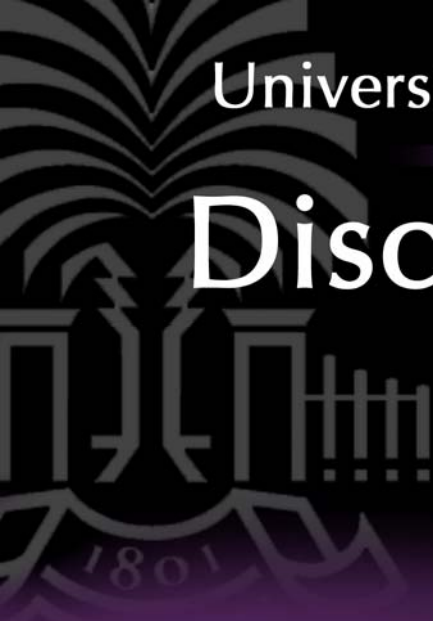


University of South Carolina

Discovery Day 2006



WELCOME from the Office of Research and Health Sciences

"Discovery for every discipline" is at the heart of Discovery Day and the mission of the Office of Undergraduate Research. Such research is key to interactive, dynamic learning. The experience of working shoulder-to-shoulder with USC's world-class faculty provides our students with the opportunities, challenges, and skills to pursue their dreams and invent their futures.

The Office of Research and Health Sciences is pleased to sponsor this forum for recognizing faculty mentors who have instilled the excitement of exploration into the next generation, and the talented students who will be sharing their knowledge and their enthusiasm for learning. On behalf of USC, I wish everyone an engaging day of new discoveries.

Sincerely,

Harris Pastides
Vice President
Office of Research and Health Sciences

THANK YOU from the Office of Undergraduate Research

Discovery Day represents the very best in undergraduate research and this office is honored to have the opportunity to recognize the incredible amount of work by our dedicated faculty and students to make this happen. We invite you to browse the posters, ask questions of the presenters, and congratulate them on their projects.

We would like to thank our student presenters, mentors, and judges for participating in Discovery Day 2006 and a special thanks to this year's sponsors, this day could not happen without you.

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Thank you,

Julie Morris
Program Director

Cover art by William Morris, Director of Technology, South Carolina Honors College

SCHEDULE OF EVENTS

- 9:00 am - 9:15 am **Welcome:** Russell House Theater
Dr. Harris Pastides, Vice President
Office of Research and Health Sciences
- 9:15 am - 11:30 am **Oral Presentations:** Russell House Rooms 201-205
- 12:00 pm - 3:00 pm **Poster Session:** Russell House Ballroom
- 3:00 pm - 3:30 pm **Reception:** Russell House Room 204
- 3:30 pm - 4:00 pm **Awards Ceremony:** Russell House Theater
Dr. Andrew Sorensen, President
University of South Carolina

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ORAL PRESENTATIONS 1

Curriculum Based Measurement and State-of-the-Art Training to Help Middle School Students Solve Math Word Problems

Sam McQuillin, Experimental Psychology – Charleston, SC

Gill Strait, Experimental Psychology – Columbia, SC

Shawneequa Thompson, Experimental Psychology – Greer, SC

Mentor: Dr. Bradley Smith, Psychology

Carolyn Pender, PhD Candidate, Psychology

Basic reading and math skills are essential tools for understanding the environment we live in, good citizenship, and economic survival. Evidence suggests that schools across the nation are failing to provide students with the skills they need to become successful in life. Accurate screening methods are currently lacking to detect the underdevelopment of basic skills. The curriculum based measurement (CBM) and academic intervention of the Challenging Horizons Program (CHP) aims to identify and build these vital skills in children. This oral presentation describes (a) the validation of the CHP-CBM assessment, and (b) an intervention delivered one-on-one to students in order to improve math word problem solving. To validate the CHP-CBM, sixth grade students ($n = 129$) completed CBM screening activities in basic math fact calculation, math word problem reading and math word problem solving. Results suggested that math word problem solving was an efficient and accurate predictor of PACT performance. Subsequently, the CHP-CBM was used to assess weekly progress in twenty students enrolled in the CHP after-school program for students with learning or behavior problems. Twelve of these students were randomly assigned to participate in a specialized program that involved training students in a hierarchy of skills including basic math skill accuracy and fluency, math word problem reading, identifying math problem types, and actually solving math word problems. Daily assessments were also administered to monitor progress. Findings, implications, and future directions for research and application are discussed.

Individualized Reading Intervention for a Middle School Student

Stephanie Lawrence, Experimental Science – Sumter, SC

Mentor: Dr. Bradley Smith, Psychology

Fluency with text is defined as the ability to translate letters to sounds effortlessly (LaBerge & Samuels, 1974). Reading fluency is an important academic skill that allows students to complete critical activities within the time allotted. Students who read more quickly can accomplish studying and other academic tasks in shorter periods of time, possibly reducing stress or annoyance with school work. The current study describes a reading intervention with a student who is in the Challenging Horizons Program, an after school program for middle school students with learning or behavior problems. The student was provided with two different reading interventions given on alternating days of the week. The listening passages intervention was given for 10 minutes, twice week (i.e., student has a passage read, then reads it himself) and also twice a week the student completed readings (i.e., reads the passage twice, then reads it twice more timed for one minute with feedback on the number of words read and the number read incorrectly). The outcome will be assessed using the Dibels stan-

standardized test (Dynamic Indicators of Basic Early Literacy Skills). The student was assessed as reading 99 words per minute and should be reading 130 words per minute. The intervention began on March 20, so results are not yet available. This low-cost, simple to administer intervention has promise for improving reading fluency. This case study illustrates how the procedure can be done and provides an overview of factors that might affect the success of programs like this.

Effects of Homework Hotlines on Recording Proficiency in an After-School Intervention Program

William Blackmon, Experimental Psychology - Manning, SC
Allison Odle, Experimental Psychology

Mentor: Dr. Bradley Smith, Psychology
Jessica Carfolite, PhD Candidate, Psychology

The Challenging Horizons Program is an efficacy-based intervention program for middle-school children with attention deficit/hyperactivity disorder, as well as other disorders of learning and development that affect children. A primary request from parents in CHP was to have their child accurately record homework assignments. Thus, parents require a method of assessing recording accuracy. Since only 25% of CHP parents have home access to the Internet, we used homework hotlines in an effort to get 41 students into the habit of correctly recording assignments. We measured recording accuracy by comparing hotline updates with student recording and assessed hotline efficacy by comparing a matched-pairs sample from 45 students with control data gathered during the previous year. Preliminary results indicate that student reporting was heavily influenced by monitoring provided by CHP staff. During USC Spring Break, an average of 1.5 students recorded assignments, compared to 16.03 before break and 13.88 after. It is noteworthy that about half of teachers did not update the hotline during the year, although a Pearson correlation revealed that updates did not correlate with recording accuracy. Technical errors with the network also resulted in non-updates, but teacher motivation played a more significant role, setting an upper limit on hotline effectiveness. Hotline practicalities demonstrate that students and teachers could benefit from external structure aimed at better accuracy in homework information. We suggest finding ways to better engage parents and teachers in using homework hotlines to benefit students such as those in the CHP who clearly need monitoring.

The Down Regulation of the mRNA Stability Factor HuR Through the Use of Small Interfering RNAs

Melinda Lynch, Biological Sciences – Tucson, SC

Mentor: Dr. Dan Dixon, Biological Sciences

Colorectal cancer (CRC) is second only to lung cancer in mortality rate and provides a model for the study of other cancers. Similar to most cancers, colon cancer is mitigated by the overexpression of several growth-related oncogenic genes. Cyclooxygenase-2 (COX-2) is the target of aspirin and non-steroidal anti-inflammatory drugs (NSAIDs) and promotes CRC due to its overexpression in tumors and cancer cells. The mRNA stability factor HuR is also overexpressed in CRC and elevated HuR levels promote COX-2 expression by stabilizing COX-2 mRNA. Small interfering RNA

(siRNA) technology was used to target HuR expression in cancer cells and determine if HuR downregulation resulted in complementary downregulation of COX-2. When expressed in a cell, siRNA are able to recognize targeted mRNA of interest and promote its degradation, thus limiting gene expression. A siRNA construct complimentary to human HuR was tested to determine its ability to inhibit HuR expression. When expressed in HeLa cells, this siRNA was effective at reducing (>90%) both HuR mRNA and protein levels at concentrations of 0.07 to 0.1 μ M siRNA. Western immunoblot analysis revealed that the HuR siRNA was able to downregulate COX-2 protein expression. Furthermore, analysis of mRNA levels revealed that not only did the siRNA reduce HuR mRNA, it also reduced COX-2 and the angiogenic factor VEGF mRNA expression as well. These findings indicate that targeted inhibition of HuR by RNA interference (RNAi), may be an effective means to influence levels of a number of cancer-associated oncogenic genes.

Use of plumbagin as a novel treatment for leukemia

Yolanda Stephens, Biological Sciences - Warren, OH

Mentor: Dr. Robert McKallip, Pathology and Microbiology

Impure extracts from *Plumbago zeylanica*, *Plumbago rosea*, *Plumbago europaea*, have long been used in Asian folk medicine and are included as Ayurvedic medications to treat a number of conditions including cancer. However, most of these claims are supported only by anecdotal evidence and there are few scientific reports describing their mechanism of action or their efficacy in the treatment of cancer. The naphthoquinone, plumbagin (PLB) is believed to be the main active component of these plant extracts. Therefore, in the current study, we examined the effect of plumbagin on the growth and viability of human leukemia using the Jurkat cell line. The effect of plumbagin exposure on the cell viability and induction of apoptosis was examined by Trypan blue dye exclusion and TUNEL assay, respectively. The results demonstrated that exposure of Jurkat cells to 2 μ M plumbagin or greater led to a significant reduction in the number of viable tumors through the induction of apoptosis. Plumbagin exposure led to an increase in intracellular reactive oxygen species (ROS). Furthermore, pretreatment of Jurkat cells with the ROS scavenger NAC prevented plumbagin-induced cell killing as well as plumbagin-induced apoptosis, suggesting that PLB-induced apoptosis was mediated through the generation of ROS. Together, the results from this study demonstrate that plumbagin exposure leads to the induction of apoptosis through the generation of ROS and suggest that plumbagin may have significant potential for use in the treatment of leukemia.

ORAL PRESENTATIONS 2

Characterization of the aquatic environment and fish communities at the Fort McCrady SCARNG Training Center, Leesburg, South Carolina

Chanda Cooper, Biological Sciences - Camden, SC

Mentor: Dr. Stephen Stancyk, Biological Sciences

Dr. Marcel Reichert, Biological Sciences

Francis Helies, Masters candidate, Biological Sciences

The Fort McCrady SCARNG Training Center encompasses approximately 15,000 acres, much of which is forest and wetland that harbors a variety of wildlife. The main watershed through the fort includes several firing range impact areas, over 100 miles of heavily-used dirt roads and an extensive system of fire breaks. Consequently, there is a potential for contamination of the creek by pollutants associated with munitions as well as through erosion and sediment deposition. We began to characterize the aquatic environment in this watershed in 2004 by installing and monitoring two permanent data sondes (YSI Model 6920-S) which measured temperature, depth, pH, dissolved oxygen, conductivity, and turbidity. Physical conditions were typical of southern woodland streams, with low pH, dissolved oxygen, and conductivity. High turbidity and conductivity followed rain events, and differences between the north and south sites indicated that the sediment added to the creeks from Fort McCrady was considerable. Between May and August 2005, we began to assess fish species diversity and abundance by deploying baited minnow traps weekly at 13 sampling sites in the watershed. A total of 415 fishes representing 7 families and 19 species were collected. Ten of these species are not included in the wildlife list published online by Fort Jackson. Fish were abundant in ponds and unexpectedly rare in creeks, with an average catch of 42 fishes per pond trap location and only 9 per stream site. Strong differences in species composition in one subdrainage indicate potential localized effects of runoff in different watersheds.

Assessing the Capabilities of Coastal Ocean Observing Systems in the Southeast to Meet the Needs of Regional Coastal Managers

Emily McDonald, Marine Science - Herndon, VA

Mentor: Dr. Braxton Davis, Biological Sciences

Achievement and sustainability of an Integrated Ocean Observing System (IOOS) is a major focus of ocean science and policy in the United States. Portions of the IOOS system that serve coastal areas are known as Coastal Ocean Observing Systems (COOS) and are regional and sub-regional systems in the U.S. territorial waters. COOS are intended to provide timely data and information products to a wide range of users, including coastal managers. Linking scientific efforts with management needs is often difficult. The study was designed to improve understanding of the applications being developed by southeastern COOS, focusing on how application are able to meet the needs of regional coastal managers, based on results of a recent survey from coastal managers. A comprehensive matrix based on the priority needs highlighted in the CSO survey was generated to give snapshots of how current COOS capabilities line up with what coastal managers need. COOS interactions with the management community were highlighted in specific case studies and followed-up by interviews and

outreach personal or principal investigators for the observing system. The study serves to help further IOOS and COOS efforts by highlighting the ways these systems are capable of meeting the needs of coastal managers in the southeast.

Organic Matter Cycling in the Chukchi Sea

Laurel Stanko, Marine Science

Mentor: Dr. Ronald Benner, Biological Sciences

The Arctic Ocean is relatively understudied and has become a focal point of interest because it sensitively reacts to the world's changing climate. Carbon dioxide is a major player in climate change and is also a part of the ocean carbon cycle. Carbon cycling in the ocean is not well understood in terms of what kind of carbon is preferentially transformed and what product it turns into. In August 2004, the RUSALCA program attempted to address carbon cycling by surveying the Chukchi Sea, one of the most productive ocean systems which interfaces with many different types of water including riverine, marine, and ice melt. On this cruise, CTD measurements were taken and samples were collected to later be analyzed for nutrient and organic matter content. The results showed that on average, nutrients were high in the bottom waters while organic matter was high in the surface due to production. Riverine DOC and DON averaged $\sim 100 \mu\text{M}$ and $6\text{-}8 \mu\text{M}$, respectively while marine DOC and DON ranged between $60\text{-}70 \mu\text{M}$ and $4 \mu\text{M}$. UV data above $\sim 0.5 \text{ m}^{-1}$ indicated organic matter from a terrestrial origin. Throughout the system, changes in the organic and nutrient concentrations suggested processes such as bacterial degradation, nutrient remineralization, ice melt dilution, and benthic production took place. Along with the temperature/salinity CTD data, the movement of water and the cycling of carbon could be better understood. Understanding the system at present will provide insight as to how it may change later.

