Sociology
Reclaiming “Development” within the Context of Low-Income Neighborhoods

Danielle Pearl, CURO-OVPR Summer Research Fellow
Dr. Keith Langston, Germanic and Slavic Languages
Press Freedom, E.U. Accession, and Democracy in Croatia

Daniel Perry, CURO Summer Research Fellow
Dr. David Landau, Department of Physics and Astronomy

Andrew Pierce, CURO Summer Research Fellow
Dr. Thomas McNulty, Department of Sociology

Richard Piercy, CURO-OVPR Summer Research Fellow
Dr. Cory Momany, Department of Pharmaceutical and Biomedical Sciences

Kurinji Pandiyan, CURO Summer Research Fellow
Dr. Steven Holloway, Department of Geography
Understanding Public Space in a New Urbanist Development

Mandy Redden, CURO-BHSI Summer Research Fellow
Dr. Robert Arnold, Department of Pharmaceutical and Biomedical Sciences
Towards a More Effective Delivery System for Anti-Cancer Drugs

Eva Bonney Reed, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology

Lisa Rivard, CURO-Toxicology Summer Research Fellow
Dr. Jeff Fisher, Toxicology

Sonia Talathi, CURO-OVPR Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
Effectiveness of Ca2+-Independent Phospholipase A2 Inhibitors in the Induction of Chemotherapeutic-Induced Cancer Cell Death

Erika Vinson, CURO Summer Research Fellow
Dr. Richard Siegesmund, Art Education

Joshua Watkins, CURO Summer Research Fellow
Dr. Patricia Sullivan, Department of International Affairs
The Price of Victory: When Leaders Underestimate the Cost of War

Daniel Weitz, CURO-OVPR Summer Research Fellow
Dr. Gary Bertsch, Department of International Affairs
The Impact of a European Union Nuclear Weapons Free Zone on the International Non-Proliferation Regime

Shannon Yu, CURO-BHSI Summer Research Fellow
Dr. Nancy Manley, Department of Genetics
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Appendix J
2005 CURO Summer Research Fellows

Grace Anglin, CURO-OVPR Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Family Focused Emotion Communication Training

Ashley Beebe, CURO Summer Research Fellow
Dr. James R. Holmes, Center for International Trade and Security
The Influence of Media on Economic Policy in Brazil and Argentina

Ingrid Bloom, CURO-BHSI Summer Research Fellow
Dr. Steven Steice, Department of Animal and Dairy Science
Differentiation of Human Embryonic Stem Cells into Endothelial Progenitors

Ian Lewis Campbell, CURO Summer Research Fellow
Dr. Glenn Wallis, Department of Religion
Theories of Mythology and the Way That Myths Have Affected Social and Political Formation

Kimberly Coveney, CURO-CIT Summer Research Fellow
Dr. Brian Cummings, Department of Pharmaceutical and Biomedical Sciences
Role of iPLA2 in Phospholipid Metabolism in Chemotherapeutic-Induced Cancer Cell Death

William Collier, CURO-OVPR Summer Research Fellow
Dr. Amy D. Rosemond, Institute of Ecology
Analysis of an Exotic Species’ Interactions with Native Aquatic Trophic Dynamics: Quantifying the Effects of the North American Beaver (Castor canadensis) on Sub-antarctic Stream Food Webs in the Cape Horn Archipelago, Chile

John Crowe, CURO Summer Research Fellow
Prof. Mark Callahan, Ideas for Creative Exploration
AUX Launch: Art, Representation, and Commerce on the Web

Katie Griffith, CURO Summer Research Fellow
Dr. Diana Ranson, Department of Romance Languages, and Dr. Judith Preissle, College of Education
Assessing Cultural Values and Political Beliefs in a Nicaraguan Classroom: A Participant Observation

Matthew Haney, CURO-CTEGD Summer Research Fellow
Dr. Rick Tarleton, Department of Cellular Biology
Antibody Depletion of Highly Abundant Proteins in Trypanosoma cruzi for the Fine-tuning of Proteomic Analysis

Ned Hembree, CURO Summer Research Fellow
Dr. Timothy Dore, Department of Chemistry
Rce1 and Ste24 Inhibition by Dipeptidyl Acyloxymethyl Ketones: A Potential Target for Cancer Therapeutics

Alicia Higginbotham, CURO Summer Research Fellow
Dr. Thomas Cerbu, Department of Comparative Literature
Christopher Logue’s Iliad: A Work in Translation
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Scott Jacques, CURO Summer Research Fellow
Dr. Mark Cooney, Department of Sociology
The Social Reality of Young, Middle Class Drug Dealers

Lisa Jordan, CURO Summer Research Fellow
Dr. Ruth Harris, Department of Food and Nutrition
The Effect of Leptin on Sympathetic Nerve Activity in White Adipose Tissue

Carey Kirk, CURO-OVPR Summer Research Fellow
Dr. David Z. Saltz, Department of Theatre and Film Studies
The Effectiveness of Drama Techniques in Treating People Suffering from Trauma

Andrew Leidner, CURO-CTEGD Summer Research Fellow
Dr. Pejman Rohani, Institute of Ecology
Coevolutionary Behavior and Interference between Fatal Diseases

Jon McGough, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
The Role of Female Choice in Sexual Selection of Drosophila pseudoobscura

Tatyana Nienow, CURO-BHSI Summer Research Fellow
Dr. Walter K. Schmidt, Department of Genetics
Adapting Yeast for the Study of Pitrilysin and Other M16A Enzymes

Erika Porter, CURO-BHSI Summer Research Fellow
Dr. Charles H. Keith, Department of Cellular Biology
Intrinsic Fluorimetric Imaging of Neural Activation in Cultured Cells and Zebrafish

Kurinji Pandiyan, CURO-CAES Summer Research Fellow
Dr. Raj Rao, Department of Animal and Dairy Science, and Dr. Steven Stice, Department of Animal and Dairy Science
Genomic Instability of Human Embryonic Stem Cells

Kelly Proctor, CURO-OVPR Summer Research Fellow
Dr. Lee B. Becker, College of Journalism and Mass Communication
Differences in Environmental Reporting: China and the United States

Rebecca Trupe, CURO Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Family Focused Emotion Communication Training

Russ Richardson, CURO Summer Research Fellow
Dr. Ron Carroll, Institute of Ecology
Sugarcane Processing Waste as a Soil Amendment on Organic, Shade-Grown Coffee under Simulated Drought Conditions for Control of Plant-Parasitic Nematodes

Dustin Williams, CURO-BHSI Summer Research Fellow
Dr. Scott T. Dougan, Department of Cellular Biology
Development of Transgenic Zebrafish to Understand How Activation of Hyal-2 Leads to Tumor Formation
Fei Yang, CURO Summer Research Fellow
Dr. Janet Westpheling, Department of Genetics
Regulation of Branched-Chain Amino Acid Catabolism in Streptomyces coelicor: Applications for Metabolic Engineering of Polyketide Antibiotic Biosynthesis

Stephanie Yarnell, CURO Summer Research Fellow
Dr. Carl Bergmann, Complex Carbohydrate Research Center
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Appendix K
2004 CURO Summer Research Fellows

Cara Altimus, CURO Summer Research Fellow
Dr. Jonathan Arnold, Department of Genetics
Isolation of a Light Receptor in the Biological Clock of N. crassa

Westin Amberge, CURO-BHSI Summer Research Fellow
Dr. Steven Stice, Department of Animal and Dairy Science
Guided Differentiation of Human Embryonic Stem Cells into Endothelial Cells: Focusing on the Ulex Europaeus Agglutin I Lectin

Namrata Asuri, CURO Summer Research Fellow
Dr. Sidney Kushner, Department of Genetics
Analysis of the Role of Ribosomal S1 in the Polyadenylation Pathway of Eschericia coli

Erin Bohan, CURO-OVPR Summer Research Fellow
Dr. Katarzyna Jerzak, Department of Comparative Literature
The Reconciliation of Selves: The Emigrant Experience in America

Rebecca Brantley, CURO-OVPR Summer Research Fellow
Ms. Ashley Callahan, Georgia Museum of Art
The Early Fashion Design of Mariska Karasz and the Influence of Her Native Hungary

Josef Broder, CURO Summer Research Fellow
Dr. Andrew Sornborger, Department of Mathematics
Techniques in High Noise Image Analysis

Beau Bryan, CURO-BHSI Summer Research Fellow
Dr. Michael Pierce, Department of Biochemistry and Molecular Biology
N-Cadherin Gl

Susannah Chapman, CURO Summer Research Fellow
Dr. Virginia Nazarea, Department of Anthropology
Designing Sui Generis Systems for Traditional Plants and Associated Local Knowledge

Clayton Griffith, CURO-OVPR Summer Research Fellow
Dr. Amy Rosemond, Institute of Ecology
The Effect of the North American Beaver (Castor Canadensis), an Exotic Herbivore, on the Composition, Structure, and Regeneration of the Riparian Vegetation of Sub-Antarctic Forested Streams in Chile

Christopher Hale, CURO-BHSI Summer Research Fellow
Dr. Thomas F. Murray, Department of Physiology and Pharmacology
Adolescence as a Distinct Period of Vulnerability to Nicotine Addiction

Catherine Hudson, CURO-BHSI Summer Research Fellow
Dr. Harry Dailey, Department of Microbiology and Biochemistry and Microbiology
Negatively Affecting the Heme Biosynthetic Pathway in “Escherichia coli”
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Douglas Jackson, CURO Summer Research Fellow
Dr. Nigel Adams, Department of Chemistry
Reactions of Protonated Carboxylic Acid Ions with Amines in the Interstellar Medium

Andrew Leidner, CURO-BHSI Summer Research Fellow
Dr. Pejman Rohani, Institute of Ecology
Parasitoid Behavior and Evolutionary Dynamics

Janel Long, CURO-OVPR Summer Research Fellow
Dr. Jean Martin-Williams, School of Music
The Partitas of Franz Krommer and Natural Horn Technique

John McWhorter, CURO-BHSI Summer Research Fellow
Dr. Daniel Colley, Department of Microbiology
Induction of the Regulatory Ligand PD-L2 and the Co-regulatory Receptor PD-1 on CD4 Lymphoctes
During Early Experimental Schistosomiasis Mansoni

William Parker, CURO Summer Research Fellow
Dr. Marly Eidsness, Department of Chemistry
Trigger Factor

Gehres Paschal, CURO-OVPR Summer Research Fellow
Dr. J. David Puett, Department of Biochemistry and Molecular Biology
Activating Mutations of the Lutropin/Choriogonadotropin Receptor Associated with Familial Precocious Puberty, Male Pseudohermaphorditism, Hypogonadism, Amenorrhea, Leydig cell Hyperplasia, and Metastatic Thyroid Carcinoma

Kevin Patrick, CURO Summer Research Fellow
Dr. James Anderson, Department of Classics
Cicero and the Foundations of a Legal Education at Rome

Katherine Price, CURO Summer Research Fellow
Dr. Janet Westpheling, Department of Genetics
Site Specific Chromosomal Integration Mediated by Bacteriophage Integrase

Matthew Rudy, CURO Summer Research Fellow
Dr. Marly Eidsness, Department of Chemistry
Analysis of Cotranslational Protein Folding in E-coli and Determination of the Role of the Trigger Factor Gene in the Folding Process

Desiree Smith, CURO Summer Research Fellow
Dr. Roberta Fernandez, Department of Romance Languages
Projecting a Positive Educational Experience for Latina/os in the South

Christopher Stokes, CURO-OVPR Summer Research Fellow
Dr. Randy Kamphaus, School of Professional Studies
Family Health and Classroom Behavior: A Pilot Study

Shana Strickland, CURO-BHSI Summer Research Fellow
Dr. Kimberly Shipman, Department of Psychology
Emotional Regulation and Coping Skills in Maltreated Children

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Adam Stroupe, CURO Summer Research Fellow
Dr. Boris Striepen, Department of Cellular Biology
Drug and Nutrient Trafficking in the Human Pathogen Cryptosporidium parvum

Teerawit Supakorndej, CURO-BHSI Summer Research Fellow
Dr. Michael Terns, Department of Biochemistry and Molecular Biology

Tendoh Timoh, CURO Summer Research Fellow
Dr. Marly Eidsness, Department of Chemistry
Fluorophore-modified Nascent Polypeptides

Jora Vaso, CURO-OVPR Summer Research Fellow
Dr. Katarzyna Jerzak, Department of Comparative Literature
The Effect of Communism on the Works of Andric, Kadare, and Szymborska

Leslie Wolcott, CURO-OVPR Summer Research Fellow
Dr. Betty Jean Craige, Center for Humanities and Arts
The Environment in Georgia’s Literature, Past and Present
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Appendix L
2003 CURO Summer Research Fellows

Anthony Anfuso, CURO Summer Research Fellow
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology
Developing a Fast Plant Expression System to Identify Biosynthetic Genes Involved in Pectin Synthesis

Tiffany Beal, CURO-BHSI Summer Research Fellow
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
Determining How Pectins Inhibit Cancer Growth and Metastasis

Robert Brady, CURO Summer Research Fellow
Dr. Nader Amir, Department of Psychology
Malleability of Interpretation Bias in Social Anxiety and General Anxiety

Josef Broder, CURO Summer Research Fellow
Dr. Chi N. Thai, Department of Biological and Agricultural Engineering
Operational Characteristics of a Mobile Spectral Imaging System for Plant Health Detection

