



# *Discovery Day*

*A forum for student ingenuity*

*2011*

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The Discovery Day planning committee  
would like to give special thanks to the following:

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South Carolina Honors College

College of Arts and Sciences

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Russell House Bookstore

the student presenters,  
faculty and staff mentors,  
judges and volunteers  
all for supporting student success

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# Schedule of Events

8:30 am - 9:00 am	<b>Registration (judges and participants)</b> Russell House Lobby (2nd floor)
9:00 am - 3:00 pm	<b>Creative Presentations</b> Russell House Theatre
9:00 am - 11:30 am	<b>Oral Presentations</b> Russell House 201, 203, 205, 302, 303, 304, 305, 315
12:00 pm - 3:00 pm	<b>Poster Session</b> Russell House Ballroom
3:00 pm - 3:30 pm	<b>Reception</b> Russell House TBA
3:30 pm - 4:30 pm	<b>Awards Ceremony</b> Russell House Theatre

# Table of Contents

## Oral & Creative Presentations:

Creative Presentations .....	page 2
Business & Politics.....	page 8
Education .....	page 12
Humanities.....	page 15
Humanities & Social Sciences.....	page 18
Public Health & Health Sciences.....	page 21
Science, Computing, & Engineering .....	page 24
Science, Engineering, & the Environment .....	page 27
Sciences: Biomedical & Neuroscience .....	page 31

## Poster Presentations:

Arts & Humanities .....	page 36
Biology & Biomedical Sciences I.....	page 41
Biology & Biomedical Sciences II .....	page 46
Chemistry.....	page 50
Chemistry, Physics, & Math.....	page 55
Computer Science & Engineering.....	page 60
Engineering.....	page 64
Environmental Sciences I .....	page 67
Environmental Sciences II .....	page 71
Experiential.....	page 76
Health & Medical Sciences .....	page 80
Neuroscience & Experimental Psychology I.....	page 86
Neuroscience & Experimental Psychology II.....	page 91
Psychology & Social Sciences.....	page 95
Psychology, General.....	page 100
Social Sciences & Business .....	page 105
Social Sciences & Education .....	page 111
Social Sciences & Public Health .....	page 116

# Earth Day

For more than 40 years, Earth Day has been celebrated on April 22, with people all around the world taking part in activities that celebrate our Earth. The day serves to bring awareness to the many issues surrounding the environment and our ever-important impact on its well-being.

We want to take this day to recognize our students' contributions to these efforts at USC. Sustainable Carolina is the next stage in the evolution of sustainability education and advocacy at the University of South Carolina, encompassing the efforts of the Green Quad, the Learning Center for Sustainable Futures and the Office of Sustainability. Their mission is to advance the University of South Carolina's efforts to educate and transform the campus by promoting collaborative relationships among administrators, students, faculty, staff and community members for exploring and implementing the changes required to create a sustainable campus and society.

At this year's Discovery Day, the Office of Undergraduate Research has collaborated with Sustainable Carolina to select presentations that represent their mission. **Sustainable Carolina Approved** presentations will be marked with this logo. Please take the time to note these "green" presentations, and support the Sustainable Carolina mission!



## Scavenger Hunt

Discovery Day is a showcase of our students who have gone beyond the classroom to participate in research/scholarly projects, internships and co-ops, leadership activities, service-learning and community service, national fellowship competitions, and even studied abroad. As students, faculty, and staff wander through the posters, we've created an opportunity for a more interactive experience – join us for the Discovery Day scavenger hunt (available at Information Point). The scavenger hunt is intended to encourage attendees to visit a variety of posters and talk with presenters about their projects and experiences. The scavenger hunt also includes possible questions to spark conversation.

Tell me about your project/experience.

Why did you choose this particular project/experience?

What roadblocks did you encounter?

What did you enjoy most about this experience?

What was something surprising that occurred during your experience?

What advice would you give someone who wanted to do something similar?

What do you wish you had known before you started this?