Vertical Porosity Distributions in Pervious Concrete Pavement

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 related to urban runoff in developed and developing areas. These problems may include, but are not limited to, petroleum contaminants entering the surface waters or the soil base, aquifers and ultimately the water supply. Pervious concrete allows rain and runoff to infiltrate into the subsoils where filtration and natural remediation may take place in-situ. Additional research is important in the field of pervious concrete so that better specifications can be made and the product can be used more effectively in the field. An important property of pervious concrete is porosity, which will affect the hydrological and strength properties of the material. This research shows that there is a vertical distribution of porosity in field-placed slabs placed with a commonly used placement technique. The vertical variation of porosity can affect the strength distributions within the material, the infiltration rate of the system and its potential for clogging. The vertical variation of porosity was investigated by obtaining cores from field-placed samples, measuring their porosities and then dividing the samples into numerous smaller vertical cores and obtaining these vertical cores porosities. These studies indicate that for slabs of around 15 cm (6 inch) height which were placed with an approximately 10% surface compaction technique, the porosity in-

creases significantly from top to bottom. A series of vertical porosity distribution equations have been developed to effectively model this using the percent compaction and average cored porosities.

Investigation of Biomimetic Nastic Structures for use in Unmanned Aerial Vehicles

Luke Matthews, Mechanical Engineering – Blythewood, SC

Mentor: Dr. Victor Giurgiutiu, Mechanical Engineering

Shape-changing wings have been used in aircraft for decades, but interest has risen in compact inflatable wings for use in Unmanned Aerial Vehicles (UAVs). Interest has stemmed from the need for smaller systems with fewer moving parts and an integrated energy source. Inspired by plants, synthetic nastic structures are being researched to begin a new generation of morphing wings for UAVs. The Venus flytrap possesses the ability to rapidly close its jaws on insect prey using nastic movement. This process occurs when specialized motor cells are pumped full of fluid, causing them to increase in size from the hydrostatic force, resulting in tissue displacement and shape change. Synthetic nastic structures are designed to imitate this process, for use as wing components to move and change shape during UAV flight. Nastic structures are composed of an array of actuators, designed to imitate motion-driving motor cells in plants. Nastic structures also contain a fluid reservoir to house the chemicals needed to react and release energy that powers actuation, as well as fluid to be pumped into the actuator. When the actuators undergo volume change, like plant motor cells, they cause deformation across the structure. When non-uniform volume increase occurs, various shape changes are possible. Research has found chemical and environmental conditions that affect the energy released and the overall actuation range. Material studies were conducted to predict actuator response to biochemically powered work. Results have determined chemical and mechanical parameters that will make the nastic structures most efficient during UAV flight.

Synthesis and Characterization of Pt Clusters in Aqueous Solutions and on a γ -Al₂O₃ Surface

Karen Wigal, Chemical Engineering - Morgantown, WV

Mentor: Dr. Michael Amiridis, Chemical Engineering

Dr. Oleg Alexeev, Chemical Engineering

Attilio Siani, PhD candidate, Chemical Engineering

Conventional preparation techniques such as incipient wetness, wet impregnation, and deposition-precipitation are frequently used for preparation of supported Pt catalysts. However, these techniques involve deposition of cationic Pt precursors from an aqueous solution onto various oxide supports, and do not allow for adequate control of the size of the resulting metal particles. Alternative synthetic routes based on the deposition of organometallic cluster precursors and metal colloids have been employed for a better control of the size of the supported metal particles. 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 colloids in aqueous solution based on the chemical reduction of H₂PtCl₆ with NaBH₄ was examined in this work. This technique does not require the use of any surfactants or templating

agents and leads to the formation of nearly uniform Pt clusters that remain intact upon deposition onto a γ -Al₂O₃ support. UV-Vis spectroscopy, Extended X-ray Adsorption Fine Structure spectroscopy (EXAFS), and FT-IR spectroscopy were used to monitor the solution chemistry and characterize the morphology of the Pt clusters in the solution and on the γ -Al₂O₃ surface.

ORAL PRESENTATIONS 3

Making Dust Smart: The Historical Development of Nanoscale Sensor Technology

Richard Fairbanks, Philosophy - Greenville, SC

Mentor: Dr. Ann Johnson, History

The advent of the notion of an "information economy" during the tech bubble of the 1990s has signaled the commodification of data-collection in contemporary societies. People today task sensor technology with providing ever greater quantities and varieties of data for increasingly powerful computer processors. Likewise, sensor packages are decreasing in size while increasing in efficacy. Nanotechnology - engineered solutions at the scale of a fraction of the width of a human hair - is the natural goal for sensor business. The historical development of distributed wireless sensing networks is a series of steps, intentional and otherwise, in a process of miniaturization. Perceived demands for ambient environmental awareness from medicine, public health, defense and environmental monitoring are driving R&D of increasingly small sensors. Despite corporate desire for dust-sized sensing networks, considerable real and practical hurdles remain. This presentation will examine the historical development and future applications of increasingly small wireless distributed sensing networks.

Christianity Meets Nano

Joshua Kammerer, Religious Studies - Cayce, SC

Mentor: Dr. Ed Munn, Philosophy

Christianity is the most influential religion in the United States. It will be affected and will affect developments in nanotechnology. How Christians respond will be determined by the way that they approach the world as a whole. This approach has been and is being greatly influenced by several movements and authors. Among these are John Piper and Christian Hedonism, Nancy Pearcey with what I will call the Christian Worldview Movement, and Brian McLaren and the Emergent Church. Through interviews with these authors and by analyzing the most influential of their works, I will discuss responses to certain developments in nanotechnology from each of these points of view. My research examines how Christians might respond to emerging technologies in light of the new paradigms of thinking that each of these movements has produced. I chose these three Christian movements because they have significant influence on Christian youth in America particularly college aged Christians. This means that those who will most influence and be influenced by nanotechnology are also influenced by these authors and their movements. It is therefore important to understand how these Christian will respond to emerging technologies. This will help us to understand whether these technologies will be accepted, rejected, or become a source of cultural conflict.

Public Understandings of Nanotechnology

James Reynolds, Sociology - Goose Creek, SC

Mentor: Dr. Christopher Toumey, Anthropology

This is a study of the South Carolina Citizen's School of Nanotechnology. It focuses on the questions brought up by participants in the Fall 2005 and Spring 2006 sessions of the SCCSN. In looking at these questions it was expected that there might be a difference in the type of questions males and females ask, whether there is a change in sophistication of the questions over time, and whether any topics of specific public interest can be determined from the data. The Fall 2005 data found a difference between genders, a change in sophistication, and that nanomedicine was a topic of particular interest. The Spring 2006 data will be compared against the Fall 2005 data.

Collecting Creativity

Jeff Stephens, English - Lamar, SC

Mentor: Dr. Donald Greiner, English Language and Literatures

To a young writer who seeks to become a published one, little in his search is as important as being exposed to the works of contemporary authors who have already tasted success. If that writer also has scholarly ambitions, as I do, then it is just as imperative that a scholar know his subject thoroughly. Thus the purpose of "Collecting Creativity" is two-fold, both scholarly and creative. The first phase of the project used print and online indexing services to ferret out the last ten years of items published in periodicals by three leading short fiction writers: John Updike, Lorrie Moore, and Frederick Busch. The previously uncollected items among these were then assembled into indexed collections spanning the past ten years of each author's career. Reading these writers' words for creative inspiration led to the second phase of the project: crafting my own portfolio of short stories, taking tips from the methods of these successful writers. For the scholar, then, the product of this endeavor will expand the breadth of his familiarity with these three authors' works; for the writer, the insights learned from masters are key to successful writing, as I hope my short stories illustrate.

The Effects of 6-Week Exercise Training on Functional Aerobic Capacity in HIV-Infected Males

Catherine J. Carlstedt, Exercise Science - Sun Prairie, WI

Mentor: Dr. Gregory A. Hand, Exercise Science
Wesley D. Dudgeon, PhD candidate, Exercise Science

Background: HIV and its pharmacological treatments often cause physical and psychological effects leading to diminished health. In HIV-infected individuals these effects, along with chronic infections, frequently contribute to decreased Functional Aerobic Capacity (FAC). **Purpose:** To determine the effects of a 6-week moderate-intensity exercise program on the FAC of HIV-infected men. **Methods:** Twelve sedentary HIV-infected males, medically cleared for study participation following a graded exercise stress test (GXT), were randomized into an exercise group (EX) or a non-intervention control group (CON). Prior to training, subjects completed a GXT to determine FAC and completed a pre-test strength assessment. Twice per week over a 6 week period the EX participants completed 30 minutes of moderate-intensity aerobic training at 60-80% of age predicted maximum heart rate, followed by 1 set of 12 repetitions on selected upper and lower body resistance exercises. **Results:** At baseline, subjects had a mean VO_{2max} of 30.63 ± 2.2 ml/kg/min, which translated to a FAC 27% below predicted values. Following the intervention, the CON (N=7) had a 9% decrease in FAC, the result of VO_{2max} dropping from 33.5 ± 2.5 ml/kg/min to 30.4 ± 2.8 ml/kg/min. The EX group (N=5) increased VO_{2max} from 26.6 ± 3.5 ml/kg/min to 29.1 ± 2.8 ml/kg/min, resulting in a 12% increase in FAC. **Conclusion:** These data indicate that 6 weeks of combined moderate-intensity resistance and aerobic exercise training can improve FAC in HIV-infected men. Findings suggest that the impairment is likely due to lifestyle rather than a direct result of the HIV-infection.

Effects of Radiation Exposure on Antioxidant Levels in the Blood of *Hirundo rustica*

Michael Dole, Biological Sciences - Greenville, SC

Mentor: Dr. Tim Mousseau, Biological Sciences

As the twentieth anniversary of the nuclear disaster at Chernobyl approaches, the extent of the effects of the extreme elevations of radiation in the surrounding area has yet to be fully understood. Previous studies have indicated that exposure to radiation causes antioxidant depletion. In this study we hypothesize a reduction in the concentration of antioxidants in the blood of barn swallows (*Hirundo rustica*) from Chernobyl and a subsequent increase in damage to DNA caused by oxygen free radicals. Antioxidant levels from forty specimens exposed high or low radiation levels were measured blindly through an analysis of their absorption rates when dyed with PicoGreen measured with a Safire II Microplate Absorbance Reader. The antioxidant levels of barn swallows exposed to high levels of radiation were found to be approximately 1.03mM while the barn swallows exposed low levels of radiation were found to have antioxidant levels of approximately 1.67mM, supporting previous studies of birds from this region. We are presently using single cell gel electrophoresis methods (Comet) to examine levels of genetic damage in these birds.

Genetic Defects as Revealed by Sperm Abnormalities in Barn Swallows and Fruit Flies from Chernobyl

Christi Lynn, Biological Sciences - Hartsville, SC

Mentor: Dr. Timothy Mousseau, Biological Sciences

The Chernobyl accident has left > 200,000 km of land in Europe radioactively contaminated. This still affects people today, as most of the effects seen are from inhalation or ingestion of the radioactive isotopes, which are still present and will be for thousands of years. Spermatogenesis has been shown to be particularly susceptible to mutagens in the environment. Sperm motility and morphology are factors that can affect fertilization success. Therefore, these measures of sperm "fitness" are very important for sexually reproducing organisms as well as being excellent biomarkers for toxins in the environment. In this study, sperm were collected from fruit flies (*Drosophila melanogaster*) and barn swallows (*Hirundo rustica*) from radioactively contaminated areas near Chernobyl as well as uncontaminated control regions. Morphological measurements were taken using a computerized video digitizing system and data were analyzed to test the hypotheses that sperm morphology was affected by radiation. In addition, the symmetry of the fruit fly wings, and measure of developmental stability, was analyzed using a landmark analysis, and chromosomal damage was assessed using a Single Cell Gel Electrophoresis (comet) analysis. Results will be presented in support of the hypotheses that low-level radiation generates mutations that influence development and sperm morphology.

The Effect of Exercise and a High Fat Diet on the Intestinal Polyps Incidence in ApcMin ^{+/+} mice

Manish Dave, Biological Sciences - Bloomingdale, IL

Mentor: Dr. James Carson, Exercise Science

Lifestyle and genetics affect colorectal cancer risk. Lifestyle factors include diet and exercise. Mutations in the APC (Adenomatous Polyposis Coli) gene cause familial adenomatous polyposis. ApcMin/+ mice are predisposed to intestinal and colon polyps. The APC gene is a tumor suppressor involved in Wnt signaling. The study's purpose was to examine diet and physical activity effects on ApcMin/+ mouse intestine Wnt signaling and inflammation. Cellular β -Catenin expression, a marker of Wnt signaling, and cellular COX-2 expression, a marker of inflammation, were analyzed by immunohistochemistry on intestine sections. An anti- β -Catenin antibody identified polyp foci and anti-COX-2 antibody identified polyp COX-2 positive cells. Diet and exercise were manipulated. The diet was a defined rodent diet (AIN), or a high fat, high caloric diet (Western), and the physical activity treatment was sedentary or treadmill running (18 m/min; 60 min/day; 6 days/week; 9 weeks). The four treatments (n = 12) were: AIN Control, AIN Treadmill, Western Control, and Western Treadmill. Diet and exercise did not alter polyp cellular β -Catenin expression. However, COX-2 positive cells/polyp in AIN-treadmill (10.0 ± 4.3) were 175% lower than AIN-controls (27.5 ± 3.7). Exercise had no effect on COX-2 positive cells in Western diet-fed mice (14.8 ± 3.7 vs. 22.5 ± 3.1). There was no difference in COX-2 positive cells between mice fed an AIN diet (27.5 ± 3.7) and Western diet (22.5 ± 3.1). In conclusion, exercise alters intestinal inflammation, and diet composition can modulate this change.