Martha Rose Calamaras, CURO Summer Research Fellow
Dr. Kim Shipman, Department of Psychology
Emotional Understanding in Abused and Neglectful African-American Families

Daniel del Portal, CURO-BHSI Summer Research Fellow
Dr. Marcus Fechheimer, Department of Cellular Biology
The Physiological Role of Hirano Bodies

Dustin Dyer, CURO Summer Research Fellow
Dr. Guigen Zang, Department of Biological and Agricultural Engineering
Dr. Michael Geller, Department of Physics and Astronomy
Energy Dissipation in Nanomechanical Resonators

Sarah Fritts, CURO Summer Research Fellow
Dr. John P. Carroll, School of Forest Resources
An Inventory and Assessment of Medicinal Plants and Animals Used by Makuleke Traditional Healers on the Northern Boundary of the Kruger National Park, South Africa

Betsy Goodwin, CURO-BHSI Summer Research Fellow
Dr. Ronald Blount, Department of Psychology
A Study of the Psychology of Pediatric Pain and Chronic Illness

Patrick Gosnell, CURO Summer Research Fellow
Prof. Ben Reynolds, Department of Photography
The Beautiful and the Absurd

Paulette Andrea Greene, CURO-BHSI Summer Research Fellow
Dr. Wyatt Anderson, Department of Genetics
Conspecific Sperm Precedence and Speciation in Drosophila pseudoobscura
Andrea Haltiner, CURO-BHSI Summer Research Fellow  
Dr. Ruth Harris, Department of Foods and Nutrition  
The Effects of Leptin on Leptin Receptor Expression in High-Fat Fed Mice

Luke Hoagland, CURO-BHSI Summer Research Fellow  
Dr. Marcus Fechheimer, Department of Medical Cellular Biology  
The Role of Myosin II in Hirano Body Development and the Impact of Hirano Bodies on Cell Viability

Christopher "Kit" Hughes, CURO Summer Research Fellow  
Prof. Mark Callahan, School of Art  
Tagging

Steven Jocoy, CURO Summer Research Fellow  
Dr. Michael Bender, Department of Genetics

Leena Kukkarni, CURO Summer Research Fellow  
Dr. Maor Bar-Peled, Department of Biochemistry and Molecular Biology  
Identification Characterization of Enzymes and Gene Products Involved in the Synthesis of Pectic Polymers Using Mucilage as Acceptors

Valerie Marshall  
Dr. Ben Blount, Department of Anthropology

Ashley Neary  
Dr. Susan Sanchez, Department of Medical Microbiology and Parasitology  
Sensitive and Specific Detection of Fungal Keratitis in Horses

Ngozi Ogbuehi, CURO Summer Research Fellow  
Dr. Mary Alice Smith, Department of Environmental Health Science  
Comparing Apoptosis During Different Stages of Limb Development in Chick Embryos

Melissa Payton, CURO Summer Research Fellow  
Dr. Lillian Eby, Department of Psychology  
Antecedents and Consequences of Networking Behavior for Individuals Seeking Reemployment

John Drew Prosser, CURO Summer Research Fellow  
Dr. Wyatt Anderson, Department of Genetics  
Kin Recognition in Drosophila paulistorum

Ryan Rhome, CURO Summer Research Fellow  
Dr. Jan Westpheling, Department of Genetics  
Analysis of bkdR Protein Function in Streptomyces coelicolor and S. avermitilis

Susan Ritger, CURO-BHSI Summer Research Fellow  
Dr. Duncan C. Ferguson, Department of Physiology and Pharmacology  
Immunoreactivity and Bioactivity of Recombinant Thyrotropins (TSH)

Ben Solomon, CURO Summer Research Fellow  
Dr. Kevin McCully, Department of Exercise Science  
Measuring Age Related Changes in Muscle Compliance Using Ultrasound
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Mary Tolcher, CURO Summer Research Fellow
Dr. Tim Hoover, Department of Microbiology
Identification of Developmentally Regulated Proteins in the Budding Bacterium *Hyphomonas neptunium*

Meghan Wilson, CURO-BHSI Summer Research Fellow
Dr. James Lauderdale, Department of Cellular Biology
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Ryan Wilson, CURO Summer Research Fellow
Roger Moore, Department of Landscape Architecture

Thomas Wood, CURO Summer Research Fellow
Dr. Walter Schmidt, Department of Biochemistry and Molecular Biology
Analysis and Characterization of CAAX Proteases
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Appendix M
2002 CURO Summer Research Fellows

Nadia Behizadeh
Dr. Tricia Lootens, Department of English

Ashley D. Chadha
Dr. Michael McEachern, Department of Genetics
Characterization of stn-1 M1 mutant in K. lactis

Emily DeCrescenzo
Dr. Susan Sanchez, Department of Biochemistry and Molecular Biology
Development of a Detection Method for TSST-1 exotoxin from Staphylococcus aureus Associated with Toxic Shock Syndrome in Horses Directly from Clinical Samples

Ivy Forkner
Dr. Debra Mohnen, Department of Biochemistry and Molecular Biology
Functional Expression of Putative Biosynthetic Genes for Pectin: A Plant Polysaccharide with Anti-Cancer Activity

Cory S. Gresham
Dr. James B. Stanton, Department of Pathology, and Dr. Corrie C. Brown, Department of Pathology
Development of a Reverse Transcriptase-Polymerase Chain Reaction Based Assay for the Detection and Differentiation of Dolphin Morbillivirus and Porpoise Morbillivirus

Nowell Hesse
Dr. Maor Bar-Peled, Department of Plant Biology
Identification of Nucleotide-Sugar Biosynthetic Genes Involved in Glycoconjugate Synthesis

Matt Hoffman
Dr. Will York, Department of Biochemistry and Molecular Biology
Comparative Structural Analysis of Xyloglucans from Plants in the Subclass Asteridea

Parker Hudson III
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CURO

Summer Research Fellowship

Book of Proposals

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July 15, 2016

Dear UGA Faculty and Students,

We are delighted and honored to recognize this year’s CURO Summer Research Fellows, each of whom is featured here with a summary of his or her faculty-mentored research proposal. The goal of the CURO Summer Research Fellowship is to provide opportunities for intensive, immersive, faculty-mentored research experiences for academically talented undergraduates. The program advances the students’ knowledge and abilities to think critically, solve problems, and contribute to a greater understanding of the world.

We are proud of the accomplishments of present and past CURO Summer Fellows and with the mentorship provided by our exceptional faculty. The Summer Fellowship program has contributed to building a culture of undergraduate inquiry at the University of Georgia, and the CURO Summer Fellows serve as ambassadors, sharing their enthusiasm and expertise in a variety of professional forums on campus as well as at regional, national, and international meetings.

The 2016 CURO Summer Research Fellowship is funded through the Honors Program, the Office of the Senior Vice President for Academic Affairs and Provost, and the Alumni Association.

Please join us in congratulating these young scholars on the occasion of being awarded these prestigious fellowships. Please join us also in thanking the faculty research mentors whose support and guidance are crucial to the CURO Summer Fellows’ success.

Sincerely,

Dr. David S. Williams, ’79, ’82  
Associate Provost and Director

Dr. Martin P. Rogers, ’01, ’11  
Associate Director
Density-Dependent Selection Model for the Sociality of *Ceratina (Neoceratina) australensis*  

Alison Adams; Mentor: Dr. David Hall, Genetics

Natural selection is acting every minute of every hour of every day. However, evolutionary responses to natural selection that are substantial enough to be measured can take long times, measured in tens to thousands of generations. For this reason, evolutionary ecologists often turn to mathematical models to test hypotheses. The proposed research will use a mathematical modeling approach to test a recent hypothesis concerning the evolution of sociality in a diminutive bee.

Dr. Sandra Rehan at the University of New Hampshire studies the social evolution and genetics of bees. Much of her recent work has focused on *Ceratina (Neoceratina) australensis*, the Australian small carpenter bee. This species is socially polymorphic with both solitary and social nests collected in the same populations. Nests can only be scored after they are collected in dead broken stems of giant fennel (*Ferula communis*) in southern Queensland, Australia. Stems are split lengthwise to reveal the nest and then the numbers of adult females present are counted. Solitary nests contain a single adult female bee and social nests contain two adult females. Interestingly, solitary nests tend to do better per female than social nests, but only when a parasitic wasp is absent. When the wasp is abundant, solitary nests suffer high levels of parasitism and loss of brood. Rehan’s research has led her to believe that cooperative brood care (“social nests”) is “more likely a product of latent genetic tendency for dispersal” and there is a “density-dependent selection maintaining the polymorphism of solitary dispersers and social non-dispersers.” The density dependence is hypothesized to be generated by the parasitic wasp: when solitary nests are dense, the wasp increases in numbers, which leads to an advantage for social nests and vice versa. Dr. Rehan initiated collaboration with Dr. Hall to address this hypothesis, since he has extensive experience using mathematical models to address evolutionary questions.

This summer, I will develop several mathematical models that capture the biology of this system. I will begin with density-dependent model for the interaction of the two types of female bees (social and solitary) and the wasp. The model will predict, using field data from Dr. Rehan for realistic parameter value estimates, the number of social and solitary nests in a population. Two important parameters that the model will incorporate are the rate of parasitism and the fitness cost of parasitism as they are expected to have important affects on the social-solitary nest balance. One prediction is that there will be parameter values where cyclic dynamics will occur because as the number of social nests increases, the rate of parasitism will decline, which will favor solitary nests. However, we also predict that a stable equilibrium will be possible for some parameter values as that is observed in nature. The model will be written to show the fluctuations in both the nests and parasitism, ultimately being used to find equilibrium.

After becoming familiar with modeling and analytical techniques on this first set of models, I will extend the models to include genetic variation in the bees for probability of being social versus solitary. I will then find the level of sociality favored at equilibrium for different parameter values. This work will allow us to test an evolutionary hypothesis in a mathematical framework.
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Structure from Motion and Ocean Color Analysis with Low-Earth Orbit Satellite Systems

Caleb Adams; Mentor: Dr. Deepak Mishra, Geography

The primary goals of the M.O.C.I Satellite mission are to provide 3D terrain modeling of the Earth’s surface using space based photogrammetry and to determine effective data compression and transmission techniques while training undergraduate students in STEM related fields. The secondary goals will investigate coastal phenology and land cover as well as off coast harmful algal blooms from river runoff. It will be used to monitor coastal water quality (phytoplankton, inorganic sediment, and colored dissolved organic matter) and the health and productivity of coastal wetlands. Monitoring these systems is important due to their ecological/economic productivity and vulnerability to human pressure and climate change. This proposal follows the University Nano-satellite Program’s objective to promote innovative partnerships among academia and industry in response to the White House STEM Education Plan by building and fostering learning through the development of curriculum and techniques to prepare students for the industrialized workforce.

The primary goal of the D.A.W.G. Satellite mission is to develop and operate the first moderate resolution coastal ecosystem and ocean color CubeSat with a focus on Earth science applications. The mission will generate multispectral moderate resolution imaging products to monitor coastal wetlands status, estuarine water quality, and near-coastal ocean productivity in compliance with National Aeronautics and Space Administration’s strategic objective of advance knowledge of Earth as a system to meet the challenges of environmental change and to improve life on our planet. The data will be used to monitor wetland biophysical characteristics and phytoplankton dynamics in estuarine and near shore waters. We will utilize a spectral imager to acquire image data between 400 and 800 nm. We will also use a Red, Green, and Blue light camera to preform experimental depth measurements and structure from motion from Low-Earth Orbit. The 3U CubeSat will contain all relevant flight systems such as Attitude Determination and Control System, 2.4 GHz radio band used for data transmission and radio bands used for commands/telemetry communications, a Micro-controller Unit, as well as power and thermal dispersion. We have partnered with NASA Ames for testing of the payload and communications. The proposed CubeSat will be delivered and subsequently deployed from the International Space Station via a Japanese H-II Transfer Vehicle, Russian Soyuz, or Commercial Cargo vessel under NASA CubeSat Launch Initiative.

We have begun the research and development of the hardware components necessary for both satellites and will begin development of our Attitude Determination and Control System, Electronic Power Supply, and Micro-controller Unit over the summer of 2016. During this research process we will develop many new capabilities for the University of Georgia such as space rated solar panel testing equipment, space-like environmental vacuum chambers, Helmholtz coils to test magnetic and gyroscopic control systems, orbital mechanics simulation software, and a potential UHF/VHF (ultra and very high frequency) ground station for Low-Earth Orbit communications. I will be actively involved in leading the research for all of the above capabilities. The research that
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these missions provide will push UGA’s engineering program, and indeed the entire STEM program, forward as we push ourselves into space.
Senior Housing in Madison and Monroe, Georgia
Sarah Barrett; Mentor: Dr. Jerry Shannon, Geography

An increasingly important aspect of communities in the U.S. is the availability of senior housing. The population of people 65 and over is growing twice as fast as the national average (1), meaning that communities need to consider how they are going to ensure adequate senior housing is available for the large aging population. I intend to look into this need by conducting research in conjunction with Georgia Initiative for Community Housing (GICH). Georgia Initiative for Community Housing is a program dedicated to helping communities meet their housing and neighborhood needs by creating an individualized local plan for each community that is accepted into their three year program. The results from my research can be implemented by GICH to enhance the plans for these communities. I plan to assess the current status of senior housing in Monroe and Madison, Georgia and the future needs of senior housing in these cities.

