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Schedule of Events

9:00 am - 9:15 am  Welcome:
Russell House Theater

9:15 am -11:30 am  Musical Performances:
Russell House Theater

9:15 am -11:30 am  Oral Presentations:
Russell House Rooms 201, 203, 205, 302

12:00 pm - 3:00 pm  Poster Session:
Russell House Ballroom

3:00 pm - 3:30 pm  Reception:
Russell House Ballroom

3:30 pm - 4:00 pm  Awards Ceremony:
Russell House Theater

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Seaport Security since 9/11

Malvina Hryniewicz, Political Science - Little River, SC

Mentor: Dr. Katherine Barbieri, Political Science

The September 11th, 2001 terrorist attacks awakened the United States to realize its vulnerability to possible attacks. While aviation security has received much attention, less has been given to maritime security. However, the seaports in the United States are vulnerable to a terrorist attack for two reasons: first, seaports are easy to penetrate – due to other weak links in the global supply chain; and second, an attack on any seaport would devastate the world’s economy. Therefore, it is important to determine if enough has been done to protect our seaports. To do this, I compare seaport security regulations and compliance in the periods before and after 9-11. I evaluate whether new laws, procedures, policies, and technologies have done enough to strengthen security after 9-11. Through research, analysis, and expert testimonies, I was able to determine the faults in these new policies. Lastly, I looked at the rise of piracy as well as the war in Iraq as examples of the threats to seaport security. I found that the seaports in the United States are not safe from terrorist attacks, because enough has not been done to protect seaports. Since terrorists are employing technologically advanced tactics, the United States must outsmart and outdo these groups in order to protect its homeland.

Marginalization of Latina Women - Economic, Social, and Health Care

Asma Jaber, Anthropology - Travelers Rest, SC

Mentor: Dr. Elaine Lacy, History

The face of immigration is constantly changing. This is true for the United States as Latino immigrants are moving into states (such as Alabama, Georgia, and South Carolina) that are not usually considered immigrant gateways. For many reasons - whether due to the Immigration Reform and Control Act of 1986 or the booming economy of the area - the Southeast has become a place of settlement for Latino men and women.

Latina women in the new settlement areas of the Southern states comprise nearly 40% of the Latino immigrant population. More wives are joining their husbands as they settle in the South and even out the current gender imbalance. Previous research reveals that immigrant women play an important role in the settlement process, largely by creating and utilizing social networks. However, most of this research was carried out in traditional Latino settlement areas like Texas, California, and Chicago, areas with longstanding Latino communities in place that can assist newcomers. As a new settlement area, South Carolina lacks such a support system, and many of these new immigrants find themselves isolated and marginalized in many ways. Most lack much needed English skills, transportation, and social support. My analysis of two primary sources will reveal the different ways in which Latina women in South Carolina are marginalized. I will trace the history behind the marginalization of Latina women, account for the marginalization as it relates to economic, social, and health care and discuss the implications.
Impact of the Iraq/Afghanistan War on Soldiers and their Families

Clarie Precil, International Business - Columbia, SC
Mentor: Dr. Katherine Barbieri, Political Science

People have long debated whether wars are good or bad for the economy and society. Many agree that war has both costs and benefits some of which vary across different segments of society. Given the vital role that the soldiers play during any war, it is important to understand how war impacts soldiers and their families. Are the costs of going to war far greater than the benefits the soldier and his or her family receive? This is an important question to ask as the US continues its wars in Afghanistan and Iraq. In this study, I examine the impact of war on military families by comparing the costs and benefits endured by soldiers at war and the families they may leave behind. I focus on two types of benefits provided to soldiers and/or their families: (1) salary and (2) services. I then consider some of the costs endured during war. I will evaluate the extent to which military families’ needs are being satisfied and determine whether changes in salary and services associated with the war are sufficient to cover added costs. I will focus on the Army and rely upon data from military sources. I will supplement my data with interviews conducted with military spouses and personnel.

The Impact of Economic Interdependence on Russia’s Foreign Relations

Oskana Slobozhan, International Studies - Columbia, SC
Mentor: Dr. Katherine Barbieri, Political Science

The effects of economic interdependence on the relationships between trading partners has always been an issue that attracts debate. While advocates of the ‘peace-through-trade’ hypothesis believe that trade always promotes peace; others argue that trade often causes conflict. There are also those who think that trade has a mixed impact or no impact at all on relationships between countries. This work looks at the ‘trade-conflict’ debate in the context of the USSR/the Russian Federation. With the dissolution of the Soviet system, Russia took on a new course of foreign policy reflected in its ‘multipolar concept.’ This thesis studies the results of the changed policy that are reflected in new types of interactions between Russia and its close trading partners. The work investigates how ‘trade-conflict’ debate applies to three cases – Russia’s relations with 1) ‘Far Abroad’ (dalnee zarubezhye) – Western Europe, 2) ‘Near Abroad’ (blizhnee zarubezhye) – Eastern Europe, with the division between new EU members from East Europe, and CIS countries, and 3) the East Asian bloc. In all three cases, the effects of trade on the relationships between the countries are very different. This supports the view of those who believe the impact of trade on peace or conflict is mixed. In the case of Russia, it is not the overall increased value of trade, but the government’s security policy that has influenced either peaceful or conflictual patterns of interaction. Trade patterns are heavily directed by government to attain specific security objectives.
Incidence of Foreign Direct Investment into Developing Economies in the Temporal Context of War

Samuel Wellborn, International Studies - Lexington, SC

Mentor: Dr. Katherine Barbieri, Political Science

Most scholars agree that war affects a nation’s economy—sometimes in a sweeping and long-term way. Statistics show that in developing economies, foreign direct investment (in tandem with capital accumulation and domestic reinvestment) is a critical component to the course of development—that of a rising gross domestic product and human development index. Conflict can curtail investment, thereby inhibiting economic growth. This study primarily examined the incidence of foreign direct investment (FDI) in post-war developing economies as compared to pre-war FDI levels. Because the aim of the research was to find general trends relating FDI and conflict, cross-national, longitudinal data from 1970 to 2000 was used—as a secondary focus, regional trends were derived and analyzed. Data was correlated from the World Bank’s published World Development Indicators, United Nations Development Program’s Human Development Reports, Correlates of War Project, and the Uppsala Conflict Database. It was found that nations’ gross domestic products declined substantially and steadily preceding periods of conflict; those steady, declining trends did not recover as the period of conflict waned and passed; a set of possible explanations is offered.

Melting in the Melting Pot: Lebanese Immigrant Identity in South Carolina after 9/11

Nick Younginer, Anthropology - Columbia, SC

Mentor: Dr. Karl Heider, Anthropology

Through the study of Lebanese immigrants in South Carolina, I attempt to locate the manner in which these group identifies itself among its members and outsiders in this post 9/11 society. Discovering how members of a group negotiate their identity is vital to understanding how they fit into the larger social fabric. With a grant provided by the Office of Undergraduate Research’s Magellan Scholars program I was able to set up a research schedule in the summer of 2006 and complete the project as an undergraduate thesis in the Anthropology department.

Through members of my extended family who are Lebanese, I was able to secure five informants who I would interview three times apiece throughout the month of June. Coupled with previous research on the subjects of identity formulation and notions of national identity my research determined that the label of ‘Arab’ that is placed on Lebanese is not necessarily accepted by some members of the group. This is due to the fact that the connotation of Arab now has a different meaning as a result of 9/11.

Further, I examined the ways in which 9/11 has changed the notions of identity among the informants. I found that there was little identity change undertaken because of the small social circle held by the immigrants interviewed. The informants in this study see themselves as more correctly being labeled ‘white’ than ‘Arab’ and this project illuminates factors that contribute to identity their identity formation.
Changes in Attitudes Towards Science in Nineteenth Century Mainstream America

**Alan Clamp**, History - Newberry, SC

Mentor: Dr. Ann Johnson, History

Scientific American, today a popular and respected magazine, was, beginning in 1845, a weekly newspaper. Though its beginnings were humble, it developed rapidly during an era when numerous similar publications came into and out of existence within the space of a few years. It can be shown that Scientific American had a very broad readership during the nineteenth century, ranging from what we might call academic scientists, to inventors and engineers, to those who aspired to such and those who simply had an interest in science in general. Studying the first fifty years of the publication, along with a few other primary and secondary sources, provides much insight into mainstream American attitudes towards science during the nineteenth century. What we might call pure science, such as chemistry or physics, and practical science, such as engineering and technology, were largely considered together under the broad heading of “science” in the mid-nineteenth century. American science developed during the nineteenth century with a sense of national pride. There was much debate and discussion as to the extent that science should be practical, but a dichotomy between the activities of pure science and those of practical science, does not seem to be part of the way mainstream America thought of science before the early 1880s.

Botanical Knowledge among South Carolina Elementary School Students

**Chanda Cooper**, Biological Sciences - Camden, SC

Mentor: Dr. Gail Wagner, Anthropology

What is the status of plant knowledge among South Carolina elementary school children, and can informal botanical education experiences in the setting of a public school increase students’ interest in and knowledge about plants and their local environment? In a pre-test, fourth- and fifth-grade students at Pine Tree Hill Elementary School in Camden, South Carolina (n=10) freelisted plant names and attempted to identify 60 plant pictures. They also completed a survey to indicate factors that may contribute to the learning of plant names, including how often they participate in outdoor activities. Students freelisted an average of 30.9 ± 12.1 items at different taxonomic levels and were able to identify approximately 33.7 ± 6.84% of plant pictures. However, children identified an average of 70.8 ± 13.7% of food and crop plants, suggesting that while American children may not be familiar with native species, they do possess culturally important botanical knowledge. Following pre-testing, students spent two hours each week in a Nature Class where they engaged in hands-on experiences designed to spark their interest in plants and natural history. The Nature Class discussed plants and their uses, took nature walks, created nature journals, planted a school education garden, was visited by several naturalists, and began a school composting program. Post-assessments will indicate what, if any, effects this program has had on the children’s knowledge of plants. This research has important implications for conservation, environmental education and nature study programs, and the growing interest in the connections between nature and childhood.
Revitalization of a Main Street Icon: Restoration of the State/Fox Theater

Carrie Giauque, History and Anthropology - Provo, UT

Mentor: Dr. Robert Weyeneth, History

The building located at 1607 Main Street, known as the State/Fox Theater, is the only surviving movie theater of the five that were in business on Main Street during the 20th century. Currently it is a store that sells beauty products but as part of an effort to revitalize the downtown area, the theater has been purchased in order to restore it to a movie theater. For this reason, I created a restoration plan for the State/Fox Theater and constructed a history of the building and businesses that operated there. Using the standards set forth by the U.S. Secretary of the Interior for the treatment of historic properties, I analyzed the layers of history in the building and determined their historical significance and the level of action needed. Physically, the building has gone through several changes, including the addition of a third story and the adjacent building at 1605 Main Street. Many decorative elements remain on the interior and exterior from the time it was used as a movie theater, but several are missing such as the marquee. The building can be restored to its original 1936 appearance and also be adapted to fit the needs of the new owners. With proper restoration, it should be eligible for the National Register of Historic Places, signifying its importance in Art Deco architecture and connection to the community.

South Carolina’s Unfinished Revolution: Benjamin Franklin Randolph and Randolph Cemetery

Gale Lyons, History - Sumter, SC

Mentor: Dr. Valinda Littlefield, History

The project is historically designed to establish U.S. Senator (Chaplain) Benjamin Franklin Randolph as a significant political figure during the Reconstruction era through primary evidence to document his biographical, religious, and political history. Randolph was never a slave - born a free mulatto during slavery, in Kentucky; he was raised and educated in Ohio, with some citizenship privileges (i.e., voting). He enlisted in the Civil War in New York as a Commissioned Army Chaplin in the 26th Regiment of the U.S. Colored Soldiers Army that emerged with Beaufort. In 1867, Randolph wrote to the Freedmen’s Bureau for a return to South Carolina: “I don’t ask position or money. But I ask a place where I can be most useful to my race…my faithful service as Chaplain demand that I seek such a place.” In 1867, he returned to South Carolina as a teacher and later appointed Assistant Superintendent of Education. In 1868, Randolph was elected Chairman of the 1868 Constitutional Convention, and later in the year, as U.S. Senator representing Orangeburg County, the Ku Klux Klan assassinated him in Abbeville based on his political agenda of social equality. In 1871, Randolph’s body was removed from Abbeville for reburial in his own cemetery, Randolph’s Cemetery, located on Elmwood Avenue. Elsie H. Booker wrote about the reburial, “We had a nice time…in reburying the body of B.F. Randolph, there was about 2,000 people in the procession.” Our research suggests that Randolph’s life and death was of political importance, resulting in an unfinished revolution.
The Challenging Horizons Program: Contributions of USC Undergraduates to the Development of an Evidence-Based, Award Winning Program

Samuel McQuillin, Experimental Psychology - Charleston, SC
John Terry, Experimental Psychology - Hilton Head, SC

Mentor: Dr. Bradley Smith, Psychology
Ms. Carolyn Pender, PhD Candidate, School Psychology

This presentation highlights the contributions of USC undergraduates to the Challenging Horizons Program (CHP), which is a program that serves the needs of middle-school students who exhibit learning or behavior problems. The CHP is an evidence-based, award-winning program that was originally provided as an after-school for students with Attention-Deficit/Hyperactivity Disorder (Evans, Smith, and Molina, 2006). The CHP is staffed primarily by USC service-learning students who fill entry-level counselor positions, senior counselor positions, and undergraduate research positions. In the past five years, the CHP has expanded to meet the needs of a broader range of middle-school students including students in School District One of Richland County who have done poorly on state standardized academic achievement tests, students in School District Five of Lexington and Richland Counties who have been expelled from school due to behavior problems, and underprivileged minority youth in Marlboro County, South Carolina. One of the presenters, Sam McQuillin, has made major contributions to the development of math assessment and tutoring intervention. The other presenter, John Terry, has begun a study of math self-efficacy, thus taking the first steps in moving the CHP from a primarily behavioral intervention to a cognitive-behavioral program. In addition to describing their own contributions, the presenters describe the undergraduate leadership structure in the CHP, which often leads to graduate studies. The authors hope to encourage more widespread appreciation for the CHP and raise awareness on campus regarding undergraduate student clinical experience and research involvement opportunities available through the CHP.

Developing Diversity in Undergraduate Research

Bradley Setzler, Philosophy - Newberry, SC

Mentor: Dr. Ann Johnson, History

In recent years, it has been theorized that the future of studies in science, technology, engineering, and mathematics will converge into fields as exciting as nanotechnology to create a revolution in the means by which humans will interact with one another and with the world. This revolution will center primarily on the professional research being conducted in universities, who in turn acquire their researchers from undergraduate institutions. As positions in these developing fields have become more competitive and important, research experience as an undergraduate has become paramount for admissions. The undergraduates who receive the opportunity to partake in research are likely to be the revolutionaries who will lead our society into the future, and surely the perspectives of these individuals will influence their work.

The purpose of my research is to comprehend the effect that the changing role of undergraduate research is having on underrepresented populations, particularly in the developing field of nanotechnology and other STEM fields, but also in general undergraduate studies. If the student population is not chosen with concern for diversity of perspective, our future society may continue to exclude those who may be
said to be presently excluded. With many universities and funding institutions taking an interest in this problem, my research aims to discover the extent to which the problem exists and the effectiveness of potential solutions.

Archaeological Results from the V. Green Site (38KE287) and the Richardson Site

James Stewart, Anthropology - Seneca, SC
Mentor: Dr. Gail Wagner, Anthropology

In the fall of 2006, I conducted an archaeological survey and testing archaeological survey of the north field of the Wateree River Correctional Institution was conducted with the aid of a Magellan Scholar grant. The purpose of this project was the detection of the Contact period 'Congeree Town' mentioned by John Lawson. Though the site was not rediscovered, two Woodland period sites were detected and an area was removed from the search.
The Effect of β-Arrestin 2 Deficiency on LPS-induced Inflammatory Responses in Polymorphonuclear Leukocytes

Fahmin Basher, Chemical Engineering - Orangeburg, SC

Mentor: Dr. James Cook, Department of Neuroscience, MUSC

Previous studies have implicated heterotrimeric Gi proteins in signaling leading to inflammatory mediator production induced by bacterial LPS. β-arrestins are ubiquitously expressed proteins that alter signaling by G-protein-coupled receptors. Recently it has been demonstrated that β-arrestin 2 plays a multifaceted role as a signaling adaptor and scaffold in regulating cellular inflammatory responses. Polymorphonuclear leukocytes (PMNs) activated by LPS induce inflammatory responses resulting in organ injury during sepsis. We hypothesized that β-arrestin 2 suppresses the inflammatory response of PMNs upon activation by LPS. To examine the potential role of β-arrestin 2 in LPS-induced cellular activation, we employed homozygous β-arrestin 2-deficient, heterozygous, and wildtype mice. The effect of LPS on the induction of PMN inflammatory gene expression was examined by incubating PMNs harvested from the peritoneal cavity with varying concentrations of LPS. Tumor necrosis factor (TNF-α) and interleukin (IL-) 6 were assayed by ELISA; in parallel studies, differences in chemotaxis were examined by quantifying the number of cells recruited into the peritoneal cavity. Peritoneal exudate cell counts, as well as production of TNF-α and IL-6 were increased in the knockout mice compared to heterozygous mice. It was found that β-arrestin 2 inhibits chemotactic activity as well as the production of TNF-α and IL-6 in neutrophils, thus demonstrating that β-arrestin 2 is a negative regulator of neutrophil activation. Delineation of the role of β-arrestins in TLR signaling may provide new insights into the molecular mechanisms of innate immunity and possibilities of deterring the inflammatory responses to TLR ligands in sepsis.

Vaso-Occlusive Pain Early In Life Increases Acute Procedural Pain in the Pediatric Sickle Cell Population

Teresa Mark, Biological Sciences - Aiken, SC

Mentor: Dr. Sarah Sweitzer, Pharmacology, Physiology and Neuroscience

Children with Sickle Cell Disease (SCD) experience significant painful vaso-occlusive episodes (VOEs). The first VOE may occur as early as six months, but age of onset, frequency, and severity vary. Studies of premature infants and male infant circumcision at birth indicate painful experiences early in life affect the developing nervous system and alter pain sensation. Little is known regarding the impact of VOEs on subsequent pain experiences. This study used a multi-method evaluation of pain in response to a routine venipuncture across three age groups (2-4, 5-9, & 13-18 years) of children with SCD. Venipuncture pain was evaluated via heart rate changes, parent and child pain reports, and observations of behavioral distress. This investigation is the first to conduct a multi-method evaluation of procedural pain across age. Change in heart rate, pain reports, and behavioral distress decreased as age increased. Data was also analyzed to compare the affect of VOE onset prior versus after 3 years. Patients whose first episode occurred in the first 3 years of life exhibited greater increases in heart rate, higher pain reports, and more behavioral distress. These data indicate venipuncture pain is greater for younger children and painful VOEs early in development sensitize a child to acute procedural pain later in
Migration rates of invertebrate grazers in eelgrass (Zostera marina) bed: variation with species, time, and distance among patches

Philip Matich, Marine Science - Johnson City, NY

Mentor: Dr. Claudia Benitez-Nelson, Geological Sciences

Seagrass is an important part of ecosystems worldwide, and migrating mesograzers in seagrass beds consume epiphytic algae, which aids seagrass health. The research conducted focused on the migration rates of mesograzers in eelgrass beds. Artificial seagrass units (ASUs) were used in 2 experiments in the Goodwin Island seagrass bed, and the results of both experiments were similar: total epifaunal abundance, biomass, species richness, and diversity increased with time; total epifaunal abundance, biomass, and species richness decreased with distance; diversity increased with distance; Caprella penantis and Gammarus mucronatus abundances increased with time and decreased with distance; and Microprotopus raneyi abundance decreased with time and increased with distance. The results of high diversity at extended distances from seagrass patches is beneficial for seagrass, because higher diversities of mesograzers results in better resource utilization, improved epiphyte control, and aid in seagrass spore dispersal. Results were promising, but additional research should be conducted to find the maximum distances different species of mesograzers can migrate, how long it takes mesograzers to migrate and colonize seagrass at these distances, and are there differences at different seagrass beds and during different seasons.