Mapping MSP1-19 Binding Regions in Band 3 Peptide

Heather Mentzer, Chemical Engineering - Beaufort, SC

Mentor: Dr. Athar Chishti, Pharmacology; University of Illinois at Chicago

The overall purpose of this research was to understand the mechanisms of the plasmodium falciparum invasion of erythrocytes with band 3 as a host receptor in the red blood cells, for merozoite surface protein 1 (MSP1-19) in the malaria parasite. From this knowledge, new vaccines can be created. The objectives are to test the binding strengths of two segments 5ABC and 6A from band 3 peptide with MSP1-19 found in a malaria parasite. The secondary objectives are to test the binding strengths of two truncated forms of the segment 5ABC, 5 and 6 as well as test two chimeric proteins 5ABC6A and 6A5ABC. The experiments will use GST-5ABC, GST-5ABC6A and GST-6A5ABC and Trx-MSP1-19, Trx-MSP1-19A, Trx-MSP1-19B, where GST and Trx are moiety fusion proteins. The results of the experiments showed signs of strong binding with GST-5ABC and GST-6A with Trx-MSP1-19, Trx-MSP1-19A, and Trx-MSP1-19B. Weak binding was found for GST-5 and GST-6 with Trx-19. Stronger binding occurred in the experiments of GST-5 and GST-6 with Trx-19A. The proteins, GST-5ABC6A and GST-6A5ABC with the Trx-19 showed no signs of binding occurring when GST-5ABC6A or GST-6A5ABC were immobilized on the chip as ligands. Stronger binding appeared when Trx-MSP1-19A was immobilized on the chip and the experiments were repeated. The two segments 5ABC and 6A seemed to bind to the malaria parasite, meaning that the MSP1-19 had a role in the invasion of the red blood cells.

In Vitro Studies of the Application of Ferromagnetic Wire Implants for Magnetic Drug Targeting: Analysis of Delivery Parameters for Maximum Magnetic Drug Targeting Efficiency

Thomas Smith, Biological Sciences - Orangeburg, SC

Mentor: Dr. James Ritter, Mechanical Engineering

The basis of drug targeting is to distribute the major fraction of the drug such that it interacts exclusively with the target tissue at the cellular or subcellular level. Many drug delivery systems fail to accomplish this because they lack specificity in targeting the therapeutic agent to the required area of the body, where only a small fraction of the dose actually reaches the intended organ or disease. This deficiency usually produces several adverse effects, including over dosage of the therapeutic agent and the possibility of toxicity inducing side effects at non-target organs. To prevent such complications, high gradient magnetic separation (HGMS) principles coupled to magnetic drug targeting (MDT) have been proposed. This method seeks to physically direct drug agents by integrating them with a magnetic component that will respond in the presence of an external magnetic field to the magnetic gradients produced around a ferromagnetic wire located at the target site. To test the adequacy of the proposed HGMS-MDT system, a systematic investigation of delivery parameters was conducted in two different experiments. These results from these first of their kind experiments reveal that the role of the ferromagnetic wire in the collection of polymer magnetic particles at a specific target site is found to be quite successful at enhancing the CE, five to seven-fold improvement were observed with the collection efficiency reaching above an astonishing 70 %. The proposed in vitro HGMS-MDT system has many potential applications to facilitate the development of a highly effective magnetic drug targeting system.

Mechanism of HOX A9 to Down Regulate Endothelial Cell Activation

Thomas Smith, Biological Sciences - Orangeburg, SC

Mentor: Dr. Rekha Patel, Biological Sciences

Intracellular adhesion molecules are essential for the recruitment and extravasation of circulating leukocytes and monocytes at sites of inflammation and play an essential role in the development of inflammatory diseases like atherosclerosis. Cytokine-induced expression of adhesion molecules such as intracellular adhesion molecule-1 (ICAM-1), vascular cell adhesion molecule-1 (VCAM-1), and E-selectin, cause leukocyte adherence to the endothelium at particular anatomic sites in the capillary wall. The leukocytes migrate across the endothelial cell barrier and accumulate in the subendothelial space, where some of the monocytes ingest lipid and become foam cells. The induction of ICAM-1, VCAM-1, and E-selectin are down-regulated rapidly by the homeobox gene HOXA9. HOXA9 is a transcription factor expressed in endothelial cells and its expression is down-regulated rapidly in response to inflammatory signals. Since endothelial cell activation is a key event in the pathology of atherosclerosis, it is crucial to understand the transcription factors that maintain basal state of endothelial cells by negatively regulating their expression. The mechanisms that maintain endothelial cells in a "basal" state and negatively regulate endothelial cell activation have not been identified. HOX A9 inhibits endothelial cell activation downstream of NF- κ B's nuclear localization, but does not inhibit NF- κ B's DNA binding or transactivation capacity. We hypothesize that HOX A9 interacts directly with NF- κ B's subunit rel A (p65), an activation domain, and down regulates NF- κ B's expression thus leading to down regulation of endothelial cell activation.

The Effect of Chemopreventive Agents on Mainstream Cigarette Smoke-induced DNA Adducts and Enzyme Activities

Xin Wang, Pharmacy - Lexington, SC

Mentor: Dr. Theresa Smith, Basic Pharmaceutical Sciences, College of Pharmacy

Tobacco smoke contains chemicals suspected of damaging DNA and being human carcinogens. Various chemopreventive agents are able to inhibit DNA damage induced by carcinogens in animals. The present study investigated the effect of phenethyl isothiocyanate (PEITC), green tea polyphenol (GTPP), and squalene on mainstream cigarette smoke-induced DNA damage and antioxidant and detoxification enzyme activities. In experiment one, A/J mice were exposed to filtered air (control) or mainstream smoke from 3 standard University of Kentucky 2R1 cigarettes per day over a 3 h period for 3 consecutive days and sacrificed at 4, 8, 12, 24 and 48 h after the last cigarette on day three. Mainstream smoke increased pulmonary and hepatic 8-hydroxydeoxyguanosine (8-OHdG) by 1.4- to 2.4-fold, peaking at 12 h after exposure. Mainstream smoke decreased activities for glutathione peroxidase (GPX), NADPH-quinone oxidoreductase, and glutathione S-transferase (GST) 4-8 h after exposure. In experiment two, mice were given diets without chemopreventive agents or diets containing PEITC (3 mmol/g diet), 2% squalene, or 0.3% GTPP in the drinking water starting three weeks before exposure to mainstream smoke or filtered air. Twelve hours after the last exposure, the formation of pulmonary 8-OHdG was increased by 2.2-fold. GTPP and squalene decreased 8-OHdG by 29 and 43%, respectively. Mainstream smoke decreased GPX activity by 25%; this decrease was returned to control levels by squalene and PEITC. GTPP and PEITC increased GST activity by 1.3-fold. The results suggest that chemopreventive agents decrease tissue oxidant levels and increase

detoxification enzyme activities may inhibit mainstream cigarette smoke-induced DNA damage.

Effect of Hyperglycemia on the Cardiac Fibroblast Response to Mechanical Stretch

Xiaoyi (Tina) Zhang, Biological Sciences - West Columbia, SC

Mentor: Dr. Wayne Carver, Cell and Developmental Biology and Anatomy

Individuals with diabetes have an increased incidence of cardiovascular disease. The mechanisms of this are not completely understood. Exposure of fibroblasts to high glucose levels promotes a fibrotic response characterized by increased expression of extracellular matrix components including interstitial collagens. Little is known about the effects of glucose levels on other aspects of fibroblast function. Fibroblasts in the myocardium are surrounded by an extensive extracellular matrix composed predominantly of type I collagen. Interactions between fibroblasts and the myocardial extracellular matrix are thought to affect heart function by altering the ventricular diastolic properties. The purpose of the present study was to determine the effects of altered glucose levels on the interactions between heart fibroblasts and the collagenous extracellular matrix. Studies were performed to determine the effects of relative glucose levels on the ability of fibroblasts to adhere to and migrate on a collagen substratum. These experiments illustrated that exposure of cardiac fibroblasts to high glucose levels (25 mM) resulted in decreased adhesion to collagen relative to that seen in low glucose (5.5 mM). Exposure to high glucose also decreased migratory activity of fibroblasts on a collagen matrix and decreased fibroblast proliferation. In contrast, high glucose stimulated collagen expression and contraction of 3-dimensional collagen gels by cardiac fibroblasts. These studies demonstrated that altered glucose levels induce important changes in the interactions of cardiac fibroblasts with the collagenous extracellular matrix.

Nanoscale Instruments: Commercialization and its Epistemological Roles

John Ellis, International Business - Augusta, GA

Mentor: Dr. Otávio Bueno, Philosophy

This paper examines the importance of the commercialization of a significant nano-scale instrument: the Scanning Electron Microscope (SEM), and some effects of that commercialization on scientific research. Being a product widely used in scientific investigation, the SEM has a unique economic condition where commercialization increases its efficiency over time and directly impacts the research. In particular, through commercialization, the SEM became more available, allowing for wider use and novel explorations of the resources of the microscope. Since its invention in the 1950s, and its subsequent commercialization, the SEM has received several attachments and improvements, such as the ability to detect the chemical composition of the sample under investigation. These changes made it an instrument widely used across a variety of areas. As more adaptations to the SEM become available, the cost of the instrument decreased and its efficiency increased. In effect, as argued in the paper, commercialization of SEM improves the quality, scope, and accessibility of the research that is possible using that instrument.

MarSci, the Online Journal for Undergraduate Research in Marine and Aquatic Science

Katherine Hyland, Marine Science - Highland, NY

Mentor: Dr. Doug Williams, Geological Sciences

MarSci is the first of its kind research journal aimed at undergraduate research in the marine and aquatic sciences. The purpose of such a journal is primarily to be an outlet for the often-unrecognized research of undergraduate students, providing access to such research and also opportunities for publication. MarSci is unique in that it is completely electronic- all issues and publications can be found online, along with contact information for the journal and its staff via email. Also unique to MarSci is that it is entirely student run (with a faculty advisor). Positions held by the student staff include Editor-in-Chief, Associate Editor, Webmaster (in charge of handling the main MarSci web page) and also the several Peer Reviewers in charge of reading and reviewing submitted manuscripts. The goal of this journal and its staff is to provide a sustainable conduit for the research being conducted by undergraduates here at the University of South Carolina and elsewhere.

Two Roads from Laboratory to Commercial Project

Vivek Thakur, Chemistry Columbia, PA

Mentor: Dr. Davis Baird, South Carolina Honors College

There are five research thrusts of the USC NanoCenter: (1) polymer nanocomposites, (2) bionanotechnology, (3) nanoelectronics, (4) catalysis, and (5) societal interactions.

One effort of the societal interactions thrust examines two scenarios by which the NanoCenter is trying to bring research results to commercial fruition. The NanoCenter is developing polymer nanocomposites [PNCs]. These are plastics that incorporate nano-sized particles, which can enhance physical and mechanical properties. Nano-clay platelets have been exfoliated into polyethylene terephthalate [PET], the standard soda-bottle plastic. The resulting material could be of significant use in food packaging and biomedical equipment. USC is trying to interest established chemical companies into incorporating this technology. A second group of NanoCenter scientists and entrepreneurs have created a start-up company, Ometric. Instead of seeking to interest companies in their intellectual property, Ometric has been acquiring venture capital to develop, manufacture, and sell its real-time in-line optical spectrometers. These instruments perform chemical analysis—and control processes— of industrial manufacturing on-site rather than in a laboratory. In the PNC venture, overcoming scientific difficulties entails the formation of a trusting relationship with industry and the implementation of an industrial-style project into the university. With Ometric, it has required entrepreneurial nimbleness and to the ability to attract scientists to a specific, developing project. In both cases, the creation of human networks has been crucial to moving out of the laboratory and into the commercial sphere. My poster will trace and compare these two roads from laboratory to commercial product.

Applications of Geochemistry to the Provenance of Calcareous Sandstones

Elizabeth Bell, Geology - Christiansburg, VA

Mentor: Dr. David Barbeau, Geological Sciences

Traditional petrographic methods of determining sandstone provenance have limited applicability to sands composed largely of carbonate clasts. The contributions of various carbonate sources are typically not resolvable by visual inspection. A possible method for determining calcareous sand provenance is the use of geochemical species to constrain source units for sand. Species which have a high variability in carbonates are most desirable – for example, stable isotope ratios of carbon ($\delta^{13}\text{C}$) and oxygen ($\delta^{18}\text{O}$). The southeastern Ebro basin (northeastern Spain) contains foreland sediments derived from the Catalan Coastal Ranges (CCR), which in our study area are composed of a thick Mesozoic carbonate succession. The basin sediments are mainly calcareous, consisting of both fluvial sandstones and alluvial-fan sandstones and conglomerates. This makes the Ebro basin an ideal location for testing a provenance-determining method for calcareous sands. We have determined whole-rock $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values for all carbonate source units in our study region of the CCR, for sandstones from various levels within the basin succession, and single-clast $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values for many basin units. Our data show systematic trends in some geochemical tracers by height in the basin section, with higher-order variability in all species. Our single-clast analyses show relationships between conglomerates and the single-clast and whole-rock analyses for their associated sandstones. With further data (constraining other factors affecting sandstone isotopic composition), determination of provenance by geochemical tracers should prove to be a viable method.

A Survey of the Vascular Flora of Congaree Bluffs Heritage Preserve: the Effects of Burning on the Upper Coastal Plain

Elizabeth Jane Bradbury, Biological Sciences - Blacksburg, VA

Mentor: Dr. John Nelson, Biological Sciences

The Congaree Bluffs Heritage Preserve comprises over 200 acres on the west side of the Congaree River in Calhoun County, South Carolina, the river separating this site from the extensive floodplain ecosystem of the Congaree National Park. Steep north- and northeast-facing bluffs reaching 60m above the river are an anomalous part of the landscape here, but are nevertheless characteristic of major Southeastern river systems. These bluffs feature a diverse vascular flora including a number of taxa more commonly found in the Piedmont and mountains. The rolling topography that dominates the site has been highly altered after years of human habitation and agriculture. This high ground is traditionally accepted as a part of the state's historical longleaf-pine-dominated midlands, although *Pinus palustris* is no longer present at the site. In order to understand how burning has affected the ecosystem on Congaree Bluffs, an inventory of vascular plant life was conducted following a controlled burn in March, 2004, along with a seed bank and soil sample analysis. The results of all three areas of analysis show a significant difference between burned and unburned land, as well as land that had been previously farmed and previously unfarmed, with greatest spe-

cies diversity present on land that was neither farmed, nor burned. Our results do indicate that burning restores species diversity to previously farmed land. This provides additional evidence to support the use of controlled burning to restore land that has suffered from extended human habitation.