Assessing the current senior housing availability and future needs of these cities is not explicitly looked at by GICH but is a vital aspect in planning for the future of a city. Both Madison and Monroe, Georgia would benefit greatly from this research, as I would be providing useful information to these small cities that they might not otherwise be able to afford. Information regarding current senior housing stock and the projected future needs of senior housing in these two cities will allow Madison and Monroe, Georgia to make a more comprehensive and effective plan for their future senior housing needs.

I will be provided population data and projected population data independent of this research and use this data in conjunction with data I collect on senior housing facilities in these cities to assess the current senior housing condition and future senior housing needs based on the projected population. I plan to use an array of geospatial tools to collect and display this research. In addition to using quantitative data, I intend to conduct interviews with key stakeholders in these communities who may have expertise regarding senior housing. These interviews will provide me with information that data cannot, such as what members of the community see as important regarding the future needs of senior housing. Additionally, I intend to look at the accessibility of healthcare facilities in these two areas, as health care often becomes increasingly important with age. Using the two-step floating catchment area method (2) I would be able to measure the accessibility of healthcare in these two cities. Since I am implementing both quantitative and qualitative research, using an interactive program such as Esri’s story map to display my findings would be most effective. This program will provide me with a platform to display the maps I create with my data, including images of these cities and highlighting my interview findings.

Understanding current senior housing availability and the future needs of this type of housing in communities is imperative, especially with the currently large aging population. This research on Madison and Monroe will highlight to GICH and these two communities the future needs of senior housing, therefore allowing these cities to develop a better and more efficient plan for their future.
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References:

Effects of Fire in a Riparian Zone on Aquatic Fungal Production, Reproduction, and Biomass

Sarah Clement; Mentor: Dr. Amy Rosemond, Odum School of Ecology

Introduction:
Prescribed burns are a commonly used method of forest management. Many studies have been conducted on the effects of fire on biogeochemical functions, such as the cycling of organic and inorganic nitrogen (N). Though combustion results in a net loss of N from terrestrial systems, following the fire there is often a temporary increase in inorganic N that is biologically available. Studies conducted in streams where riparian zones have been effected by fire have shown that this N is loaded into the streams, causing N enrichment in the water.

Nutrient enrichment can have a large impact on stream ecosystems. One of the effects of artificial nutrient enrichment seen on aquatic fungi is an increase in the proportion of fungal productivity going to conidia production, rather than biomass. However, no studies have been conducted to test if the influx of nutrients following a burn would have a similar effect on instream fungi as artificial nutrient enrichment.

Fungi play an important role in stream ecosystem functions. Fungi colonize plant matter, increasing its nutrient quality and making it more palatable for leaf shredding macroinvertebrates. This allochthonous plant matter is a valuable food resource for nutrient poor-streams. After a fire in the riparian zone we may see a decrease in allochthonous resource inputs, as leaf litter that might have blown into the streams is burned.

Determining the effects of fire on aquatic fungi will deepen our understanding of the impacts of silviculture management tools and of natural forest fires on stream ecosystems. Given the limited data on aquatic fungal assemblages following a fire, it is hard to predict how the burn could affect fungal biomass, species richness, and species composition. The goal of this study is to elucidate the effects of fire on biomass and diversity of aquatic fungi. We aim to determine if bottom-up effects of altered riparian vegetation and allochthonous resources cause a change in fungal biomass and reproductive output. We will also investigate how the nutrient release of the fire impacts fungal biomass and reproductive output. We will use reproductive output in the form of conidia production as a means of determining fungal species richness and abundance. Finally, we are interested in the effect fire will have on fungal carbon allocation, particularly the ratio of carbon going to biomass versus reproduction.

Methods:
The study will be carried out in three streams: one receiving a cut and burn treatment, one receiving a no-cut burn treatment, and one reference stream. We will compare pre-burn conditions (1 sampling date) to post-burn conditions (4 sampling dates) for all 5 elements of stream and fungal response measured in the study.

We will:
1. Analyze soil, water, and sediment samples for nutrient C:N:P.
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(2) Collect and quantify leaf litter standing stocks. We will calculate leaves per area (mg/m²) to calculate benthic food resources available to the microbial fungi.

(3) Collect fungal spore (conidia) samples within the streams and identify and quantify them to analyze species richness and relative species abundance.

(4) Quantify fungal biomass via ergosterol extraction using leaves collected within the streams. Ergosterol will be calculated on a per gram leaf litter basis.

(5) Use additional ergosterol extracts to estimate production, via stable isotope analysis or radio labelled carbon uptake rates.

We will compare mean conidia concentrations and number of species identified (via conidia) in the streams before and after the treatment, using paired ANOVA. Regressions will be performed for conidia concentrations versus production rates and for biomass estimates versus production rates. Regressions will also be performed for nutrient concentrations versus biomass and nutrient concentrations versus reproductive output.
Proposals

Predicting Oyster Recruitment and Survival through Cheaply Obtained, Remotely Sensed Data

John Coffin; Mentor: Dr. Jeb Byers, Odum School of Ecology

Introduction:

The American Oyster, *Crassostrea virginica*, is an important ecosystem engineer in estuarine systems. Ecosystem engineers physically alter habitat for other species, stabilize banks and provide habitat for many estuarine species. Reefs worldwide have been reduced by 88% due to overharvesting and habitat degradation and loss. Resource managers need better data to implement optimal management practices and increase the efficacy of species management programs.

Oyster recruitment and survivorship are thought to be influenced by current velocity and wave energy. Water body width exerts a nonlinear influence on current velocity, with currents being slow in both very wide and narrow bodies of water and faster in intermediate bodies. Water bodies with larger fetches have increased wave action. This study investigates the effects of current velocity and wave energy on oyster larval recruitment and survivorship. The study will also determine whether water body width and prevailing wind fetch can be used as proxies for current velocity and wave energy, respectively.

Hypotheses:

I predict that estuaries have four main zones—sounds, rivers, creeks, and creek heads—each with unique current and wave energy regimes. I expect an association between current velocity and oyster success, with recruitment highest in medium current velocities (sounds and creeks) and lower at high (rivers) and low (creek heads) velocities. A negative association is expected between wave energy and oyster survivorship. I also predict that water body width and wind fetch will be good proxies for current velocity and wave energy, respectively.

Methods:

- Fifteen sensor rigs will be constructed and rotated between sixty sites throughout the estuary surrounding St. Catherines Island, GA. Sites will represent a full spectrum of current and wave energy regimes and will log one month of data for each site.
- An inertial measurement unit, attached to a tethered float, will gather wave data and a flow meter will measure current velocity. Sensors will be read by an Arduino microcontroller powered by a solar panel. Measurements will be broadcast in real-time through a radio network. These rigs are based on units developed at the University of Georgia’s MakerSpace and presented at the Odum School of Ecology Graduate Student Symposium.
- Oyster recruitment and survivorship will be monitored at each site with two spat sticks. One stick will be monitored during rig placement at that site, and the other will be monitored for the duration of the study.
- GIS analysis of aerial photography will be used to predict the current and wave energy of each site using the water body width and prevailing wind fetch.
- Correlation between current and wave energy, and oyster recruitment and survival will be tested. Additionally, correlation between sensor data and GIS proxies will also be tested.
Significance:

The low cost and open source nature of this project enables inexpensive replication, and provides a highly adaptable rig platform from which I and other researchers can develop and collaborate on future projects. To this end, I am publishing all rig schematics. If water body width and prevailing wind fetch are found to be effective proxies for current and wave energy, then analysis of aerial photography will provide an easy and cost-effective solution to predicting optimal oyster settlement.

A better understanding of relationships between abiotic drivers and oyster success will empower resource managers to make informed decisions regarding oyster management. This will profoundly affect the Georgia aquaculture industry, and will help identify ideal locations for oyster restoration projects and living shoreline designs, taking the guesswork out of management efforts and potentially saving resource managers and homeowners thousands of dollars.

References:


6 Coffin, J. L. “Can Oyster Larval Recruitment and Survivorship be Predicted through Cheaply Obtained, Remotely Sensed Data?”, Graduate Student Symposium, Athens, GA, Odum School of Ecology.

Production of Ethanol using High Temperature Alcohol Dehydrogenase  
Alexander Crowley; Mentor: Dr. Michael Adams, Biochemistry & Molecular Biology

The research I have been working on for two semesters by the time of this fellowship pertains to the production of biofuels using the hyperthermophilic Archaea *Pyrococcus furiosus*. This microorganism lives normally at temperatures of 95°C and naturally produces low levels of ethanol. The graduate student whose project I have been working on introduced an Alcohol Dehydrogenase (AdhA) into *Pyrococcus furiosus*, which created a pathway for ethanol production in conjunction with the native aldehyde ferredoxin oxidoreductase (AOR) enzyme and made far more ethanol than the native enzymes in *Pyrococcus furiosus*. The project from last semester was to create alternate pathways of ethanol production in *Pyrococcus furiosus*. I worked with the bifunctional acetaldehyde dehydrogenase (AdhE) enzyme from different thermophilic microorganisms in an attempt to create an efficient pathway for ethanol production. This enzyme can convert acetyl CoA into acetaldehyde and then also to ethanol. However, the native enzymes in the control strain used during growth experiments always produced more ethanol than the strains containing the inserted AdhE enzymes. The AdhE enzyme has to compete with the high affinity enzyme acetyl CoA synthetase for its substrate acetyl CoA, which hindered the production of ethanol in these strains.

Since that was not an efficient form of ethanol production, this semester the current project is to manipulate the native ethanol producing enzymes in *Pyrococcus furiosus* to increase ethanol production and to discover exactly how this pathway works. The pathway of native ethanol production in *Pyrococcus furiosus* involves the redox enzyme pyruvate ferredoxin oxidoreductase (POR) that decarboxylates pyruvate to acetaldehyde, and then the most likely next step is the native alcohol dehydrogenase (AdhC) turns acetaldehyde to ethanol. There are other alcohol dehydrogenases present in *Pyrococcus furiosus*, but AdhC is the most likely candidate. To test this theory, this semester three new strains have been made so far and have been used in a growth curve experiment at varying temperatures. The strains made contain *Pyrococcus furiosus* with both the AdhC and AOR enzymes deleted, the AdhC enzyme deleted, and the AdhC enzyme over expressed using a strong promoter added to the plasmid respectively. If the strain with the AdhC enzyme deleted produces ethanol in the same amounts as *Pyrococcus furiosus* wild type, then either AdhC is not involved in the native ethanol production pathway or another alcohol dehydrogenase took on the same role. The sample results taken from the growth experiment have not yet been analyzed in total, but an exciting discovery was made. The *Pyrococcus furiosus* strain grown at 95°C produced a significant amount of ethanol. This is the first example of significant ethanol production in *Pyrococcus furiosus* at temperatures this high as normally ethanol producing enzymes denature at such high temperatures. For this summer depending on results from this current semester, the proposed research would be to continue studying the native ethanol producing enzymes of *Pyrococcus furiosus* and possibly add other enzymes to increase the efficiency of a constructed pathway or to create a new pathway, specifically at higher temperatures of 90°C or greater.
An Examination of the Political Impact of Obama’s Appellate Court Appointments on Policy Issues

Bryson Culver; Mentor: Dr. Susan Haire, History

In the past fifty years, the appointment of judges to the lower federal courts has become a highly politicized and policy-driven activity. Beginning with the Nixon administration, Presidents have become increasingly inclined to appoint justices in order to further their policy goals. By installing judges who share an administration’s policy goals, the influence of these policy goals remain significant far beyond the life of the administration that spurred them. After Nixon, the successive Presidential administrations have installed appointment procedures and processes that aim to find the best candidates to fulfill this objective.

While the Nixon, Carter, and Reagan administrations enjoyed little opposition to their policy-based appointments, the later Clinton, Bush, and Obama administrations were forced to face Congressional reaction to partisan appointments. In the appointment process, the “Advice and Consent” of the Senate has historically been a formality. Before 1977, the confirmation rate was almost 100%; however, following a Senatorial reaction to the President’s politically motivated nominations, the actions of the opposition party reduced the confirmation rate to 65% under Clinton and almost 50% under Bush. Additionally, the confirmation process tripled in length with some nominations taking three years to be confirmed. These pressures combined with severe vacancy issues in the courts, forced the latter Presidents to find more moderate, confirmable candidates.

The changing political dynamics of the appointment process are shown in the actions of the judiciary. In looking at the voting records of judges, the conservative and liberal tendencies often follow the party of the judge’s appointing President. This trend especially manifests itself in the earlier nominations under Reagan and Carter as they had little political opposition. The trend varies more under Clinton, Bush, and Obama who were forced to compromise with a more politically aggressive Senate. Additionally, the emphasis on equal representation in the judiciary affected the political composition of the appointments.

The aim of this research is to determine the voting behaviors and trends of the Obama Appellate Court appointees who were named to the bench from 2009 and beyond. Keeping in perspective the various aspects of the appointment and confirmation procedure, I will be collecting data on the published U.S. Courts of Appeals’ decisions on their voting behavior from 2009-2012. In addition to gathering information on their confirmation and backgrounds from the Federal Judicial Center and other sources, I will be drawing on, and extending, the Multi-User Database on the U.S. Courts of Appeals. Comparing the decision making of Obama’s appointees to those named by previous presidents will give insight on the growing effect of this cohort on policy making in these courts.