The Effect of microRNAs on Cyclooxygenase-2 (COX-2) Expression

Ashleigh Moore, Biological Sciences - Clinton, NJ

Mentor: Dr. Dan Dixon, Biological Sciences

Prostaglandins are lipid compounds that act as mediators during inflammation and have a variety of other physiological effects in the human body. Prostaglandins derived from the prostaglandin synthase COX-2 have been shown to play roles in carcinogenesis, immune response suppression, apoptosis inhibition, angiogenesis, and metastasis. COX-2 has been found to be aberrantly overexpressed in colon cancer, and thus the regulation of COX-2 gene expression is of great interest. One such regulator of interest that acts on a post-transcriptional level is the microRNA (miRNA) hsa-miR-542-3p. miRNAs engage in imperfect base pairing with specific sequences in respective target mRNAs, and regulate the expression of protein-coding genes by binding to the 3’ untranslated region (3’UTR) and preventing expression of the targeted mRNA.

Hsa-miR-542-3p has been identified to interact with a region of the 3’UTR on the COX-2 gene. When cancer cells were transfected with hsa-miR-542-3p miRNA, protein expression of COX-2 was significantly down regulated when compared with a negative control miRNA. This finding indicates that the presence and action of this miRNA may control COX-2 gene expression. In addition, I have identified that the binding site of hsa-miR-542-3p is located in a region of the 3’UTR where the T8473C single nucleotide polymorphism (SNP) is located. This SNP has been associated with increased risk for cancer, elevated levels of prostaglandins, and high COX-2 expression. These findings suggest that the presence of the SNP can alter
the ability of hsa-miR-542-3p to effectively control COX-2 expression.

**Ethical Implications of Nanomedicine in the Military**

*Tina Shah*, Biological Sciences - Columbia, SC  
Mentor: Dr. Robert Best, Biochemistry

Nanotechnology is a field of science and technology that is centered on the control and engineering of matter at the scale of one-billionth of a meter. Nanomedicine, a specified branch of nanotechnology concerned with the manipulation of atoms and molecules at the nano scale in the pursuit of tissue repair and disease prevention and extermination, is hailed for its military potential to reduce the extent of injury in combat and preserve soldier life through biochemical changes at the molecular level in humans. Research into the government’s Defense Advanced Research Projects Agency has revealed several revolutionary applications of nanomedicine that could potentially allow military troops to bypass certain health obstacles in battle such as the fatigue and injury they would otherwise encounter. There is, however, insufficient information as to the possible consequences of the emerging technologies to the individual soldier.

While the advances in nanomedicine are ultimately geared towards preserving the health and safety of the military personnel, many of these technologies begin to blur the distinction between medicine and enhancement of the soldier, giving rise to the question if whether military applications of nanomedicine, originally designed for traditional medicinal use, will now create more danger than good for the soldier. After analysis of the ethical risk assessment of the impending applications of nanomedicine in the military, it is concluded that while there may be an overall decreased risk of danger to the troops as a whole, it appears that there is an increased risk of danger to the individual soldier.

**The Syntheses and Structural Determinations of Several New Metal-Halide Compounds of Bismuth, Lead, Copper, and Silver.**

*Meredith Tershansy*, Chemistry - Kingsport, TN  
Mentor: Dr. Hans-Conrad zurLoye, Chemistry and Biochemistry

The chemistry of the main group metal-halides has been widely explored for several decades owing to the promising physical properties that such compounds often exhibit including semiconductivity, luminescence, and non-linear optical activity. Our group has been interested in the synthesis of new materials containing complex haloanions of bismuth(III). Though reports of many such compounds have appeared in the literature, the majority of these materials have employed organic counter-cations for charge balance. We have been interested in the synthesis of mixed-metal halobismuthate materials as synergistic interactions between two different metal-containing species may result in interesting physical properties. We have developed a reliable and versatile solvothermal method for the synthesis of mixed-metal halobismuthate materials that employ a d-metal coordination cation for charge balance. We have expanded the project to include the synthesis of metal-halide compounds with mixed-metal anions of bismuth(III), silver(I), copper(I), and lead(II). We have also been interested in developing a viable synthetic method which yields 1-Dimensional anionic chains versus 0-Dimensional discrete anionic clusters. The syntheses and single crystal structure determinations of several novel 1-Dimensional and 0-Dimensional mixed-metal halobismuthate materials will be presented.
Clay Clogging and Vertical Porosities in Pervious Concrete

Robert Freeman, Civil Engineering - Aiken, SC
Mentor: Dr. Liv Haselbach, Civil and Environmental Engineering

Pervious concrete is an alternative paving material that may alleviate many of the environmental problems caused by urban runoff from developed areas. Additional research is important so that pervious concrete can be better specified and more effectively used.

An important property of pervious concrete is porosity, which will affect the hydrological and strength properties of the material. This research elaborates on the vertical distribution of porosity in slabs placed with certain placement techniques. The vertical variation of porosity may affect the permeability of the system and its potential for clogging with different soil types and particulate matter. These studies indicate the area most prone to clay clogging limited by the porosity increases significantly from top to bottom. A series of clay clogging relationships have been observed during the course of this research which may add in further development of clay clogging experiments of pervious concrete with various types of soil and particulate matter.

Understanding Alzheimer’s Disease: Mechanistic Studies of Amyloid-beta Surface Assembly

Kathryn Johnson, Chemical Engineering - North Augusta, SC
Mentors: Dr. Jonathan Bender, Chemical Engineering
Dr. Melissa Moss, Chemical Engineering

Amyloid-beta protein (A-beta) has been implicated as an agent in Alzheimer’s disease (AD), the leading cause of senile dementia. Monomeric A-beta aggregates into soluble “protofibrils,” which in turn are precursors of the insoluble fibrils that form the hallmark AD interneuronal plaques. A-beta aggregation pathways can be separated in vitro into two mechanisms, elongation of protofibrils through monomer deposition and lateral association of protofibrils. These pathways have been studied in solution at micromolar concentrations; however, A-beta exists in vivo at nanomolar concentrations in contact with cell membranes. Techniques were developed for using a quartz crystal microbalance (QCM) to monitor A-beta elongation and association near a surface, with the goal of comparing these aggregation rates to rates in bulk solution. A mass-sensing device capable of measuring nanogram levels of analyte, the QCM relates a decrease in a quartz disk’s resonance frequency to an increase in deposited mass. We predict that this device will facilitate measurement of aggregation rates at lower, more physiologically relevant A-beta concentrations and permit study of A-beta aggregation as a surface phenomenon. Protofibrils containing 10 mol% biotinylated monomer were immobilized on an avidin-functionalized crystal. Elongation and association experiments were performed, validating the usefulness of the QCM for studying protofibril growth. Solution experiments showed that, in the time frame of QCM studies, the biotin label slowed the rate of elongation but did not significantly affect association. Future work will include finding the minimum biotin content for protofibril immobilization and exploring detection limits for protofibril and monomer on the QCM.
Down regulation of the mRNA stability factor HuR through the use of small interfering RNAs: A Novel Gene Therapy Method

*Melinda Lynch*, Biological Sciences - Tucson, AZ

Mentor: Dr. Dan Dixon, Biological Sciences

The study of colorectal cancer (CRC), which is second only to lung cancer in rates of mortality, provides a model for the study of other cancers. Similar to most cancers, colon cancer is mitigated by the over expression of several oncogenic genes. The gene cyclooxygenase 2 (COX-2), which is the target of aspirin and non-steroidal anti-inflammatory drugs (NSAIDs), is over expressed in and promotes colon cancer. Furthermore, the novel mRNA stability factor HuR is also over expressed in CRC and elevated HuR levels promote COX-2 expression by stabilizing COX-2 mRNA. From these observations the following hypothesis was developed: Over expression of COX-2 in colon cancer is promoted by the over expression of the mRNA stability factor HuR. RNA interference (RNAi) techniques were used to inhibit HuR expression and to allow for the normal rapid degradation of COX-2 mRNA transcripts and controlled COX-2 expression. An adenovirus was developed and tested as a proposed novel gene therapy based method to target HuR in colon cancer using RNAi.

Time Synchronization of Data Collected by Wireless Sensors for Modal Identification of Slow Moving Structures

*Brandon Mogan*, Civil Engineering - Columbia, SC

Mentor: Dr. Juan Caicedo, Civil and Environmental Engineering

Wireless networks provide an attractive solution for the instrumentation of civil infrastructure. These networks are used to obtain valuable information with utility including damage detection and model updating. Current modal identification techniques require time synchronized data records, which is an inherent issue with data collected using wireless networks. The outcome of this research project is to evaluate the effects of time delay on modal identification using current techniques. The study is limited to large structures with low frequencies of vibration such as cable-stayed bridges.

After evaluating various alternatives the hardware chosen for this study was the MaxStream® Xbee™ wireless modules. One module, the transmission node, was connected to a computer while the other module, the receiver node equipped with a serial repeater, was configured to loop back any packages sent to it. The time delay was calculated as the time that elapsed between when the package was sent and when it was received. Software delay contributed to a majority of the time delay. Among multiple tests, the time delay pattern stayed relatively consistent.

Acceleration records from the Bill Emerson Memorial Bridge in Cape Girardeau, Missouri were used to study the effect of the time delay recorded during this project on modal identification. A model of the recorded time delay was used to alter the records from the bridge. The Stochastic Subspace Identification (SSI) was used as the modal identification technique. The results show little effect on modal identification caused by applying the time delay model to the bridge data.
2D Landmarks Correspondence

Kenton Oliver, Computer Science and Engineering - Anderson, SC
Mentor: Dr. Song Wang, Computer Science and Engineering

Shape correspondence is a method used for statistical shape analysis which has applications in medical image processing. This type of analysis uses traditional statistical tools on a set of shape instances to build a probabilistic model, which should well describe the possible deformation space of the shape structure. The problem with this method is that traditional statistical tools don’t apply to continuous shape contours, so a set of discrete landmark points along the contour must be sampled. The process of sampling landmarks along the contour of each shape, such that the landmarks correspond to one another across shape instances, is called landmark based shape correspondence. We present a novel landmark based correspondence method which achieves optimal landmark correspondence while preserving shape topology. This is a robust algorithm which can be applied to single closed curve, single open curve, and multiple curve shapes. We conducted benchmark evaluations comparing the state of the art method for shape correspondence, Minimum Description Length, with our Landmark Sliding method. The results show that in terms of accuracy our method performs as well as MDL while taking substantially less CPU time.

Determining the Role of Succination of Protein Thiols during Exercise using Electrospray Ionization Mass Spectrometry

Vivek Thakur, Chemistry - Horsham, PA
Mentor: Dr. John Baynes, Chemistry and Biochemistry

As indicated by the title, there are two novel aspects to this project, in biological and analytical chemistry, respectively. We set out to investigate the role of succination of cysteine residues on proteins, a newly discovered biochemical modification. The formation of S-(2-succinyl)cysteine (2SC) is the first example of a non-enzymatic modification of protein by a Krebs cycle intermediate, fumarate. Fumarate increases ~7-fold in humans during exercise. Because many key antioxidant enzymes, proteins and transcription factors have active site free cysteine residues, we think that this succination may play a regulatory role in response to oxidative stress.

Ascertaining the connection between exercise, fumarate production, and the formation of 2SC requires sophisticated analytical techniques. We collected gastroc muscle samples from mice exercised at various intensity levels and attempted to quantify 2SC in extracted proteins. Proteins were hydrolyzed in HCl to release free amino acids and we attempted to measure 2SC by ultra performance liquid chromatography (UPLC) and electrospray ionization mass spectrometry (MS).

Despite this cutting-edge method, we could not reliably quantify 2SC in the tissue, because the three negative charges on 2SC hinder the standard positive ionization technique used in MS. Thus we are testing a novel, recently developed method for derivatizing amino acids to increase sensitivity for electrospray analysis. The derivative compound, an N-hydroxysuccinimide ester of N-butylnicotinic acid, has been synthesized. Whether or not we glean exciting data about the role of 2SC, our results will be enlightening from an analytical chemistry perspective.
Interactive Computer Music and Cellular Automata

Andrew Allen, Music - Walterboro, SC
Mentor: Dr. Reginald Bain, Composition and Theory

The synthesis of real-time interactive computer music and cellular automata (CA) techniques is a fundamentally experimental field. Over the past three months, I have created three compositions based around the idea of CA. The first work, “Parasitic”, for processed soprano and electronics, uses “direct sonification.” It is a mapping of a 12x12 CA matrix to MIDI pitch data, which is used to create a single organically conceived harmonic progression. The second work, “What I Want”, for rock band and processed video sampler, uses CA to process video samples from Aqua Teen Hunger Force, an animated cartoon TV show. The third work, “2nd Installation”, is an aural installation that uses sensors to read data from the users and processes this data using CA seeded generations that control samples, pitch, density, volume and register. For Discovery Day, work will be presented on the three pieces, including a live performance of the first work with the help of soprano Kelly Mayo as well as a demonstration of the visual algorithmic component of the second piece and finally, an open-invitation to assess the interactive aural installation. Papers discussing the mechanics used in all three pieces will also be available upon request.

Advanced Study of Chamber Music and Performance Skills

Aubrey Gray, Music - Chapin, SC
Mentor: Dr. Robert Jesselson, Music Education, History and Theory

During the summer of 2006, I had the opportunity to attend the Green Mountain Chamber Music Festival and embark upon an in-depth study of chamber music and performance skills. The Festival granted students the chance to study under an internationally acclaimed faculty and work with students from various music schools and conservatories around the country. In addition to studying with professors from different areas of the United States, I also continued my private study with the USC Professor of cello, Dr. Robert Jesselson. The demanding daily schedule consisted of student and faculty performances, master class attendance and performance, chamber ensemble rehearsals and coachings, private lessons, and four hours of individual practice. Some key areas of exploration include how to focus mentally when practicing, how to achieve selfless artistry and how to prepare one’s mind and body for a performance. This insight gained will be valuable in my career as a music performance major as I share my knowledge with future and fellow students and apply it to my own playing. As an example of the literature I studied this summer, I will play selected movements from Suite No. 2 for solo cello by Bach to demonstrate aspects of the study.

Gaining Perspectives from the Best of the Music World – Consultations with Mr. David Kim, Concertmaster of the Philadelphia Orchestra

Jessica Robinson, Music - Decatur, GA
Mentor: Dr. William Terwilliger, Music Education, History and Theory

Three trips were taken to Philadelphia, Pennsylvania to consult with Mr. David Kim,
Concertmaster of the Philadelphia Orchestra. The objective of these trips was to gain a better knowledge and understanding of violin solo and orchestral literature and to build a strong foundation as a music performer and as a leader. During each visit, I observed the Philadelphia Orchestra in rehearsals, attended a concert and had a personal consultation with Mr. Kim lasting approximately 1 hour. While attending rehearsals, I observed how Mr. Kim works with his colleagues in the orchestra and how different conductors rehearse and communicate their musical ideas to the ensemble. During the concerts, I observed how each musician in the ensemble must prepare themselves to give a committed, focused and accurate performance. During the consultations, both fundamental violin techniques and the challenges of reaching new levels of musical artistry were reviewed and discussed. Through these consultations I have improved my leadership skills and technique, increased my awareness of musical issues, discovered new artistic ideas and understand better what it takes to be a successful performer.

A Glimpse into the Solo Tabla Drumming Tradition of India

Vivek Thakur, Chemistry - Horsham, PA
Mentor: Dr. Chris Tollefsen, Philosophy

Indian classical music is of interest because only in the twentieth century did patronage shift from royalty and religious institutions to government agencies, industrial corporations, connoisseur-led music circles, and mass media. The transformation from the court to the concert hall, from temples to DVD, occurred recently, rapidly, and during a time of social, political, and technological change. Supported by both modern academics and a diverse, centuries-old master-disciple system, this presentation itself illustrates the confluence of cultures and changing times that have made the tabla solo an increasingly popular event, and, at the same time, increasingly rare in its original form.

Because of the delicacy and diversity of the sounds that it can produce, the tabla has superseded the pakhavaj, dholak and naqqara in becoming the most prominent drum of north India. However, one hears its timbres and tones not only in Indian classical, folk, and popular genres, but also in fusion, modern jazz, and Western popular music. Indeed, it has now become an icon of Indian and Eastern music in general.Tabla is primarily used to accompany Indian melodic music, such as vocal or sitar performances. Here we explore solo drumming, the hidden backbone of tabla tradition in which the most intricate fingering and rhythmic patterns, and in which the traditional roles of melody and rhythm are inverted. I will present a brief tabla solo of basic but authentic and historically important compositions -- a testament to tabla's global prominence and a tribute to its rich and multicultural heritage.

Exploring the Cello with Bonnie Hampton

Justin Vaughn, Music - Rock Hill, SC
Mentor: Dr. Robert Jesselson, Music Education, History and Theory

The Magellan Scholar project I created was “Exploring the Cello with Bonnie Hampton”. I chose this project after performing in a master class for Ms. Hampton. I asked her if I may study with her and she agreed. I wanted to explore and experience her methods of teaching the cello.

Through your grant, I traveled to New York City, twice, to have a total of five hours of cello lessons and dinner with Ms. Hampton. During the lessons, I explored differ-
ent approaches in my sound and technique. I listened to her sound and watched her hands and arms as they moved. Afterward, we discussed what she was doing. Then, I would try and she would coach me. I learned to control the body parts that play a major role cello playing.

After these lessons, I was able to use her approaches and suggestions to improve my own cello playing and work toward a deeper, more resonate sound and a relaxed, fluid left hand technique. The experience in New York City, visiting Julliard, and working with Bonnie Hampton was a wonderful experience that has left me more prepared for professional life.
Love bug Emergence Patterns across the Southeastern United States

*Michael Dole*, Biological Sciences - Greenville, SC
Mentor: Dr. Timothy Mosseau, Biological Sciences

Twice a year, during spring and late summer/early fall, many parts of the coastal southeast United States are inundated with *Plecia nearctica*, commonly referred to as love bugs. The history of the love bug is not well understood and limited research has been conducted on the life history patterns and mechanisms of these bugs which spend the majority of their adult life spans in copulation. An initial understanding on the location and time pattern of the emergence of adult populations is an important foundation to begin research. This study focused on these emergence patterns across the southeast United States. Since 1998, individuals across the southeast have documented and notified Dr. Mosseau upon observing love bug populations. These reports have been compiled to view the trends and patterns of emergence. The hypothesis is that love bug populations emerge along coastal areas of the southeast United States, especially after precipitation, twice a year between March and June and again between August and October, depending on the location. Initial results support the hypothesis of peak emergence following precipitation throughout the southeast areas, from the far south of Florida to as far north as Georgetown, South Carolina and through central Texas. These populations range from very sparse to extremely dense. Surprisingly, isolated populations have periodically arisen in areas outside of this population zone, although these populations appear to go extinct after a few years.