Sierra Nevada Earthscope Project: Constraints on the Sierran seismic structure from regional waveform modeling

Katrina Byerly, Geophysics - Auburn, AL

Mentor: Dr. Thomas Owens, Geological Sciences

The Sierra Nevada Earthscope Project (SNEP) represents the first FlexArray broadband temporary deployment within the broader EarthScope/USArray Transportable Array effort, and has as its ultimate goal to improve our present understanding of the ongoing foundering of mantle lithosphere beneath the Sierra Nevada. The network consists of over 40 broadband stations (CMG3T sensors & RT-130 digitizers). Phase I of SNEP involves operating continuously for ~1 year in an approximately square grid with an average interstation spacing of ~25 km. The network extends from the western foothills to eastern Nevada between 36°-39° N latitude. Since the SNEP stations were installed in summer 2005 several high-quality regional waveforms (epicentral distances between 200 and 500 km) with magnitudes greater than 4.0 mb have been recorded. Most of these waveforms have raypaths lying largely within the Sierras and provide a unique opportunity to probe the seismic structure of its underlying crust and uppermost mantle. In this study, we will attempt a full seismic waveform modeling of the recorded regional waveforms in order to constrain structural and compositional parameters of the Sierran crust and uppermost mantle. Preliminary results show that there are differences in the crust along an east-west profile across the Sierras, as well as differences along the north-south profile. We expect that this knowledge will help unravel the dynamics of the removal of the mantle lithosphere under the Sierra Nevada.

Ghost Fishing by Blue Crab Pots

Bonnie Coggins, Marine Science - Shawnee, OK

Mentor: Dr. Robert Feller, Biological Sciences

The blue crab fishery is large and economically important in South Carolina and several other states; millions of pounds of blue crabs are caught annually by thousands of crab pots. A "lost" pot is typically the result of the flotation/identification buoy becoming detached from the pot. As many as 25% of commercial pots are lost each year, with an unknown number of recreational pots lost as well. Limited research in various pot fisheries has found that lost pots continue to fish long after the original bait is gone. The purpose of this study was to mimic lost blue crab pots as closely as possible to determine the extent to which they continue to fish. Crab pots in this study were "lost" and subsequently monitored on a weekly basis for up to three months in the summer of 2005 in North Inlet, South Carolina. Data collected allow calculation of catch rates, mortality rates, bycatch incidence, and blue crab gender ratios. The crab pots did continue to fish blue crabs for several weeks, as well as catching a variety of other motile species.

Changes in the Southwest Asian Monsoon

Corinne D'Ippolito, Marine Science - Boulder, CO
Alice DuVivier, Physics; Colorado College, Boulder, CO

Mentor: Dr. David Anderson, Chief of Paleoclimatology Branch, NOAA, Boulder, CO;
Institute of Arctic and Alpine Research, University of Colorado
Dr. Anil Gupta, Geology and Geophysics, Indian Institute of Technology; India
Dr. Robert Thunell, Geological Sciences, USC

With more than 60% agriculturally based employment, one region of the world that is particularly susceptible to the detrimental effects of abrupt climate change is the Indian subcontinent. The Southwest Asian Monsoon is the major contributor to India's yearly rainfall, and uncovering the past history of these monsoon rains is critical to understanding how the intensity of the monsoon might change in the future. This study represents a high-resolution analysis performed on sediment cores taken from the Oman Margin with the goal of understanding small scale changes in the southwestern monsoon intensity that occurred from approximately 1,000 to 6,000 years before present. The foraminifera species *Globigerina bulloides* was used as a paleoclimate proxy for the monsoon winds off the coast of Oman. Soutar box subcores from two locations (18° 13'N, 57° 41' E at 698 m depth and 18° 14'N, 57° 36'E at 498 m depth) were sampled at two-millimeter intervals, and the percentage of *G. bulloides* was determined in each sample. In addition to confirming the previously identified long-term, gradual decrease in monsoon intensity from ~6,000 years before present through 1,000 years before present, the data from this study indicates a relatively short period of weak monsoon intensity ~1,000 years ago. Rather than changing gradually, we found that modern monsoon winds can change abruptly and this may contradict the idea of a long periodicity to the monsoon intensity curve.

Fiddler Crab Megalopae

Geoffrey Grice, Biological Sciences - Dillon, SC

Mentor: Dr. Renae Brodie, Biological Sciences

Throughout a series of experiments which require the capture of planktonic fiddler crab megalopae, the USC Brodie lab has incorporated the use of two sampling devices: light traps and pump samplers. The light traps fluid 1 cm below the surface of the water column and attract early life-stage *Uca minax*, *U. pugnax*, and *U. pugilator* by means of a fluorescent chemical stick. The pump sampler uses a motor to draw water from the estuary and runs it through a 54 μ m filter, also capturing *Uca megalopae*. In this experiment both a suction pump and light trap were used simultaneously. Then the DNA of the captured megalopae was analyzed to positively identify individuals to species. Once the identification process was complete, species frequencies were compared between the pump sampler and the light traps to determine if the collection devices gave the same or different results. There was no statistically significant difference between the *Uca* species frequencies in samples captured by the light trap and the pump sampler. Species abundance relative to a falling tide were also examined, and temporal differences in the species frequencies were noted: while there was a general decrease in larval abundance over time, *U. pugilator* concentrations increased while *U. pugnax* peaked and then sharply declined in the water column. Further examination of these trends over a longer period of time and in conjunction with water conditions would be beneficial to understanding species-specific behavior.

Seasonal changes in dissolved organic carbon in the Beaufort Sea

Alex Jester, Marine Science - Cincinnati, OH

Mentor: Dr. Ronald Benner, Biological Sciences

The purpose of this project is to document seasonal changes in dissolved organic carbon (DOC) and nitrogen (DON) in the Arctic Ocean off the northern coast of Alaska. The area of study is one of extreme seasonal differences ranging from completely ice-covered in winter, to ice-free in summer with exceptionally long day length. In summer, fresh water from melting ice results in strong water column stratification, trapping phytoplankton in well-lit surface waters. Through photosynthesis, phytoplankton convert atmospheric carbon dioxide into an organic form. The fate of this phytoplankton-produced organic carbon is a major question in the oceanic carbon cycle. This study investigates the link between phytoplankton abundance and water column organic carbon concentrations over broad seasonal and temporal scales. The samples were collected during the spring and summer of 2004. Based on the 2002 study of this region, there is expected to be strong seasonal changes in the DOC and DON content. All samples were analyzed for DOC and DON and these data were compared to *in situ* measurements of chlorophyll fluorescence. We detected large seasonal and spatial variations in the concentrations of all three constituents. These data will provide critical information about the role that phytoplankton play in the organic carbon cycle of the Western Arctic Ocean.

Discharge, tidal propagation and currents near an upriver tidal boundary

Joseph Jurisa, Marine Science - Merrillville, IN

Mentor: Dr. Richard Styles, Geological Sciences

The mechanisms of tidal wave transformation in estuaries are well known. Few studies, however, have focused on tidal wave characteristics near the upriver tidal boundary, where the waters are fresh and the river discharge signal is strongest. Stations for measuring full water column currents were occupied during the months of October 2004, March, May, June and July 2005 near the tidal boundary of the Winya Bay estuary located in South Carolina. The deployments were approximately 7 days in duration and bracketed in spring phase of the lunar tidal cycle. Excluding October 2004, two acoustic Doppler current profilers (ADCPs) were deployed at various reaches along the channel to examine variations in tidal phase, amplitude and velocity. Correlations between the average discharge from upriver stations and our monitoring sites were high, with a correlation between the average discharge from upriver stations and our monitoring sites were high, with a correlation coefficient of 0.98. Tidal currents amplitude generally decayed upriver and was sensitive to changes in river discharge. Mechanisms responsible for the observed variability are to be discussed.

***Littoraria Irrorata* Size Frequency and Abundance Changes Through Time in North Inlet, SC**

Rachael Kefalos, Marine Science – Charleston, SC

Mentor: Dr. Robert Feller, Biological Sciences

Previous studies suggest that increased abundances of the periwinkle snail, *L. irrorata*, as a result of decreased predation by the blue crab, *Callinectes Sapidus*, is devastating *Spartina alterniflora* biomass. This census of an intertidal population of *L. irrorata* was conducted over a four-month period to test the null hypothesis that the size frequency and abundance of the periwinkle snail population does not change through time and space. Two transects that extended from a section of high marsh to low marsh in North Inlet, South Carolina, were sampled in a stratified random design from June until September of 2005. Snail abundance and shell height was measured at five meter intervals along each 30-meter long transect, within a 0.1m² quadrant in each stratum. Periwinkle snail abundance decreased from high to low marsh. A greater abundance of larger snails (15-18 mm) was found in both transects; however, there was no trend suggesting major differences in the size distribution by stratum. The population of *L. irrorata* was variable in abundance and size distribution. The extent to which predator-prey interactions or other factors affect these patterns remains unknown.

Reconstructing the History of Hurricanes from Sediments of South Carolina Coastal Environments

Alan Rickenbaker Jr., Geology – St. Matthews, SC

Mentor: Dr. Doug Williams, Geological Sciences

Additional Authors:

Mrs. Lisha Hylton, Teacher, Pelion Elementary School, Rising Tide Program

Ms. Abby Springer, PhD candidate, Geological Sciences, USC

Ms. Dahlia Bahoumi, senior, Chapin High School; SPRI program

Coastal environments of South Carolina with the potential to contain archives of past hurricane strikes are diverse from freshwater and brackish water ponds and lagoons to estuaries, salt marshes and barrier islands. In the summer of 2005, the Rising Tide Team developed a research project to help understand more about the impact of hurricanes from coastal environments of Cape Romain Wildlife Refuge, the North Inlet-Winyah Bay National Research Reserve, and Debidue Island. In our study, we used a combination of aerial photographs, sediment cores and ground penetrating radar (GPR). Results from our study showed that Middleton Pond of Debidue Island evolved from a marsh to a freshwater environment and contains a record of hurricane activity back into the 1500's. GPR profiles combined with vibra-coring from the North Island show evidence of overwash events either from Hurricane Hugo or some prior hurricane. These results will be presented and discussed.

Liquid Hydrogen in Compression Ignition Engines

Crystal Byrd, Mechanical Engineering - Gastonia, NC

Mentor: Dr. Abdel Bayoumi, Mechanical Engineering

A popular issue in science as well as politics has been decreasing America's dependence on fossil fuels. The search for alternative fuels has led to hydrogen, a renewable, virtually nonpolluting energy source. While the technology of the future is likely to be hydrogen fuel cells, an intermediate step is using hydrogen in conventional engines. The objective of this research program is to design an injector for a compression ignition (diesel) engine run on hydrogen. Diesel engines are used in many heavy duty applications today due to high power output and efficiency. Two options for the hydrogen fuel are in liquid and gaseous form. This specific project studied liquid hydrogen stored at a temperature of 20 K (-424 F). A mathematical model was designed to study temperature and pressure changes from the fuel line to the fuel injector. The model showed that ambient temperatures outside the injector causes the temperature to rise slightly in the injector, but the range of temperatures results in nearly the same adiabatic flame temperature-the temperature of the combustion products in the cylinder. Calculated flame temperatures are about 100 degrees less than for gaseous hydrogen in the similar conditions. Oxides of nitrogen (NOx) are the only emissions considered for fossil fuel, and research shows that lower flame temperatures produce lower NOx emissions. Our research suggests that, from the emissions perspective, liquid hydrogen would be preferred over gaseous hydrogen in diesel engine cycles.

Analysis of Dipicolinic Acid Released from Spores Treated with Supercritical CO₂

Nishita Dalal, Chemical Engineering - Greer, SC

Mentor: Dr. Michael Matthews, Chemical Engineering

This research project supports the development of a new medical sterilization process based on using supercritical carbon dioxide (scCO₂) as the sterilization fluid. The potential benefits of CO₂-based fluids include low temperatures and mild chemical conditions, which are conducive to sterilizing sensitive biomaterials and complex medical devices. The specific purpose of this work is to sterilize two model bacterial spore species (*B. atrophaeus* and *B. anthracis*) and then to quantify dipicolinic acid (DPA) release after exposure to the scCO₂-process. These measurements give insight on the fundamental mechanism of CO₂-based sterilization. DPA is a marker for spore coat perforation, and its release indicates rupture of the spore core and the surrounding peptidoglycan layer. Lyophilized spores were exposed at varying pressures and treatment times (4000 psi, 4 hours; 1500 psi, 1 hour) at 40°C. Treatments were performed with both pure scCO₂ and a mixture of scCO₂ and hydrogen peroxide (H₂O₂). DPA was quantified by a fluorescence method sensitive to levels on the scale of parts per billion. Comparison to untreated controls confirms perforation of the spore coat for the spores treated with scCO₂ and H₂O₂ but not for the spores treated with pure scCO₂. An increased treatment time and pressure were more effective in damaging the spores. Finally, *B. anthracis* spores release a similar percentage of DPA as *B. atrophaeus* spores, despite a thicker exosporium; DPA analysis does not seem to correlate simply with killing efficiency or with the structure of the peptidoglycan layer.