I expect to see a growing presence of moderate appointments in the Appellate Courts. The conflict between the President and the Senate is the result of the polarization of appointees based on policy goals. Bench vacancies have grown under the Clinton and Bush Administrations leaving Obama little choice but to nominate moderate “confirmable candidates.” Additionally, Obama’s
commitment to diversifying the court might lead him to choose candidates that match racial, ethnic, or sexual qualifications with less regard to their political and policy motivations.

In an era of polarization, understanding the politics of the judiciary is essential. What is generally the least exposed branch of our government oftentimes has a large impact on the public policy of our country. By gaining insight to the effects of Presidential Appointments on the Appellate Courts, one can generate a better understanding of the ideological leaning of the judiciary and its possible sway in public policy.
Feminization of Amphibians in Developed Landscapes

Sara Diamond; Mentor: Dr. John Maerz,
Warnell School of Forestry and Natural Resources

Land use creates many challenges for the conservation and management of wildlife. Increasing agricultural and suburbanizing landscapes result in a diverse cocktail of compounds running into and accumulating in fresh waters. Many of these compounds mimic natural hormones (e.g., estrogen), which can affect the sex ratios and result in the feminization of males or masculinization of females (Lambert et al., 2015). Altered sex ratios and feminization of males can lead to reproductive depression and declines in animal populations (Lambert et al., 2015).

Amphibians and fish are two common taxa that show hormone disruption and feminization in response to land use and development. For example, a number of studies show high rates of intersex male fish in urban landscapes, particularly downstream from wastewater discharge points (Tetreault et al., 2011). Other research shows that male frogs in agricultural landscapes show high rates of feminization including the development of oocytes (eggs) in their testes linked to the use of pesticides such as atrazine (Hayes et al., 2002, Hayes et al., 2006). Recent research suggests that frogs in a suburban landscape in Connecticut showed female biased sex ratios and are exposed to higher levels of estrogenic compounds (Lambert et al., 2016). It is hypothesized that estrogenic compounds that leak from septic tanks and run off from lawns and agricultural fields are responsible for the feminization of developing tadpoles, leading to higher numbers of females at metamorphosis (Lambert et al., 2016). Studies from other landscapes have not verified the generality of this phenomenon, and no study has examined whether adult male frogs in developed landscapes show feminization.

Recent research by Dr. Robert Bringolf, Associate Professor in the Warnell School of Forestry and Natural Resources, has shown high rates of intersex male fish in suburban and agricultural ponds in the Athens, Georgia region. The objectives of my study are to determine whether adult male Green frogs (Lithobates clamitans) and Bullfrogs (L. catesbeianus) show increased feminization among the same ponds compared to reference sites. Specifically, I will measure the secondary sexual characteristics of male frogs (size of ear and amount of yellow coloration on the throat), and I will examine the testes of male frogs to look for the presence of oocytes in the testes. In addition, I will determine the sex ratios of recently metamorphosed frogs at ponds with high intersex fish ratios compared to reference sites.

My study will be the first study to correlate patterns of feminization of fish and amphibians among the same ponds within the same landscape, and it will be the first study to look for evidence of feminization of male secondary sexual characteristics linked to feminization of gonads. My project has significant broader impacts. Endocrine disruption and the feminization of males can negatively impact reproduction and population growth, which may threaten species and impact conservation in developing landscapes. Amphibians populations are declining globally in large part due to habitat loss and degradation, and pollution and endocrine disruption is identified as a conservation threat (Hayes et al., 2006). My project will also be a collaboration between two labs, the Maerz Lab, which has a
focus on amphibian ecology and conservation, and the Bringolf Lab, which focuses on ecotoxicology and physiology of fish and wildlife.

References:


Ionized radiation is any type of electromagnetic wave that carries enough energy to remove tightly bonded electrons from its orbit causing it to become charged or ionized. The higher energy and higher frequency portion of the electromagnetic spectrum from X rays and above are considered ionized. When ionized radiation passes through living tissue, electrons are removed from neutral water molecules to produce \( \text{H}_2\text{O}^+ \) which is a free radical. Free radicals are extremely reactive molecules and can lead to removed electrons and hydrogen atoms. This can cause progressive damage to the membrane, nucleus, chromosome, or DNA chain that leads to uncontrolled growth of cells and mutations. Exposure to high levels of radiation for an extended duration leads to detrimental effects such as cancer. Our atmosphere can absorb and filter radiation from outer space but still we receive low doses of gamma rays and heavily charged particles. This study investigates the physiological responses of the model vertebrate, Medaka fish (\textit{Oryzias latipes}) to chronic low doses of IR via glycomic profiling.

Glycomics is the comprehensive study of all glycan structures of an organism. Mass spectrometry based technology developments provide a wonderful platform for studying quantitative changes in glycan distribution within the cell which is important for understanding the molecular function of each glycan structure. The specimen being used is Medaka fish (the Japanese Rice Fish). It is an ideal vertebrate model species due to available genome sequence databases (~800 Mb), which are vital to the successful interpretation of proteomics data (Kasahara et al., 2007). Before being used for sample preparation, the Medaka fishes were exposed to varying levels of low dose IR at the Savannah River Low Dose Irradiation Facility (LoDIF). The overarching goal is to quantify comparative proteomic and glycomic responses of Medaka across varying levels of chronic, low doses of IR, and identify proteins and glycans involved in organismal adaptation to environmentally relevant radiological exposure for development of targeted hypotheses aimed at elucidation of evolutionary pathways associated with IR exposure. This investigation will specifically focus on the glycomic responses of the Medaka fish to varying levels of chronic, low dose IR. A state-of-art glycomic methodology that pairs mass spectrometry with current bioinformatics tools will be used to provide a novel methodology to understanding the physiological effects of chronic, low dose IR on organisms.
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University of Georgia Amending and Roll Call Project
Ryan Freeman; Mentor: Dr. Michael Lynch, Political Science

As measured by roll call voting behavior, congressional polarization is up to the highest levels since the Civil War. As a result, congressional approval ratings are extremely low. A recent January Gallup poll pegged approval at 16%. While interest groups on both sides of the aisle have begun to research methods to fix the problem, there is comparably little scholarly research into Congressional institutions in recent decades. Moreover, the little work that exists focuses on existing data from roll call voting patterns of members. Often times, these votes are taken out of context and no additional details regarding lawmaking are provided.

My research proposal seeks to fill in some of these gaps. I would like to continue working with the University of Georgia Amending and Roll Call project, but expand my efforts beyond data collections. The University of Georgia Amending and Roll Call project is the first systematic effort to model the roll call generating process. Professors Madonna and Lynch have worked with undergraduate students to code data on all amendments to landmark enactments (as opposed to simply amendments that received roll call votes). They have reported a sharp increase in votes on “messaging” amendments. These are amendments offered solely for the purpose of putting partisan opponents on record, with little policy success. This, they argue, may serve to artificially increase polarization.

Through my own experiences on the project, I learned a great deal about congressional lawmaking. However, data alone is likely not helpful for members of the general public interested in congressional lawmaking. Most casual observers of politics are unlikely to download a dataset and skim through it. In order to better serve the public, I am proposing writing up and making publically available legislative bill histories on landmark bills passed during the most recent Congress. Working with Professors Madonna and Lynch, I will make these bills history available online for anyone to access.

The legislative histories will be based on information from the Congressional Record. It will include things like: What procedures were used in the House of Representatives? What procedures were used in the Senate? What did opponents of the bill argue? What did proponents argue? Was the bill part of the President’s agenda (i.e. was it mentioned in a State of the Union speech)? How many amendments were offered on the floor of both chambers? What was the vote split on key votes?

I believe this project will not only help further my education in congressional lawmaking, but help the broader public. Currently, the most thorough, publically available source for information on legislation is Wikipedia, which is extremely limited. Nothing exists that is comparable to Oyez for Supreme Court cases. This website also will aim to provide definitions and examples of contemporary legislative procedures, and dates regarding reauthorizations, government funding and the debt ceiling. This is all in an attempt to help the public to be more informed, and make the process more transparent.
Proposals

Development and Construction of a Low-Earth Orbit ‘Structure from Motion’ Nanosatellite

Graham Grable; Mentor: Dr. Deepak Mishra, Geography

Structure from Motion (SfM) photogrammetry is an imaging technique capable of low-cost three-dimensional topographical models from Low-Earth Orbit (LEO). Typical three-dimensional terrain data requires complex camera setups including three-dimensional camera location definitions. However, SfM is able to eliminate complex setups through movement of the camera sensor and matching of overlapping images (Westoby, 2012). SfM has already proven to be a valuable instrument in monitoring the health and activity of various ecosystems on Earth. A group of researchers successfully studied calving of the Store Glacier in Greenland using an Unmanned Aerial Vehicle and SfM technology (Ryan, 2015). Despite the low-cost of SfM, its ability to produce useful terrain data anywhere on Earth is limited by the difficulty to setup in remote areas. A nanosatellite, a satellite typically in the shape of a cube and weighing less than one kilogram, equipped with SfM technology in LEO can cheaply gain valuable terrain data almost anywhere in the world.

Realizing this, Dr. Deepak Mishra and a team of undergraduates, including me, have been accepted into the United States Air Force University Nanosatellite Program (UNP) to develop a nanosatellite with SfM capabilities, the first of its kind, called MOCISat (Mapping and Ocean Color Imaging Satellite). MOCISat is only one of ten satellites chosen to become part of the UNP this year. The UNP helps to fund MOCISat and in return creates a rigorous system of reviews and requirements as a way to educate and prepare students for the workforce. MOCISat poses a unique set of mechanical-based challenges. These challenges are the focus of my research and include: 1) analyzing and developing power constraints, 2) developing attitude control, and 3) developing the test environment.

I will research and study each of the three challenges in order to contribute to the success of MOCISat and further develop SfM technology. While analyzing and developing power constraints (1), I will help research solar power generation, power distribution to subsystems (ex: SfM sensor, antenna, etc.), and Electromagnetic Interference (EMI). Researching solar power generation will require field experiments to confirm previously developed models, and simulation software will be used to analyze power distribution throughout MOCISat and to study EMI. The development of the attitude control (2) is closely related the SfM sensor as it will be responsible for pointing MOCISat towards Earth for successful collection of terrain data, and I will be working with other team members to research the constraints and requirements for attitude control. Developing the test environment (3) is very important as testing will simulate an LEO-like environment and determine which parts of MOCISat need to be replaced or re-designed. To simulate the test environment I will help setup Helmholtz coils, to produce a magnetic field similar to one in LEO; a vacuum and thermal chamber, to simulate the environment of LEO; and a shake bed, a table which vibrates to frequencies that would be found during launch conditions.

The research I will be performing with MOCISat will be valuable not only for the development of nanosatellites, but also for SfM technology in LEO. Additionally, my research will serve as a foundation for a new class to be offered yearly. Learning and researching the development
of a nanosatellite is personally important as a Mechanical Engineering student, and as the first stepping stone of my career in the aerospace industry.

References:

Local Effective Microorganisms: The Effect on Soil Carbon, Soil Nitrogen, and Plant Protein

Lori Hanna; Mentor: Dr. Dorcas Franklin, Crop & Soil Sciences

With the increase of the world population and the rising demand for agricultural products, innovation is necessary. Past innovations have led to dramatic increases in crop production, specifically chemical inputs of nitrogen and phosphorous which contributed to 50% of the increase in crop production up to 1989 (1). These chemical inputs, however, are environmentally unsustainable through nutrient runoff and economically unsustainable through the high cost of chemical fertilizers (2). In order to support the growing population and to adapt to changing agro-ecological conditions caused by rising global temperatures, sustainable innovations must be made (3). One such innovation that is being used widely in tropical and subtropical regions is Local Effective Microorganisms (LEM).

LEM is a solution of locally derived microbes produced using leaf litter from nearby forest and carbohydrate rich substances. The purpose of these microbes is to improve crop yield by increasing photosynthesis, producing hormones and enzymes, controlling soil diseases, and accelerating decomposition in the soil (4). Anecdotally, this method is working, but there is little scientific evidence on the impacts of LEM to the soil community, nutrient cycling and availability, and the overall nutrient density of plants. If this innovation is a sustainable solution and could reduce the use of chemical inputs or alter the carbon footprint of agriculture, it must be recommended with a clear understanding of the mechanisms behind it.

For my research, I will be collaborating with Dr. Franklin and her team of graduate students to research the mechanisms and impacts of LEM. My research focus is how application of LEM affects 1) ratios of total carbon and total nitrogen in the soil 2) plant available nitrogen 3) carbon dioxide (CO₂) respiration of the plants and 4) protein density. Graduate student Laura Ney is already researching the yield of crops. To expand on this, I will measure the protein content of two types of legumes to determine if increased quantity correlates to increased quality.

My research will be a parallel study conducted in conjunction with Ney’s research with two study sites: Watkinsville, Georgia and Monteverde, Costa Rica (UGACR). At the UGACR campus, LEM is used in the composting of waste as a nutrient source for the organic gardens. Costa Rica is an excellent study site because the warm weather and humidity are ideal for rapid completion of the composting process, for crop production, and for more rapid LEM culturing. Black beans are a staple for those that live throughout the region and it is also important to study this technique in the climate and microbial ecosystem where it is currently being used. I will have 18 plots of edamame (soybeans; *Glycine max*) in Watkinsville, Georgia and 18 plots of black beans (*Phaseolus vulgaris* L.) in Costa Rica. The plots will be divided into LEM, false-LEM, and controls. I will collect soil and plant samples and analyze them for carbon, nitrogen, and protein. I will also collect CO₂ respiration measurements. I will assist Dr. Franklin’s team in keeping the fields well managed for more consistent and accurate results.