Sex Ratio Distortion in *Brachys tessellates* Resulting from a *Rickettsia* Bacterium

*Michael Dole*, Biological Sciences - Greenville, SC
Mentor: Dr. Timothy Mosseau, Biological Sciences

*Brachys tessellates*, the buprestid leaf mining beetle, is a common beetle throughout the central South Carolina fall line sand hills region. The beetle uses *Quercus laevis*, the Turkey Oak, for larval development by mining into the interior of the leaf after initial hatching to feed on the interior leaf products for nutrition. Previous studies by Mousseau et al (2001) indicated that there is a highly skewed sex ratio, depending on population site, due to infection by a *Rickettsia* bacterium which is commonly associated with sex ratio distortion (SRD). In the original study, sex ratios ranged from 1.3 to 6.0 females per male. In this study we examined the current SRD of *B. tessellates* in 32 population sites, some of which are the same sites as in the original study. Our hypothesis is that sites with a higher population density would result in a higher SRD because lower competition from less dense sites would cause mothers to selectively denature the *Rickettsia* bacterium resulting in a less skewed sex ratio. The process of the denaturing is an area of future research resulting from this study. Our results indicated that overall distribution had not changed, now 1.2 to 5.9, while higher population densities did not differ greatly from medium population densities, although both differed from lower population densities significantly, 3.32:3.92:1.73. An unexpected result was repeated populations from sites in the original study all increased their SRD.
Nitrogen Fixation by Plant Associated Vibrio Alginolyticus Strains

Nicole Haghshenas, Biological Sciences - Greenville, SC

Mentor: Dr. Charles Lovell, Biological Sciences

The importance of diazotrophy in estuarine ecosystems arises from the limitation of plant primary production caused by shortage of biologically available nitrogen in these environments. Diazotrophic (nitrogen fixing) bacteria are a major source of combined nitrogen in these systems and grow in association with the roots of estuarine plant species. Diazotrophic species of the genus *Vibrio*, few of which were previously reported to fix nitrogen, have been recovered from estuarine soils and plant roots. Current research is focused on *Vibrio alginolyticus*, which is frequently recovered from estuarine plant roots and was not previously known to be diazotrophic. *V. alginolyticus* strains were identified on the basis of 16S rRNA gene sequence analysis and growth responses on TCBS agar. The ecologically relevant physiological, and particularly nitrogen fixation characteristics of these strains were determined. Rates of nitrogen fixation were measured using the acetylene reduction assay. Growth responses to salinity and temperature were also determined. Further confirmation of diazotrophic abilities were obtained by amplification of the nitrogenase iron protein (*nifH*) gene and sequencing for comparison via phylogenetic analysis. The identification of the estuarine strains as *V. alginolyticus* was confirmed by both phenotypic characters and phylogenetic analysis. *V. alginolyticus* strains fixed nitrogen in the presence or absence of oxygen and displayed broad tolerances for temperature and salinity. Phylogenetic analysis of *nifH* sequences demonstrated that these sequences were closely allied with those from other nitrogen fixing *Vibrio* species, but were different from all previously reported sequences.

Preliminary Determination of Natal Origin of Juvenile Loggerhead Sea Turtles (Caretta caretta) of Charleston, South Carolina, United States During Summer, 2006

Adena Leibman, Marine Science - Myrtle Beach, SC

Mentor: Dr. Joseph Quattro, Biological Sciences

During the Summer of 2006, the South Carolina Department of Natural Resources (DNR), Marine Resources Division conducted an in-water survey of juvenile loggerhead sea turtles (Caretta caretta) along the coastline of Charleston, South Carolina. Utilizing both fisheries-dependent and fisheries-independent trawling, loggerhead sea turtles were captured, standard measurements were taken with whole blood samples and the turtles were equipped with passive integrated transponder (PIT) tags if not tagged previously. The whole blood samples were stored in a preservative buffer and received for genetic analysis. Partial mitochondrial DNA control region sequences were analyzed for each of the samples in comparison with previously described haplotypes assigned to specific loggerhead nesting beaches. The relative contributions of natal beaches to the turtles sampled from Charleston, SC were determined to estimate the dynamics of the Summer, 2006 population.

Through understanding of which nesting beaches are contributing to the foraging grounds of the Charleston, SC coast, better conservation strategies can be implemented. Not only can programs protecting the foraging ground itself be developed, but by protecting the natal beaches as well, it is possible to establish a more encompassing conservation strategy for the entire loggerhead sea turtle population. Marine turtles are a treasure and as they are constantly in jeopardy, mostly from human
forces, it is imperative to attempt to defer these detrimental acts with better understanding and innovative conservation tactics.

The Role of MAPKK2 in the Systemin Signaling Pathway of Tomato Plants

Wayne Miller, Biological Sciences - Simpsonville, SC
Mentor: Dr. Johannes Stratmann, Biological Sciences

Plants perceive information about their environment by means of molecular receptors often located in the cell surface, which then send or transduce signals into the plant cell where a response can be generated. In response to wounding in tomato leaves, such as from an herbivorous insect eating the plant, a signal transduction pathway is initiated by the signaling peptide systemin. This starts an intracellular signal cascade eventually leading to the synthesis of defense proteins, such as proteinase inhibitors. The role of MAPKK2, an enzyme previously implicated in transduction of the systemin signal, was investigated here by Virus-Induced Gene Silencing, a method that leads to decreased expression of a gene (gene silencing). Our results show that silencing of MAPKK2 leads to decreased defense protein levels. This shows that MAPKK2 is an essential component of the systemin signal transduction pathway in tomato leaves.

Virus-Induced Gene Silencing of MAP Kinases and MAP Kinase Kinases in Tomato

Suchita Pancholi, Biological Sciences - Columbia, SC
Mentor: Dr. Johannes Stratmann, Biological Sciences

Plants are sessile organisms that have developed sophisticated defense mechanisms to battle pathogens, herbivores, and other stresses. Upon wounding by herbivorous insects, a series of intracellular changes occur in the tomato plant (Lycopersicon esculentum), and a mitogen-activated protein kinase (MAPK) cascade is initiated for the transduction of the wound signal. In the cascade, a MAPK kinase kinase (MAPKKK) phosphorylates and activates a MAPK kinase (MAPKK), which in turn phosphorylates and activates a MAPK. The MAPK cascade eventually triggers activation of defense genes, such as those coding for proteinase inhibitors (PIs). MAPK activity in response to insect feeding by tobacco hornworms (Manduca sexta) was examined using kinase assays. MPK1 and MPK2, specific tomato MAPKs, were activated in the wounded leaf of tomato plants after tobacco hornworm feeding.

We further studied the wound response pathway by investigating tomato MAPKs and MAPKKs in reduction-of-function plants. These plants were generated by implementing virus-induced gene silencing (VIGS) and have reduced levels of MAPK transcripts. MPK1 and MPK2, two tomato MAPKs, were co-silenced. These silenced plants showed reduced MPK1 and MPK2 transcript levels, reduced MPK1 and MPK2 activity, and reduced PI levels. These plants in comparison to control plants were found to be less resistant to an attack by tobacco hornworms. The effect of silencing MKK4, which is upstream of MAPK1 and MAPK2, was studied. Gene expression of MKK4 will be studied using northern blots. We expect that a lesser amount of PIs in a plant will correlate with a reduced transcript level of MKK4.
**The Effects of Cadmium on Amphipholis gracillima Regeneration**

**Katrina Phillips**, Marine Science - Spartanburg, SC  
Mentor: Dr. Steve Stancyk, Biological Sciences

Cadmium is a heavy metal found naturally in marine environments at very low levels, but anthropogenic activity has been shown to raise cadmium concentrations significantly in coastal areas. Positive cadmium ions entering bodies of water tend to bind to negatively charged clay particles, removing the ions from the water column and concentrating them to the benthos. Benthic organisms may then experience stronger and longer lasting effects of cadmium contamination than pelagic organisms. This study focuses on the brittle star Amphipholis gracillima, which burrows its central disc into the sediment and extends its arms to the surface for feeding. Because predators graze on these exposed arm tips, A. gracillima is always regenerating, and we wished to examine the effect of cadmium on regeneration patterns. Individual organisms collected from the Baruch Marine Field Lab in Georgetown, SC were separated and placed into dishes containing either filtered seawater (controls) or cadmium concentrations of 1ppm, 2ppm or 6ppm. Water samples taken before, during and after the experiment were analyzed with an Inductively-Coupled Plasma Mass Spectrometer (ICP-MS) to determine exact concentrations. Cadmium-exposed organisms demonstrated abnormal regeneration and survival patterns.

**Detection of tactile cues from the predatory seastar Luidia clathrata by the brittlestar Ophioderma brevispinum**

**Daniel Russo**, Marine Science - Richmond, VA  
**Michele Ross**, Marine Science - Norfolk, VA  
Mentor: Dr. Steve Stancyk, Biological Sciences

An important survival behavior for any organism is a flight response to a predator. Conversely, reaction to non-predatory stimuli would be a waste of time and energy. We studied the reaction of Ophioderma brevispinum to touch stimuli from the predatory sea star Luidia clathrata and two non-predatory asteroids, Astropecten articulatus and Echinaster spinulosus. We hypothesized that 1) O. brevispinum would react to the touch of Luidia clathrata but 2) not react to the two non-predatory sea stars or a control (a glass rod). Individual O. brevispinum from were randomly exposed to one of the four treatments on either the disc or the arm tip. Data, including initial response (defined as two arm strokes in one direction), and duration of collected via video camera. Seventy-five percent of the brittlestars fled from the touch of L. clathrata and 80% did not react to the non-predators or the controls, indicating that brittlestars can distinguish between their predator and non-predatory stimuli. Previous research has shown that brittlestars react only weakly to L. clathrata - conditioned seawater, so further research is being conducted to determine the source and nature of the unique membrane-bound cues from L. clathrata.

**Dietary changes during molting of Callinectes sapidus (blue crab)**

**James Samson**, Marine Science - Sumner, WA  
Mentor: Dr. Robert Feller, Biological Sciences

The typical dietary habits of Callinectes sapidus (the blue crab) are well known. They are omnivorous and ingest a diverse variety of prey. What is not as well known is what happens to their diet during their molting stages. In this study I ex-
examined how the pH of the crab’s stomach fluids changes both before and after molting. The pH was determined by gaining access to a live crab’s stomach and inserting a strip of litmus paper. The stomach pH of a crab that had not eaten in 5 days was 6.50 while the pH only got slightly more acidic hours after ingesting a meal. There was a very large change in the crab’s stomach acid pH immediately following a molt while the crab’s carapace was still soft. The pH of the freshly molted crabs’ stomach fluids was much lower. Curiously, the newly molted crab’s gut either contained all bivalve shell material or was empty. This supports the hypothesis that crabs ingest calcium carbonate shells prior to molting as a dietary source of CaCO3 to supplement that which they acquire directly from seawater for hardening their new carapace.

**Differences in DNA damage in Barn Swallows from the Chernobyl region versus a control region**

*Andrew Voris*, Biological Sciences - Blythewood, SC  
Mentor: Dr. Timothy Mousseau, Biological Sciences

The goal of this research was to determine if there was significantly higher amount of DNA damage to barn swallows (*Hirundo rustica*) in the radioactively contaminated areas around Chernobyl than in a control areas. The Comet Assay was used to quantify DNA damage and the data was quantified with the software system. The Comet Assay is a single cell electrophoresis technique that allows experimenters to take measurements on a cell by cell basis. By determining a length of migration of DNA (known as a tail) the overall damage to cellular DNA can be determined. The cells used were blood cells from the birds (birds have nucleated red blood cells). Preliminary data suggest that DNA damage in barn swallows is higher in regions around Chernobyl than in relatively “clean” control areas.
Do cardiac mast cells undergo apoptosis in an experimental model of heart failure?

Samirah Ashraf, Biological Sciences - Columbia, SC

Mentor: Dr. Mary Forman, Cell and Developmental Biology and Anatomy

Mast cells are found in various parts of the body including the heart and play a vital role in the development of heart failure. We know that there is an increase in the numbers of these cells during different stages, these numbers fluctuate and cells mature during this process. One reason for these fluctuations may be programmed cell death or apoptosis. Apoptosis differs from metabolic cell death, or necrosis because it is a genetically determined process of cell self-destruction marked by the fragmentation of nuclear DNA activated either by the presence of a stimulus or removal of a stimulus. The objective of this project is to determine whether the additional mature mast cells undergo apoptosis when numbers decline. In order to determine the outcome of these cardiac mast cells we will be using a surgical model that produces an overload of blood to the heart. I will evaluate these mast cells from male rats 5 and 7 days after surgical model. I will test our hypothesis by staining the mast cell nuclei to detect DNA fragmentation and identify a number of protein receptors that induce apoptosis in mast cells. These protein receptors are Tumor Necrosis Factor I and II, the Fas receptor and the Trail-2 receptor. Localization of these receptors on mast cells will confirm positive nuclear staining for DNA fragmentation. This research will allow us to further understand the lifecycle of cardiac mast cells and could prove to be beneficial in other research concerning heart disease.

Effects of the Flavanoid, Quercetin, on Endurance Exercise Performance

Catherine Carlstedt, Exercise Science - Sun Prairie, WI

Mentor: Dr. Mark Davis

The overall objective of this project is to confirm in humans what appears to be the major benefits of consuming the novel herbal extract, Quercetin, on the ability to consume oxygen and delay fatigue during prolonged exercise that was recently established in small animals (mice and rats). Quercetin is a polyphenolic compound found in a variety of human foods such as apples, red onions, and citrus fruits and has potent antioxidant, anti-inflammatory and anti-carcinogenic activities. Our goal is to determine the effects of 7-days of Quercetin supplementation on 1) maximal oxygen consumption (VO2max), and 2) ride time to fatigue and perceptual ratings of mood and perceived exertion during prolonged exercise. A double blind, repeated measure, crossover design is used with 10 athletic, screened, and informed male and female University students. Subjects are randomly assigned to the control group; receiving tang (orange breakfast drink), or the supplement group, receiving quercetin enriched tang (500mg of quercetin twice daily, 1000mg total/day). At the end of each seven day supplementation period, participants will repeat the VO2 maximal oxygen uptake test and then on the following day, the cycle to fatigue test. Data is currently being collected since there were a few delays in equipment availability and research methods. After data analysis, conclusions will be drawn. Experiment aims would be that quercetin supplementation will show improved VO2 max values and length to fatigue times; not only to increase exercise performance, but to stress the importance of an adequate, healthy diet.
Estrogen-Receptor Dependence of Female Cardioprotection

Judith Clary, Biological Sciences - Clinton, SC
Mentor: Dr. Jason Gardner, Cell and Developmental Biology and Anatomy

Post-menopausal women have an elevated risk of cardiovascular disease in comparison to pre-menopausal women and age-matched men. This loss of cardioprotection is thought to be due to a decrease in ovarian hormones, particularly estrogen. In this study, an estrogen receptor blocker, ICI 182,780, was given to intact female rats to evaluate the role of estrogen in cardioprotection against adverse ventricular remodeling. These studies used the rat aorto-caval fistula model of congestive heart failure. A shunt (i.e. fistula) is made between the abdominal aorta and vena cava using an 18-gauge needle, which causes ventricular volume overload. Four groups of female rats were studied: sham-operated (SHAM), intact fistula (FIST), ovariectomized fistula (FOX) and intact fistula rats treated with ICI (FIST+ICI). Cardiac function was assessed temporally (every 2 wk) using echocardiogram and by conductance catheter at the 6 wk post-fistula endpoint. All rats with fistula had significantly increased cardiac output (e.g., 119±52 ml/min for FOX vs. 26±5 ml/min for SHAM, p<0.05). This volume overload induced significant left ventricular (LV) hypertrophy in the fistula groups. All fistula groups developed significantly increased LV internal diastolic dimension (LVIDd), indicating LV dilatation, with the FOX and FIST+ICI groups having the greatest increases (300% and 290% increase, respectively, relative to prefistula LVIDd baseline). These data indicate that ovarian hormones are essential for cardioprotection against adverse remodeling in female rats subjected to volume overload. Additionally, blocking estrogen signaling in intact females induces remodeling similar to that of ovariectomized females post-fistula, thus demonstrating the estrogen-receptor dependence of female cardioprotection.

Preventative treatment of cardiovascular complications secondary to Type II diabetes

Lindsey Gainey, Undeclared - Cayce, SC
Mentor: Dr. David Murray, Cell and Developmental Biology and Anatomy

The objective of this study was to determine the efficacy of Advanced Glycation End-Products (AGE) chelators (carnosine, tetramine, and citric acid) in preventing diabetic cardiomyopathy. Hypothesis: We hypothesize that carnosine, tetramine, and citric acid will significantly prevent AGE induced changes in ventricular structure and function secondary to diabetes. Methods: Lean Control (LC) and Zucker Diabetic Fatty (ZDF) rats were maintained on a diabetogenic diet for 24 weeks. All treatments were administered to three separate ZDF groups through drinking water ad libitum. Cardiac functional assessment was determined using a high fidelity Millar pressure/volume catheter placed in the left ventricle of the heart at sacrifice. Results: Relative to control, there was a significant decrease in body and LV weights in the untreated, carnosine and citric acid treated ZDF animals. End diastolic volume (EDV) for the ZDF animals was markedly increased by 36% suggestive of LV dilatation. This was mirrored by a noticeable 30% increase in the end diastolic pressure (EDP) in the ZDF group compared to LC. Tetramine and Citric acid significantly prevented this increase in EDV and EDP. Whereas, carnosine treatment led to a 36% increase in EDP comparable to the untreated ZDF group. Conclusion: After 24 weeks, indications of a diabetes induced cardiomyopathy are evident by changes in the EDV and EDP in the ZDF group compared to LC. Treatment with two known...
AGE chelators (tetramine and citric acid) significantly prevented the structural and functional changes. Carnosine appeared to be a less effective treatment course of therapy.

**The Role of Brain Glucose and Adenosine on Central Nervous System Fatigue**

*Julia Gambone*, Exercise Science - Berwyn, PA  
Mentor: Dr. Mark Davis, Exercise Science

In comparison to mechanisms of muscle fatigue, little is known about the mechanisms of central nervous system (CNS) fatigue. Both increased adenosine concentration and decreased glucose concentration in the extracellular space in the brain would indicate increased brain metabolism and have been identified as possible factors in CNS fatigue. Brain microdialysis probes implanted into either the nucleus accumbans (NAc) or ventral tegmental area (VTA) of rats allowed for collection of their extracellular fluid during exercise on a motor driven treadmill to fatigue. Collections taken before exercise, at fatigue, and 1 hour post-fatigue were analyzed for their concentrations of glucose and adenosine. Glucose measurements in the NAc indicate a drop in glucose level at fatigue followed by an increase towards basal levels 1 hour post-fatigue, while glucose measurements in the VTA indicate a drop at fatigue followed by a further drop 1 hour post-fatigue. Adenosine measurements in the NAc indicate a large increase in adenosine concentration at fatigue as compared to the basal levels followed by a return to basal levels 1 hour post-fatigue. Adenosine also increased at fatigue in VTA measurements but no measurement was taken at 1 hour post-fatigue. These results indicate that brain glucose and adenosine concentrations may play a role in central nervous system fatigue. Further research will indicate whether or not the relationship between glucose levels and fatigue or adenosine levels and fatigue is causal and whether these variables can be manipulated with external means to delay CNS fatigue thus increasing brain performance under stress.