Failure Inferencing based Fast Rerouting

Chase Gray, Computer Science - Tega Cay, SC

Mentor: Dr. Srihari Nelakuditi, Computer Science and Engineering

When a link in a network fails, all routers in that network must account for that failed link and re-compute their routes. Traditional routing protocols used in the Internet perform network-wide updating of link state changes. This information exchange and the subsequent route re-computation at every router in the network can be time consuming. Our motivation is to find a way to enhance service availability without jeopardizing routing stability. To achieve this, we can use Failure Inferencing based Fast Rerouting (FIFR). Global updates are avoided under FIFR by inferring potential failed links based on the packet's incoming interface. FIFR requires no alterations to the forwarding plane of a router and only minimal changes to the control plane. The project consists of furthering the research on FIFR and developing and conducting simulations for FIFR to evaluate the efficacy of the FIFR approach. Our stretch simulation results show that this scheme only incurs light traffic overhead while re-routing packets through alternative paths. Other simulations results demonstrate and validate the robustness and resiliency of FIFR. We are using routing frameworks such as Click and XORP from MIT to implement our algorithms in a realistic setting. Future work focuses on the development and testing of an incremental routing scheme, more complex implementation in routing frameworks, and actual deployment of modified routers in the field. This research is being funded by my recent reception of the Magellan Scholar award and Dr. Nelakuditi's NSF career award.

Power Enhancement of Portable Solar Arrays Using an Optimum Configuration

Albena Iotova, Electrical Engineering - Columbia, SC

Mentor: Dr. Roger Dougal, Electrical Engineering

Solar arrays in portable applications such as solar jackets and solar bags are subject to partially shading and continuously changing shadow conditions. For example, while carrying a solar jacket through a city, the illumination condition on the surface of the solar array changes continuously and the intensity is non-uniform across the surface due to shadows of the trees, vehicles, and buildings, as well as due to change of orientation of the array relative to the sun. If a solar module using the classical design is partially shaded, its power generation decreases dramatically. Therefore, it is necessary to find out an optimum array configuration in terms of cell connections to maximize the array power generation. In this project a novel solar cell configuration was constructed. A second solar cell module was built in the conventional configuration to serve as a control. The configurations are not discussed further in this abstract due to intellectual property matters. After the two modules were constructed, a DC/DC power converter was attached to each of them to provide a constant output voltage to the load. Both the simulation results and the experimental tests demonstrated that the power generation capability is enhanced by as much as a factor of 2 at no extra component costs, compared to the conventional configuration.

Improved Error Coding for IEEE 802.11 Wireless Networks Using Adaptive Computing Methods

Stacey Ivot, Computer Science and Engineering - Pittsburgh, PA

Mentor: Dr. James Davis, Computer Science and Engineering

Wireless networking protocols require error coding schemes having varying strengths, due to the unpredictable nature of noise on a wireless channel. This presents a trade-off in code strength, in the face of long-burst noise, versus channel utilization, as a result of increased frame length. The 802.11b/g wireless network standards use the CRC coding scheme, providing error detection but no error correction capability at all. Thus, when transmission is disrupted by noise, there is a lengthy process of sender time-out and retransmission. This process rapidly increases channel load, due to retransmission traffic, and greatly decreases network throughput, because more traffic is comprised of retry frames. Our study explores using adaptive computing techniques to deliver higher-performing Reed-Solomon code schemes on programmable logic devices for use in 802.11b/g wireless networks. We explore this tradeoff in code strength versus channel utilization by using adaptive computing techniques. We define an architecture for runtime code selection, and create coding circuit models for simulation experiments and implementation on programmable logic devices. We use the Algorithmic State Machine (ASM) method to create executable models of selected R-S(n,k) coding circuits, to run cycle-accurate simulation experiments, and to collect data on circuit size and speed. We compare our results against those for IEEE standard 802.11b/g networks to show the benefits of error coding by adaptive computing as a means to improve utilization and throughput of the wireless channel.

Weak Interactions on an Oscillating Micro-electrode Array

Kathryn Johnson, Chemical Engineering - North Augusta, SC

Mentor: Dr. John Hudson, Chemical Engineering; University of Virginia

The electrodisolution of nickel electrodes with resistance in sulfuric acid provides a model for studying oscillations in chemical and biological systems. A nickel microelectrode array was used to look for interactions between current oscillations. These interactions had not previously been observed in nickel systems. Interactions were observed on electrode pairs and were further studied for dependence on acid concentration, separation distance, and applied potential. The interaction effects, which were not strong enough to cause synchronization, were asymmetric; one electrode exhibited periodic variations in amplitude and waveform that the other electrode did not. Acid concentration and electrode distance were not shown to have an effect on either phase difference or waveform effects. The applied potential did influence the interactions, with smaller phase differences and more-defined waveform disturbances occurring at higher potentials. Future experiments with larger numbers of electrodes will look for more complex interactions and pattern formation. It is hoped this research will provide insight into biological systems such as epilepsy and circadian rhythms. *This research was undertaken as part of an NSF Research Experience for Undergraduates program.*

Development of a low-cost omnidirectional robot drivetrain for FIRST competitions

William Leverette, Marketing - Irmo, SC

Mentor: Dr. Philip Voglewede, Mechanical Engineering

Every spring, thousands of high school students around the world participate in the FIRST (For Inspiration and Recognition of Science and Technology) Robotics Competition (FRC). As part of the competition, teams receive a standard kit of parts that can be assembled into a solid and functional chassis and drivetrain (the Kitbot). The default configuration of the Kitbot is a two-wheel drive skid-steer chassis similar to that of a bulldozer or tank. In recent years, some teams have experimented with an omnidirectional robot which allows for movement in any direction without turning. These omnidirectional solutions have historically been costly and required advanced fabrication abilities. This project attempts to level the playing field by developing a low cost (under \$500) omnidirectional chassis and drivetrain that is easily fabricated, able to be built from the standard kit of parts, legal under the current FRC rules, and would be reasonably effective in competition. Parts were designed assembled and tested electronically using Pro/ENGINEER software before progressing to fabrication, leading to minimal wasted parts. Finalized drawings and results of testing will be reported

Development of Metal-free Catalysts for PEM Fuel Cells

Kelvin Moore, Chemical Engineering - Columbia, SC

Mentor: Dr. Branko Popov, Chemical Engineering

Vijayadurga Nallathambi, PhD candidate, Chemical Engineering

The non-renewable resources currently used to produce energy are diminishing due to the increased demands of our society. Over the years alternatives to supply energy through various applications have been developed, with the most viable option being the fuel cell. Fuel cells are electrochemical devices that convert the chemical energy of an energy carrier, such as hydrogen, directly into electricity. The most promising type of fuel cell is the polymer electrolyte membrane fuel cell (PEMFC), due to its low operational temperatures and the versatility of its use in stationary and portable applications. The PEMFC consists of three basic elements namely, the anode, the electrolyte, and the cathode. Currently, the state-of-the-art catalysts that facilitate the reactions of oxygen reduction (cathode) and hydrogen oxidation (anode) are composed of platinum, which is a rare and expensive metal. This makes the widespread use of PEMFCs unfeasible due to material limitations and excessive costs. The objective of our research is to prepare inexpensive metal-free catalysts that will have a performance comparable to that of platinum catalysts. Using chemically modified carbon, we have successfully developed low cost metal-free cathode catalysts that show performances comparable to that of platinum in the rotating ring disk electrode (RRDE) experiments.

Preparation of Silver-Platinum Bimetallic Catalysts via Electroless Deposition

Anna Pickerell, Chemical Engineering - Mt. Washington, KY

Mentor: Dr. Christopher Williams, Chemical Engineering

Bimetallic catalysts are typically prepared using either successive impregnation or co-impregnation of the metallic catalyst, which leads to the formation of individual supported metals as well as bimetallic catalysts. An alternative approach for the preparation of bimetallic catalysts is the use of electroless deposition (ED) of reducible metal salts onto other metals. ED is a process for the deposition of metallic components by a controlled chemical reaction that is catalyzed by the pre-existing metal (catalysis) or the metal which is being deposited (auto-catalysis). In this study electroless deposition of Ag is carried out using an aqueous bath containing HCHO as the reducing agent, AgNO₃ as the reducible metal salt, and Pt (as Pt/SiO₂) as the pre-existing metal. Final Ag weight loadings are a function of AgNO₃, HCHO, and concentration of surface Pt sites. A working rate equation that relates the rate of deposition of the Ag onto Pt surfaces using the above variables has been developed. Preliminary kinetic evaluation of these catalysts for the hydrogenation of 3,4 epoxy-1-butene will be discussed.

Investigation of Acetonitrile on a Model Support by Method of Sum Frequency Spectroscopy

Jacob Smith, Chemical Engineering - Bloomington, IL

Mentor: Dr. Christopher Williams, Chemical Engineering

Sum-Frequency spectroscopy (SFS) is a relatively new technique used for investigating "buried interfaces." SFS is a non linear approach, which enables it to selectively probe interfacial molecular vibration properties, even the presence of significant bulk phase species with similar or identical vibrational signatures. In this study, SFS has been used to probe the interface between a model support of Al₂O₃ and liquid mixtures consisting of acetonitrile in ethanol. Vibrational features associated with both C=N stretching (ca 2250 cm⁻¹) and C-H stretching (2800-3000 cm⁻¹) are observed for adsorbed acetonitrile. The study of nitrile adsorption at different acetonitrile concentrations in ethanol was used to form an adsorption isotherm wherein this isotherm will be used in future nitrile hydrogenation studies. In addition, the C-H stretching vibrations have also been probed using various polarizations combinations of the sum frequency, visible and infrared beams in order to determine the orientation of acetonitrile with respect to the surface normal. However due to the birefringence of the Al₂O₃ support, the orientation studies were inconclusive.

An Interactive GIS Based Model for Active Transportation in the Built Environment

Katie Wright, Exercise Science - Kingsport, TN

Kim Swygert, Civil Engineering - Batesburg-Leesville, SC

Mentor: Dr. Sarah Baxter, Mechanical Engineering

Ms. Veronica Addison, PhD Candidate, Mechanical Engineering

Americans' growing consumption of fast foods and decreased physical activity have contributed to an obesity epidemic in our society. The Center for Disease Control esti-

mates that more than 60 million Americans over the age of 20 are obese. In an attempt to ameliorate this problem, the Surgeon General recommends "including a moderate amount of physical activity on most if not all days." Obesity is caused by an energy intake higher than energy expended. The purpose of this project is to develop an interactive computational tool to provide feedback on an individual's estimated energy expenditure during active transport about the built environment of the University of South Carolina, Columbia campus. Using ArcMap, a digital mapping software, a map of the sidewalks and well-traveled pathways on campus was created. Using the techniques of Geographic Information Systems (GIS) these maps will be linked to estimates of energy expenditure allowing the user to select routes on campus that maximize energy expenditure per time, increasing physical activity and decreasing health risks. To illustrate the use of this tool, and provide some base line data, researchers walked various paths on campus. Steps taken from place to place were counted, times needed to travel the distances were recorded and changes in elevation were documented. Energy expenditure was estimated using equations from the American College of Sports Medicine: Guidelines for Exercise Testing. Energy plots are presented for several routes to and from the Engineering Complex to the LeConte College, a common destination for engineering students.

Characterization of Ball-point Pen Ink by UV/Visible Microspectrophotometry for Forensics and Document Conservation

Natalya Hall, Chemistry – Lexington, SC

Mentor: Dr. Stephen Morgan, Chemistry and Biochemistry

Historically and culturally significant documents from past eras are not receiving conservation necessary to preserve them for the future. For example, paper makers often use a high concentration of wood pulp (cellulose). The acidity increases over time, causing paper to turn brown and become brittle; the inherently high level of acidity may also be reactive to ink components. Ink may also degrade over time via heat or photolytic processes. The first stage in developing improved methods for document conservation is the identification of ink components so that appropriate preservation treatments may be designed and applied. In collaboration with document specialists at the USC Thomas Cooper Library, we have acquired documents written in ballpoint ink. The diverse chemical structures of colorants and other components in ink provide a chemical basis for their discrimination and identify their characteristic component materials. Protocols for sampling/extraction of ink from documents in a minimally invasive manner have been developed using selection of current-era ballpoints pens. We have tested the efficacy of different solvent combinations for ink extraction. UV/visible and fluorescence microspectrophotometry generates spectral signatures that can be used for discrimination of different inks. With the development of a spectral data base, this information could also be employed for forensic identification of inks on questioned documents in cases of forgery, document provenance, and other criminal or civil investigations.

Chemical Composition of Latent Fingerprints by Gas Chromatography-Mass Spectrometry

Rachael Hipp, Chemistry – West Columbia, SC

Mentor: Dr. Stephen Morgan, Chemistry and Biochemistry

The oldest method of personal identification for forensic purposes is latent fingerprint analysis. With recent advances in modern technology, forensic scientists have begun to examine whether more information than just ridge patterns might be obtained from fingerprints left at a crime scene. For example, researchers have discovered that they can obtain a suspect's DNA profile by applying the polymerase chain reaction to skin debris present in fingerprints left on forensic evidence. Progress has been made in determining the chemical composition of a latent fingerprint using infrared (IR) microspectroscopy and gas chromatography-mass spectrometry (GC-MS) This information could allow a suspect pool to be reduced even if the fingerprints obtained from a crime scene were smudged or patterns were not matched after being processed in the FBI Automated Fingerprint Identification System. Fingerprints primarily consist of secretions produced by eccrine and sebaceous glands. Chemical components in these secretions include inorganic salts, amino acids, and lipids such as fatty acids and cholesterol. Fingerprint residue samples were collected on glass beads, extracted using chloroform, converted to trimethylsilyl derivatives, and analyzed using gas chromatography-mass spectrometry. While the major constituents in the residue of all volunteers

were fatty acids and squalene, chromatograms from female volunteers were often found to contain signature cosmetic ingredients like octyl methoxycinnamate, a common sunscreen component. Trace amounts of nicotine could also be identified in chromatograms obtained from smokers. In addition, initial experiments suggest that the amount of urea present in fingerprint residues is gender dependent.