This fellowship would make it possible to travel to Costa Rica to research in the environment of existing application. I must stress that this is not an innovation that is being proposed for future
use. It is being used on crops, compost, and animal waste throughout the tropics and subtropics right now. The outcome of my project could lead to changes in fertilizer use, changes in how we analyze and reduce the carbon footprint of agriculture, and changes in the nutrition of the plants themselves. It is urgent and imperative that we understand the impact of this innovation.

References:


Cas Protein Complexes in Adaptation of Streptococcus Thermophilus Type II-A CRISPR-Cas System

Erin Hollander; Mentor: Dr. Michael Terns, Biochemistry & Molecular Biology

For bacteria and archaea, adapting to a changing environment enables the evolution of novel defense systems. One such adaptation is the recently discovered CRISPR-Cas system, which resides in approximately 50% of bacteria and 90% of archaea. This system efficiently defends the microorganisms from nucleic acid invaders through versatile loci that serve as a heritable “memory” of past invasions.

The CRISPR-Cas system uses a three-stage process to mediate phage resistance: (1) adaptation, (2) expression, and (3) interference. During adaptation, the CRISPR-Cas system recognizes a PAM sequence (Protospacer Adjacent Motif) on an invading foreign nucleic acid and incorporates the protospacer sequence into the CRISPR array. These segments, known as “spacers,” are interspersed between short, identical DNA sequences called “repeats.” Transcription of the array and cleavage of the resultant transcript in the expression stage leads to small CRISPR RNAs (crRNAs). Finally, during interference, crRNAs recognize and bind to invading nucleic acids. Cleavage of the crRNA – phage DNA complex by Cas proteins, guided by crRNAs, enables the microorganism to successfully defend itself from the viral invader.

This research project focuses on the Type II-A CRISPR1 (CR1) system of S. thermophilus, a key bacterium used in the dairy industry during fermentation. With only four proteins, this system is the simplest and most widespread CRISPR system in S. thermophilus. The invader silencing protein of Type II systems, Cas9, is a powerful tool for genome editing, allowing targeted modification of sequences within a genome. The CRISPR-Cas locus contains cas genes encoding for proteins involved in the immune mechanism. This project utilizes the Type II-A CR1 system of S. thermophilus. The universal proteins Cas1 and Cas2 are present along with Csn2 and Cas9. Cas9 is the signature protein of Type II systems.

In my third year at the Terns lab, I am now focusing on the possibility of the Cas proteins forming complexes during the process of adaptation. Cas1 and Cas2 have previously been shown to form a complex in the CRISPR-Cas system of E. coli. As these two proteins are ubiquitous among CRISPR-Cas systems with highly similar functions, it was hypothesized that these two proteins would complex together along with Csn2. His-tagged Cas1 had previously been shown to pull down in a complex with Cas2 and Csn2 in an affinity assay when Cas2 and Csn2 were overexpressed on a plasmid. My work will focus on better understanding the complex formed by the Cas proteins and how it functions in vitro in spacer generation and integration into a CRISPR locus. As one of the simplest systems in S. thermophilus, the Type II-A system is an excellent model with which to derive the mechanisms of the Cas proteins and the CRISPR-Cas system as a whole. With only four proteins, the system has a broad range of applications, including novel gene therapy techniques, preventing the transference of antibiotic resistance genes, and protecting beneficial microbes such as S. thermophilus from phage attack.
References:


Evaluation of Cas4 Function in CRISPR-Cas Adaptation
Jesse Hu; Mentor: Dr. Michael Terns, Biochemistry & Molecular Biology

Given that viruses are the most abundant biological entities on the planet, bacteria and archaea have evolved extensive protective systems to defend against genetic invaders (Suttle, 2007). One component of this defense is CRISPR-Cas (clustered regularly interspaced short palindromic repeats–CRISPR-associated), an adaptive prokaryotic immune system found in nearly all archaea and half of prokaryotes (van der Oost et al, 2014). This system is composed of a CRISPR array and associated Cas proteins, which vary by specific CRISPR system type. The CRISPR array affords memory of past infections and contains identical repeats separated by variable sequences known as spacers, which are derived from a foreign nucleic acid. In brief, CRISPR functions in three stages: adaptation, CRISPR RNA (crRNA) biogenesis, and crRNA guided interference. During adaptation, new spacers are captured from the invader and incorporated into the CRISPR array through a process called integration. The CRISPR array is then transcribed during crRNA biogenesis, and the transcript is processed to generate small crRNAs complementary to invader DNA. Finally, during interference, the crRNA guides Cas proteins to the invader, allowing for catalytic cleavage of foreign genetic materials (Heler et al, 2014).

For the last semester, I have worked with Julie Grainy, a PhD student in the Terns lab studying the mechanism of adaptation for CRISPR-Cas systems of Pyrococcus furiosus (Pfu) and Thermococcus kodakarensis (Tko). Pfu, is a hyperthermophilic archaeon that contains 7 CRISPR loci, each sharing the same proteins for adaptation, Cas1 and Cas2, which are conserved across all CRISPR systems (Majumdar et al., 2015). Tko is a highly related hyperthermophilic archaeon with 3 CRISPR loci, which also share Cas1 and Cas2 to achieve adaptation (Elmore et al., 2013).

Though the result of adaptation has been characterized and both Cas1 and Cas2 have been demonstrated as necessary for integration, the biochemical mechanisms of adaptation are not fully understood (Makarova et al., 2011; Nuñez et al., 2014). Furthermore, recent unpublished work in the Terns lab has uncovered a requirement for a third Cas protein, Cas4, in mediating adaptation. In vivo data acquired by the Terns lab suggests that Pfu Cas4-1 has an inhibitory effect on adaptation, but that Pfu Cas4-2 is required. This is an intriguing result that I want to test in vitro, in order to better understand the mechanism of Pfu Cas1, Cas2, Cas4-1, and Cas4-2 and their role in spacer selection, processing, and integration. Although Tko adaptation has not been studied in vivo, I am interested in testing Tko Cas1, Cas2, Cas4-1 and Cas4-2 in vitro as they are highly conserved with Pfu. Tko also contains a third Cas4-3 protein that I am interested in characterizing.

Therefore, this summer, my proposed research will focus on better understanding the process of adaptation by evaluating the functions of Pfu and Tko Cas4 proteins in vitro. I predict that some Cas4 proteins may inhibit integration, but others may also be essential for integration to occur. Spacer integration by Pfu and Tko Cas1 and Cas2 will be simulated using a radiolabeled spacer that can be integrated into an artificial CRISPR locus. This locus will then be visualized through autoradiography to assess integration. The effect of different Cas4 proteins will be measured by these assays. Determination of integration site within the CRISPR loci will be determined through sequencing. Proteins for these reactions have already been cloned, expressed, and purified. Moreover, I will work
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with Julie to design and test methods evaluating the preceding steps of adaptation, such as spacer selection, cleavage, and processing. Using these approaches, I hope to gain a better understanding of how CRISPR-Cas acquire new spacers, and hence gain immunity to new invaders.

References:


The Effect of Saharan Dust Events on the Distribution of Pathogenic Vibrio Species in Tropical Waters

Kylie Isaack; Research Mentor: Dr. Erin Lipp, Environmental Health Science

*Vibrio* is a genus of marine bacteria that has species that are harmful to both human health and economics. Studies done through CDC show that there has been an increase in *Vibrio* infection in the past twenty years (Newton, 2012). Some of the human diseases include the severe diarrheal disease cholera (*V. cholerae*), shellfish associated gastroenteritis (*V. parahaemolyticus*), and seawater associated wound infections (*V. vulnificus*). The economic effects include infection in both fish and shrimp harvested for seafood production. Previous studies in our lab have determined that *Vibrio* have a tendency to bloom in response to iron addition, something that is bountiful in the tropical Caribbean waters after dust from the African Saharan Desert is deposited during seasonal dust storms (Westrich et al., 2016). The iron-rich dust is blown from desert source regions by easterly trade winds and deposited thousands of miles away in downwind ocean water. Our lab has taken samples of ocean water before, during, and after these dust storms have deposited nutrients in tropical waters. We hypothesize that there will be higher counts of pathogenic *Vibrio* species within the samples that were obtained after the arrival of dust storms, compared to pre-dust conditions.

Finding the link between pathogenic *Vibrio* blooms and the arrival of Saharan dust clouds proves to be an important topic in public health. Using satellite tracking, the dust storms can be observed and predictions can be made as to where they will deposit once they travel across the Atlantic. This means that we would have the potential to warn residents of these affected areas that the dangerous bacterial blooms were present. Typically, phytoplankton are the organisms that are studied in response to Saharan dust, but bacterial blooms are also a significant part of their ecosystems and deserve further study.

We have samples that were collected from surface waters in the Florida Keys during Saharan dust events during the summers of 2014-2015. I will be using *Vibrio* specific TCSB agar to further isolate these unknown *Vibrio* species followed by DNA extraction. We will then examine the presence of pathogenic genes within the sample using specific pathogenic PCR targets. These procedures will be done to both the pre-dust and post-dust samples so we can compare the results at the end of the experiment. By doing this we hope to further understand the connection between the growth of these harmful *Vibrio* populations and their link to the Saharan dust events.

References:

Investigation of a Fast, Tunable Microwave Photonic Phase Shifter
Aneek James; Mentor: Dr. Mable Fok, College of Engineering

Importance of Microwave Phase Shifters:
Microwave Phase Shifters are a vital component to communication systems today for signal processing and microwave beam directing. For example, phase shifters are the main components that make up phased array radars, devices that can send electromagnetic signals in one particular direction. This functionality has many uses in broadcasting, optical communications, and many more fields. Recently, for example, the MESSENGER spacecraft sent on a NASA mission to Mercury was the first deep-space mission to use a phased-array antenna for communications, proving it’s potential use in future missions [1]. Phased array antennae are also used in weather research, as evidenced by the National Severe Storms Laboratory’s project using a US Navy phased array antenna to gather information on thunderstorms and tornadoes [2].

Operational Theory of Phase Shifter:
The mathematical description of a phase shifter is relatively simple. If given a radio frequency (RF) sinusoidal signal, i.e. \( \cos(2\pi ft) \), a phase shifter will ideally alter the signal by adding a phase shift \( \phi(f) \) inside the term:

\[
\cos\left(2\pi ft + \phi(f)\right)
\]

where \( \phi(f) \) should be a constant value for all frequencies (as shown in Figure 1). The frequency range for which the phase shifter can achieve this behavior without unevenly altering the amplitude of the signal defines its operational bandwidth. Though many electrical phase shifters exist in the market, the nature of electrical circuits reduces the possibilities for increasing the operational bandwidth of a phase shifter and ensuring full 360° phase shift capabilities.

Microwave Photonics:
Microwave photonics (MWP) has grown in popularity in the past couple of years due to the number of advantages it possess over traditional microwave engineering systems. Incorporation of photonic components into microwave systems allows MWP to be inherently immune to electromagnetic interference, to exhibit low signal attenuation over large distances, and to be tunable at fast speeds [3-5]. These benefits contribute to MWP phase shifters as having a far larger operational bandwidth. As of now, there are a number of realized of
microwave photonic phase shifters, but none that prove to be a fast, tunable alternative. For viability in dynamic systems where requirements for signal processing can change rapidly, the need for a fast alternative is growing every year.

**Goals and Objectives for Research Project:**

I propose investigating several promising schemes to design a microwave photonic phase shifter that is fast and widely tunable. Two possible schemes that will be investigated the most thoroughly are: 1.) coherent population oscillations using an electroabsorber (EA) and 2.) modifying a true time delay scheme into a pure phase shifter. Both schemes are of interest due the optical effects which they are based on being phenomena with fast response times (i.e GHz range). If these phenomena can be used to control the tuning of the phase shifter, it is possible to see an extraordinary improvement to the versatility of current schemes.

**References:**


Human Multiple Myeloma (MM), a cancer of the plasma cells, is one of the most common hematologic cancers in the United States and is currently without a cure or reliable method of early diagnosis. In collaboration with Cohava Gelber, a mouse monoclonal IgG antibody (VAC69) has been identified that specifically recognizes a glycoepitope on MM cells over chronic myelogenic leukemia (CML) cells even with their similar lineage and characteristics. VAC69 is, therefore, a prime candidate for a useful MM early detection biomarker; it binds with a glycoprotein membrane molecule solely located on MM cells, not cells of prostate, breast, cervical, or other cancer types. This project will focus on determining the chemical structure of the glycomarker in the monoclonal IgG antibody and how it is regulated during cancer progression.