**Physical compatibility of various concentrated intravenous drugs with neonatal total parenteral nutrition solution**

*Alyson Gibson*, Pharmacy - Columbia, SC  
Mentor: Dr. Laura Fox, Pharmacy

The purpose of this study was to determine the Y-site compatibility of selected drugs with neonatal TPN. Study drugs were selected based on the lack of compatibility data with neonatal TPN and on the frequency of use in a neonatal unit. Equal volumes of neonatal TPN or water for injection were combined with study drugs or water for injection at concentrations that are used clinically in neonates. Each test was performed in triplicate. The samples were examined via turbidimetric analysis and visually against a light and dark background immediately after mixing and at each timepoint and observations recorded. Analysis of variance was used to determine statistical difference between the experimental groups and controls.

Most of the drugs studied exhibited no visual or turbidimetric evidence of incompatibility when combined with neonatal TPN for up to 3 hours in a simulated Y-site injection. Pentobarbital, phenobarbital, and rifampin formed visible precipitants immediately upon mixing with neonatal TPN solution. The turbidity of the amiodarone-TPN mixture was significantly greater than either amiodarone-water for injection or TPN-
water for injection. Pentobarbital, phenobarbital, rifampin, and amiodarone were not compatible with neonatal TPN and should not be administered via Y-site injection with neonatal TPN. Caffeine citrate, clindamycin, enalaprilat, epinephrine, fluconazole, fosphenytoin sodium, hydrocortisone, metoclopramide, and midazolam exhibited no visual or turbidimetric evidence of incompatibility when combined with neonatal TPN for up to 3 hours in a simulated Y-site injection.

Effect of IL-6 Manipulation on Type IIB Skeletal Muscle Fiber Cross Sectional Area in the Cachetic Apc Min/+ Mouse

*Samantha Ingram*, Biological Sciences - Simpsonville, SC
Mentors: Dr. James Carson, Exercise Science
Mrs. Kristen Baltgalvis, Exercise Science

Cachexia is described as the loss of body weight, muscle mass, and muscle strength. It occurs with many types of cancers. IL-6 is an inflammatory cytokine that is a promising candidate to induce cachexia, but the mechanism is not certain. The ApcMin/+ mouse is heterozygous for the Apc gene, which is a tumor suppressor gene, causing it to develop intestinal tumors and become cachetic. Skeletal muscles contain 3 different fiber types which may be differentially affected by cachexia. The three muscle fiber types include Type I, which is slow/oxidative; Type IIA, which are fast/oxidative; and Type IIB, which are fast/glycolytic. The purpose of this study was to determine if IL-6 over-expression in the Apc Min/+ mouse accelerates muscle loss and if the loss is fiber-type dependent. Myosin ATPase staining was carried out on gastrocnemius muscle sections to differentiate Type IIA and Type IIB fibers. Digital imaging was used to measure fiber cross-sectional area on the muscle sections stained. Results demonstrated that there was an 11% decrease of mean cross-sectional area (CSA) in Type IIB fibers, but there was no change in Type IIA fiber area. When analyzing the frequency distribution of the Type IIB fibers, IL-6 induced a 43% decrease in the number of large fibers (2400µm²). The activity of Lactate Dehydrogenase (LDH), a glycolytic enzyme, will also be quantified. In conclusion, IL-6 induces wasting in Apc Min/+ mouse gastrocnemius muscle, specifically in Type IIB fibers. Funded by South Carolina Honors College & NIH P20 RR-017698

Using African variation at chromosome 8 to unravel causation of aggressive cancers

*Jenna Oberstaller*, Biological Sciences - Spartanburg, SC
Mentor: Dr. Bert Ely, Biological Sciences

African Americans regularly have the highest overall rates of cancer incidence of all American ethnicities (ACS 2005). Even when African Americans do not represent the most cancer-affected ethnicity for a particular site, those who are diagnosed can often expect a much grimmer prognosis than patients of other ethnicities. Amandadotir et al. (2006) found that African Americans with African ancestry at a particular region of chromosome 8 are more likely to get cancer, and get it at a younger age, than African Americans with European ancestry at this region. Because all African Americans do not have equal probability of getting aggressive cancers (and because all those who get aggressive cancers are not African American), it is likely that there is some genetic factor on the 8th chromosome involved in determining cancer aggressiveness across all ethnicities. This genetic factor, while it can occur in any genome, is hypothesized to be common among African lineages. The pur-
The purpose of this study was to determine genotypic variation between two African populations, Equatorial Guinea and Ghana, at six different loci in the chromosome 8 region of interest with the eventual goal of comparing the haplotypes generated to those of cancer patients. Thus far we found that two of the six loci are not significantly variable in either the Equatorial Guinean or the Ghanaian populations, suggesting that these loci are not significant in determining cancer aggressiveness. Haplotypic patterns of the remaining loci will be determined to help identify possible factors involved in increased risk for aggressive cancer.
**New Fluorescent Probes for Human Thymidylate Synthase**

*Blake Hodges*, Chemistry - Florence, SC

Mentor: Dr. Qian Wang, Chemistry and Biochemistry

Human thymidylate synthase (HTS) is an important enzyme that plays a crucial role in DNA production. For this reason it becomes a potential target for the antiproliferation drug design in cancer research. It exists in two distinct conformations, the active state and the inactive state. Upon binding of an inhibitor on the active form of HTS, an 180° rotation of the active site loop occurs which leads to the formation of the inactive form. We are especially interested in developing new fluorescent probes to differentiate these two states in vivo based on the different response of emission intensity and wavelength when introduced to HTS. In our study, a series of fluorescent dyes have been synthesized using Cu(I) catalyzed cycloaddition reactions between azides and alkynes. Such dyes have been employed to perform binding studies with HTS, and we have found certain dyes that show very strong interactions with HTS. Upon binding to HTS, emission intensity and wavelength have both shown an increase as well as evidence of FRET, an exchange of energy between the protein and dye due to their close proximity and fluorescent properties.

**DRIL1 As A Substrate of PKR**

*TuAnh Khuu*, Biological Sciences - Greenville, SC

Mentor: Dr. Rehka Patel, Biological Sciences

In a previous experiment, a deleted Δ220 DRIL1 construct has been found to interact with PKR through kinase activity assays and showed indications of being phosphorylated by PKR. Since dsRNA-activated PKR has been known to interact with Δ220 DRIL1, we hypothesized that it will also form interaction with a full-length DRIL1 protein and therefore, DRIL1 may be a substrate of PKR. We further hypothesize that PKR phosphorylation of DRIL1 renders it inactive to interact with E2F1 and aid in G1/S transition thereby leading to growth arrest. In order to prove our hypothesis the pET15b vector was utilized for the expression of hexahistidine-tagged DRIL1 protein in E. coli. We initially sub-cloned the DRIL1 coding region in the pET15b vector, which contains a hexahistidine tag sequence, to generate a DRIL1/pET15b plasmid. We then transformed the DUS2L/pET15b plasmid into the bacterial expression host BL21(DE3), and three different batches of pure recombinant DRIL1 protein were prepared. The yield of purified protein was about 1 milligram from a 200 ml starting culture (5mg/liter). When added to the in vitro kinase assays, the recombinant DRIL1 protein showed a strong interaction with PKR and also phosphorylation by PKR, thus confirming our hypothesis.

**Evaluation of Differentially Expressed Genes in Node-Negative and Node-Positive Colorectal Cancer Tumors as Molecular Indicators of Metastasis**

*Samantha Miller*, Philosophy - Ladson, SC

Mentor: Dr. Phillip Buckhaults, Pathology and Microbiology

Serial analysis of gene expression (SAGE) was used to produce global gene expression profiles for a node-negative and a node-positive colorectal tumor. A com-
combined total of 365,824 tags were present in the two original tumor samples. Of the 22,513 different transcript tags identified, 462 genes were identified as being statistically significantly differentially expressed between the two tumors—237 were over-expressed in the primary tumor that originated in a patient who developed lymph node metastases, whereas the other 225 were over-expressed in the tumor that was excised from a patient who suffered no lymph node metastasis. The top 200 genes that were statistically significantly differentially expressed greater than 17-fold in the original SAGE libraries were chosen and then analyzed using quantitative RT-PCR. This resulted in a set of 34 discriminate genes that were confirmed as being statistically significantly differentially expressed. One gene, fibronectin (FN1), was of particular interest as it was over-expressed in the node-positive tumor and, therefore, may be a molecular indicator of metastasis. Thus, evaluation and analysis of these candidate genes will be of immense diagnostic importance, as the data can be utilized to develop expression-based predictors of clinical outcome for colorectal cancer patients.

Critical amino acids in an essential RNA modification enzyme.

**Bryan Sibert**, Biological Sciences - Goshen, KY

Mentor: Dr. Jeffrey Patton, Pathology and Microbiology

Pseudouridine synthase 1 (hPus1p) is responsible for the modification of several uridines in human tRNA. Pseudouridine is required for the secondary structure and function of tRNA. The missense mutation of an active site arginine (R116) to tryptophan has been associated with mitochondrial myopathy and sideroblastic anemia (MLASA). It is predicted that the active site is composed of at least four amino acids including a catalytic aspartate that is absolutely required. This aspartate is constrained by two arginines (R116 & R267) and a tyrosine. Replacement of R116 with typtophan shows no activity in vitro, but conservative mutation at this position has been shown to retain partial activity. We wanted to test whether the other arginine (R267) has equivalent constraints. Mutant forms of hPus1p were created using site-directed mutagenesis. The protein was produced in and isolated from bacteria. Enzyme kinetics assays were performed on wild-type and mutant forms of the protein using various tritium labeled tRNA substrates. Initial data suggests that conservative replacement does allow for activity of the enzyme with substrate dependent limitations. Further research will include the investigation of additional putative active site amino acids as well additional characterization of the arginine mutants that have shown activity.

The nature and role of CD44 isoforms in the interactions between melanoma and endothelial cells

**Melissa Tanverdi**, Biological Sciences - Columbia, SC

Mentor: Dr. Robert McKallip, Pathology and Microbiology

In the current study, we tested the hypothesis that endothelial cell expression of CD44 isoforms plays a critical role in the ability of tumor cells to bind to and migrate through the endothelium. To test this hypothesis, we first characterized specific isoforms of CD44 present in B16F10 melanoma cells and TME endothelial cells. The expression of CD44 and its isoforms was examined by RT-PCR and electrophoresis. The results showed that both cell lines express CD44 isoforms as well as...
variants, including V6 and V7 isoforms. Next, glycosaminoglycans (GAGs), which are thought to act as specific ligands for many CD44 isoforms, were tested for their ability to block the binding of TME to B16F10. The results demonstrated that with increased concentrations of GAGs, the amount of B16F10 binding to TME was decreased. Furthermore, siRNA technology was used to effectively knock down the expression of CD44 on both cell lines and the effect of CD44 knock-down on binding between the cell types was determined. The results demonstrated that reduction of CD44 expression on the cells inhibited the ability of B16F10 tumor cells to bind to the TME endothelial cells. Together, the results of this study demonstrate that the expression of CD44 and/or CD44 isoforms by TME plays a role in the ability of B16F10 to bind to endothelial cells, suggesting that CD44 may play a significant role in tumor metastasis. This study could potentially lead to new understandings and treatments of various metastatic cancers.

Tetramine and Citric Acid Therapy may prevent Renal Failure in Diabetic Rats

Vivek Thakur, Chemistry - Horsham, PA
Mentors: Dr. John Baynes, Chemistry and Biochemistry
Dr. David Murray, Cell and Developmental Biology and Anatomy

Affecting over 171 million people and rapidly increasing in prevalence, diabetes is among the world’s foremost public health concerns. Diabetes arises from insufficient production of insulin (type-1), or generalized insulin resistance in tissues (type-2), and is characterized by elevated levels of sugar (hyperglycemia) and lipids (hyperlipidemia) in the blood. While medications and dietary and lifestyle modifications have been helpful, diabetic patients continue to develop long-term, morbid complications, including cardiovascular disease, retinal and nerve damage, and renal failure.

Immunomodulatory Properties of Plumbagin

Tina Zhang, Biological Sciences - West Columbia, SC
Mentor: Dr. Robert McKallip, Pathology and Microbiology

Impure extracts from plants containing plumbagin, a bicyclic naphthoquinone, have been used in Asian countries as natural treatments for ailments such as rheumatoid arthritis, cancer, and dysmenorrhea. Recent work has shown this compound, easily extracted from both P. zeylanica and P. capensis, to possess anticarcinogenic, antiatherosclerotic, and antimicrobial properties. However, little is known about the effect of plumbagin and similar compounds on the immune system. Splenocytes were obtained from BALB/C and C57BL/6 mice and treated with plumbagin, juglone, and menadione. Plumbagin, the most effective of the three compounds, was then used in further experiments designed to characterize its effect on splenocyte viability, proliferation, levels of apoptosis, mitochondrial membrane potential, and caspase activity. Results showed a significant decrease in cell viability following treatments of ≥ 0.50µM plumbagin. However, this effect was inhibited by the addition of 10mM N-acetylcysteine (NAC), a reactive oxygen species scavenger. Both the Annexin/PI assay and PI cell cycle analyses revealed increases in apoptotic cells. Further investigation of the role of the intrinsic apoptotic pathway showed a plumbagin-induced loss of mitochondrial membrane potential, inhibited by the addition of NAC. An in vivo study on plumbagin was also performed using a concanavalin A-induced hepatitis mouse model to assess its therapeutic potential for autoimmune
disorders. The induction of autoimmune hepatitis was verified by plasma aspartate aminotransferase (AST) levels. However, treatments of plumbagin showed no immediate protective effects. Further work to characterize plumbagin’s mechanism of action will be done to better understand its immunomodulatory properties and any potential therapeutic applications.

Identifying miRNA Genes in Rice (Oryza sativa)

Brenda Zosa, Biological Sciences - Columbia, SC

Mentor: Dr. Lewis Bowman, Biological Sciences

Micro RNAs (miRNAs) are small, noncoding RNA molecules about 21-24 nucleotides in length, that posttranscriptionally regulate gene expression in plants and animals by either inducing transcript cleavage or translational inhibition. MiRNAs are expressed in a temporal and spatial manner and influence development and stress responses. However, for most organisms, very little is known about the primary transcripts from which miRNAs are derived and promoter and termination sites have not been mapped. This knowledge is essential for understanding how the expression of miRNAs is regulated. We utilized rice for these experiments because of its significance as a crop plant and due to the fact that there is virtually nothing known about the regulation of miRNA in rice and other monocot species. Rapid amplification of cDNA ends (RACE) was used to map the 5’ and 3’ ends of primary transcripts, taking advantage of the fact that primary transcripts are polyadenylated and capped. Locations of promoter regions and termination sites for several miRNA primary transcripts are being mapped and relationships to known genes are being analyzed. Identifying genes in the rice genome that are regulated by miRNA can improve our understanding of rice development and can be utilized to engineer crops that can withstand more varied conditions. This data will be added to an online database for the scientific community to utilize in further studies of rice.
Novel Nitrogen Fixing Bacteria Isolated From Salt Marsh Plants

*Tamera Beam*, Biological Sciences - Cherryville, NC
Mentor: Dr. Charles Lovell, Biological Sciences

Salt marshes are of scientific interest and societal value due to their roles as nurseries for ecologically and commercially important fish and as buffers against storm surges and other flooding events. A vital limiting resource within these highly productive ecosystems is combined nitrogen. As the biological process of converting atmospheric nitrogen to combined nitrogen can only be accomplished by diazotrophic (nitrogen fixing) bacteria, these bacteria are important members of the salt marsh microbial community. Bacteria belonging to the genus *Vibrio* are ubiquitous in coastal environments. Although a great deal of research has examined the roles of certain *Vibrio* species as opportunistic pathogens, little is known about the roles of non-pathogenic *vibrios* in nutrient cycling and especially nitrogen fixation. *Vibrios* isolated from North Inlet, SC were analyzed for nitrogen fixation using the acetylene reduction assay. Strains positive for acetylene reduction were further classified using physiological and molecular biological methods, including analysis of the sequences of a key gene in nitrogen fixation, *nifH*. Of the numerous diazotrophic *vibrios* analyzed, one new species was selected for characterization. Strains were characterized using accepted physiological and molecular techniques. 16S rRNA gene sequencing demonstrated that this species is new to science, and physiological tests confirmed these findings. This is important because although nitrogen fixation has been documented in *vibrios* isolated from coastal marine waters, little work has been done to characterize salt marsh species. This research contributes to understanding the composition of the diazotrophic microbial community and its contributions to the salt marsh.

Applying Stable Isotope Geochemistry to Determine the Provenance of Calcareous Gravels

*Elizabeth Bell*, Geology - Christiansburg, VA
Mentor: Dr. David Barbeau, Geological Sciences

Tying the individual grains in a foreland basin succession to rock units within an adjacent orogen can determine the timing of the orogen’s deformation. Calcareous sediments, however, cannot often be easily tied to source units. We analyze calcareous gravel from Spain’s Ebro Basin on the basis of both optical properties and stable isotope ratios of carbon and oxygen ($\delta^{13}C$, $\delta^{18}O$). We hypothesize that by comparing the distribution of these optical and geochemical properties of calcareous material both within our basin-fill and within prospective source units, we can assign basin sediments to distinct source units and determine the relative contributions of each to the basin-fill. One hundred gravel-sized clasts were randomly selected from a basin alluvial-fan unit and classified according to their lithology and color. Material from the clasts and from carbonate formations within the prospective source region was analyzed by gas source mass spectrometry to determine their $\delta^{13}C$ and $\delta^{18}O$. Clast compositions vary from -8 to -1 ‰ $\delta^{18}O$ and from -6 to 3 ‰ $\delta^{13}C$ (PDB), consistent with their derivation from measured source units. Further, our results indicate that the majority of clasts derive from the Triassic of the source succession, with minor Jurassic input and negligible Cretaceous input – suggesting that the
lower part of the basin section received deep sediments from a source region already highly eroded early in the history of alluvial fan sedimentation in the basin. The extension of our study to other basin-fill units will allow evaluation of shifting provenance with conglomerate age.

**EARS and the Bulk Crustal Properties of the Sierra Nevada**

*Katrina Byerly*, Geophysics - Auburn, AL

Mentor: Dr. Thomas Owens, Geological Sciences

The Sierra Nevada Earthscope Project (SNEP) seeks to advance our understanding of the ongoing foundering of mantle lithosphere beneath the Sierra Nevada. SNEP is a temporary broadband deployment within the broader USArray Transportable Array (TA) network. The SNEP deployment consists of two phases and a network totaling ~75 broadband stations. The network extends from the western foothills to eastern Nevada between roughly 37N to 40.5N with an average station spacing of 25km. Using the automated receiver function technique implemented by EARS (The EarthScope Automated Receiver Survey), we are calculating the bulk crustal property estimates (thickness and Vp/Vs ratio) for SNEP stations and surrounding USArray TA stations. Through the study of areas of suspected transitions in crustal properties and comparison of EARS results to other SNEP results, we will be able to evaluate the value of the EARS approach as an interpretational aid to portable PASSCAL and USArray/FlexArray experiments. The resulting determination of the lateral variations in the bulk properties of the Sierra Nevada crust will provide baseline observations in the search for the existence and extent of foundered crust/upper mantle within the SNEP footprint and serve as a starting point for more advanced analysis of receiver functions within the SNEP footprint.