Three-Dimensional Dynamic Visualization of University Facilities

Carrie Allison Humphries, pre-Pharmacy - Summerville, SC

Mentor: Dr. Michael Hodgson, Geography
Lynn Shirley, Geography

USC's current 2-D map of campus, available on-line and in paper form, lacks many desired features such as continuity with the rest of downtown Columbia, zoom capability, and information on new building sites and emergency facilities. Facilities Services maintains a separate 2-D map with detailed information, such as call-box and trash can locations and green space, water features, etc. A combination of the two databases in a 3-D visualization application, such as ESRI's ArcGlobe or Google Earth, would provide a realistic 'walkthrough' of campus via the Internet and a tool for planning future facilities modifications. This research explored approach for modeling and delivering 3-D maps of these facilities. Two approaches can be used to create a 3-D building data model: 1) forming details by means of insets of the initial 3-D design or 2) inferring those details by using images of the building as texture on the outer walls. Both methods were explored as the model of Preston Residential College was created. The first method involves gleaned information from the facilities geographic database, building blueprints, and field verification. The model was created line-by-line with fine detail and accurate measurements. The raster-based method began with a rough box of the college made from vector methods while detail was created by 'wallpapering' photographs of the building to its faces. The first method, with finer detail added to the exterior walls, was more time-consuming and difficult. The second method created a larger file with poor resolution but was the quicker approach for creation.

Sensitivity to change of accelerometry as a measure of physical activity

Mary Lohman, Exercise Science – Atlanta, GA

Mentor: Dr. Karin Pfeiffer, Exercise Science

Most children fail to meet health recommendation for adequate daily physical activity. To combat this health concern, researchers are investigating intervention programs designed to increase physical activity in school age children. Such projects often rely on data from accelerometers (motion detecting monitors) objectively measure activity in their subjects. There is some concern over the use of accelerometers, ability to detect changes in physical activity over time is currently unknown. This study investigated the sensitivity to change activity of two different accelerometers. The participants were in third through fifth grade in Columbia, SC. Each participant wore one ActiGraph accelerometer and one Actical monitor simultaneously for two weeks. During the first week, participants wore the monitors while engaged in normal daily activities. During the second week they spent 2 hours with research assistants every day after school, simulating a physical intervention. The preliminary data from a small sample of children were analyzed. The results from each monitor type were used to

determine the number of minutes spent in activity intensity levels. Both monitors showed the participants to be significantly more active during the intervention week than the normal week. The ActiGraph monitor detected a significant difference in moderate-to-vigorous physical activity, while the Actical monitor showed a significant difference in vigorous activity. These results suggest that both types of accelerometers are able to detect changes in physical activity time, supporting their feasibility as a tool to determine the effectiveness of interventions.

The Role of MAPKK 1 and 2 in the Tomato Wound Response Pathway

Wayne Miller, Biological Sciences – Simpsonville, SC

Mentor: Dr. Johannes Stratmann, Biological Sciences

Herbivorous insects are a major threat to plants. Unable to move, they must defend themselves using chemical mechanisms that have evolved over millennia. In this project, we investigated how this defense response is triggered in tomato (*Lycopersicon esculentum*) upon wounding. When attacked by an insect, the plant releases a small signaling peptide, Systemin, which is then transported through the phloem to the rest of the plant, where it interacts with a receptor, resulting in Jasmonic Acid synthesis, triggering an intra-cellular MAP Kinase cascade that results in a defense response from the plant. Previous work has isolated several MAP Kinases of interest. Here, we investigated MAPK1 and MAPK2 using a double silencing TRV-VIGS construct to silence the genes, and then measured Jasmonic Acid levels and defense protein levels. We found that both jasmonic acid and defense protein levels were significantly reduced in silenced plants as compared to control plants, showing that MAPK1 and MAPK2 are integral components of the systemin mediated wound signaling pathway.

Spore color as a method for discerning genetic variation in *Basidiomycete* populations

Alisha Owensby, Biological Sciences – Chattanooga, TN

Mentor: Ms. Briana Timmerman, Biological Sciences

The effect of spore dispersal on fungal biodiversity is a subject that is superficially well-understood. The intricate working of genetic variation in individuals and in resulting populations is yet to be clearly discerned, however. In this study we examined the hypothesis that *basidiomycete* species with dark spores will have greater genetic diversity and less inbreeding due to UV radiation resistance, and the opposite for species with light colored spores. To do this, two species' populations (one with dark spores, one with light) were tested using DNA analysis of ITS and IGS sequences. Our results suggest that the species with light spores is actually more diverse than its dark spored counterpart. Data was also compiled by performing a meta-analysis of current mycological literature. The literature study shows the same pattern of less inbreeding in the light spored populations, and less reliance on sporulation in species with dark spores, as do our results.

Activation of MAP Kinases in Tomato and Potato Leaves in Response to Wounding

Suchita Pancholi, Biological Sciences – Columbia, SC

Mentor: Dr. Johannes Stratmann, Biological Sciences

Plants use defense mechanisms to protect themselves from various biotic and abiotic stresses. In response to wounding by herbivorous insects, the signaling peptide systemin induces a signal transduction pathway in leaves of *Lycopersicon esculentum* (tomato) plants. This pathway is mediated by the activation of a mitogen activated protein kinase (MAPK) cascade. Because the role of wound- and systemin-responsive MAPKs in *Solanum tuberosum* (potato) is not well known, MAPK activation in both tomato and potato was investigated. We tested whether MAPK activation for both *Lycopersicon esculentum* and *Solanum tuberosum* is systemic, and if the activity is different in wounded leaves compared to systemic unwounded leaves. Also, we investigated whether MAPK 3 is a wound-responsive MAPK. Samples from experiments of mechanical wounding and feeding by *Manduca sexta* larvae were analyzed using in-gel and immunocomplex kinase assays. Results indicate that MAP kinases 1 and 2 were systemically activated due to mechanical wounding and wounding inflicted by feeding insects. Additionally, reasonable systemic MAPK 3 activation occurred in response to insect feeding in tomato. MAPK activation showed similar patterns in both plants, and hence, orthologous MAP kinases of both plants might share a similar function.

Systematic Investigations of Environmental Effects on Textile Fibers for Forensic Fiber Examinations

Heather Taylor, Chemistry - Lexington, SC

Jennifer Yiu, Chemistry - San Francisco, CA

Mentor: Dr. Stephen Morgan, Chemistry and Biochemistry

Clothing, upholstery, curtains, and carpets are subjected to environmental conditions, contaminants, and laundering in everyday use. During such environmental exposures, dyes and finishes may be degraded, changed in chemical form, or partially or completely removed. Fabrics may pick up contaminants, such as soils and body fluids, and deposition of chemicals may occur during cleaning. Because of these exposures, fibers from the same source may, over time, show differences that the forensic trace evidence examiner may need to explain in court testimony. For example, in the early 1980's Wayne Williams case, some of the fibers found on bodies recovered from the Chattahoochee River had been bleached. This chemical change was confirmed by forensic investigators who exposed known fibers to small amounts of river water. We have performed weathering and exposures using a reference set of fabric samples designed to mirror fiber polymers, dyes, and finishes in common use. The hypothesis tested by these experiments is that changes in appearance and dye composition on fibers can be explained by photo-bleaching, chemical degradation, physical leaching, and deposition of new materials. UV/visible and fluorescence microspectrophotometry has been employed to measure changes in fibers resulting from laundering and natural and accelerated weathering. Spectra of the fiber samples show distinct progressions throughout the weathering processes, and the observed changes in spectral bands may provide insights to degradation processes. By clearly defining the nature of changes that result from such environmental exposures, these experiments serve to establish a stronger scientific basis for forensic fiber examinations.

Solvothermal Synthesis, Structural Determination, Optical Properties and Thermochromic Behavior of Several New Mixed-Metal Bismuth Halide Compounds

Meredith Tershansy, Chemistry Kingsport, TN

Mentor: Dr. Hans-Conrad zur Loye, 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 contain 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. The syntheses, single crystal structure determinations, and optical properties including Ultraviolet-Visible spectroscopy and thermochromic behavior of several novel mixed-metal halobismuthate materials will be presented.

A Translational Task of Attentional Set Shifting in Rats: A Pilot Study

Lauren Bright, Experimental Psychology - Spartanburg, SC

Mentor: Dr. Sandra Kelly, Psychology

The development of tasks that can be used in rats, nonhuman primates and humans will aid in the ability to translate findings in basic neuroscience to the clinic. Test of attentional set shifting in primates have recently been modified to be used in rodents by Birrell and Brown (2000). This study attempted to replicate and improve upon this task in rats. Adult male Long Evans rats were trained to dig in bowls for a food reward. After two weeks of training, the rats performed a series of discriminations within one of three dimensions (odor, digging medium, or texture of the bowl) between pairs of food bowls that differed along all three dimensions. The series of discriminations included reversals, an intra-dimensional shift, and an extra-dimensional shift. The rats were less adept at the extra-dimensional shift compared to the other discriminations, which confirms what Birrell and Brown (2000) found in their study. Since ability to do different components of this task have been shown to depend upon different regions of the frontal cortex in rodents and primates, this task will be very useful to assess frontal cortex function in animal models of disorders, such as Fetal Alcohol Spectrum Disorder. (Funded by NIAAA 11566 to SJK.)

Alterations of GAD Production by Lentivirus Mediated Gene Transfer Modified Seizure Severity in Genetically Epilepsy Prone Rats

Alisha Epps, Experimental Psychology - Lexington, SC

Mentor: Dr. James Coleman, Psychology

Our previous studies have shown a reduction in seizure behaviors in a developmental model of epilepsy (audiogenic seizures, AGS) using lentiviral gene transfer to alter GAD production. Of current interest are the effects of these viral vectors on the genetic model of AGS, using Genetically Epilepsy Prone Rats (GEPRs). Adult GEPRs were induced to seizure activity for two AGS-tests before surgery and five tests during the 30 day period following surgery. The central nucleus of the inferior colliculus was bilaterally injected with lentivirus vectors (multiply attenuated, replication defective, and self-inactivating) encoding 9.6 ug/ml GAD65 sense or lac-Z. At the current injection amount of 1 ul, the GAD65 lentivirus vector appeared only moderately effective in reducing the severity of AGS behaviors in GEPRs. Latencies to both wild running and clonus were not significantly increased. There was also no significant change in the duration of post-ictal behaviors. However, the total seizure duration of GAD65 injected rats was extended for Post-tests 2 ($t = -2.553, p < 0.05$), 4 ($t = -7.124, p < 0.01$), and 5 ($t = -3.870, p < 0.01$). This suggests a reduction in seizure severity, as subjects now required an increasing amount of exposure to sound stimulus in order to induce seizure behaviors. Current immunological studies should further explain these findings by providing better understanding of the location of the viral vector. Additional work using viral constructs, perhaps involving larger areas of infection of epileptogenic tissues, will provide further evidence that altering GABA mechanisms can reduce seizure activity in a genetic model of epilepsy.

Age-Specific Role of Protein Kinase C in a Rodent Model of Sickle Cell Pain

Emily Holzinger, Biological Sciences – Great Falls, SC

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

Endothelin-1 (ET-1) is a potent vasoconstrictive peptide that contributes to the pain associated with sickle cell disease, cardiovascular disease, and cancer. Our laboratory has recently shown that ET-1 produces increased pain associated behaviors (nociception) in younger animals than in older ones. Also, in the younger animals, ET-1 produces more of these behaviors in males than in females. Protein kinase C (PKC), a family of developmentally regulated enzymes, has been shown to drive nociceptive responses. We hypothesize that PKC mediates sex- and age-specific ET-1 induced nociception. This hypothesis was tested by administering a non-specific PKC agonist (PMA) or a PKC antagonist (Chlerythrine) followed by ET-1 subcutaneous in the left plantar hind paw in postnatal day 7 and 21 Sprague Dawley rats. Animal behaviors were recorded for 75 minutes and later analyzed for paw flinching and licking by a researcher blinded to animal treatment. Our results showed that in P7 rats, PMA alone did not produce nociceptive behaviors. However, PMA increased ET-1 induced behaviors from 50-75 minutes. In P21 rats, PMA alone produced behaviors at all times. PMA injected along with ET-1 produced more behaviors from 0-20 minutes. In P21 rats, CH injected with ET-1 decreased behaviors from 50-75 minutes. We can conclude from these results that PKC mediates age-specific responses to Endothelin-1 in neonatal rats. These findings have implications for pain therapies that specifically target infants, children, or adults.

Post-Training Lesions of the Medial Prefrontal Cortex Interfere with Retrieval on Trace Eyeblink Conditioning Task

Stephanie Maddox, Experimental Psychology - Columbia, SC

Mentor: Dr. Barbara Oswald, Psychology
Dr. Donald Powell, Psychology

Rabbits 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 medial prefrontal cortex (mPFC) centered on the prelimbic region (Brodmann's area 32) 1 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 each retraining period. However, by the third and fourth days of retraining, the lesioned animals were performing at a level comparable to the sham lesioned group. These findings were interpreted to indicate that the mPFC is involved in retrieval processes rather than consolidation or storage, in that the animals were initially impaired but were able to relearn the task.

Effect of Binge Morphine Exposure on Pain Thresholds and Opioid Analgesia in Neonatal and Adolescent Rats

Teresa Mark, Biological Sciences - Aiken, SC

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

It has been shown that a history of substance abuse can make pain management more difficult. Studies show that adult methadone maintenance populations have chronically altered pain thresholds, but no studies have been done on the effects on pain thresholds and analgesic efficacy in prenatal or adolescent opiate exposure. This study characterizes how “binge” morphine exposure in neonatal and adolescent rats affects pain thresholds, exogenous morphine efficacy, and endogenous analgesia. Starting on the day of birth (for neonates) or postnatal day 32 (P32, adolescents) morphine (3 mg/kg) was subcutaneously administered to the animals for 9 consecutive days. Saline vehicle and naïve controls were used for both ages. For adolescent animals, paw withdrawal thresholds and latencies were measured every other day pre- and post-injection from P32-P40, and done a single time P42-44. For the neonates, paw withdrawal thresholds and latencies were measured during an abstinence period of P12-P49. Swim-induced analgesia tests were performed on P45 for adolescents and P50 for neonates. A morphine dose response curve was performed in the neonates on P50 as well. Morphine exposure in both neonatal and adolescent rats produced decreased thresholds and latencies. Both age groups exhibited decreased efficacy of exogenous morphine. Only the neonatal exposure decreased swim-induced analgesia. In conclusion, binge morphine exposure in both neonates and adolescents decreases pain thresholds and morphine efficacy, but only affects endogenous swim-induced analgesia as the result of neonatal exposure.