Early detection of cancers is critical for their successful treatment. Since abnormal glycosylation of cell surfaces is an indication of oncogenesis, identification of cell surface glycans that represent these alterations is essential to find new cancer markers. Over the years, development of monoclonal antibodies as diagnostic tools for identification of several cancer-associated glycans has been used with varying degrees of success. Almost all antigens that recognize and bind to mAbs can also bind to regular non-cancerous cells, potentially decreasing the effective functionality of the antigenic targets. The focus of this research is to define the epitope of monoclonal antibody VAC69, which shows specificity for multiple myeloma (MM), as well as ovarian carcinoma, and does not bind to non-cancerous cells and tissues when tested using differential immunization. In five MM cell lines, the epitope is expressed on what appears to be a single glycoprotein with molecular weight of about 80KDa. The identification of this glycoprotein remains undefined and is a component of this research. VAC69 was produced by the C. Gelber laboratory and has been provided to us in collaboration between the Pierce and Gelber laboratories. Preliminary results show that treatment of MM cell lysates with PNGaseF (N-glycanase) results in the loss of VAC69 binding to Western blots of MM cell lysates, demonstrating that the epitope is most likely part of an N-glycan or N-glycopeptide. We aim to further characterize the sequence, structure and cell type-specificity of this epitope, which will allow VAC69 to be evaluated as a potential diagnostic and therapeutic tool for cancers such as multiple myeloma.
Environmental Consequences, Tic Symptom Severity, and Psychological Comorbidities in Children with Tourette Syndrome

Colleen Keeler; Mentor: Dr. Ronald Blount, Psychology

This summer, I will continue my work with the Pediatric Psychology Lab under the direction of Ronald Blount, Ph.D. I will collect data from campers at Camp Twitch & Shout, a weeklong summer camp for children with Tourette syndrome (TS), and their caregivers. With this data, I aim to clarify how environmental consequences (e.g., environmental reactions to displaying tic symptoms, family socioeconomic status [SES]) influence tic symptom severity and psychiatric comorbidities in children with TS. TS is a neurological disorder that typically develops between the ages of 3 and 9 years (National Institute of Neurological Disorders and Stroke [NINDS], 2014). TS symptoms include repetitive, involuntary vocalizations and/or movements, known as tics (NINDS, 2014; e.g., eye blinking, head jerking). An estimated 200,000 Americans suffer from the most severe form of TS (NINDS, 2014). More than 80% suffer from psychiatric comorbidities, with Attention Deficit Hyperactivity Disorder (ADHD) and Obsessive Compulsive Disorder (OCD) being the most common (Centers for Disease Control and Prevention, 2015.)

Researchers have examined how factors within the family environment, such as SES and environmental consequences of the display of tics, are related to the likelihood of developing TS and severity of tic symptoms. Capriotti et al. (2014) recently found that the majority of youth suffering from chronic tic disorders report experiencing consequences of tic behavior (e.g., attention, getting out of performing unpleasant tasks) that are correlated with greater tic severity. Another study determined that an unstable family environment, which is often a consequence of TS, might contribute to the worsening of tic symptoms (Hong et al., 2013). SES has been identified as a risk factor for developing TS and chronic tics (Miller et al., 2013). Family accommodation to the child’s symptoms is another factor of interest, as it has been linked to higher functional impairment in children with OCD (Storch et al., 2007). Because TS and OCD are both characterized by repetitive behaviors, the same relationship may exist in children with TS.

I will expand upon this pioneering research. Utilizing standardized measures, I will look at factors such as environmental consequences to children’s TS symptoms and how much parents accommodate their child’s TS symptoms, as well as demographic factors, such as SES, education level, and racial background. I will then examine how these factors relate to child’s tic severity and internalizing and externalizing disorder symptoms. I hope to identify environmental consequences that relate to children’s tic severity and their experience of comorbid disorders. My findings have the potential to inform the development of family-focused behavioral interventions that will help children with TS cope with tic and comorbidity symptoms.

All study procedures have been approved by the University of Georgia’s Institutional Review Board. Families of Camp Twitch & Shout attendees will receive an email from the camp asking them to complete measures six weeks prior to camp. Informed consent or assent will be obtained from all participants before completing any measures. The following measures will be completed by children: (a) Multidimensional Anxiety Scale for Children-2nd Edition, (b) Tic Symptom Self-Report (c) Behavior Assessment Scale for Children-2nd Edition, d) Child Demographic Questionnaire (Wei, et
Caregivers will complete the following proxy-report measures: (a) Multidimensional Anxiety Scale for Children, (b) Behavior Assessment Scale for Children-2nd Edition, Parent Rating Scales, (c) Tic Symptom Parent Report, d) Tic Accommodations and Reactions Scale. (Capriotti et al, 2014.) I hypothesize that lower SES (e.g. lower income, lower parent education) will be associated with greater severity of tic symptoms and higher prevalence of comorbid disorders. Additionally, I hypothesize that as environmental consequences of the child's TS symptoms increases, severity of tic symptoms and prevalence of comorbid disorders will increase.

References:
Mapping and Ocean Color Imaging (MOCI) Satellite
Adam King; Mentor: Dr. Deepak Mishra, Geography

Overview:
This satellite, the Mapping and Ocean Color Imaging (MOCI) Satellite, will be built to provide proof-of-concept for photogrammetry using Structure from Motion (SfM) technology from space. It will also be used to provide imaging data to allow the principal investigator, Dr. Deepak Mishra, to study coastal and wetland statuses. This satellite is classified as a Nanosatellite (NanoSat), meaning that its form factor and size fit within smaller-scale design restraints. The MOCI Satellite will be designed for maximum flexibility of transportation in order to complete its mission. Ideally, the NanoSat will be deployed from a module on the International Space Station (ISS) deemed the “Kibo” module. Upon release, the satellite will use a combination of Reaction Control System (RCS) wheels and magnetorquers to stabilize its orbit. The mission duration is expected to be 18 months.

Research – End Goal:
The primary mission goals is to use space-based photogrammetry to provide 3D terrain modeling of the Earth’s surface. This will be accomplished using the NanoCam C1U (NC1U), a moderate resolution, visible light camera. This will provide proof-of-concept for Structure from Motion (SfM) photogrammetry measurement from Low-Earth Orbit (LEO). This data will allow monitoring of wetland biophysical characteristics. The 3D SfM data will be the first of its kind from a NanoSat platform. The results of this can be applied to various fields, since the computation applied to moderate images could also be applied to higher-resolution imaging missions. The secondary goals of this mission will be to investigate coastal land cover and phenology as well as river runoff that causes harmful off-coast algal blooms. This data will then be used to monitor the quality of coastal water, such as phytoplankton dynamics, color-dissolved organic matter, and inorganic sediment in estuarine and near-shore waters.

Initial Research and Early Contributions:
My initial contributions to this project will include, but are not limited to:

- Integration of the Attitude Determination and Control System (ADCS) and development of control software to stabilize movement during image capture
- Research of orbital mechanics, aerodynamic drag, and physical modeling simulations
- Research into use and modification of the National Aeronautics and Space Administration (NASA) Core Flight Software (CFS) for use on the NanoSat

Currently, our undergraduate team is in the beginning phases of this project. I will assist in development of software for use in obtaining data from the ADCS to correct for attitude variations. These simulations will begin with the creation of a virtual environment to test our detumbling sequence code to ensure that we are obtaining our desired results before physical testing.
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Using NASA's General Mission Analysis Tool (GMAT) software, I will also aid in the virtualization\textsuperscript{6} and understanding of how the NanoSat would behave in space during the mission. This program takes into account orbital mechanics and aerodynamic drag as well as mission duration specifications.

To enable our satellite to record images and transmit data, we will be utilizing NASA's CFS. I will aid in researching the documentation for the software, gaining an understanding of its general uses and how it would tie into the mission as a whole. The CFS is expected to act as a bridge between sensors to the software we will build and also as a bridge between the software output and actuators\textsuperscript{7}.

Definitions:

1. **photogrammetry** – the science of making measurements from photographs, including 3D rendering using several 2D images
2. **nanosatellite** – an artificial satellite with a mass between 1 and 10 kilograms
3. **magnetorquer** – a satellite system for attitude control, detumbling, and stabilization build from electromagnetic coils; creates a magnetic field that interfaces with an ambient magnetic field, usually Earth's, so that the counter-forces produced provide useful torque
4. **phenology** – the study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life
5. **attitude** – the orientation of an aircraft or spacecraft, relative to the direction of travel
6. **virtualization** – the conversion of something to a computer-generated simulation of reality
7. **actuator** – a device that converts electrical input to mechanical output
Effect of Invasive Macroalgae *Gracilaria vermiculophylla* on Feeding Behavior of *Dasyatis Americana*

Katie Maddox; Mentor: Dr. Jeb Byers, Odum School of Ecology

**Introduction:**

Seaweeds are rare on the Georgia coast because of high turbidity in the water column, which reduces light to insufficient levels, and a paucity of hard substrata for attachment. However, a non-native ecosystem engineer has recently invaded, the seaweed *Gracilaria vermiculophylla*, which survives due to a mutualistic interaction with native tubeworms\(^3\). This invader could have a major impact on the physical characteristics and trophic relationships of Georgia’s estuarine communities\(^1,2\). *G. vermiculophylla* forms a layer of substrate that, before its introduction, was not present on Georgia’s mudflats\(^2\). This addition of *G. vermiculophylla* has dramatically boosted primary productivity and native invertebrate populations.

However, it is possible that higher-level predators may also benefit from *G. vermiculophylla*’s presence. *Dasyatis americana*, or the southern stingray, is readily found on the mudflats along the southeastern United States. The southern stingray feeds on a wide range of invertebrates such as shrimp and clams, which are some of the species that proliferate within the mats formed by *G. vermiculophylla*\(^4,5\). My study will focus on the effect the emergence of this landscape-altering seaweed has on the feeding behavior of *D. americana*.

**Methods:**

I will quantify the effects of *G. vermiculophylla* on the southern stingray and its prey base using both a field and a lab experiment. I will initiate a study on the mudflats in Wassaw Sound, Savannah, Georgia where *D. americana* are found. On mudflats where *G. vermiculophylla* is present, two plot treatments will be manipulated: a treatment that excludes stingrays and a treatment in which they are not excluded. Treatments will each have three replicates. Stingrays will be excluded using evenly spaced stakes that will not interfere with the passage of water or medium to small-sized organisms. After running for three tidal cycles, I will quantify the magnitude of their feeding effect by comparing the abundance of invertebrates within the *G. vermiculophylla* plots that have been exposed and not been exposed to stingrays.

Next I will conduct a lab-based behavioral study to investigate the effect the density of *Gracilaria vermiculophylla* has on the foraging behavior of the southern stingray. My study will be conducted in the UGA Marine Extension Service aquarium on Skidaway Island, Georgia. Within a 5000 gallon tank, I will anchor *Gracilaria vermiculophylla* to the substrate at the bottom of the tank using one of four density treatments: 0g/m\(^2\), 50g/m\(^2\), 100g/m\(^2\), and 1000g/m\(^2\). One density treatment will be tested at a time in a sequential random block design. These reflect actual densities of *G. vermiculophylla* recorded in Wassaw Sound. Each treatment will be replicated five times, replacing the stingray for each replicate. Twenty juvenile clams, *Mercenaria mercenaria*, will be placed in the tank one hour prior to the addition of the stingray. I will run each trial for three hours and record prey survival in order to index which *G. vermiculophylla* density most interferes with ray foraging. The trials will be videotaped to enable me to quantify complementary behavioral metrics, including exploratory time,
excavation rates, and foraging behaviors. Collectively my project will give insight into how *Gracilaria vermiculophylla* affects the foraging of *Dasyatis americana*.

**Conclusion:**

It is known that more invertebrates are found in areas with greater *Gracilaria vermiculophylla* density, however it is unclear whether *G. vermiculophylla* physically interferes with stingray foraging\(^4\). There may be a threshold in *G. vermiculophylla* density at which point it becomes difficult for *Dasyatis americana* to forage. Due to the potential for a threshold effect, I would expect to see higher stingray foraging rates in the 100g/m\(^2\) treatment.

**References:**


Investigations of Histone Chaperone Protein (NAP1) as it pertains to the CAAX Protein Shunt Pathway

Michael Morgan; Mentor: Dr. Walter K. Schmidt, Biochemistry & Molecular Biology

CAAX proteins play vital roles in cellular process such as cellular differentiation, proliferation, and apoptosis. Because of this, CAAX proteins are commonly involved in carcinogenesis and many are targets of therapeutic strategies\(^1\). A subset of CAAX proteins are Ras GTPase proteins. Roughly a third of all human cancers involve mutated forms of Ras, including 95% of pancreatic cancers and 60% of solid tumors overall. Years of cancer research have sought to block the oncogenic properties of these Ras proteins with little success, but major efforts continue at both the federal, academic, and industry levels\(^2\).

To better understand the signal transduction pathways that involve CAAX proteins, Dr. Schmidt’s lab investigates the post-translational modifications (PTMs) that regulate the activities of CAAX proteins. There are three distinct modifications that occur to RAS, and these have been presumed to generally occur to all CAAX proteins (Figure 1). The first PTM is farnesylation of the CAAX motif. Subsequent PTMs involve proteolysis and carboxylmethylation. Using the yeast model, the Schmidt lab has recently discovered a novel branch to the standard PTM pathway herein referred to as the shunt pathway. In this pathway, CAAX proteins complete farnesylation but are not subsequently modified. These proteins are “shunt pathway” candidates.