**Insights into Sediment Trap Efficiency: Dissolution of Biogenic Silica in the Santa Barbara Basin**

*Susan Herron*, Marine Science - Lexington, KY

Mentor: Dr. Claudia Benitez-Nelson, Geological Sciences

In marine systems, the flux of particulate biogenic silica (opal) to depth reflects the biological production of diatoms in overlying waters. This flux is generally measured using automated sediment traps, but recently questions have arisen as to the integrity of trap samples due to solubilization of particulate matter within the trap. Our study examined the loss of silica to the trap cup supernatant as part of a larger project which also examines the integrity of carbon and phosphorus in these samples. The supernatants were collected from a trap in Santa Barbara Basin (California) moored at 550 m. They were then filtered and analyzed for silica using the Koroleff method (1999). The samples span 1993-1999 (eight cruises; 76 samples total). This data was then compared to the previously measured particulate silica from the trap to calculate the percent loss. This loss varied between 0.1 and 2.0% (mean = 0.8%). No correlation was found between percent loss to supernatant and duration of deployment, trap cup number, or cup volume. This is consistent with a theory proposed in an earlier study that percent loss is low during times of high particulate silica flux, as in this experiment, and highest during periods of low flux. Interestingly a seasonal pattern was observed, in that silica loss peaked during March and October. This trend may be explained by seasonal variation in diatom species whose frustules (shells) may dissolve at different rates, a theory supported by SEM images of these samples which show mainly non-altered shells.
3-D Maps of Salinity and Groundwater Type Beneath South Carolina's Coastal Plain

Ashley Shull, Geology - Lexington, SC

Mentor: Dr. Alicia Wilson, Geological Sciences

Knowledge of groundwater quality and type is necessary for understanding groundwater resources. The local distribution of salinity and geochemical composition of groundwater in South Carolina is known, but has not been compiled in a single location. Multiple databases of water analyses were collected, reaching to almost 3000 entries. After quality checking, 1400 records remained. Depths of the wells range from near the surface to approximately 950 meters, and range in location from the fall line to off the coast. Salinity and the geochemical type of the water were plotted in two and three dimensions using ArcGIS software. Results show that there is a substantial amount of potable freshwater below South Carolina, even at large depths at the coastline. Salinity generally increases towards the coast, and the Charleston region has the highest salinity at lower depths than any other coastal region. Calcium bicarbonate waters dominate many of the wells, which is a normal state for fresh groundwater. There is a zone of sodium chloride dominated water in the Charleston area and along the fall line. There are also many sodium bicarbonate dominated samples, which develop when sodium ions in clays are exchanged with calcium ions when seawater retreats. The abundance of sodium bicarbonate water all across South Carolina and deep beneath the coastline and offshore tells us that sea level has both risen and fallen in the past. These results can be used in climate change studies to estimate what may happen if sea level were to rise or fall again.

Trace Element Sample Collection, Preparation and Analysis

Jeremy Smith, Marine Science - Concord, NC

Mentors: Dr. Christopher Hintz, Environmental Health Sciences
Dr. Timothy Shaw, Chemistry
Dr. G. T. Chandler, Environmental Health Sciences

I participated on Voyage 426, Leg 1, onboard the RV Oceanus, assisting Drs. Chandler, Shaw and Hintz in sample collection. A Conductivity, Temperature and Depth (CTD) profiler was deployed to obtain the salinity and temperature as a function of depth on the Little Bahama Bank, Great Bahama Bank, Charleston Bump, and the Northeast Providence Channel. 5-L Niskin bottles were used in conjunction with the CTD to collect water samples throughout the water column for later analysis. Seawater samples were immediately filtered using 0.22 µm polyether sulfone (PES) syringe filters under a laminar flow hood. A Multicorer was used to collect 10-cm diameter cores at the sediment/water interface. Under inert argon atmosphere, 0.5 cm sediment/pore-water sections, from the surface to 3.0 cm sediment depth, were centrifuged to isolate the pore water from the sediment. After separation the pore-water samples were also filtered with 0.22 µm PES syringe filters under a laminar flow hood. These water samples were analyzed for the trace elements Sr, Ca, and Mg by isotopic dilution Inductively Coupled Plasma Mass Spectrometry (ICP-MS). These seawater samples were first acidified to a pH 2.0 using ultra-pure nitric acid. Stable isotope spikes (87Sr, 43Ca, and 25Mg) were calibrated using reverse isotopic dilution. The methods will then be replicated to ensure accurate and precise measurements. The seawater trace element results were compared against certified standard open ocean concentrations and produced varying results. These data were used to construct pore-water profiles and produced accurate descriptions of the sediment trace element environment.
Complete Lower Level Control and Semi-Automation of a Microcontroller-Based Articulated Robotic Arm Demonstration

Thomas Behling, Mechanical Engineering - Hilton Head, SC
Mentor: Dr. Philip Voglewede, Mechanical Engineering

The USC mechanical engineering department currently possesses an articulated robotic arm, or serial manipulator. This six-axis arm has an estimated $15,000 in man-hours and materials invested into it, but it lacked a key feature of useful robots: control. The previous setup uses momentary switches to turn on individual motors for each axis, but this on-off level of control, known as “bang-bang” control is elementary in comparison to the advanced capabilities found in industry robotics and insufficient for complex applications, such as the simultaneous control of manipulator links. A massive overhaul of the hardware was performed to upgrade the failing encoders, which provide feedback to the controller, repair mechanical damage, solve previously unknown mechanical design problems that hindered function, and generally reduce nonlinearities within the system. A proportional-integral-derivative (PID) controller was selected for its fast response time and disturbance rejection abilities and integrated with a high power H-bridge motor driver to control each of the six axes. A microcontroller serves as an intermediate for communication between the motor controllers and the host computer, from which a user can perform simple motion operations under PID control. The completed system can be used under PID control and serves as a future platform for more advanced control methods, such as nonlinear controls.

Power coupler for contactless energy transmission device

Jeffrey Cuttino, Electrical Engineering - Georgetown, SC
Mentor: Prof. Roger Dougal, Electrical Engineering

The object of this research is to design and analyze an inductive energy coupler, which is an essential element of a Personal Power Network. The proposed personal power network is a suggested approach to improve the efficiency and weight of the power sources used for military applications. The system will allow a soldier to carry one main power source (such as a battery or fuel cell) that will charge each piece of his electronic equipment. The power converter that will be used to drive the coupler is a resonant converter, which has been chosen because it is believed to increase efficiency by using the leakage inductance of the transformer (which is normally related to loss) as a component of the resonant converter. Previously a simulated efficiency analysis had been performed using Maxwell SV to compare efficiency vs. air gap. Maxwell SV was also used to compare efficiency vs. frequency. Once an optimal frequency range was determined based on the simulated results, a experimental analysis of the loss due to winding resistance was compared to a theoretical analysis of the loss due to winding resistance. The system must be designed to be very compact and light weight to allow mobility of the soldier, while providing a very high efficiency. Therefore, the circuit must be designed then tested before it is manufactured into a compact component.
Preparation of Silicon Carbide crowns for further study of different crystallographic orientation characteristics

Kevin Daniels, Electrical Engineering - Columbia, SC

Mentor: Dr. Tangali Sudarshan, Electrical Engineering

A common problem with film growth of SiC is the need to cut it 8° off-axis for high quality growth. This leads to a waste of material that could be avoided by cutting the material at a lower different angle. Growth on a wafer that is cut on-axis (0°), which would result in zero loss of material, is not possible due to the lack of steps on the surface for nucleation. By analyzing the convex crown from a boule, one could observe all the possible off-cut angles and directions at once and from this determine the best angle to cut wafers from with minimal loss in material. The problem is that due to its unusual shape, typical processing techniques had to be modified for this analysis to be possible. This includes modifying grinding, polishing and cutting procedures to accommodate its unusual size and shape. By mounting the crown in epoxy for the majority of the procedures, much of the problems with its shape were resolved. By mounting the crown, dome facing down, grinding and polishing of the backside were possible; though polishing had to be done by hand for the best surface quality. Due to the epoxy’s strong adhesion to the crown, Trichloroethylene (TCE) was used to remove it from the sample. Cutting the sample into quarters was carried out using a diamond embedded cutting wheel with the crown mounted back in epoxy with the polished side down. This prep work could lead to less wasted material of bulk SiC, and thus prepare the crown for epitaxial film growth studies.

Inhibition of Amyloid-β Protein Aggregation via Cyclic Compounds

Timothy Davis, Chemical Engineering - Garden City, SC

Mentor: Dr. Melissa Moss, Chemical Engineering

Alzheimer’s disease (AD) is an illness that affects an estimated 40% of the population over the age of 80, but more shocking than the percent of the population who are afflicted with AD, is the fact that modern medicines fail to halt disease progression. There is, however, hope in new biomedical research that could effectively combat AD before it can devastate the cognitive faculties of its victims.

The cause of AD has been identified as a buildup of protein plaques in and around the brain cells, causing neurocellular death. One protein responsible for the buildup has been identified as the amyloid-β protein. Aggregation of the Aβ protein involves a series of structures: single monomer, partially aggregated soluble protofibrils and fully formed insoluble fibrils. From intermediate protofibril structures, two mechanisms of growth have been identified and termed elongation and association.

The intermediate protofibrils and their growth mechanisms provide distinct targets for therapeutic inhibition of Aβ aggregation. Previous research has shown that cyclic structures and their chemical binding properties may play an important role in the inhibition of Aβ aggregation. We have examined the inhibitory characteristics of a library of cyclic chemical compounds. Inhibitors were first scanned for their ability to inhibit fibril formation from monomer, without regard to growth mechanism. Effective inhibitors were then introduced into assays that isolate elongation and association mechanisms of protofibril growth. The results generated by the established experimental practices show that multiple cyclic compounds exhibit inhibitory behavior. In particular, these compounds selectively target protofibril association.
Efficient Router Designs for Special-Purpose Distributed Processing Systems

Shaun Gause, Computer Science and Engineering - Lexington, SC

Mentor: Dr. Jason Bakos, Computer Science and Engineering

“High-Performance Reconfigurable Computing (HPRC)” is a computational model where a programmable logic device, called a Field Programmable Gate Array (FPGAs), is used in conjunction with an off-the-shelf computer to achieve high-speed computation for scientific applications. In this model, an FPGA is configured such that it can perform specific, often repeated, and expensive computations on behalf of a particular application. Since computations generally faster in hardware than software, HPRC can yield supercomputer-class performance within a desktop computer.

However, a traditional problem for HPRC is the limited resources available on a single FPGA. This is a problem for applications whose performance can benefit from more resources than are available on a single FPGA. To address this problem, we are developing technology that will allow an arbitrary number of FPGAs to be interconnected and act as a single, large FPGA. This technology relies on a number of enabling concepts, including a mesh interconnection network, integrated routing elements, and protocols to abstract the application architecture from the network architecture. For this project I have developed a set of hardware designs for integrated routing elements. My designs include support for wormhole switching (which splits packets of data into fragments to lower buffer requirements) and an experimental dynamic load-balancing technique that reduces network congestion and improves performance relative to state-of-the-art techniques. I have performed a simulation study of my designs to demonstrate their functionality, and I have synthesized my designs to an FPGA to demonstrate their operating speed and resource utilization fall within the design requirements.

Analysis of gas permeation through polymer membranes using a new permeation cell technique

Jacob Hunter, Chemical Engineering - Mt. Pleasant, SC

Mentor: Dr. Harry Ploehn, Chemical Engineering

Polymer films are employed to protect materials from contamination from outside gases or to retain gases within packaging. Every day examples include Saran® wrap (polyvinylidene chloride) used to protect foods from air along with soda bottles used to retain carbon dioxide, CO2. The measurement of gas permeation rates through films is important to understanding and improving the barrier properties of polymers. However, existing methods for measuring the permeation of different gases through polymers are not fast or convenient.

We have developed a new instrument for measuring gas permeation through polymer films. The instrument uses a specially designed permeation cell to expose one side of a polymer film to a single test gas or a mixture of gases. As the gas diffuses across the film, a flow of sweep gas picks up the permeating gases and carries them out of the cell where the mixture is sampled through a variable leak value by a residual gas analyzer that quantifies the composition of the gas mixture. By measuring the gas mixture composition continuously, we can determine the permeation rate of the test gas through the polymer film as a function of time. In order to prove the principle of this new instrument, we have measured the permeation rate of CO2 through Mylar® films of varying thickness. We compare the CO2 permeation rate...
with published values and show that our instrument can give accelerated gas permeation measurements that can in the future be used for characterizing the gas barrier performance of polymer nanocomposites.

**Development of a multiple-ratio drive system for competition robotics**

*William Leverette*, Marketing - Irmo, SC  
Mentor: Dr. Philip Voglewede, Mechanical Engineering

Working with a team of students from Columbia High School, a multiple-ratio drive system was developed for the 2007 FIRST (For Inspiration and Recognition of Science and Technology) Robotics Competition game, Rack 'n Roll, with the aim of improving the team’s competitiveness on the field compared with past seasons. Working under a tight six-week deadline, the research explored drive systems utilized in past competitions with similar field and gameplay characteristics. A working design was created using the Pro/ENGINEER Wildfire 3.0 software which permitted several design iterations before actual fabrication began. Particular care was taken to minimize the amount of fabrication required by the team. The drive system, as well as the rest of the robot, was completed in time to ship by the February 20 competition deadline. The team will compete with this robot at the 2007 FIRST Robotics Competition Palmetto Regional at the Colonial Center from March 29th through the 31st; full findings will be made available with the poster.

**Cellular Automata Modeling of the Growth Mechanism of Gold Nanorods**

*Tyler Ray*, Mechanical Engineering - Midlothian, VA  
Mentor: Dr. Sarah Baxter, Mechanical Engineering  
Dr. Catherine Murphy, Chemistry and Biochemistry

Metallic nanoparticles, in the form of colloidal gold nanospheres, have around since the Middle Ages. Both artisans and researchers have harnessed their unique optical properties for a variety of applications; however, despite substantial interest in gold nanorods, little is known about the nanorod crystal growth mechanism and few models exist that capture, describe, or predict this growth. This specific project involved applying a unique modeling approach to the nanorod growth mechanism through the utilization of cellular automata (CA) modeling techniques. CA modeling is computationally efficient in modeling complex systems, such as biological self-assembly, by drawing upon core principles of emergent (or complex) behavior. CAs model a set of elements with simple, well-understood descriptions through the implementation of a lattice or 2-D grid where the local interaction of each point is governed by a set of simple, well-defined rules. This project developed a series of models extending existing CA paradigms, including diffusion limited aggregation and annealing, to construct a CA modeling framework which will become the basis for a model of the nanorod growth mechanism. This research suggests that the growth mechanism can indeed be modeled in a computationally efficient manner by focusing holistically on the rod growth rather than on the atomic interaction level. Future research will focus on the actual development of such a model.
Synthesis of Nearly Uniform Pt Clusters in Aqueous Solutions and on a Al2O3 Surface

Karen Wigal, Chemical Engineering - Morgantown, WV
Mentor: Dr. Michael Amiridis, Chemical Engineering

Conventional techniques widely used for the preparation of supported metal catalysts usually offer limited control over the size of the metal particles. Alternative synthetic routes based on the deposition of metal colloids have been suggested for better control of metal particles size. However, the use of metal colloids typically requires the chemical reduction of transition metal salts in aqueous media in the presence of templating agents and surfactants in order to stabilize the metal nanoparticles formed. A novel approach to the synthesis of stable Pt clusters in aqueous solutions, which is based on the chemical reduction of H2PtCl6 with NaBH4 without the use of any surfactants or templating agents, was suggested in this work. This technique leads to the formation of nearly uniform Pt clusters that remain intact upon deposition onto a Al2O3 support. UV-Vis spectroscopy, Extended X-ray Adsorption Fine Structure spectroscopy (EXAFS), and FT-IR spectroscopy were used to characterize the morphology of the Pt clusters in the solution, on the Al2O3 surface, and during the catalytic conversion of isopropyl alcohol to acetone. In addition, the activity of the Pt/Al2O3 catalyst was evaluated in the gas phase CO oxidation.
Humanities

Topper: Discovering Early Man in America

Erin Curtis, Media Arts - Lexington, SC
Mentor: Dr. Albert Goodyear, Anthropology

Perhaps no subject is in more debate among American archaeologists than the question of when man first arrived in the Western Hemisphere. The long-held theory that man crossed the Bering Strait into Alaska some 16,000 years ago is being tested in light of recent archaeological evidence found among sites in North and South America, and the discovery of pre-Clovis stone tools – that is artifacts dated much earlier man was originally thought to inhabit the Americas. The Topper site in Allendale County, South Carolina has emerged as a key location for the excavation of these pre-Clovis artifacts.

Expeditionary Scenic Design: Exploring Art in Europe

Samantha Hayford, Theatre - Lexington, SC
Mentor: Prof. Nic Ularu, Theatre and Dance

As a scenic designer, it is important to have an understanding of the current trends in the international theatre community. My research into recent practices began by traveling to Romania and attending the International Theatre Festival in Sibiu. At the festival, performances presented by groups from different countries including Armenia, Canada, Australia, Russia, and Romania were attended, as well as workshops taught by Jean-Guy Lecat, renowned scenic and space designer for Peter Brook. The University of South Carolina was represented at this festival with a performance of The System, an original play produced and performed by Theatre South Carolina. I served as stage manager for this production and toured with the show in Romania at the Teatrul Foarte Mic and National Theatre of Constanta. I received a second opportunity to observe the reception of an American play by a Romanian audience through assisting scenographer Nic Ularu on his design for a translated version of Baby with the Bathwater by Christopher Durang in Constanta. To conclude cultural research in Europe, I explored the fine arts in the collections at the Louvre, the Musee d’Orsay, and the Van Gogh Museum. The influence of the performances and museums observed, the opportunity to tour with an American show in Romania, and assisting the design of an American play for a Romanian audience gave a broad glimpse into the contemporary world of theatre and design.

Modernity and Baudelaire’s Parisian Dream

Edward Schmidt, English - Columbia, SC
Mentor: Dr. Tony Jarrells, English Language and Literature

The French poet Charles Baudelaire (1821-67) lived during a unique age, one in which culture was drastically changing. This study interprets his poem “Parisian Dream” as lyrically illustrative of the shift from Romanticism to Modernity. Extensive historical and theoretical reference is made to both Walter Benjamin and Marshall Berman, writers who spent a considerable amount of time discussing Baudelaire and his position in history.
Developing a matrix of interpretation for reading his poetry begins with examining Baudelaire’s dual status as both poet and flâneur, which is, basically, someone who is at home in a crowd. Using both Benjamin and Berman, I argue that Baudelaire’s duality of rôles makes him a well-qualified “inside” source for understanding the change in cultural consciousness that was occurring in nineteenth-century Paris. Both critics point to Baudelaire’s use of material symbols of this change, and this study focuses on his use in “Parisian Dream” of the arcade, or an outlet for luxury goods that protects both commodity and customer from the elements, an example of which can still be seen in downtown Columbia, SC. For material and cultural history of this building, I draw upon Johann Geist’s exhaustive study of this architectural design. This study concludes by actualizing the developed method of interpretation in a close reading of “Parisian Dream”, in which is seen how the changing of philosophy, culture, and ideas creates a tension between Baudelaire’s identity as a flâneur and the inescapable “progress” of society towards modernity, an advancement well represented by the arcade.