Microanatomical Effects of Prenatal Cocaine Exposure

Mariel McWilliams, Anthropology – Nevada, IA

Mentor: Dr. Daniel Buxhoeveden, Anthropology

Previous studies of the effects of prenatal cocaine exposure on the prefrontal cortex of rat brains suggested that cell columns and apical dendrite bundles are closer together compared to controls in layer III. The goal of this study was to determine whether the other effects related to minicolumns, such as neuron size and forking patterns of MAP2 apical dendrite bundles, would further suggest differences in the connectivity. Cell column spacing in layer V was examined for the first time. All brains used were male and aged 21 days. Pregnant female rats were administered cocaine according to a model that best mimics recreational use. For the material used in the neuron size study there were n=9 controls and n=8 cocaine. To study apical dendrite patterns, n=6 from each group were used. Areas tested included cingulate cortex, Cg2, and prelimbic. Findings indicate that the volume of pyramidal cells in layer V of the prefrontal cortex are larger in the cocaine brains than the controls for both areas combined, and individually for each area. Apical dendrite bundle forking was found to be nearly equal in cocaine and control tissue, while differences were observed in the number of fibers remaining intact from the infragranular to supragranular layers, with the cocaine group having fewer. The study comparing cell column spacing in the two groups using imaging software did not yield noteworthy differences. The significance of these results is yet to be determined, but the data implies that the effects of prenatal cocaine exposure are lamina-specific.

Effects of Chronic Melatonin Ingestion on Tumor Progression and Mood Behaviors in a Rat Model of Mammary Adenocarcinoma

Catherine Meekins, Biological Sciences - Columbia SC

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

Melatonin, a hormone produced in the pineal gland, has been shown to decrease the size and growth rate of tumors, and to have anxiolytic and antidepressant properties. This study investigated if mammary adenocarcinoma causes changes in anxiety- and depression-like behaviors in a tumor-bearing rat model, and if melatonin can attenuate either the development of mammary adenocarcinomas or the altered behaviors. Female Fisher 344 rats were monitored daily for food intake, water intake, and estrous cyclicity. 2 days prior to cell injection, 4mg/kg/day of melatonin in drinking water began. Animals were injected with either serum free medium or 1.0×10^6 MTLn3 cells for tumor growth. Once significant tumor growth occurred palpable tumor size was recorded daily. For assessing anxiety-like behaviors, animals were tested on the elevated plus maze 19-20 days following injections. Two days later, depression-like behaviors were evaluated using the Porsolt forced swim test. Circulating and brain melatonin levels were higher, even in daylight hours, in melatonin treated animals compared with controls. The presence of tumors induced significant increases in anxiety-like behaviors, but melatonin did not attenuate this effect. Neither melatonin ingestion nor presence of tumors altered depression-like behaviors. Nocturnal melatonin supplementation did not alter tumor growth in this model.

Prenatal Tetrahydrocannabinol (THC) Exposure Disrupts Social and Open Field Behavior in Male Long Evans Rats

Ryan Newsom, Experimental Psychology - Columbia, SC

Mentor: Dr. Sandra Kelly, Psychology

Marijuana is the most frequently used illegal drug among women of reproductive age, but little is known about the consequences of using marijuana during pregnancy. THC (delta-nine-tetrahydrocannabinol), one of the active chemicals in marijuana, has been shown to cross the placental barrier as well as to be present in breast milk. In this study, pregnant Long Evans rats were assigned to one of three treatment groups (THC-exposed, vehicle control, and non-treated control) on day 1 of gestation. Drug exposure consisted of 2mg/kg of natural THC, administered twice daily by subcutaneous injection, from gestational day 1 through the entire pregnancy. Pups continued to receive drug exposure through postnatal day 10. Male rats from each group were tested starting on postnatal day 90 in a battery of tests, including open field activity, active social interaction, and forced-swim test. Results: There were no significant differences in weight gained by dams or weight of offspring when compared to controls. THC-exposed rats showed decreased distance traveled in the inner part of the open field and an increase in investigation time in the test of social interaction compared to both control groups. THC-exposed rats did not differ from controls in the forced-swim test. Conclusions: Prenatal delta-9-THC exposure can result in increased susceptibility to anxious behavior and may impair social functioning in offspring. (Supported by NIAAA RO1 11566 to SJK and the University of South Carolina Honor's College.)

Unconscious Brain Processing of Motor and Verbal Responses: A Study of Visual Neglect

Kelly Sullivan, Experimental Psychology - Irmo, SC

Aisha Ali, Experimental Psychology - Newberry, SC

Charlotte Laird, Experimental Psychology - Lexington, SC

David Smith, Experimental Psychology - Aiken, SC

Mentor: Dr. Gordon Baylis, Psychology

Visual neglect typically results from unilateral brain damage and is considered an attentional deficit. Patients with neglect often fail to detect events contra lateral to their lesions, hence they 'neglect' their contralesional side. Interestingly, it has been shown that neglected stimuli may still be processed by the brain and reach some level of implicit awareness. This study was designed to investigate this unconscious brain processing. Two experiments were conducted in which participants were instructed to report (either verbally or motorically) whether or not they saw an X appear on a computer screen, and reaction times (RT) were measured. It was found that there was no difference in RT for verbal and motor responses suggesting that the cognitive mechanisms for both response types may be similar in neglected patients. A previous study by Mijovic_Prelec (*Neuropsychologia*, 36, 797' 1998) suggested that neglected stimuli can be processed by the brain to speed up RTs - so called "fast-denial". Our results showed no evidence of this effect. Furthermore, previous findings suggest that people without neglect (both healthy control participants and patients with brain damage but no neglect) would respond fastest when no stimulus was presented, and would respond at a slower rate when there was an event presented in their visual field. In contrast, we showed that all participants responded fastest when X appeared compared to when there was not an X presented. Our findings contradict the suggestion that unconscious processing in neglect patients causes neglected stimuli to lead to "fast denial."

Cortical sources of pre- and post-saccadic ERP during a saccadic eye movement task

Cade Warren, Interdisciplinary Studies - West Columbia, SC

Mentor: Dr. John Richards, Psychology

In order to better understand the emerging technique of integration and cortical source analysis in cognitive neuroscience, the following research was an attempt by the author to use and study the various aspects of integration. Integration combines different neuroimaging modalities to compensate for the weaknesses of each. EEG/ERP are excellent at gaining temporal data, whereas fMRI is good at measuring spatial data during a given task. MRI can be used to record a detailed image of the entire brain, which is used to map EEG/ERP and fMRI data in a standardized fashion. This research used EEG/ERP, MRI, and fMRI data to examine the underlying cortical basis of ERP activation recorded during a saccadic eye movement task. This requires the use of various programs such as MRICro and EMSE Suite to analyze and co-register the data in order to do integration. The data were analyzed after integration to see what areas of the brain were found to be involved in the saccade task, with both temporal and spatial precision.

The Role of Landlords in the Functioning of Persons with Severe Mental Illness Living in Supported Housing

Payton Foust, Experimental Psychology – Lexington, SC

Mentor: Dr. Bret Kloos, Psychology

Clinicians and patient advocates have argued that landlords can have a significant impact on lives of tenants with severe mental illness (SMI). However, there has been surprisingly little research investigating the impact that landlords may have on the functioning of persons with SMI living in community settings. This study utilizes data from the USC Housing and Adaptive Functioning project funded by NIMH; it examines the role that landlords may have in tenants' self-reported functioning. It was predicted that more positive reports of landlord relationships would be associated with reports of greater life satisfaction, less perceived stress, and a greater sense of mental illness recovery. Using linear regression analysis, it was found that positive landlord relationships accounted for a small yet significant amount of variance in life satisfaction. Next, the landlord relationship scale score was included in a regression model with other indices of potential community supports or stressors to predict scores on perceived stress and recovery scales: neighborhood social climate, neighborhood relationship, and neighborhood safety scales. The regression model for these outcomes was also tested with the landlord scale removed from the analyses. Consistent with earlier findings, the landlord scale by itself accounted for a small yet significant amount of the variance in both perceived stress and recovery. The results of this study suggest that those involved in the administration of community-based housing programs investigate which resources landlords can offer that are beneficial for tenants with SMI and design intervention that can maximize this potential source of support.

Daily Hassles and Uplifts as Predictors of Academic and Social Functioning

Robert Frankenberger, Experimental Psychology – Goose Creek, SC

Mentor: Dr. Brad Smith, Psychology

Attention Deficit Hyperactivity Disorder (ADHD) is characterized in part by a lack of executive attention control. This can impair an individual's ability to appropriately switch their attention between tasks (i.e., multitask) or to persist on one task. ADHD can often lead to stress due to continual failure in academic and social situations. Research has shown that continual failure in learning situations can cause an individual to develop a pessimistic explanatory style characterized by explaining the failure as personal, global, and long-lasting. The current study aims to identify whether there exists a connection between the psychopathology present in children with ADHD and those children's explanatory styles. This research also attempts to determine if explanatory style can be used as a predictor of academic and social success. Participants were thirty-nine children (ages 11 to 14; 45% with a diagnosis of ADHD) participating in an after school program targeting academic and behavioral problems were given the Cognitive Style Questionnaire for Children (CSQ-C), which measures explanatory style, and the Harter Self-Perception Scale for Children, which assesses positive self perception. Their parents were also given a parent-report version of the Harter Scale, allowing us to calculate a discrepancy score between the parent's per-

ceptions of their children and the children's perceptions of themselves. Outcome measures included the Academic Skills Index, the Behavior Assessment Scale for Children, Second Edition (BASC-2), and the child's progress within the program. Data collection was underway when the poster was submitted.

Examining Means of Increasing Generalization Across Time: Repeated Readings v. Multiple Exemplars

Amy Goddard, Experimental Psychology - Cincinnati, OH

Mentor: Dr. Scott Ardoin, Psychology

Well-developed reading skills are a critical component of student success in all aspects of education. One aspect of reading education which is currently undeveloped in schools is the promotion of reading fluency. Numerous research studies have established repeated readings (RR) as an effective method to promote reading fluency. This study investigated the transfer of reading fluency from practiced to novel passages. Two methods were compared: repeated readings of a single passage, and single readings of several similar passages. Participants included 41 male and 43 female second-grade readers at a local elementary school. Participants' baseline fluency was establishing using a passage adapted from a second-grade text. Following practice in one of the two conditions described above, students read a passage similar to the first passage to establish the transfer of fluency from the practice passages to the final passage. Additionally, students' accuracy on ten "target" words was evaluated. The target words were selected for their unfamiliarity to second-grade students and were included in all baseline, practice and generalization passages used in the study. Preliminary results indicate no difference in fluency gains between the two conditions. Implications of these findings and suggestions for future research will be discussed at the Discovery Day Poster Session.

Affective symptom specificity and cognitive vulnerabilities among underserved early adolescents: Predicting depressive versus anxiety symptoms

Andrea Leatherman, Experimental Psychology – Rock Hill, SC

Mentor: Dr. Benjamin Hankin, Psychology

Background: Numerous theories have been proposed about how adult's understanding of their social environment may act as predictors of depression. Studies have shown that cognitive vulnerabilities, such as dysfunctional attitudes, along with stressors, cause depression. There is not, however, abundant research of these theories on adolescents. Purpose: The purpose of this experiment was to see if the dysfunctional attitudes and interaction with stressors will cause specifically depression in adolescents. Methods: Two hundred 6th grade children (an average age of 11.5), 53% girls, were chosen to participate in this study. All participants were underserved (receiving free/reduced lunch), were mainly rural and were ethnically diverse. Measurements of dysfunctional attitudes, reflections, depressive and anxiety symptoms, and stressful life events were taken for each child. Data was collected twice during a four-month study either over the phone or in a classroom setting. Each child was paid five dollars for each survey completed. Once data was completed hierarchical regression analyses were used to test the hypothesis. Results: Data is still currently being collected

and analyzed. The data already collected shows, however, that rumination and stress interaction predicts solely depression and not anxiety. The research also shows that dysfunctional attitudes and stress interaction shows depression specifically. Conclusion: This research is pertinent in understanding predictors of depression among adolescents. This study provides a direction for future research in intervention of children at risk for depression especially children in impoverished or undeserved areas.

The Effects of Hurricane Katrina: Evacuees' levels of Hope/Optimism and the Correlation of Substance Use

Amber Martin, Experimental Psychology – Dalton, GA

Mentor: Dr. Kate Flory, Psychology

Making landfall in August 2005, Hurricane Katrina was possibly the largest hurricane of its size and strength to hit the United States in recorded history. As a result of this devastating storm, many people along the Gulf Coast lost their homes, families, and jobs, and were forced to evacuate. The purpose of this study is to examine, among the evacuees now living in Columbia, levels of hope/optimism and how they correlate to evacuees' use of alcohol and nicotine. Previous research with both adults and children who have experienced a traumatic event suggests increased use of alcohol and tobacco and a lower sense of hope among these individuals. In the present study, 53 adult evacuees (64% males) staying in the Columbia area were given the Hope Scale to assess their level of hopefulness/optimism, the AUDIT Questionnaire to assess their consumption of alcohol, and the Fagerstrom Test to assess their smoking frequency and nicotine dependence. The mean score on the Hope Scale was 23.57 (SD = 6.48) on a 6 to 36 range. The mean score for the AUDIT was 8.7 (SD = 7.32) on a 0 to 40 range, with 20 participants scoring above the cutoff for problem drinking, and the mean score for the Fagerstrom was 4.83 (SD = 2.50) on a 0 to 10 range. Preliminary analyses suggested that there was not a significant correlation between hope and substance use problems. These findings have implications for understanding how people react following substantial traumatic events.

The Repeated-Name Penalty Observed in Reference to Concrete Objects

Sara Peters, Experimental Psychology – Merrillville, IN

Mentor: Dr. Amit Almor, Psychology

The repeated-name penalty (RNP) is an increase in reading times of repeated full references to a salient referent in previous discourse in comparison to pronouns. This effect has played an important role in theories of reference resolution. To date, the RNP has only been observed in reading paradigms with referents that were introduced by the text. We therefore asked whether the RNP will occur in reference to concrete referents. Three experiments examined reference to objects in pictorial displays. Experiment 1 instructed participants to click on objects in the display using discourses with repeated full references and pronouns. Experiment 2 instructed participants to verify discourses describing the objects in the display using repeated full references and pronouns. Experiment 3 replicated Experiment 2 but included an additional manipulation to increase the salience of the referent. Only Experiment 3 found a RNP. Experiments 1 and 2 found instead a repeated name facilitation in that repeated references led to faster reading times than pronouns. These results are important in showing that the RNP occurs in reference to concrete referents similarly to text referents.