My research project this summer will investigate NAP1, a histone chaperone protein. Elevated expression of NAP1 occurs in malignant appendicial carcinoids and goblet cell adenocarcinoids\(^3\). Based on Dr. Schmidt’s past research, the hypothesis being tested is that NAP1 is a shunt pathway protein. Objectives of my research include the creation of NAP1 expression plasmids and NAP1 mutants as tools to investigate the importance of the shunt pathway to NAP1 biology. The lab is very proficient at making yeast expression plasmids, and this work can be easily completed over the summer timeframe of the proposal. Both shunted and standard model mutants will be created to assess the impact of PTMs on NAP1-dependent phenotypes. Green fluorescent protein (GFP) tagged versions of NAP1 will also be created to investigate effects on subcellular localization. The effects on NAP1 function will be followed using assays that focus on cell death and anaerobic
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growth⁴. I will also confirm that the NAP1 CAAX motif directs proteins to the shunt pathway by transferring the motif onto other reporters used to study both the shunt and standard PTM pathways.

These investigations are expected to support NAP1 as a shunt pathway protein, giving us greater insight into the pathways used by CAAX proteins. These findings will in turn help guide the development of therapeutic agents aimed at disrupting the PTMs associated with CAAX proteins. NAP1-dependent cancer therapy may benefit from strategies that interrupt farnesylation (i.e. the first PTM) rather than subsequent PTM steps. By contrast, Ras-dependent cancer therapy could target each PTM step but might be improved to reduce off-target effects by focusing on just the subsequent steps to avoid disrupting the function of shunt pathway CAAX proteins.

References:


<http://www.yeastgenome.org/locus/S000001756/phenotype>
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Satellite Development and Photogrammetry using Structure from Motion
Nicholas Neel; Mentor: Dr. Deepak Mishra, Geography

During the summer of 2016, I will be conducting satellite research with Dr. Deepak Mishra. A team of undergraduate students has been selected by the Air Force Research Laboratory to create a Cube Satellite which uses images taken from Low-Earth Orbit to compile into a 3D model in which we can analyze the results and determine structures from the images. This concept is called structure from motion.

As soon as the term begins, we will work on creating a complete virtual model of our satellite in order to test it in NASA’s GMAT software which is a program NASA released for simulations. When we have our model completed, we will ensure that the mission we have chosen is feasible.

Initially, we need to be able to test communications so that we are able to transmit data from large distances. This will be done by the development of drones to carry a transceiver to various altitudes to test the success of a transmission. This will be where we will be required to develop encryption algorithms to securely transfer our data. We will also be testing various image compression algorithms to attempt a lower file size to be transmitted.

Next, we shall work with the college of engineering to construct testing environment for our satellite’s components. This will include the manufacturing of a Hemholtz coil to try and replicate the magnetic field that the satellite will deal with while it is in orbit. We also will be ensuring that our system reaches a safe equilibrium temperature. This is so it will operate within each components operational temperature range.

For our actual payload, we will attempt to compile images into a single 3D object file using the SIFT algorithm. We will start by scaling the problem down to determining object’s size by taking photographs in the lab. We will first try to implement a custom program to analyze the data. If this succeeds we will do the same procedure using drones.

If we are able to achieve all that is above over the summer then we will be ahead of what the Air Force requires. Now, I will explain why this research matters.

The reason we care about structure from motion is to be able to identify flood plains as well as flow patterns. We will also be able to use this data as a measure of environmental health. We will work closely with the center for geospatial research to apply our received data to its full potential.
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Ideological Republican Factions in State Legislatures
Robert Oldham; Mentor: Dr. Charles S. Bullock, Political Science

Since the 2010 midterm elections, the Republican Party has been split between “establishment” and “extremist” ideological factions. This division was exemplified in the House of Representatives when the ultra-conservative Freedom Caucus revolted against Speaker John Boehner. In the U.S. Senate it is seen in the obstructionism of Ted Cruz, and in the 2016 presidential primary it is shown when anti-Washington candidates like Donald Trump pit themselves against “insiders” like Jeb Bush. From there, Republican factions only get more complex. Many younger conservatives identify as libertarians, evangelical Christians as social conservatives, and the wealthy as pro-business progressives. To accommodate these diverging interests, the Party must pitch a big tent.

Previous research has noted Republican divisions. Deutchman and Lucas found the major divide among House Republicans to be between social liberals and social conservatives.¹ Bond and Evans saw it as between establishment types and the 2010 Tea Party freshmen. Their research shows that representatives elected in 2010 were less likely to support “functional” legislation such as government funding bills than members who were elected before then.²³ Others have studied factions’ effect on gridlock. Muirhead thought that the popular notion of gridlock being caused by the growing ideological divide between the parties obscures the real culprit: the extremist wing of the Republican Party which disempowers moderates who want to work with Democrats on issues of general agreement.⁴ By refusing to allow centrists to bring bipartisan legislation to a vote (the Hastert Rule requires a majority of Republicans to agree to advance legislation), extremist Republicans have crippled Congress’s ability to legislate.

McCarty found polarization in state legislatures to be similar to polarization in Congress but did not study whether factions cause similar trouble for party leadership.⁵ If Muirhead is correct and congressional gridlock is the result of intraparty splits between “centrists” and “extremists” rather than rising polarization between the parties, then it is important to know if state legislative factions exist and if they behave similarly to congressional factions.⁶ Focusing on state legislatures can reveal the effect of ideological factions in a variety of legislative settings. Some states have institutional rules such as filibusters and variations of the Hastert Rule that could impede party leadership from advancing an agenda when extremists object. Studying the differences in faction strength between states that have these rules and those that do not can show whether or not party factions are responsible for creating state-level gridlock or at least hindering Republican leadership goals.

To examine state legislative factions, I will analyze a sample of roll call votes across state legislatures in time periods with varying degrees of polarization. I want to know if certain Republicans vote against party leadership in consistent groupings and on consistent issues. Roll call votes will reveal if factions persist over time, if they consistently stick together, and if the issues that they form around are changing. Particularly important are the differences between factions that formed before and after the 2010 midterms because it is likely that the ideological Tea Party movement has increased Republican factionalization. I will also look into several other questions including: Do factions tend to form in the lower or upper chambers of state legislatures? Do moderate and liberal states develop the same factions as conservative states? Does a legislator’s district ideology or leadership status affect...
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faction membership? There is plenty to learn from state legislative factions, but my primary focuses will be seeing if the national Republican divide is mirrored in state legislatures, if the existence of ideological factions correlates with increased polarization and gridlock, and if institutional rules increase a faction’s ability to obstruct party leadership.

References:


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Emerging Ivermectin Resistance of *Dirofilaria immitis* Prompts Need for Improved Heartworm Medication for Dogs

Connor O'Neill; Mentor: Dr. Adrian Wolstenholme, Infectious Diseases

Macroyclic lactones (ML) are currently the only available preventative for *Dirofilaria immitis* (heartworm) infections in dogs (Vatta, *et al*., 2014). In the absence of an alternative treatment, lack of efficacy (LOE), or resistance, towards ML’s has been increasingly reported among *D. immitis* strains since 2005 (Pulaski, *et al*., 2014). Although most of these LOE strains have been reported in the Mississippi Delta region of the United States, their true prevalence and impact on overall animal health remain unknown (Wolstenholme, *et al*., 2015). Furthermore, while many different anti-heartworm medications exist on the market, they are all categorized as ML’s (Wolstenholme, *et al*., 2015). Therefore, if *D. immitis* strains develop LOE towards one brand of ML medication, then they can just as easily develop LOE towards the rest of the medications on the market (Wolstenholme, *et al*., 2015).

In response to this threat to animal health, the ultimate objective of this proposed research is to discover an improved treatment for *D. immitis* infections before their developing LOE defeats current ML preventatives. To accomplish this, it is important to understand the mechanism by which ML medications such as ivermectin interact with both the *D. immitis* pathogen and the host’s immune system. Peripheral blood mononuclear cells (PBMC’s) from the immune system of an uninfected dog will recognize and bind to *D. immitis* parasites while they are in the larval stages of their life cycle (Wolstenholme, *et al*., 2015). When ivermectin is added to an infected blood sample at a low concentration, it enhances the ability of the PBMC’s to recognize and bind to parasites (Vatta, *et al*., 2014). However, because there is no direct interaction between the parasite and the drug, ivermectin should only increase recognition and binding to parasites without LOE (Vatta, *et al*., 2014). Therefore, it is anticipated that if ivermectin suppresses the ability of *D. immitis* pathogens to bypass the host’s immune system, then it should only make a noticeable impact on non-LOE parasites.

To test this hypothesis, larval *D. immitis* parasites will be extracted from blood samples from infected dogs. These parasites will then be mixed with immune cells, which will be extracted from blood samples from uninfected dogs. Ivermectin will then be added to some samples while other samples will remain completely free of ivermectin. The ability of the PBMC’s to bind to and kill parasites in each blood sample will be observed. These data will be recorded to electronic records and analyzed to compare the ability of PBMC’s to kill *D. immitis* parasites in the presence or absence of ivermectin. If the PBMC’s in samples with ivermectin bind to and kill a significantly greater quantity of *D. immitis* parasites, then the original hypothesis is supported. Likewise, if no significant difference is found in this ability between the presence and absence of ivermectin, then the original hypothesis is not supported. Should this hypothesis fail to gain sufficient support in this research, alternative mechanisms among the host’s immune system and ML’s like ivermectin will be further investigated.
References:


Increased Levels of Tissue-Nonspecific Alkaline Phosphatase in Hypophosphatasia

Trey Powell; Mentor: Dr. Luke Mortensen, Animal & Dairy Science

Hypophosphatasia (HPP) is a rare genetic disease that prohibits the process of bone mineralization due to severely low levels of tissue-nonspecific alkaline phosphatase (TNAP). Infantile HPP manifests with complications including hypercalcemia, vitamin B6-dependent seizures, and craniosynostosis. These patients die from respiratory failure. Other forms of HPP include perinatal, childhood, adult, and odonto-HPP with symptoms ranging from still birth to loss of teeth. As there is no current cure for Hypophosphatasia, any combination of these genetic abnormalities leads to the death of over 50% of people diagnosed or suffering from HPP within nine months of birth.

Current investigations into HPP therapy include bone chip transplants, mesenchymal stem cell therapy (MSC), and enzyme replacement therapy. Enzyme replacement therapy was recently approved for human use. This therapy hinders the livelihood of HPP patients, as it requires daily intravenous treatment, and symptoms quickly reappear if treatment is stopped. This therapy does not provide a high quality of life for the patients, thus creating a need for a new therapy. Mesenchymal stem cells derived from bone tissue have shown promise to treat HPP with a low allogenic transplantation rejection rate and by increasing bone mineralization and regaining muscle mass in patients receiving MSC therapy. Therefore, MSC therapy should be explored as a curative treatment for HPP.

The research of The Mortensen Lab of the University of Georgia’s Regenerative Bioscience Center involves improving upon MSC therapy as a treatment for HPP. As a CURO Summer Fellow, I will further the work on MSC therapy by transfecting MSCs with viral vectors to deliver elevated levels of TNAP to the bone. I aim to express soluble TNAP within the cells and allow cells to secrete the TNAP into their environment. Modification to the expression of TNAP will be monitored with in vitro studies using an enzyme activity assay. My work this summer will lead to in vivo studies where administration of MSCs expressing high levels of TNAP into the cellular space could rescue bone mineralization, thus providing a more effective treatment for HPP.

My work will have larger implications in biomedical research. I aim to use MSCs as a means to deliver therapy to diseased tissue. My work will model this technique for treatment of other diseases.
References:


Proposals

A Study of the Prevalence, Community Awareness, and Environmental Levels of *M. leprae* – A Baseline Survey in Ayappakkam, Tamil Nadu, India

Vineet Raman; Mentor: Dr. Corrie Brown, Pathology

Leprosy is an infectious disease caused by the bacteria *Mycobacterium leprae*. Though it has largely been eradicated in industrialized countries, leprosy is still found in developing areas, with South America and Southeast Asia currently accounting for 81% of all new cases. Furthermore, leprosy’s five-year incubation period and ability to remain dormant for up to twenty years make early detection difficult. As a result, typical cases present with severe symptoms characteristic of late-stage leprosy such as visible deformities and visual impairment, leading to what the World Health Organization (WHO) terms Grade 2 Disability (G2D) cases. These G2D cases indicate a lack of health infrastructure capable of detecting the early stages of leprosy. Southeast Asia has documented an increase in numbers of Grade 2 Disability (G2D) cases; the number of G2D cases in India alone reached 500,000 in 2015.

In 2005, the National Leprosy Eradication Program (NLEP)—an initiative of the Indian Ministry of Health—declared that leprosy had been “eliminated as a public health problem” as the prevalence rate of 0.95 cases per 10,000-member population had declined below the threshold of 1.00 case per 10,000-member population. However, recent community surveys conducted by the National Institute of Epidemiology (NIE), a WHO Collaborating Center for Leprosy Research, in the state of Tamil Nadu have indicated that the actual prevalence of leprosy may be higher than previously reported. Despite these findings, no long-term cohort studies currently exist in Tamil Nadu that examine the epidemiology of leprosy.

The objective of this project is to conduct a cross-sectional study of the prevalence of leprosy in Ayappakkam, a sub-urban district 40 kilometers west of Chennai, the capital of Tamil Nadu. By means of our study, we also hope to measure the level of awareness of leprosy in the community, describe and evaluate the experiences of leprosy patients and their family members as they seek help and progress through the existing health systems, examine the presence of *M. leprae* in the patient specimens by characterizing the pathogenic bacteria as multibacillary or paucibacillary, and to determine any additional risk factors that contribute to likeliness of infection.