— Oral & Creative —  
Presentations

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# Creative Presentations

## **Role of Mini-Video in Autobiography**

**Rachel Allen**, Film and Media Studies - Senior

Mentor: Prof. Simon Tarr, Art

From May 1st to March 31st, I shot 5-20 seconds of video every day for a year on a Flip camera. At the end of that time, I edited it down to a very short piece documenting that particular year, as well as the change affected in my life in that year. I was interested in the use of framing, sound, and small-format video to constitute a “self” in a particular style of autobiography, and how the rules I set in place can both made my piece more confusing while also creating a sense of cohesion. I learned about how I see the world, how that differs from how I see the world through a camera, and how to create meaning through video. Over a hundred years of video autobiography have shaped what seems to be a fairly stabilized documentary voice; although there are many experimentations and changes to that form, it is interesting to explore the fringes of the genre. I learned about the all-important role of voice in autobiography – the thing which shapes how the audience interacts with the creation, and shapes the very self that I’m creating – and how to create my own, unique voice. I really feel as though I’ve grown as a filmmaker in this past year, and have begun to more fully utilize my ear for sound and my eye for video in such a way as to create higher-quality movies.

## **Mount Kilimanjaro: A Girl’s Guide to Hiking a Boy’s Mountain**

**Amanda Casto**, Business Administration - Freshman

Mentors: Dr. Patrick Hickey, Nursing and Faculty Principal for Capstone Scholars  
Prof. David Weintraub, Journalism and Mass Communications (Visual Communications)

Summer of 2010 after traveling with a study abroad class from the Moore School of Business in Tanzania, I stayed to hike the world’s fourth tallest mountain, Mount Kilimanjaro. I stumbled through the planning process, unable to find reliable resources geared toward women. In order to encourage girls to hike Mount Kilimanjaro, or participate in adventure trips historically male oriented, I focused my senior thesis on creating a resource to fulfill women’s travel needs. To create this resource I synthesized and analyzed my first hand experience trekking Mount Kilimanjaro and documented it in writing. I am publishing my experience on a daily blog, [www.passportsandpearls.blogspot.com](http://www.passportsandpearls.blogspot.com). This experience has shown me that while hiking Mount Kilimanjaro is intimidating, with extra research and preparation any woman can increase their odds of summiting the world’s highest freestanding peak. In the course of writing the blog and gaining “followers,” feedback from other girls, as well as Tanzanian tour operators and other websites about trekking Mount Kilimanjaro, has supported the need for more female based travel information to make this trip more accessible to women. Having had this experience has empowered me to overcome challenges I otherwise would have hesitated to encounter, and has opened my eyes to the need for female travel resources. Upon completion of my thesis about Mount Kilimanjaro, I plan to continue my blog with travel opportunities for women. Hopefully USC females and women in general will benefit from this resource and will form a community embracing one another’s travel ambitions.

## **Interactive Museum Project**

**Taylor Ferguson**, Dance - Senior

**Leslie Smith**, Dance - Senior

Mentor: Dr. Mila Parrish, Theatre and Dance

The interactive Museum Project explores innovative methods of performing dance. In many ways the art of dance is dying; in a world that is technology driven and obsessed with instant gratification dance has somewhat become obsolete. We integrated a select group of dance students from A.C. Flora high school to help us with our research. We selected to use high school age students because they approach dance with fresh new ideas, and their lives are so intertwined and dependent on technology. They have a unique understanding of how technology enhances and affects their lives. With the use of digital cameras, video cameras, and projections we experimented different ways of incorporating these aspects of technology into a performance. Using these type of technology with also make dance more accessible to people in lower income areas. Dance no longer has to be performed on a proscenium stage. Using technology we can make dance more relatable to today's culture, as well as opening up the opportunities to perform dance in new and different spaces. We will present our final performance at the Richland One honors dance concert. After the concert we plan to interview audience members asking their opinion of the innovative work.