This supports theories of reference that view the RNP as a general effect that is not restricted to specific discourse types.

Cross–Cultural Well–Being of Older Adults

Olivia Pethtel, Experimental Psychology – East Liverpool, OH

Mentor: Dr. KC Kirasic, Psychology

The increasing number of older people is changing the demographics of most populations around the world. This change has caused the United Nations to recognize the well-being of older people as one of the most imperative and universal issues of our time. Understanding the diversity within the elderly population is crucial for implementing effective care and programs. A cross-cultural approach to the issues of aging is the best way to assess their well-being since their quality of life is dependent on their culture. This project reflects a compilation of data from research done in countries all around the world. The purpose of this review was to determine the influences of culture regarding the general well-being of older adults in those cultures. Information regarding aging and well-being was first identified by topic matter. Then, I proceeded to subdivide this information by culture and country. Finally, I analyzed this data by identifying related/overlapping concepts that connected or differentiated between different cultures. I found many differences and similarities among the determinants of well-being according to each culture. For example, American cultures emphasize individuality as a determinant of positive well-being while Asian cultures emphasize harmony with others. This semi-meta-analytic view of cross-cultural well-being indicates that well-being has multiple definitions, depending on the culture. The similarities and differences between these cultural definitions are important in order to implement more effective care and programs for the elderly. More effective programs will optimize the aging experience, which contributes to creating a society for all ages.

Women’s Attitudes on the Effects of Domestic Violence on Children

Lindsey Stone, Experimental Psychology – Bluefield, WV

Mentor: Dr. Frederic Medway, Psychology

Exposure to domestic violence (DV) has been found to have a host of negative effects on children’s behavior and functioning. Unfortunately, few programs are currently available to address this issue systematically. This present study is part of an ongoing project to gather information applicable in future development of an intervention program for children exposed to DV in South Carolina. It was hypothesized that higher levels of parental interest in a treatment program for children is related to knowledge of children’s exposure to domestic violence, association of DV exposure to children’s behavioral problems, the chronicity of the parents’ experience with DV, and level of child symptomology exhibited. Participants were identified through the statewide victims assistance network; data was collected via surveys from 55 women as DV victims living in shelters across South Carolina. Analyses revealed that children’s behavioral problems were not dependent on the frequency of DV in their homes. Additionally, interest in child programming was significantly related to participants’ association of DV exposure to their children’s behaviors, which was determined according to the severity of symptoms children exhibited. Results suggest that adult programming should focus on improving awareness of the effects of DV on children. Further research is needed on understanding factors that affect parental interest and expecta-

tions for child programming. Implications from this study should provide useful in the development of child intervention programs.

Daily Hassles and Uplifts Reported by Middle-School Students: Effects on Academics and Behavior

Gill Strait, Experimental Psychology - Columbia, SC

Tara Meisner, Experimental Psychology - Mt. Arlington, NJ

Mentor: Dr. Bradley Smith, Psychology

Ms. Carolyn Pender, PhD candidate, Psychology

Research suggests that daily hassles and uplifts are very influential on stress and well-being (Wagner, Compas, and Howell 1988). Currently, research investigating the relationship between problem behavior and hassles and uplifts among children is limited. The purpose of this study was to investigate how middle school students internalized positive and negative life events and the correlates of these events on their behavior. Participants ($n = 18$) were middle-school students in an after school program with levels designed to reward participation (higher = better). Each week for 10 weeks, the participants completed Kanner et al.'s (1987) "Children's Hassles Scale" (CHS) and "Children's Uplift Scale" (CUS). The CHS and CUS track 25 negative and positive events commonly experienced by children ages 9 to 12 years. Respondents identified hassles and uplifts experienced using a three-point Likert scale. Hassles and uplifts that might impact behavioral and academic functioning were examined. We predicted a small positive correlation between hassles and homework assignments, a small positive correlation between uplifts and level and participation points, a small negative correlation between levels and participation points, and a moderate positive correlation between problem behavior and hassles. Data will be analyzed using Spearman's Rank Correlations to compare weekly number of problem behaviors exhibited to CHS and CUS scores. Additionally, participation points, weekly homework assignments, and program level will be compared to these scores. Data collection will be completed by early April 2006. Implications of the findings for behavioral and academic functioning, limitations of this study and future directions will be discussed.

The Positive and Negative Effects of Rap and Hip-Hop Music on Society

Victoria Bellamy, Nursing – Winnsboro, SC

Nicola Brown, Experimental Psychology – Kingston, Jamaica

Josh Giles, Sport and Entertainment Management – Spartanburg, SC

Chris Hayashi, Economics – Rapid City, SD

Paris Pixley, Sport and Entertainment Management – Brooklyn, NY

Tameka Riley, Biological Sciences – West Columbia, SC

Mentor: Dr. KC Kirasic, Psychology; UNIV 201

Ms. Kristian McAdams, Management Science; UNIV 201

In a world filled with freedom of speech, artists are able to express themselves with little restraint. With this independence, many people believe that certain music has exceeded the boundaries and merely subjects negative influences on people and their thought processes. Many view rap and hip-hop music as a constant negative influence. Due to this stereotype, people believe that rap/hip-hop artists and their music are the source of adolescent problems. Throughout this project, we used surveys and interviews, while conducting common analytical procedures to determine the positive and negative influences that hip-hop music has on society. Our dedication to this project is due to our love for the music and our disgust for stereotypes. We are also driven by the abundance of negative media coverage that news stations air. Throughout the project, we viewed both sides of the spectrum. We looked at the good and bad effects that rap/hip-hop music has on our culture. There is substantial amount of research that confirms music is influential. Although it is influential, that does not mean that it is directly related to societal problems. Our study also reveals the lack of support to the stereotypes associated with rap and hip-hop music.

Artists Against Breast Cancer

Rachel Bowman, Interdisciplinary Studies – San Antonio, TX

Mentor: Dr. Lucia Pirisi-Creek, School of Medicine

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 that 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 was 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 preliminary 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 will be used to guide continuing research. The research will culminate in community outreach programs which will utilize various artistic mediums to promote breast cancer awareness.

Kintampo Complex Decorative Techniques at the Birimi Site

Erika Heimbrook, Anthropology, Florence - SC

Mentor: Dr. Joanna Casey, Anthropology

The purpose of this project is to illuminate the social and economic lives of the Kintampo people at the Birimi Site in Northern Ghana through an analysis of their ceramics. The Kintampo Complex represents the earliest known settlement in sub Saharan West Africa, dating from 3,000 – 4,000 years ago. Although there have been a number of Kintampo sites investigated, there is very little known about the daily lives of these people. Important questions remain about basic relationships between Kintampo and other contemporaneous complexes in other parts of West Africa. Ceramics are very significant in archaeology for the light that they can shed on the lifestyles of prehistoric peoples. In this project, an analysis of the decorative styles and techniques will be used in order to better understand social phenomena such as the contexts of vessel use, relationships among village members, and a wider social and economic network among the people of the Birimi site. The main decorative techniques found have consisted of comp stamped, incised, rouletted, and cord and stylus impressed. This information, along with a comparison with ceramics from other Kintampo sites, will add valuable information to the ever growing knowledge of the Kintampo complex.

The Effects of Youth Sports, Positive or Negative?

Christy Longman, Early Childhood Education - Irmo, SC

William Luckadoo, Sports and Entertainment Management - Leesville, SC

Brad Moody, Mathematics - Raleigh, NC

Kim Reaves, Public Relations - Lexington, SC

Lauren Suggs, Undeclared - Lake View, SC

Robert Webster, Marketing - Cheraw, SC

Mentor: Dr. KC Kirsic, Psychology; UNIV 201

Ms. Kristian McAdams, Management Science; UNIV 201

Youth sports are an increasing trend in today's society. There are roughly 52 million youth participating in sports nationwide and much debate has arose as to whether youth sports have a negative or positive impact on our youth. We felt that evidence would be found through research to support that there are more positive aspects that result in the participation in these sports than there are negative aspects. Research of positive aspects focuses on physical well-being, team commitment, academic success, and lower use of drugs and tobacco. Researching negative aspects includes abuse, aggression, player isolation, and punishment of bad performance. Research was performed through surveys of youth sports participants and case studies. Results of the research found that there are more positive aspects than negative aspects. It was found that both do exist in many forms and the participants are affected mentally and physically. All results were consistent with our hypothesis that youth sports contain more positive than negative aspects. This study can serve as a method to inform players, coaches, and parents of the participants the effects that could result from youth participating in sports.

Teacher-Implemented Interventions to Enhance Preschool Children's Physical Activity

Amanda Reeves, Early Childhood Education – Columbia, SC

Mentor: Dr. William Brown, Educational Studies

Ms. Claire Wessel, Masters candidate, Special Education

Recently, childhood obesity rates have increased and children are becoming overweight at earlier ages. Obesity has been associated with multiple health problems, most notably, coronary heart disease, hypertension, type II diabetes, and some types of cancer. Researchers have hypothesized that the increased frequency of obesity has been related to dietary changes and decreases in physical activity. Presently, we have extremely limited information about factors associated with young children's physical activity. Investigators have shown that physical activity levels of preschoolers are lower than might be expected. For example, Pate et al. (2004) found that children in preschools participated in less than the recommended levels of physical activity during the day, and that physical activity levels varied widely, depending on which preschool children attended. Recently, in three preschools in South Carolina, preliminary data indicate that low levels of moderate-to-vigorous physical activity occur during the preschool day and these levels are lower than the recommended standards for physical activity (Brown et al., in press). The aim of our study was to develop and to validate teacher-implemented interventions to increase preschoolers' moderate-to-vigorous physical activity on playgrounds. To increase physical activity, we worked collaboratively with teachers to plan and briefly implement two activities, "Track Team" and "Dance Party" with their class during afternoon outside playtime. During non-intervention sessions, children participated in their normal afternoon outside playtime. During intervention, "Track Team" or "Dance Party" were implemented for brief periods during the afternoon playtime.

Healthcare access and nutrition education of Hispanics in South Carolina

Lauren Saleeby, Biological Sciences– Florence, SC

Mentor: Dr. Deborah Parra-Medina, Health Promotion, Education, and Behavior

Objective: To gather preliminary data on the healthcare access and nutrition education of Hispanics in South Carolina and develop relationships with the participating individuals and organizations for future research collaborations. **Method:** In study 1, Hispanic children (N=24), in kindergarten through third grade, enrolled in a local after school program and were exposed to a 10 week nutrition intervention based on the "Color Me Healthy" curriculum. To evaluate the intervention, each child's perception of healthy eating was assessed pre- and post-intervention. In study 2, Hispanic adults in the community (N=31), ages 20-57, completed a self-administered paper-pencil survey. The survey included items on socio-demographic characteristics, healthcare knowledge and utilization of healthcare services, and nutrition practices. **Results:** In study 1, the majority of the children demonstrated an increased knowledge of healthy eating and balanced meals. In study 2, the survey results provided relevant data about the Hispanic participants' knowledge of prescription access, language resources, utilization of appropriate resources, availability of service, and access cost. In addition, information was collected about fears and difficulties encountered with the healthcare system. **Conclusion:** Results from study 1 indicate that future nutrition

interventions may be beneficial. The findings of study 2, especially common misunderstandings and problems with the healthcare system, can be used to tailor a healthcare access information program that would address these hindrances to healthcare for Hispanic adults in the surrounding area.

The Effect of Gender on Judicial Voting in the Supreme Court and the Court of Appeals of Canada

Amanda Seals, Interdisciplinary Studies – Clinton, TN

Mentor: Dr. Donald Songer, Political Science

Only in the last 25 years have women become a significant part of high court judicial decision-making. As a result, the influence of women on the courts is not well-understood or well-researched. For this research, I plan to conduct an analysis of the decisions of the appellate courts in Canada. In many ways, Canadian courts, which share our common law heritage, are similar to US courts, but have the advantage of having more female judges than in the US. In this study, the universe of tort and criminal Supreme Court cases between 1982 and 2000 as well as random samples of tort and criminal cases from the provinces of New Brunswick and Ontario were examined. For each case, I coded variables detailing aspects of the case including the treatment and directionality of the decision, the voting of individual judges, the province from which the case originated, and classifications for the parties involved. Characteristics of individual judges were also coded, including gender, party of appointment, and native language. After collecting the body of data, a computer program was used to run logistic regression modeling of the data. Five independent variables were controlled—gender, party of appointing Prime Minister, types of tort, and the lower court decision. The dependent variable was the directionality of the decision (pro-plaintiff or pro-defendant). It is expected that given psychological research of the decision-making of women and its communitarian rather than linear pattern that female justices will more often side with underdogs, or tort plaintiffs, than their male counterparts.

Case Study Documentation of Toddler Music Behaviors

Jessica Warren, Early Childhood Education - Columbia, SC

Mentor: Dr. Wendy Valerio, School of Music

The purpose of this research was to document and examine the music behaviors performed by one toddler. The researcher videotaped the subject during one 20-minute baseline data collection session in the toddler's classroom. Then the researcher videotaped the subject during six 20-minute Music Play classes taught by an early childhood music development specialist. After transcribing, coding, and categorizing all behaviors performed by the subject, the following themes emerged. First, the subject displayed 100%-per-opportunity response-rate to three specific songs. Responses included vocalizations, movement, or both. Second, the subject responded vocally most often when the music teacher performed songs with omissions. Finally, the subject watched the music teacher passively for a few minutes before responding to songs. By interviewing the subject's mother, the researcher found that the subject frequently sings songs from her Music Play classes at home. The subject's mother said that her daughter tends to sing more often when waking in the morning, after a nap, or during diaper changes. She also said that friends and family have all learned Music Play songs in order to sing with the subject and to help support her musical develop-

ment. By interviewing the subject's classroom teacher the researcher found that the subject vocalizes when waking up from naps there as well. Researchers should continue to document and examine the music behaviors of young children so they may better understand music acquisition and its role in human development.

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