Consequently, we will randomly sample from the 50,000-member Ayapakkam community that has been characterized demographically by the NIE. We will stratify our sample to ensure adequate representation of different socioeconomic and demographic backgrounds. We will use standardized NELP definitions for the diagnosis of leprosy in the cohort and external experts from the Central Leprosy Training and Research Institute (CLTRI) to validate the diagnoses. Trained field workers will use standardized questionnaires to gather data on socio-economic, demographic, and clinical characteristics of leprosy patients. A semi-structured questionnaire will be utilized to collect information regarding the informal and formal treatment experiences of leprosy patients and the general level of awareness of the disease. Environmental *M. leprae* specimens will be collected using standard scientific protocol to ensure the bacteria remain out of human contact and are not contaminated.
My role as research assistant would be to become well-versed in literature regarding leprosy, manage the default inputs for data collection devices (tablet computers), and to conduct field visits to ensure methodical and accurate collection of data. After data collection is complete, I will analyze the data and write a final report.

We will share the data gathered with managers from the NELP for use in their plans for possible interventions. Our findings will also help us to educate the Ayappakkam community on important aspects of leprosy, in addition to providing a much needed baseline for the establishment of further long-term cohort studies to analyze the disease trends, transmission dynamics and the efficacy of leprosy treatment services.

References:
Small Molecule Inhibition of CARM1 in Adipocytes to Control the Epigenome-Induced Risks of Obesity

Dhairya Shukla; Mentor: Dr. Richard B. Meagher, Genetics

Obesity is the condition of having excess body fat (adipose tissue), and a Body Mass Index greater than 30. Obesity has reached epidemic proportions with 35% of adult Americans being obese (Ogden 2016). It is also the leading cause of preventable death in the USA, making it one of the top research priorities. Obesity results from the increased production and size of adipocytes, fat cells, in adipose tissue. This results from imbalance between food intake and energy expenditure, leading to an excessive accumulation of adipose tissue. While genetics plays a role in obesity, the health related risks of obesity and the difficulty individuals have losing weight, may be better explained by epigenetic factors. One such epigenetic factor, Coactivator-Associated Arginine Methyltransferase 1 (CARM1) catalyzes modification of proteins such as histones at adipogenic genes and appears essential to the transformation of preadipocytes into mature adipocytes and perhaps the proliferation of adipocytes (Therrien, 2009). The cellular memory of CARM1-catalyzed asymmetric arginine modifications in visceral and subcutaneous adipose tissue (VAT and SAT) adipocytes may impact the ability to gain and lose weight (Yadav, 2008). Our main goal this summer is to identify the optimal compound that inhibits proliferation of adipocytes, the process of adipogenesis, and the maintenance of mature adipocytes on site. CARM1 is essential to the preceding processes and, if inhibited, could lead to the blockage of the development of harmful, mature fat cells. However, adipocyte cell-type-specific epigenetic analysis within adipose tissues has been difficult, because mature adipocytes are exceptionally large fragile cells that tend to lyse during isolation and manipulation. Nonetheless, Dr. Meagher’s laboratory recently developed innovative tools to enable adipocyte-specific epigenetic analysis of chromatin structures including fluorescence activated nuclear sorting of adipose tissue nuclei and a preadipocyte cell line that fluoresces when cells started to differentiate into mature adipocytes (ADNp::RFP (Ambati, Submitted). This allows us to quantify the data and determine if the inhibition of the compound is actually taking place. I will begin by inhibiting adipocyte development of this cell line using the natural compound CARM1 inhibitor Ellagic Acid and then move on to pharmaceuticals newly designed to inhibit CARM1 (Kang, 2014). The fluorescence activated nuclear sorting will be used to determine when a cell has started to differentiate, and if the drug compounds being used are inhibiting the preadipocytes from differentiating into mature fat cells. If inhibition occurs, we will further determine the effectiveness of the drug in discontinuing adipogenesis and its effect on the proliferation of adipocytes on site. Our translational medicinal goal is to reduce obesity and its harmful comorbidities including cardiovascular disease, some cancers, type II diabetes, inflammation, and dementia by testing this next in mouse models.
References:
Ambati, S., et al. (Submitted). "Adipocyte nuclei captured from VAT and SAT ".


Evaluation of the Effectiveness of Georgia Department of Natural Resources Hunt and Learn Program

Shelby Telfer; Mentor: Dr. James Martin, Warnell School of Forestry & Natural Resources

Introduction:
Experiential learning is a model that describes how individuals learn. Specifically, this model describes learning as "the process whereby knowledge is created through the transformation of experience" (Kolb 1984). Environmental education often employs this process of learning to allow children and adults to gain new experiences while simultaneously developing skills and understanding of nature and the outdoors (Kolb 1984). This approach is commonly implemented to alleviate the Nature Deficit Disorder crisis (Louv 2005).

The Georgia Department of Natural Resources Wildlife Resources Division (WRD) employs the experiential learning model when it comes to training young hunters. Since the 1980’s, the WRD has collected data that reflect a general decline in the number of Georgia licensed hunters. It is a concern that this decline may be attributed to a lack of participation by young hunters. Wildlife professionals suggest this decline has been caused by increased urbanization, competition with other recreational activities, and an overall issue with the ease of access to wildlife populations and acceptable hunting areas (Killmaster 2014). In an attempt to reverse this decline, WRD has implemented the Hunt and Learn Program.

The Hunt and Learn Program is a series of Advanced Hunter Education workshops offered at the Charlie Elliott Wildlife Center (CEWC) in Mansfield, Georgia. The first workshop was offered in May 2010. These workshops focus on the development of hunting basics, wildlife management, and firearm safety. Children between the ages of 10-17 are invited, along with a parent or guardian, to a weekend of experiential learning opportunities that focus on various game pursuits including squirrel, rabbit, white-tailed deer, northern bobwhite, wild turkey, and the sport of falconry. Participants are given the opportunity to earn their Hunter Education certificate, receive instruction from experts in the field, learn firearm safety, participate in multiple hunts, and learn culinary skills to prepare their game.

Objective:
The objective of this study is to evaluate changes in participant’s knowledge, attitude, and behavior as a result of participating in the Hunt and Learn Program.

Methods:
A retrospective survey will be designed and administered electronically using the UGA Qualtrics platform. The target audience for this survey are past participants of the Hunt and Learning Program (N = 320). The administration of the electronic survey will include a pre-notification email, initial survey distribution, two reminder emails, and final email asking participants to respond (Dillman, 2007). Analysis of the survey data will be conducted using SPSS. Cronbach’s alpha for each construct will be determined as a test of reliability (Cronbach, 1951).
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Outcomes:
This project will provide CEWC and the WRD Hunter Education program with information critical to evaluate the effectiveness of the Hunt and Learn Program. Georgia is one of only a few states in the US that has developed an educational program of this kind. The stakeholders will use the results of this evaluation to improve their program model, and share it with other states to assist them in building new programs, or improving existing programs. Results of this evaluation will ultimately benefit the conservation and management of Georgia’s wildlife.

References:


Adapting a CRISPR-Cas System in to a Novel Gene Expression Knockdown Platform

Nikita Vantsev; Mentor: Dr. Michael Terns, Biochemistry & Molecular Biology

What started off as a strange repeating sequence of nucleotides found in the genomes of various types of prokaryotes, 50% of bacteria and 90% of archaea (Doudna et al. 2016), was later found to be the prokaryotic adaptive immune system, changing the notion that only vertebrate animals can possess an adaptive immune system. The CRISPR-Cas system consists of the CRISPR (clustered regularly interspaced short palindromic repeat) locus on a prokaryote genome: invader sequences (spacers) separated by a short repeat sequences, and Cas (CRISPR associated) proteins. CRISPR-Cas systems protect prokaryotes from viruses and other invader nucleic acids.

A CRISPR-Cas system utilizes a three step process: Adaptation, in which a prokaryote integrates a short sequence of invader nucleic acid into its own CRISPR locus to become a spacer; CRISPR-RNA (crRNA) biogenesis, in which the spacers are transcribed and processed to become crRNA molecules; and invader silencing, during which Cas proteins use the guiding crRNA, to interfere with and silence future invaders (Terns et al. 2014). There are six distinct types of CRISPR-Cas systems in prokaryotes that differ primarily in the proteins responsible for invader silencing. The diverse types of CRISPR-Cas systems each execute the same three basic steps but use different RNA and protein components (Terns et al. 2014).

What makes CRISPR-Cas systems a highly relevant topic today is its new found role in genetic engineering. The Type-II CRISPR-Cas system uses a single DNA nuclease protein, Cas9, guided by base-paired tracrRNA and crRNA, to introduce nicks into the invader DNA sequence. By artificially designing a sgRNA, combining both tracrRNA and crRNA, Cas9 can be programmed to target and nick specific genes in a wide range of organisms (Jinek et al. 2012).

The purpose of this research project is to adapt the Csm invader silencing complex in Type-III CRISPR-Cas of Lactococcus lactis, as an efficient mRNA knockdown research tool. Our previous research on the Csm system has shown that it can efficiently target RNAs that are complementary to the guide-crRNA (Terns lab unpublished). I will be using genetic and biochemical methods to first, introduce mutations in the active sites of Csm proteins responsible for RNA cleavage, second, transform and express the plasmid containing the complex and the guide-crRNA sequence in E. coli, and third, let the Csm-crRNA complex, programmed by the guide-crRNA sequence, target a specific gene transcript of E. coli genome (we would be primarily targeting the mRNA of a lipoprotein (lpp), lacZ, and other highly expressed non-essential cellular proteins). Next, I will use the Northern blotting (RNA analysis technique) to probe for the mRNA produced by the targeted gene (lpp of lacZ). Based on the size of the target mRNA produced by the different variations of Csm mutants, I will be able to tell if the Csm-crRNA complex successfully cleaved the mRNA message. Additionally, I will assay for expected reduction of the protein products. By conducting a series of experiments on the Csm-crRNA complex activity and analyzing mRNA and protein data, I hope to figure out the role of each protein in mRNA targeting, which will help to determine the pathway by which CRISPR-Cas Type-III invader silencing works. Conducting these experiments would also allow me to optimize for the most efficient and accurate mRNA silencing tool in E. coli. In the long run, I hope that this novel
gene expression knockdown platform that we develop, will be effective for genetic engineering and gene discovery applications in a broad range of bacteria such as those that we depend upon for production of our food, pharmaceuticals, and new biofuels.

References:


Dementia is a major threat to public health. Due to the world’s aging population the prevalence of dementia is expected to triple by 2050. Studies show almost all aging adults will experience dementia symptoms as a result of decreased cerebral blood flow and white matter damage leading to a newly recognized form of dementia known as vascular cognitive impairment (VCI). Previously, clinicians attributed most cognitive decline to Alzheimer’s disease, however with the recognition of pronounced vascular changes exhibited by dementia patients this view is now being challenged. In 2012, the National Institute of Neurological Disorders and Stroke (NINDS) Stroke Progress Review Group cited “prevention of vascular cognitive impairment” as a major research priority as vascular dementia currently contributes to approximately 20% of all dementia cases.

There currently is no Food and Drug Administration approved treatment for VCI. In response to the demand for a viable VCI treatment, we have developed a safe, inexpensive treatment method known as remote ischemic conditioning (RIC). For this particular treatment, a blood pressure cuff is applied to the arm and repeatedly inflated and deflated promoting the brain to protect itself. In a recent publication by our group, we demonstrated in a murine VCI model that RIC effectively prevents white matter damage and cognitive impairment by increasing cerebral blood flow (CBF), and reducing the accumulation of amyloid-beta 42 protein.

Numerous therapies for dementia have failed in human clinical trials due to the use of animal models not truly representative of the human condition. The current absence of an effective, translatable dementia treatment indicates a clear need for a more human-like animal model for the development of a successful treatment. As a result, we are developing a novel VCI pig model in order to test RIC prior to clinical trials. The pig brain has comparable size and structure to the human brain. Most importantly, the pig brain has a similar composition of white and gray matter to ours and is at a similar stage of myelination, a characteristic vital to the successful development of a translatable treatment. We hypothesize that after sustaining a VCI injury, pigs will demonstrate cognitive deficits both the short and long-term, but RIC treatment will result in significant improvements in overall cognition.

One of the major assessment tools used to determine if a VCI treatment is effective is observing changes in cognitive function, specifically learning, memory and behavior. This May, I will evaluate the ability of 6 month-old male pigs to perform two cognitive tests: object recognition and open field. The animals tested in this phase of the study will be used as a baseline for normal pig cognition, memory, and behavior. I will play a primary role in the experimental design, data collection, analysis and interpretation of these object recognition and open field tests with this test group of pigs. In addition, I will continue to aid in animal habituation, VCI surgeries, pre- and post-operative care and RIC treatments. These pigs’ performance will be compared to RIC treated and non-treated VCI pigs in the next phase of this study. Development and characterization of key changes in the VCI piglet model from RCI treatment utilizing analyzed data from this summer’s
uninjured pig model will enable a more robust and predictive assessment of novel treatments that will likely lead to more success in human clinical trials.

References:


The Center for Undergraduate Research Opportunities is grateful to the following supporters of the 2016 Summer Research Fellowship:

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- The Honors Program Parent Society
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