**Tales of the Tidelands**

*Jeremy VanderKnyff*, Media Arts - Simpsonville, SC

Mentor: Prof. Laura Kissel, Art

With the recent pervasiveness of the Internet in scholarly research and advances made in digital technology, interactive online exhibitions may soon be the de facto medium for information archival, interpretation, and retrieval. This research is part of an ongoing project intended to develop an online archive of the anthropological, historical, and creative interpretations collected by a group of USC students in the spring of 2003. Titled, “Tales of the Tidelands,” their research includes vast quantities of photographs, oral narratives, and video documenting various aspects of the Georgetown region of SC: local folklore, effects of industrialization, the Gullah Nation, coastal development, and so forth. My work has been to collect and examine the students’ research and create a fluid multimedia archive for researchers at the high school level and above. In the course of this work, I have thoroughly researched each student’s topic and created not only an archive, but a multimedia interpretation that is clear, concise, and attractive, yet remains true to the student’s original studies. The project is nearing completion and online publication.

**Rites of Passage**

*Catherine Whitt*, Marketing - Rock Hill, SC

Mentor: Dr. Nicholas Cooper-Lewter, Social Work

We are proposing that I will identify the rites of passage practices of the different ethnicities that make up the modern American (U.S.A.) culture. Then, I will complete a literature search to support what I have identified. This will serve as a pictorial representation (scrapbook) that can be used to celebrate the contributions of the groups identified to the future potential “of the American dream.” The scrapbook will be of a publishable quality, i.e. e-book, and designed in such a way as to be used by professionals and non-professionals across the disciplines to allow them to understand/ experience the ways people help community members take their roles in the larger community’s future.
Synthesis and Characterization of Self-Assembling Polyboronates

Christina Baraty, Biological Sciences - Greer, SC
Mentor: Dr. John Lavigne, Chemistry and Biochemistry

Self-assembly has arisen as a simple and efficient method for the synthesis of highly ordered supra-structures. Recently boronate ester formation has been used for the generation of linear polymers, macrocyclic structures and nanoporous networks. The formation of these materials is reversible in nature, yet they possess the stability of covalent structures. The reversible nature of these materials allows for the self-repair of hydrolytically damaged polymers. The research presented herein focuses on developing this facile dehydration reaction to create self-assembling polymers. Materials based on small-molecule and larger polymeric building blocks will be discussed as well as the properties of these compounds. This research will lead to a better understanding of poly(boronate) structure and function.

A Novel Approach toward Biogenic Amine Sensing using Cross-Reactive Poly(thiophene)s Sensor Arrays

Travis Deason, Chemistry - Aiken, SC
Mentor: Dr. John Lavigne, Chemistry and Biochemistry

The potential of polythiophenes as biogenic amine sensors will be discussed. Poly (thiophene)s are of interest because of their enhanced stability and sensitivity to interactions between solution phase analytes and side-chain functionality. This sensitivity allows the generation of the sensor array through the simple addition of divalent metals to obtain unique optical properties. This research proposes the use of this array to discriminate between several biogenic amine mixtures. The detection of these amines in biological systems can point to spoiled food, and even some forms of cancer and disease. Ten different mixtures, made up of three different biogenic amines have been studied. Classification through the use of multivariate statistical analysis on the UV spectra using the polymer/metal sensor array has been obtained up to 99%.

Forensic discrimination of ballpoint pen ink using UV/Visible microspectrophotometry and multivariate statistics

Amanda Kesler, Chemistry - Irmo, SC
Mentor: Dr. Stephen L. Morgan, Chemistry and Biochemistry

Forensic document examinations involve identification, quantitation, and age determination of inks deposited onto paper. Issues include determining age of the writing, whether the same pen was used on two documents, whether multiple entries were written at the same time, or whether a document was altered. Different chemical components present in ink enable their discrimination and identification. Current US Secret Service practice involves ink analysis by thin-layer chromatography. This research is designed to evaluate the forensic applicability of UV/visible microspectrophotometry for discrimination between similarly colored ink samples. Spectroscopy is non-destructive and more rapid than TLC. Can a direct spectroscopic ap-
Proach be as discriminating for inks that are similar in color but are of different chemical compositions?

Blue and black are the most common inks and are quite difficult to distinguish visually. An ink database representative of the range of variability between different pens and pens from the same manufacturer was created. Replicate spectra were taken in transmission mode using a xenon source and a 36 X collecting objective. Discrimination between ink spectra was evaluated using linear discriminant analysis. Every ink sample we have analyzed can be discriminated from samples from different pens. Statistics are of utility in visualizing differences between groups of spectra, and in confirming the statistical validity of discrimination using statistical hypothesis tests. The designed experiments performed in this research, combined with the observed discrimination between inks, may suggest improvements in forensic document examinations in the future.

**Points of Closest Approach for Charged Particle Trajectories for the MIPP Experiment**

**Kevin Ludwick**, Physics - Pelion, SC

Mentor: Dr. Carl Rosenfeld, Physics and Astronomy

I am currently using data from the time projection chamber (TPC) of the MIPP experiment at Fermi National Accelerator Lab to measure the production rate of neutral kaons and lambdas, particles which contain a strange quark, in hadron-nucleus collisions. The challenge is to distinguish the two charged particle trajectories originating from the downstream decay of a kaon or lambda from the plethora of charged particle trajectories originating from the primary hadron-nucleus collision. The trajectories of the charged particles from a kaon or lambda have an intersection several centimeters downstream of the primary vertex. I need to find these intersections, and the TPC provides a point and a tangent for each trajectory. Using vector calculus and standard approximation methods, I present a method for obtaining the points of closest approach of the helical trajectories of two charged particles to each other. I show calculations for straight and helical trajectories. If the distance between the points of closest approach of the trajectories of two charged particles is small, I can conclude that they come from a kaon or lambda.

**The Role of sufA in Fe-S Cluster Assembly**

**Kenneth Nesbitt**, Chemistry - Sumter, SC

Mentor: Dr. Wayne Outten, Biochemistry

The suf and isc pathways are known to be Fe-S cluster biosynthetic pathways in Escherichia coli. These pathways are required to construct Fe-S cluster cofactors for use in electron transfer and substrate activation reactions in a variety of important enzymes. Of particular interest is the suf pathway because it appears to be activated under conditions of iron starvation and oxidative stress. The suf operon, sufABCDSE, contains genes for six proteins. Like the other suf proteins, sufA is being studied in an effort to characterize it and determine its role in the assembly of Fe-S clusters. A protein encoded by the isc operon, iscA, is thought to be homologous to sufA. Studies reveal that the sufA/iscA double mutant only grows when given a carbon source that can be metabolized via a pathway that does not require Fe-S cluster enzymes, while its growth is greatly diminished when given a carbon source that does require Fe-S cluster enzymes for metabolism. However, the single
mutants do not show these growth defects. This suggests that sufA and iscA can functionally substitute for one another. Further growth experiments revealed other mutant phenotypes that support the hypothesis that deleting both the iscA and sufA genes disrupts Fe-S cluster biosynthesis, which in turn disrupts pathways that require Fe-S clusters. Gene reporter assays are currently being used to determine if iron metabolism or cellular redox status are altered in the sufA and iscA mutant strains in order to better understand their role in Fe-S cluster assembly.

Critical micelle concentration of acylated homoserine lactones

*Laura Sima*, Chemistry - Minneapolis, MN

Mentor: Dr. John Ferry, Chemistry and Biochemistry

Acyl Homoserine Lactones (AHLs) are chemical messengers responsible for gram negative bacterial communication (quorum sensing). This study is focused on the possible interactions of AHLs with hydrophobic environments, analogous to those found in bacterial biofilms, and the possible role of those environments in protecting AHLs from base catalyzed hydrolysis in seawater. The surfactant properties of a series of AHLs were investigated, as well as their capacity to alter the critical micelle concentration of sodium dodecyl sulfate (SDS). The correlation between the rate of AHL lactonolysis (messenger degradation) and the presence of SDS micelles is noted and the implications for microbial communication discussed. The critical micelle concentration of the AHLs, their effect (co-solvent) on the critical micelle concentration of SDS, and the effect of SDS micelles on their hydrolysis rates are reported. 6-Propionyl-2-dimethylaminonaphthalene (PRODAN), a fluorescent amphiphilic probe, was utilized for the optical detection of micelles.

Validation Studies for the Detection of Blood on Substrates of Forensic Relevance by Fourier-Transform Infrared (FT-IR) Spectroscopy

*Heather Taylor*, Chemistry - Lexington, SC

Mentor: Dr. Stephen L. Morgan, Chemistry and Biochemistry

Blood is a critical piece of evidence frequently discovered at crime scenes. Improved detection methods are needed because small traces of blood may be obscured by surrounding backgrounds. Attempts to clean up blood may also prevent visual or chemical detection of blood. Chemical detection methods involve toxic chemicals (e.g., luminol) the use of which can also compromise DNA integrity. Infrared (IR) spectroscopy, used in a real-time mode, would address these issues and reduce analysis time. This research is designed to validate forensic applicability of IR spectroscopy for rapid detection/visualization of blood. Our hypothesis is that IR spectroscopy possesses sufficient specificity to exhibit a low false positive detection rate for blood on a variety of possible background materials (e.g., clothing, carpets, wood, or other surfaces).

Replicate spectra of neat and bloodstained substrates were collected with an attenuated total reflectance IR accessory. Olefin, nylon, and polyester polymers coated with Scotchguard™ and other stain release treatments were tested. Discrimination of bloodstained substrates from clean surfaces was achievable with few exceptions. Hemoglobin, the predominant blood protein, produces distinctive IR absorbance (an amide I and amide II doublet in the 1500-1650 cm⁻¹ spectral range). However, because nylon (commonly in carpets) is a polyamide, similar bands are seen in nylon.
spectra. This potential interference complicates determination of blood’s presence on such substrates. The use of multivariate statistical analysis allows for greater discriminating ability between spectra with similar features. This presentation will discuss the methods used for sample preparation, data collection and spectral interpretation.

**Use of a Conjugated Polymer-Based Sensor Array to Assess the Quality of Fish**

*Ivy Tran*, Chemistry - Rock Hill, SC  
Mentor: Dr. John Lavigne, Chemistry and Biochemistry

A conjugated polymer is presented as a sensor to assess the quality of fish as it relates to spoilage. The amount of biogenic amines present in a sample directly correlates with the quality of the fish. These amines are generated from the bacterial decay of proteins. Initial efforts have focused on using a carboxylated poly(thiophene) that interacts with these amines resulting in distinct color changes relating to the amount of amine present. Calibration curves are generated to correlate spoilage under varying conditions with the polymer response. Analysis has focused on studying the spoilage of tuna and salmon thus far. Arrays are readily generated by simply varying the counter-ion for the carboxylate on the polymer resulting in a differential response from the polymer. These combined responses lead to more precise quality assessments.

**Formation of rhodamine B spirolactams for the development of selective sensing materials**

*Kevin Yehl*, Chemistry - Inman, SC  
Mentor: Dr. Ken Shimizu, Chemistry and Biochemistry

Xanthene based dye are common in sensing systems and can exist in two forms: open and closed. The closed form is typically colorless and non-fluorescent. The open form is colored (ranging from red to yellow) and fluorescent. Xanthene dyes can be switched from the closed to open form by changing the pH or polarity of the solution. Recent work demonstrated the unique sensing potential of an on/off rhodamine B system for the differentiation of aliphatic amines, aminoalcohols, and diastereomeric aminoalcohols. The selectivity and sensitivity observed by the monitoring of fluorescence of rhodamine B has led to the development of a new class of sensing molecules for detection of various analytes. Herein is an account of the development of rhodamine B lactams via amidization with aniline and aminopyridines. The potential to differentiate biogenic carboxylic acids will be investigated by monitoring the fluorescence of on/off rhodamine B lactams.
Creation and testing of lentiviral vector that targets cells expressing the mu-opioid receptor

**Asma Baig**, Chemistry - Columbia, SC

Mentor: Dr. Steve Wilson, Pharmacology, Physiology, and Neuroscience

Mu-opioid receptors (MOR) play an important role in the mediation of the actions of a class of opioids including heroin and morphine. In this experiment, the effects and specificity of the MOR promoter were studied. The cDNA coding for this promoter from the rat OPRM gene was cloned into the vector, which contains genes that allow packaging of the virus by the cells, and allows MOR promoter-dependent expression. These VSV-pseudotyped lentiviral vectors can be delivered directly in vivo. They efficiently transduce the neurons and glial cells of the central nervous system of rodents and non-human primates. Thus, the virus was injected into the rat brain at the central amygdala that contained a mixture of MOR-expressing and non-expressing cells. Enhanced green fluorescent protein (EGFP) expression was analyzed by fluorescent microscopy. Immunohistochemistry from rat brain tissue was used to determine if the MOR promoter limits EGFP expression to the mu-opioid receptor specific cells. A substantial amount of EGFP expression was viewed in the rat brain tissue. Our studies show that the M1E1 promoter caused expression of EGFP in the central amygdala. Future studies will attempt to modify the expression of physiologically relevant neurotransmitters in this region.

Developmental Alcohol Exposure and Effects on Attentional Set Shifting in Long Evans Rats: A Pilot Study

**Codi Black**, Experimental Psychology - Spartanburg, SC

**Anna Walton**, Biological Sciences - Columbia, SC

Mentor: Dr. Sandra Kelly, Psychology

Attentional set shifting has been proven to provide insight into specific types of damage to the prefrontal cortex, an area of the brain involved in executive control such as decision making and ability to appreciate the consequences of one’s actions. Set shifting in humans is often evaluated using the Wisconsin Card Sorting task. A cross species equivalent has been developed to test rats by Birrell and Brown (J Neurosci 20:4320-4324, 2000). The purpose of this study was to determine whether this behavioral task is useful in assessing damage to the prefrontal cortex caused by developmental alcohol exposure in an animal model of Fetal Alcohol Spectrum Disorder. A non-treated control, an intubated-control, and an ethanol-treated group of Long Evans rats were used. The rats performed a set shifting task in which they were trained to dig in bowls for a food reward. Then, they had to learn to discriminate between two different bowls—only one of which had the food reward in it—based on different odors, mediums, or textures. A series of discriminations were tested, including intra-dimensional shifts, extra-dimensional shifts, and reversals. All rats in a pilot study were able to fully complete the set shifting task and were fast learners overall. Thus, we expect that this attentional set shifting task will be a good indicator of damage to the prefrontal cortex that may be due to developmental alcohol exposure. Supported by NIAAA grant 11566.
Neuronal activation as measured by c-fos immunoreactivity by play behavior is altered in rats exposed to ethanol during development.

**Cale Bonner**, Biological Sciences - Spartanburg, SC

Mentor: Dr. Sandra Kelly, Psychology

Perinatal ethanol exposure in rats significantly affects social interaction, a finding which parallels effects seen in Fetal Alcohol Syndrome (FAS) in humans. Play behavior, a social interaction consisting of dorsal contacts and pinning in rats, has been shown to activate c-fos, an indicator of neuronal activity, in a number of brain regions. The aim of this study was to investigate neuronal activation in perinatal ethanol-exposed rats following play behavior by analyzing c-fos immunoreactivity (c-fos IR). In this study, rats were allowed to play together for one hour in a closed field. Immediately following the play bout, rats were anesthetized and perfused. Their brains were sliced, stained, and analyzed for presence of c-fos IR. This study found that there were no significant differences among groups in the amount of c-fos IR in the striatum, nucleus accumbens, or prelimbic cortex. However, c-fos IR was significantly decreased in the primary somatosensory cortex (S1sh) of ethanol-treated rats, as compared to non-treated and intubated controls. The significantly smaller amount of c-fos IR in the S1sh of ethanol rats indicates less neuronal activation of this region during play behavior. A companion study has shown that ethanol-treated rats have significantly more pins during a play bout and that this behavior in the ethanol-treated rats is more sensitive to somatosensory degradation compared to control rats. Taken together, perinatal ethanol exposure causes a deficiency in somatosensory signal processing resulting in social interaction deficits as evidenced by abnormal play behavior.

Anxiety and Depression in a Rat Model of Temporal Lobe Epilepsy

**Huley Dru Dickert**, Political Science - Irmo, SC

Mentors: Dr. David Mott, Pharmacology, Physiology, and Neuroscience  
Dr. Marlene Wilson, Pharmacology, Physiology and Neuroscience

Temporal Lobe Epilepsy (TLE) and depression and anxiety disorders are often co-morbid and thought to arise from neuronal damage or neurochemical imbalance within the hippocampal or amygdalar regions of the limbic system. Therefore, to investigate the contribution of seizure-related neuronal alterations to the manifestation of depression and anxiety-like behaviors, TLE was modeled in Sprague-Dawley rats by pilocarpine-induced status epilepticus (SE) (Pilo group). Beginning six weeks after pilocarpine injections, a series of behavioral tests were executed that assessed the degree of depression and anxiety-like behaviors and alterations in learning and memory-recall. The findings of the Pilo group were compared against a control group created by the injection of isotonic saline solution. At approximately 30 and 60 days following pilocarpine injections, Pilo rats were video-monitored in their home cages for five days to assess the length of time after SE required for the development of spontaneous recurrent seizure (SRS) and so that the intensity and duration of seizures could be determined. Rats will be sacrificed twelve weeks after pilocarpine treatment via cardiac perfusion using 4% paraformaldehyde and brains will be sectioned for neurochemical and histological analyses. It is hypothesized that the behavioral tests will reveal an increased degree of depression and anxiety-like behaviors in the Pilo group compared to the control group. In addition Pilo animals may exhibit learning impairment and poorer memory recall. These results will provide insight into the brain mechanisms underlying and linking TLE with depres-
Prenatal intravenous (IV) cocaine: Differential long-term effects on pre-attentive processes in females and males.

Lauren Hord, Experimental Psychology - Chesnee, SC

Mentor: Dr. Charles Mactutus, Psychology

Among the most reliable neurobehavioral alteration consequent to maternal cocaine (COC) abuse during pregnancy is the appearance of attentional deficits in school age children. The acoustic startle response (ASR) and prepulse inhibition (PPI) were used to investigate COC-induced alterations in sensorimotor gating during development. Nulliparous Long-Evans female rats (N=36) were implanted with an IV access port, bred and given saline or COC HCl (3 mg/kg/ml) 1x/day from GD8-14 and 2x/day from GD15-21. COC had no significant effect on any standard maternal/litter parameters. On postnatal day (PD)18 and PD90, one male and one female pup from the Long-Evans litters were tested on ASR trials and PPI [100dB(A) white noise stimulus, 85 dB(A) prepulse white noise, 70dB(A) background, 5-min acclimation period, 6 ASR trials, 36 PPI trials (ISIs of 0, 8, 40, 80, 120, and 4000 ms, 6 trial blocks, Latin square design)]. Both gestational exposure period (saline vs. COC) and sex (females vs. males) were included in the design. No significant effects were seen on PD18. By contrast, on PD90, a 25% COC-induced decrease in peak response was noted on ASR, an effect primarily attributable to the females. For PPI trials (8-120 ms/ISI) on PD90 significant alterations by gestational exposure on latent peak response and significant alterations by sex on latency response were noted. Thus, prenatal exposure to COC, delivered by the IV route, is sufficient to cause differential long-term effects on pre-attentive processes in females and males, as indexed by sensorimotor gating. Supported by NIH: DA09160, DA013965 & DA014401.

