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
Office of the Vice President for Research
Biomedical and Health Sciences Institute
Interdisciplinary Toxicology Program
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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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-Zuíga 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 there 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.”
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.


Faculty Research Mentor: Dr. Michael Terns, Biochemistry & Molecular Biology
Dr. Rebecca Terns, Biochemistry & Molecular Biology
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*
News in the Black Belt:
Teaching Journalists How to Cover Poverty in Persistently Poor Counties
CURO-UGA Alumni Association Summer Research Fellow: Carolyn Crist

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. 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
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 endocytoxed 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 microfluidic 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 Aβ, 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 Aβ 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 Aβ, 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 Aβ, 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 Fe65 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 (Ermekova 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 shown 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. 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 archaeon 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
Usage of Linear Subspaces with Varieties

CURO Summer Research Fellow: Tyler Kelly

During my study of algebraic geometry, I have been intrigued by the concept of the Grassmannian, \( G(k, n) \). 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 \( G(k, n) \) 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 \( G(k, n) \) 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 \( \mathbb{P}^4 \), \( \{(x_0, x_1, x_2, x_3, x_4) \in \mathbb{P}^4 | x_0^4 + x_1^4 + x_2^4 + x_3^4 + x_4^4 = 0 \} \), 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 $\mathcal{D} : V \to \mathbb{P}^n$ that maps a point $x$ of $V$ to the partials of $f$ at $x$ (Clemens, Griffiths 302). So $\mathcal{D}(x)$ 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 $\mathbb{P}^n$ 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
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 cameleon fluorescence resonant energy transfer (FRET) calcium indicator are utilized in measuring changes in \( \text{Ca}^{2+} \) 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 cameleon 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
Understanding Pediatric Symptoms

CURO-BHSI Summer Research Fellow: Jennifer Lee

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 Frütsch (1994) found that the most common 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 somatizers 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
Expression and Characterization of the Heterologously Expressed Soluble Hydrogenase I from *Pyrococcus furiosus*

CURO-BHSI Summer Research Fellow: Alice Meagher

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 *in vitro*. 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
Augusto Boal’s Invisible Theatre: Political Play with an Unassuming Audience

CURO-OVPR Summer Research Fellow: **Kelly Nielsen**

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.\(^1\) 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.\(^2\) The principal pathological consequence of MS is the development of demyelinated plaques and subsequent areas of scar tissue (scleroses) in the CNS white matter.\(^3\) The damage to axons and support cells in the CNS causes a delay or complete obstruction of neural conduction.\(^3\) 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.\(^4\)

CNS axonal degeneration alters conduction to muscle tissue creating physical limitations.\(^3\) 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.\(^5\) 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.\(^2\) Although strength gains can occur through neural and/or physiological adaptations, increased strength can be due solely to neurological adaptations.\(^2\) Flexibility training has been shown improve muscle strength.\(^6\) 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.\(^7\) 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
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 exciting 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
Interactions that Define the Organization of RNA-Protein Complexes Involved in Prokaryotic RNA Interference

CURO-BHSI Summer Research Fellow: Neil Pfister

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. 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
Understanding and Preventing the Interaction between RSV’s G Protein and the CX3CR1 Cell Receptor

CURO-Interdisciplinary Toxicology Program Summer Research Fellow: Joseph Rimando

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) transfect 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
The Effect of Hirano Bodies on Mutated Tau Protein

CURO Summer Research Fellow: Aalok Sanjanwala

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 transfect 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 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 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
How Random Is Pseudorandom?

CURO Summer Research Fellow: Aileen Thomas

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
Antisaccade Performance and Deficit Characteristics in a Normal Population
CURO Summer Research Fellow: Manouela Valtcheva

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 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.
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, NO₂, 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 \(^1H\) 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 (\( \sigma_u \)) and quantum efficiency (\( \eta_u \)) 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.

![Figure 1: Release of a model biological effector from 7-hydroxyquinolines.](image)


Faculty Research Mentor: Dr. Timothy Dore, Chemistry
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
CURO 2008 Summer Research Fellowships

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 Mörke'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 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 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*
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 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

Ilan 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
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
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 D

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”
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 Psudohermaphorditism, Hypogonadism, Amernorrhea, 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 E

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*

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*
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 F

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  
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 Orielanski  
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  
Dr. Thomas Cerbu, Department of Comparative Literature  
*The Human Experience of Time: Literary and Philosophical Accounts/Representations*

Nwakasos 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  
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*
Appendix G

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  
*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*
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