Neurobehavioral and Endocrine Changes in a Rat Model of Mammary Adenocarcinoma: Effects of Melatonin, Interleukin-1beta and Interleukin-2

Catherine Meekins, Chemistry - Columbia, SC

Mentor: Dr. Marlene Wilson, Pharmacology, Physiology and Neuroscience

Despite a vast amount of research studying the effects of behavior on cancer progression, little has been done to examine the effects of tumor presence on anxiety and depression. Cytokines including IL-1â and IL-2 are released as an inflammatory response to the tumor cells and have been shown to cause behavioral disturbances such as elevated anxiety and depression. Initial studies indicated tumor presence caused higher levels of anxiety in a rat model of mammary adenocarcinoma. The purpose of the present study was to investigate the role of circulating and brain levels of cytokines on performance on the elevated plus maze (EPM) for anxiety. Also, determination if melatonin, a hormone that has been shown to attenuate tumor progression and have anxiolytic and antidepressant properties, could alter the associated mood behaviors or concentration levels of the cytokines. Female Fisher 344 rats were injected subcutaneously in the mammary pad with either serum free medium or 1.0x106 MTLn3 rat adenocarcinoma cells for tumor growth and palpable tumor size was recorded daily. Melatonin was administered in the drinking water at a target dose of 4 mg/kg/day. For the assessment of anxiety-like and depression-like
behaviors, animals were tested on the EPM and the Porsolt forced swim test following control or MTLn3 cell injections. Circulating and brain melatonin and specific cytokine levels were assessed. Early results suggest changes in circulating IL-2 levels, but other cytokines are currently being investigated using the BioRad Bioplex Cytokine Assay.

Kainate Receptors as a Therapeutic Target in Rat Model of Epilepsy

John Teal, Experimental Psychology - Cheraw, SC
Mentor: Dr. David Mott, Pharmacology, Physiology and Neuroscience

Temporal Lobe Epilepsy (TLE) is a progressive neurological disorder. Kainate receptors are a potential therapeutic target for treatment of epilepsy. Our preliminary results show that muscarinic acetylcholine receptors potentiate kainate receptor function. We examined whether this potentiation contributes to seizures and neurodegeneration in epilepsy. Rats were injected with the muscarinic acetylcholine agonist pilocarpine, followed 20 minutes later by kainate to induce seizures. These rats developed seizures at much lower doses of kainate than did control animals, indicating that prior activation of muscarinic receptors potentiated kainate seizures. This finding suggests that muscarinic potentiation of kainate receptors is a potential therapeutic target for epilepsy. We propose to use viral mediated gene transfer to knockdown a critical kainate subunit and block this muscarinic potentiation. We hypothesize that this strategy will reduce both epileptic seizures and the associated neurodegeneration. However, to test the neuroprotective capacity of this strategy it was first necessary to establish baseline levels of neurodegeneration caused by status epilepticus. Magnetic Resonance Imaging (MRI) and histological analysis were used to quantify neuronal cell loss 10 days after pilocarpine-induced status epilepticus in adult rats. Histological analysis revealed neuronal loss in the piriform cortex, the dentate hilus and CA1 and CA3 regions of the hippocampus, but not in amygdala or the granule cell layer of the dentate gyrus. Similarly, MRI exhibited a significant increase in the T2 signal, a marker of cell loss in hippocampus, medial temporal lobe and piriform cortex, but not amygdala. These results provide a baseline characterization of our epilepsy model.
Classical conditioning of zebrafish (Danio rerio) as a means to test long-term memory

Olga Agafonova, International Studies - Obninsk, Russia

Mentor: Dr. Richard Vogt, Biological Sciences

The study of learning and memory is one of the most intriguing fields of neuroscience and experimental psychology. Classical conditioning was one of the several approaches that have been used to understand the mechanisms of cognition in animals, including fish. Our experiment involved conditioning of zebrafish to associate red or green light with food and an assessment of whether they can successfully remember this association several days after training. Three-month old zebrafish were separated into an experimental and control group each of which had 16 animals. The experimental set up included 2 tanks equipped with a timer relay-controlled automatic feeder. The tanks were split into 2 equal halves with a divider. The experiment occurred in 2 stages: conditioning and recall. The conditioning phase consisted of twenty 1 min trials that taught fish to associate food with red or green light. At the start of each trial the light was turned on for 20s and then turned off for 40s. The position of the fish was recorded at 5, 10, 15, and 20s. After those 20 trials, there was a 3 min inter-phase interval and the recall phase with ten 1 min trials began. The light was turned on but no food was delivered. Fish were judged to be successfully conditioned if they were on the correct side of the tank 50% of the time. Two days later, the recall phase was repeated with the experimental group. Our data fail to demonstrate that zebrafish have the capacity for long-term memory.

Stimulus Generalization and Context Effects in the Reinstatement of Fear

Krystle Duckett, Experimental Psychology - Beech Island, SC

Mentor: Dr. Edward Callen, Psychology

A common treatment for people with phobias or fears is to expose the person to the feared stimulus until fear is reduced, a process called extinction. Although fear can be extinguished, it is also possible for a conditioning experience after extinction to produce a full recovery of fear, a phenomenon known as reinstatement. The present research was designed to investigate stimulus, context, and temporal variables in reinstatement with a discrete conditioned stimulus (CS), using an animal model. Subjects in eight experimental groups and two control groups (n=12) received two inescapable classical fear conditioning trials in a black compartment, in which a foot shock was delivered after the presentation of a tone. After conditioning, all subjects except those in one control group received 10 fear extinction trials to the CS while confined to the black grid floor compartment after 24 or 168 hours. Subjects during reinstatement received one tone-shock pairing; frequency of the tone also varied across groups. Fear testing occurred one day after reinstatement. Subjects’ escape times from the tone and black compartment were measured, with faster escape latencies reflecting greater fear. Based on previous research, it is anticipated that subjects with a delay between extinction and reinstatement will demonstrate faster escape speeds and will have higher levels of fear to the different CS than those who receive immediate reinstatement.
The Effects of Temporary Lesions to the Medial Prefrontal Cortex on Learning

**Samuel Durrett**, Chemistry - Sumter, SC

Mentor: Dr. Barbara Oswald, Continuing Education/Academic Programs

Trace eyeblink conditioning was used to teach naïve lab rabbits to blink in response to a tone paired with a mild ocular stimulus. Previous research demonstrates that the prefrontal cortex (PFC) regulates acquisition and retrieval of trace conditioned eyeblink responses. However, previous studies tested the effects of permanent lesions to the PFC, making it impossible to determine whether animals could learn if PFC were intact. In the present study, we tested animals following microinfusions of the GABA agonist muscimol directly into PFC. Muscimol temporarily deactivates neurons, producing a “reversible” lesion. Rabbits first received stereotaxic surgery to implant bilateral guide cannula into the PFC. Following recovery, rabbits were randomly assigned to receive either MUSC or vehicle (VEH) infusions immediately prior to daily conditioning sessions. Following 2 days of habituation, rabbits began training on a trace conditioning task for 9 days; conditioning was followed immediately by 5 days of extinction training (tone-alone trials). Results indicate that animals receiving MUSC infusions were impaired both in acquisition and extinction, compared to VEH controls, suggesting that the PFC is necessary to mediate both types of learning processes. Future studies will continue this research, by first training rabbits with either MUSC or VEH, and then switching the treatments, to see if MUSC impairs recall of a previously learned response. This research will help scientists to understand better how the PFC regulates learning and memory.

Blocking of PKCy Translocation in the Spinal Cord as a Potential Analgesic Technique

**Jeet Guram**, Chemistry - Columbia, SC

Mentor: Dr. Sarah Sweitzer, Pharmacology, Physiology and Neuroscience

Protein kinase C is a family of enzymes that phosphorylates target proteins. One member of the group, protein kinase C-gamma (PKCy), is activated during pain transmission. Following nerve injury, PKCy translocates from the cytoplasm to the cell membrane. If this nerve injury-induced PKCy translocation could be blocked, then transmission of the neuropathic pain could potentially be stopped. This experiment tested a novel PKCy translocation inhibitor. First, the L5 spinal nerve was transected in a group of rats. Different doses of the novel inhibitor were administered to the rats continuously for 7 days via a subcutaneous pump. On day 7, lumbar spinal cords were collected for protein analysis (Western and immunohistochemistry). As the dose of the inhibitor was increased, the western analysis showed that PKCy expression in the cell membrane of the lumbar spinal cord decreased while the immunohistochemistry showed that cytoplasmic PKCy staining increased specifically in lamina II in the dorsal horn of the spinal cord. The dorsal horn is a major communication point for the rats' nervous systems; in the dorsal horn, afferent neurons from the dorsal root ganglion synapse with neurons linking to the brain. These results support that the novel inhibitor was effective in blocking PKCy translocation from the cytoplasm to the cell membrane. This inhibitor is a potential new therapeutic agent for use in the management of neuropathic pain, with wide-ranging clinical applicability.
Neural Activity in the Prefrontal Cortex During Response Expression and Inhibition

Cynthia Krafft, Experimental Psychology - Moore, SC
Mentor: Dr. Barbara Oswald, Continuing Education/Academic Programs

Research suggests that the prefrontal cortex (PFC) is important in inhibiting responses. Extinction of learned behavior is a valid animal model of response inhibition. In order to observe extinction, this study used a differential trace eyeblink conditioning model in rabbits, an established technique. While it is known that certain areas of the PFC regulate acquisition, there is evidence that adjacent areas may function to regulate extinction. This study measured neural activity within Brodmann's areas 25 and 32 of the PFC during learning and extinction. Rabbits first received stereotaxic surgery to implant recording electrodes. Then they were trained on a differential trace conditioning task, in which two tone stimuli were used, a CS+ high tone that was always paired with a mild eyeshock US, and a CS- low tone, that was always presented alone. Conditioning occurred for 2 days, during which animals learned to perform eyeblink reflexes in response to the CS+ but not in response to the CS-. Training was followed immediately by extinction, in which the CS+ and CS- were both presented alone. Results indicated that during acquisition, select cells within area 32 of the PFC responded differentially to the paired and unpaired tones, but did not alter their firing rate during extinction. Additional animals are being tested with electrodes implanted in area 25, to determine whether these cells alter firing rate during extinction. These findings will provide evidence that area 32 of the PFC is needed for learning, while area 32 is needed to inhibit responses.

Post-training Lesions to the Medial Prefrontal Cortex Interfere with Retrieval on a Trace Eyeblink Conditioning Task

Stephanie Maddox, Experimental Psychology - Columbia, SC
Mentors: Dr. Barbara Oswald, Continuing Education/Academic Programs
Dr. Donald Powell, Psychology

Recent studies have found that the medial prefrontal cortex (mPFC) is intricately involved in higher order learning, such as in trace eyeblink conditioning in the rabbit; however, its precise role has not been well defined. While one study suggested that mPFC is involved in the retrieval of previously stored memory, animals were tested only once following surgery and may therefore have been relying on working memory mechanisms. To clarify the role of the mPFC in retrieval, animals were tested twice following lesion surgery. Rabbits (Oryctolagus cuniculus) were trained on a trace eyeblink (EB) conditioning task to a criterion of 10 consecutive EB conditioned responses (CRs). Ibotonic acid lesions were made in the mPFC centered on the prelimbic region (Brodmann's area 32) one-week following criterion. A second group of animals received sham surgeries at the same time interval. Following a two week post-operative recovery period, all animals were retrained for 4 consecutive days under the same parameters, given one week off, and retrained for another 4 days. Mean EB conditioning performance deficits in the lesion group occurred on the first and second days of the first and second retraining periods. However, by the third and fourth days of retraining, the lesioned animals were performing at a level comparable to that of the sham group at both retraining periods. Since the animals were initially impaired but were able to relearn the task, these findings were interpreted to indicate that the mPFC is involved in retrieval processes, rather than consolidation or storage.
Effect of Age and Sex on Endothelin-1 Induced C-Fos Expression in the Rat Brain

*Teresa Mark*, Biological Sciences - Aiken, SC

Mentor: Dr. Sarah Sweitzer, Pharmacology, Physiology and Neuroscience

By birth all individuals possess the anatomical structures associated with pain perception, but the level of functionality and activity across sex and development is not understood. The pain pathway involves both ascending and descending circuits that allow the body to perceive and modify pain sensations. This study analyzes the activity of various brain regions in response to acute pain resulting from an injection of endothelin-1 (ET-1) into the left plantar hindpaw of postnatal day (P) 7, 21, and 60 rats of both sexes. ET-1 release is associated with a variety of pain states including the vaso-occlusive episodes of sickle cell disease. Two hours post-injection, rats were perfused. Brains were serially sectioned and immunohistochemically stained for c-fos—a protein marker for neuronal activity. An investigator blinded to both sex and treatment counted c-fos positive neurons in the somatosensory cortex, thalamus, amygdala, hypothalamus, periaqueductal grey, and rostral ventral medulla. Preliminary analyses indicated that ET-1 increases c-fos expression in the primary somatosensory cortex, paraventricular thalamus, lateral periaqueductal grey, and central amygdala. Older animals generally had increased expression in comparison to younger animals, while some areas showed a sex dependence as well. These differences indicate changes in pain physiology across sex and development and may explain observed differences in pain behavior. Recognition and increased understanding of these differences could eventually lead to more effective and individual pain management.
Effects of Parenting Style on Smoking Behavior Among Adolescents With ADHD

Holly Carson, Experimental Psychology - Fairport, NY  
Brittany Skiles, Experimental Psychology - Aiken, SC  
Mentor: Dr. Kate Flory, Psychology

Research has suggested that adolescents with attention deficit hyperactivity disorder (ADHD) are at particular risk for smoking (Milberger et al., 1997). However, little research has examined “why”. The goal of this study is to address this question by examining parenting style as a contributor to smoking risk among adolescents with ADHD.

Our sample includes participants from an ongoing study which is examining multiple factors that may explain why adolescents with ADHD smoke cigarettes. ADHD is diagnosed using the KSADS-PL (Kaufman et al., 1997). We used parent and adolescent scores (T60 for either hyperactivity or inattention) on the BASC-2 (Reynolds & Kamphaus, 2004) as a proxy for ADHD for these preliminary analyses. Smoking behavior, expectancies, and intent are measured using self-report questionnaires. To assess parenting style, each adolescent and parent are videotaped and their interactions are coded for parenting variables by two blind observers.

Forty-seven adolescents have participated in the study, but we expect to have 80-90 participants. Preliminary results suggest that adolescents with ADHD report significantly greater intent to smoke in the future (F=4.42, p.05) and are marginally significantly more likely to have ever smoked in their lifetime (+2=3.32, p=.07) than participants without ADHD. Further, results suggest that parents of adolescents with ADHD and parents of adolescents who report ever smoking display less support/encouragement/praise (ds=.73 and .72) than parents of adolescents without the disorder and parents of adolescents who denied smoking. These results have implications for informing an effective smoking prevention program for adolescents with ADHD.

The Relationship between Cognitive Self-Efficacy, Physical Activity and Academic Performance in Underserved Adolescents Enrolled in the Active by Choice Today Trial

Ashley Cooper, Experimental Psychology - Richmond, VA  
Mentor: Dr. Dawn Wilson, Psychology

The study examines the relationship between cognitive perceptions of self-efficacy (confidence in ones ability to be physically active), physical activity (PA) and academic performance in male and female adolescents participating in the “Active by Choice Today” (ACT) NIH intervention trial. ACT is an on-going trial that evaluates an innovative motivational intervention for increasing PA in middle schools (N=24 middle schools; n= 1,560 students). The study targets underserved adolescents (low income, minorities). Specifically, the present study will expand our understanding of the role cognitive factors play on increasing PA and on improving other life trajectories such as academic performance. Participants (N=277; 56% female; mean age=11) enrolled in Project ACT were classified into three categories at baseline: normal weight (BMI85th percentile, n=115), overweight (BMI= 85th-95th percentile, n=60), and obese (BMI>95th percentile, n=102). Age-adjusted BMI was calculated as...
weight (kg)/height (meters). Self-efficacy was measured with reliable and validated self-report questionnaires. Accelerometers were used to obtain 7-day estimates of moderate-to-vigorous PA (MVPA). Boys with normal weight reported higher self-efficacy ($p=.05$) ($M=2.3$, $S.D.=0.5$) than overweight ($M=2.1$, $S.D.=0.4$) and obese ($M=2.0$, $S.D.=0.5$) boys, and levels of MVPA were significantly lower ($p<.001$) in overweight and obese compared to normal weight categories. Girls of normal weight engaged in more MVPA as compared to obese girls ($p=.05$), but no differences were found for self-efficacy across categories of BMI. Data will be forthcoming to evaluate the relationship between self-efficacy, PA and academic performance (e.g., GPA) to evaluate if increasing self-efficacy and PA improves other life trajectories in these youth.

**Analysis of Strategic Self-Presentation Observational Coding for Evaluating Interviewer-Interviewee Interactions as a Function of Gender and Race Congruency**

Christopher Gainey, Biological Sciences - Bonneau, SC

Mentor: Dr. Dawn Wilson, Psychology

This study presents the analysis of Strategic Self-Presentation (SSP) interviews for the evaluation of interviewer-interviewee interactions as a function of gender and race matching. SSP is an interview methodology that utilizes self-perception and commitment as influences to modify physical activity behaviors. Participants of the Active by Choice Today (ACT) after-school program were interviewed with a structured script by trained interviewers. These interviews were analyzed using an observational coding scheme for both quantitative and qualitative data. The variables of interest are the participant’s level of comfort in the interview situation, trust with the interviewer, and extent of engagement in the interview, each evaluated on a five-point Likert scale by observing participant interaction with the interviewer on criteria such as voice tone, non-verbal body language, and content of answers. Preliminary data ($n=18$) suggests that gender matching of the interviewer and interviewee correlates with improved student comfort (matched $4.12\pm0.82$ vs. mismatched $3.2\pm0.92$), trust ($4.0\pm0.75$ vs. $3.3\pm1.06$), and engagement ($4.12\pm0.99$ vs. $3.5\pm0.85$). Data on race matching is currently less conclusive, although trends indicate that race matching also improves student trust ($4.06\pm0.94$ vs. $3.55\pm0.78$) and engagement ($4.11\pm0.83$ vs. $3.78\pm1.11$). Current findings indicate that gender congruency of interviewer and interviewee, and race congruency to a lesser degree, may influence the outcome of an interview as observed in student videotaped sessions. This is an important finding that suggests that the effectiveness of the interview might impact the success of intended behavior change (such as increasing physical activity). Additionally, these results may extend to other clinical interview situations.

**Sex Differences in Physical Activity and Strategies for Involving Peers**

Benjamin Goodlett, Experimental Psychology - Greer, SC

Mentor: Dr. Dawn Wilson, Psychology

This study examines how underserved adolescent males and females differ in physical activity (PA) engagement and strategies they employ to engage others. In order to assess sex differences in reported PA activities and strategies, a coding scheme was developed to evaluate the information presented in a video-taped session made during a structured interview known as strategic self-presentation (SSP). SSP is an innovative motivational intervention based on research on role-play, commitment,
cognitive dissonance theory, and self-perception theory that suggests how we present ourselves to others has a powerful influence on how we come to conceive ourselves and subsequently behave. The interviews were conducted as part of a larger study, Active by Choice Today (ACT). An initial subset of interviews provides preliminary findings that indicate that boys tend to prefer competitive sports while girls prefer leisure activities. No differences in strategies for engaging others was observed in the original subset, although we hypothesize that females will prefer to use emotional strategies and boys will prefer to use skill or health based strategies. This study could have important implications for evaluating the effects of the ACT trial as well as assist in developing future PA interventions. Gender specific programs that are meant to increase PA could utilize the data to design activities and effective strategies to motivate adolescents to join.

Parent's Effects on Development of Cognitive Vulnerabilities to Adolescent

Jessica Maples, Experimental Psychology - Chicago, IL
Mentor: Dr. Benjamin Hankin, Psychology

Cognitive vulnerability to depression is a consistently dysfunctional pessimistic attitude toward self and others and predicts future depression. The present study examined potential developmental origins contributing to cognitive vulnerability and explored influences stemming from different parenting styles. Research indicates that negative cognitions about one's self are associated with negative interactions between parent and offspring. Despite theory and initial evidence that both parent-child interaction and attachment style contribute to cognitive vulnerability, there is a gap in the field's understanding of how the two interact to predict cognitive vulnerability and depression. An understanding of the developmental origins of cognitive vulnerability will assist in informing translational research, which is needed to create effective prediction, prevention, and intervention of adolescent depression. We studied parent-child relationships in the laboratory via videotaped parent-child interactions. Youth and their mother played Jenga as part of an unstructured interaction task. Youth completed self-report measures of negative cognitive style, attachment security, depressive symptoms; mothers completed questionnaires of their child's pessimism and depressive symptoms. Youth were interviewed with the K-SADS. The sample consists of 100 youth (ages 11-14) and their mothers. Results are consistent with hypotheses: Negative cognitive style was associated with depressive symptoms and insecure attachment, and the parent-child interaction codes were associated with depressive symptoms, negative cognitive style, and insecure attachment. Results suggest that aspects of parenting may function as developmental antecedents to youth's emerging cognitive vulnerability and insecure attachment, both of which predict youth's depressive symptoms.

Self-Worth and Cigarette Smoking Among Youth with ADHD

Amber Martin, Experimental Psychology - Dalton, GA
Mentor: Dr. Kate Flory, Psychology

Adolescent smoking is a major public health concern. Evidence suggests that twice as many youth with ADHD begin smoking during adolescence than those without the disorder (Tercyak et al., 2002). The goal of this study is to examine self-worth as one potential contributor to cigarette smoking among adolescents with ADHD.
The sample includes participants from an ongoing study. To date, 47 adolescents have participated. They range in age from 11-17 (M=13.74, SD=1.80); 51% of the sample is female; and 66% are Caucasian. ADHD symptoms are assessed using parent and adolescent scores (T70 for either hyperactivity or inattention) on the BASC-2 (Reynolds & Kamphaus, 2004). Smoking behaviors, expectancies, and intent are measured using self-report questionnaires. Self-worth is assessed using the Harter Self-Perception scale (Harter, 1982) and the Rosenberg Self-Esteem scale (Rosenberg, 1965). Participants with ADHD reported significantly greater intent to smoke in the future (F=4.42, p.05) and were marginally significantly more likely to have ever smoked in their lifetime (+2=3.32, p=.07) than participants without ADHD. Adolescents with ADHD also reported significantly lower global self-worth (F=4.81, p.05) and significantly lower scholastic, social, and behavioral self-worth (all ps .05) than adolescents without ADHD. The relation between ADHD group and intent to smoke was found to be significantly mediated by global and scholastic self-worth and the relation between ADHD group and ever smoked was significantly mediated by global and behavioral self-worth. Results suggest that low self-worth may be one factor that explains why adolescents with ADHD have an increased risk for smoking cigarettes.

Sex Differences in Social Support for Increasing Physical Activity in Adolescents

Amy Parnell, Experimental Psychology - Lexington, SC
Mentor: Dr. Dawn Wilson, Psychology

This study examines differences in the types of perceived social support for physical activity (PA) reported by boys and girls as part of the on-going NIH Active by Choice Today (ACT) trial. ACT is a randomized school-based trial to evaluate an innovative motivational after-school intervention for increasing PA in underserved adolescents (N=24 schools; n=1,560 students). Social support is defined as aid and assistance exchanged through social relationships. Four types of social support have been identified: Facilitation (explaining activities, taking them to facilities), Emotional (encouragement, praise), Tangible (provide equipment), and Engagement (participating in the activities). In order to assess sex differences in reported social support, a coding scheme was developed to evaluate the information presented in a video-taped session made during a structured interview known as strategic self-presentation (SSP). SSP is an innovative motivational intervention based on research on role-play, commitment, cognitive dissonance theory, and self-perception theory. Previous work in these areas suggests that how we present ourselves to others has a powerful influence on how we come to conceive ourselves and subsequently behave. Preliminary data is presented from year 1 of the trial which indicates that both boys and girls most frequently reported receiving social support for engagement in physical activity from family and friends. Overall, girls tended to report receiving more social support from both peers and family as compared to boys.

Cognitive Vulnerabilities in Youth with ADHD and Depression

Laura Stuck, Experimental Psychology - Winnsboro, SC
Mentor: Dr. Benjamin Hankin, Psychology

Attention deficit/hyperactivity disorder (ADHD) and depression often occur together in children. Possible explanations for this relationship include genetic, biological, and parenting factors, and the shared overlap of conduct disorder with depression
and ADHD. Certain cognitive vulnerabilities are known to interact with stress to cause depression. A negative attributional style, one of these vulnerabilities, has been found to be more prevalent in children with ADHD and depression when compared to children with ADHD alone. The cognitive vulnerability of attributional style, as well as dysfunctional attitudes and rumination, will be examined in children with ADHD, children with ADHD and depression, and children with depression to determine if children with ADHD and depression have the same levels of cognitive vulnerabilities as children with depression alone, and if children with ADHD and depression differ on levels of cognitive vulnerabilities from children with ADHD alone. The data analysis will be done using study measures collected from youth in 6th to 10th grades. The results will have implications for therapy for children with ADHD and depression as well as the relationship between ADHD and depression.

Coping Strategies and the Influence of Personality in the Development of Post-traumatic Stress Symptoms in the Aftermath of Hurricane Katrina

Justin Uzl, Biological Sciences - Spartanburg, SC
Mentor: Dr. Benjamin Hankin, Psychology

When Hurricane Katrina hit the coast of Louisiana in the Fall of 2005, thousands of individuals were displaced from home. This natural disaster created a horrific aftermath, but provided a unique opportunity to examine a group of people who experienced an uncontrollable major stressor, thus controlling for the natural variance in the study of the impact of stress on an individual. The focus of this study was to analyze the experience of 200 individuals from New Orleans and the surrounding areas as compared to 100 individuals from Columbia, South Carolina who did not experience the hurricane. All participants filled out self-report questionnaires assessing symptoms of post-traumatic stress disorder (PTSD), coping strategies, and personality. Data was collected longitudinally every 2 months for 8 months. The purpose of this research is to examine the possible connection between coping strategies and subsequent symptoms of post-traumatic stress disorder, PTSD. More specifically, I hypothesize that personality will moderate the relationship between coping and symptoms of PTSD.
Artists Against Breast Cancer: A Qualitative Exploration of Breast Cancer Disparity in South Carolina

Rachel Bowman, Interdisciplinary Studies - San Antonio, TX

Mentor: Dr. Lucia Pirisi-Creek, Pathology and Microbiology

According to 2005 statistics from the American Cancer Society, in 2000, African American women had a 32% higher mortality rate due to breast cancer than Caucasian women in the U.S. In South Carolina, the mortality rate for Caucasian women is 42% lower than the mortality rate for African American and other minority women in the state. As a means of addressing this issue, efforts are being made to review breast cancer education and awareness activities for African American women in South Carolina. The aim of the Artists Against Breast Cancer program is to identify discrepancies in the knowledge of breast cancer detection and awareness information, and to suggest possible means for effectively promoting more widespread breast cancer awareness. Six focus groups were conducted using open-ended questions facilitate discussion. The focus groups were either made up of college-aged African American women, or African American women aged thirty-five and over. The first set of qualitative data collected were used to assess knowledge, ideas, experiences, and feelings of the focus group participants. Focus group members were then asked to rate selected breast-cancer awareness and educational materials. The results indicate that focus group participants in both age groups possess adequate knowledge of breast cancer facts and detection techniques, but a lack of discussion of breast cancer prevalence exists in the community. The preliminary results were used to guide continuing research, culminating in community outreach programs which utilize various artistic mediums to promote breast cancer awareness.

Increasing Students’ Reading Achievement: Evaluating Tier Two Interventions

Robert Clay, Experimental Psychology - Columbia, SC
Rachel Kepes, Undeclared - Columbia, SC
Ashley Mullinax, Experimental Psychology - Columbia, SC
Brittany Prioleau, Experimental Psychology - Columbia, SC

Mentors: Prof. Scott Ardoin, Psychology
Ms. Jessica Carfolite, Psychology

One simple yet effective intervention for promoting students’ reading fluency is repeated readings (RR), which requires students to repeatedly read a passage until a pre-specified criterion is achieved. RR has increased the reading accuracy, fluency and intra passage comprehension of disabled readers (Samuels, 1979), transitional and other less skilled readers (Dowhower, 1987) and nondisabled students (Carver & Hoffman, 1981). The purpose of the presentation is to discuss the benefits of repeated readings on students overall reading achievement. Data will be presented from a 10 week after school program developed to examine the benefits of a tier two intervention on students reading achievement measured by curriculum based measurement progress monitoring. The intervention strategies evaluated include: (a) a non-repetitive strategy and (b) repeated readings. In total, 30 second and third grade students from a suburban elementary school in the Southeastern United States participated in this study. Students were divided into groups of two or three
based on a pre-intervention reading fluency measure. Groups were randomly assigned to either the repeated reading or non-repetitive intervention. Students were assessed twice weekly with four different progress monitoring probes. Results indicate meaningful differences between intervention groups. Those attending this presentation will learn of the benefits of repeated reading for students’ reading achievement.

Addressing Challenges to Medical Interpretation for Exclusively Spanish-Speaking Latina Patients in South Carolina

Mary Allison Joseph, Spanish - Greenville, SC
Anna Handley, Anthropology - Oak Ridge, TN
Mentor: Dr. Ann Kingsolver, Anthropology

With Magellan grant funding, we are researching the needs of all parties involved in Spanish-English medical interpretation in South Carolina; how these needs are currently being met; and how they could be better addressed. We were motivated to research this problem because the Spanish-speaking population of South Carolina is rapidly increasing thus the number of patients affected by insufficient interpretation will only increase. Our goal is to improve the instruction of future interpreters by contributing to curriculum development for medical interpretation courses offered in South Carolina. Additionally, we will be making Spanish language materials for use in a variety of medical settings. Our methods include participant observation, semistructured interviewing, and community-based participatory research. Throughout our research, we will interview receptionists, physicians and medical staff, state workers, Spanish-English interpreters, teachers of interpretation classes, and women who speak exclusively Spanish. Thus far the following issues have arisen: understanding the interpreter role, dangers with untrained interpreters, misinterpretation, lack of complimentary training for medical staff to work with interpreters, patient unawareness of interpreter resources, and need for interpreter certification. Based on our current findings, it is evident that interpreter training is necessary and more complex than current practice and resources would suggest. This poster will show our preliminary findings and suggestions for solutions.

Category NP anaphors in spoken language comprehension

Jeremy May, Experimental Psychology - Sumter, SC
Eric Bowers, Experimental Psychology - Walhalla, SC
Lauren Hodges, Experimental Psychology - Sumter, SC
Mentor: Dr. Amit Almor, Psychology

Many factors are known to affect the reading of referential expressions but not much is known about how the same factors affect reference processing in spoken language comprehension. Two experiments tested the effect of two such factors, discourse focus and the semantic relation between the first and second mentions of a referent, on spoken language comprehension. In both experiments, participants’ eye movements were recorded as they listened to two-sentence discourses about targets that were presented on a computer screen. Focus was manipulated by contrasting two sentence constructions. It-clefts were used to focus the first noun mentioned in Sentence 1 (e.g., “It was the oak that appealed to the gardener.”) and wh-clefts where used to focus the second noun (e.g., “Who the oak appealed to was the gardener.”). The semantic relation between the first and second mentions of the referent was manipulated by using a category term (“tree”) in Sentence 2 to refer
back to either a typical ("oak") or an atypical ("palm") member of the category from Sentence 1. In Experiment 1, the target appeared first in the Sentence 1, and in Experiment 2, it appeared second. Participants’ gaze patterns showed early facilitative effects of both focus and typicality, and a delayed interference associated with repeated reference to focused typical first mentions. These results show that spoken language comprehension is similar to reading in the overall effect of discourse focus and typicality. These results further show that factors that facilitate initial processing may interact to induce a later interference effect.

Effects of Normative and Longitudinal Feedback on Math Performance

Tara Meisner, Experimental Psychology - Mount Arlington, NJ

Mentor: Dr. Brad Smith, Psychology

In an effort to improve academic performance, many students are being tested using brief, curriculum-based measures (CBM). For instance, a five minute math test can be given weekly. These data can be used for progress monitoring (e.g., longitudinal data) or normative assessment. To date, there is minimal research on which types of feedback are most influential in promoting academic progress or self-efficacy. To address this issue, 205 sixth grade students participating in a study of math word problem solving were randomized into four groups. Group 1 (i.e., control) received their most recent test score only. Group 2 (i.e., normative feedback) received a bar graph with most recent test score and the class average. Group 3 (i.e., longitudinal) received a line graph of their scores over time. Group 4 (i.e., normative longitudinal) received a line graph of their scores and the class average over time. Follow-up measures included math CBM and self-efficacy ratings. This is a 2 X 2 pre-test, post-test design that allows for assessments of the main effects of normative and longitudinal feedback and a possible interaction between these two factors. Pre-intervention data have been collected and will be used to prepare graphs that will be delivered to students in early April. On April 11, the CBM and efficacy scales will be given as post-tests for this study. Previous experience with the CBM and self-efficacy scales suggest that the data will be available in one week and therefore will be ready for presentation at Discovery Day.

An analysis of standards of proof in international ambush marketing cases

Michael Morehead, Sport and Entertainment Management - Shelby, NC

Mentor: Dr. John Grady, Sport and Entertainment Management

Ambush marketing has been defined as “any attempt by a non-sponsor to capitalize on the popularity of an event to promote its own products or services” (Bischoff, Curry, & Berzins, 2005, p. 19). The value of official sponsorship is inevitably diluted when non-sponsors can reap the rewards of such sponsorship without paying the costs (Besser, 1999). Citing the need to address the problem associated with ambush marketing on an international scale, Vassallo, Blemaster, & Werner (2005) noted that sport properties are increasingly using their leverage to exert pressure on legislative bodies in prospective host countries to enact strong ambush marketing protection legislation. The plaintiff’s burden of proof can vary greatly according to each country’s legislation, particularly in cases involving trademark infringement. Building on previous research (McKelvey & Grady, 2004; Vassallo, et al., 2005), the purpose of this study is to analyze the standards of proof found in the legislation of
the United States, Australia, and New Zealand, in an effort to determine which standard provides the most comprehensive protection for a sport property and its official sponsors. Through analysis and application of the standards to recent ambush marketing incidents at international sports events, the researcher will demonstrate how the outcome would differ under each standard. The results of this research I provide legal scholars and international sport practitioners with a better understanding of how the choice of a particular standard of proof can impact the leverage a sport property possesses to curb ambush activity during their events.

Race and Credibility in Broadcast News
**Keshia Rice**, Broadcast Journalism - Greenville, SC
Mentor: Dr. Susanna Priest, Journalism and Mass Communications

In an age in which the public's distrust of the news is growing, the media has become increasingly obsessed with its credibility. The purpose of this study was to examine whether or not the ethnicity of a TV news anchor impacts the anchor’s perceived credibility. Subjects (N=62) watched videotapes of four female reporters of different ethnicities reading the same news story, with the order of the reporters rotated. They then rated the reporters on the following attributes: appearance, clarity, credibility, personality, voice, overall performance. The initial results of the study suggest that there is no significant difference in the perceived credibility of the four reporters. In addition, there seemed to be no difference when the race or ethnicity of the viewer was accounted for.

Federal Regulation of Nanotechnology
**Anthony Rouen**, Political Science - Columbia, SC
Mentor: Dr. Edward Munn Sanchez, Honors College

A current problem in the study of nanotechnology is the lack of a clear guide to Federal regulatory agencies and their jurisdiction over the research, production, and distribution of nanotechnology products. This research purpose is to clarify how federal regulatory agencies interact and compliment each other and summarize the results. With information complied from government documents, federal law, and secondary sources a flow chart was drawn representing the Federal agencies’ structures, such as the FDA and the EPA, the acts under these agencies, and the powers and limitations of each of these acts. This gives a visual representation of hierarchy and powers of the regulatory agencies and schemes, while providing a centralized source of information for other researchers.

Self-Efficacy and Math Performance in Middle-School Students
**John Terry**, Experimental Psychology - Hilton Head, SC
Mentor: Dr. Brad Smith, Psychology

Children’s own beliefs in their efficacy to master difficult subject matters appears to have a causal effect on their academic motivation, interest, and scholastic achievement (Bandura, 1996). Self-efficacy and math performance has been shown to have a positive correlation to each other, but the question of specificity of assessment has often been raised. This study addressed the question: is math self-efficacy best represented at the level of specific task (e.g., addition) or as more global assessment of math performance (e.g., can I get an A in math)? Students were recruited from a
local middle school where a total of 205 students completed a math-self efficacy questionnaire and brief assessment of math skills and word problem solving. Questions were specific to individual basic skills (i.e., addition, subtraction, multiplication, and division) and word problem solving. General math self-efficacy was also assessed. Math performance was measured with a five-minute basic skills probe and a six-minute word problem-solving probe. Data will be assessed using a cross-sectional design with multivariate analysis (GLM regression) to assess the unique contributions of several variables, including specific and global self-efficacy, to prediction of math performance. Preliminary analyses found that the magnitude of the specific self-efficacy correlations were similar to those found in previous studies (i.e., Pearson r’s in the range of .18 to .38). The full analysis of the data is underway and will be completed by Discovery Day. The results of this study will guide the development of future cognitive-behavioral interventions.
The effects of mental imagery and positive self-talk on student athletic performance

Andrea Leatherman, Experimental Psychology - Rock Hill, SC

Mentors: Dr. Nicholas Cooper-Lewter, Social Work
Dr. Kendra Olgletree-Cusaac, Psychology

This research sought to determine the effects of mental imagery and positive self-talk on student athletic performance. It was hypothesized that basketball shooting skills as well as psychological skills important on the court as well as in academic settings would improve as a result of mental imagery and self-talk. Nine female high-school basketball players were involved in a four-week study that assessed their basketball shooting skills as well as their psychological state. There was a control group as well as three experimental groups: Group A who listened to a mental imagery CD; Group B who listened to a mental imagery CD as well as read a self-talk script; and Group C who only read the self-talk script. The participants' shooting skills were assessed by taking 20 shots from the right base line, left base line, and the free throw. The PSIS was used to assess their psychological state in the realms of confidence, concentration, mental preparation, anxiety, and motivation. Both tests were performed pre and posttest. In the PSIS test, anxiety control improved significantly with group B and concentration improved significantly with group A. Trends of a parallel correlation were seen in all other PSIS categories with the exception of motivation. Basketball shooting skills decreased in all three subcategories for the control group but increased for the experimental groups 67% of the time. Results from the data concluded that mental imagery and positive self-talk have positive effects on student athlete performance. More research, such as expanding the time and frequency of the study still needs to be performed to establish a stronger correlation.
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