## **Unearthing 'Ingagi': The cultural and cinematic context of R.K.O's lost exploitation film**

**James Gilmore**, Film and Media Studies - Senior

Mentor: Dr. Mark Cooper, English and Film and Media Studies

This project began as an investigation of the possible links between the 1933 classic "King Kong" and the supposedly lost 1930 jungle adventure film "Ingagi," which the University of South Carolina's Moving Image Research Collections has recently discovered a partial print of. These links were established from existing scholarship written by historian Andrew Erish and published in the Los Angeles Times, and were investigated through visits to the University of California at Los Angeles's Performing Arts Special Collections and the Academy of Motion Picture Arts and Sciences' Margaret Herrick Library in Los Angeles, as well as through the University of South Carolina's microfilm library. The results of this research attempted to complicate Erish's history of "Ingagi" not only through my own examination and interpretation of newspaper articles and regional censorship documents, but also through connecting "Ingagi's" censorship discussion to broader regulatory struggles in the industry. This study constructs a reading of "Ingagi's" contemporary moment based largely on its generic affiliations to "King Kong" director Merian C. Cooper's previous films, and through reading it as a text that participates in and questions the assumptions of the ethnographic documentary genre. This project is just one of potentially thousands of research projects that could be developed from the films and newsreels housed in our extensive Moving Image Research Collections. This research will promote the continued scholarly exploration of the Collections.

## **Crossing Boundaries and Forming Communities through Dance**

**Joanna Hardy**, Dance - Senior

Mentor: Dr. Mila Parrish, Theatre and Dance

Crossing Boundaries and Forming Communities through Dance (CBFCD) created a modern day community linking students through live instruction and videoconferencing, while also promoting communication. A Community Dance activist and USC Undergraduate Dance Education student, Joanna Hardy researched community dance methods from the Foundation for Community Dance, Anne Green Gilbert, and other scholars in the area as well as investigating how these methods might be applied to the formation of a non-traditional digital community. The research team of Hardy, Dr. Mila Parrish (USC faculty mentor) and Dr. Parrish's Graduate Research Assistant, Emily Enloe, developed and implemented a curriculum on cyber bullying with two area middle schools. In this year-long research, Hardy studied the impact of videoconferencing and its ability to foster community connections with college dancers, other middle school students and educators. The main objective of CBFCD was to create a trusting community where middle school students would want to share ideas, fears and confidences about bullying and the effects on their person and schools. Through the interactive videoconferencing curriculum the CBFCD community of dancers learned how to use improvisation in creating meaningful dances on the topic of cyber bullying. This new community of dancers was created through using multi-way videoconferencing. The students could feel comfortable with the passage of information from one to another because they were in the safety of their own schools. This research will be furthered this summer by attending a workshop by community dance specialist Anne Green Gilbert in Seattle in Washington.

## **The Vagina Monologues**

**Ashley Johnson**, Psychology - Junior

Mentor: Ms. Kassie Mae Miller, Social Work

Vagina Monologues is a play consisting of a series of monologues through the eyes of women who have undergone funny, tragic, and enlightening experiences involving their vaginas—monologues that show the audience that a woman is so much more than the sum of her parts. In January of 2011, I decided to step out of my comfort zone. I auditioned for the Vagina Monologues, and received the role of the Narrator. I had read the Vagina Monologues out of curiosity, and was thoroughly entertained. Reading and actively participating are two different experiences. I realized very soon in the rehearsal process that I was going on a journey with the 17 other women involved, and the impact of said journey took me by surprise. What I received from participating in the Vagina Monologues was an overwhelming obligation to do more in the effort to educate about women's issues, whether matters of abuse, sexual assault and health. After seeing such poignant performances continuously over the span of a month, I could not walk away from the show the same person. The reactions of the audience at each show helped each of us see how big a need there is for, not only more education, but also more outlets for those who have gone through traumatic experiences.

## **Wiimote Ensemble**

**Chris Johnson**, Music - Senior

Mentor: Dr. Reginald Bain, Music Education History and Theory

In Fall of 2009 I took MUSC 336 Introduction to Computer Music with Dr. Reginald Bain. During that semester I became deeply interested in Cycling 74's Max/MSP, a computer programming environment designed specifically for musical projects. I was enthralled by the exciting new ways in which it allowed me to make music with computers and decided to continue my studies in the project-based course MUSC 540 Projects in Computer Music. In that class, I began to build an application that would allow me to create an ensemble of virtual instruments controlled by Nintendo Wiimote controllers. The Wiimote controllers allow a human performer to control aspects of sound such as pitch, intensity, duration, timbre, and so forth. My research focuses on software development in Max/MSP for the Wiimote-based control interfaces that will allow me to create a Wiimote ensemble. I am currently working on a composition titled *Silvester*, an eight-minute work for Wiimote quartet which is scheduled to be premiered on April 5 at the USC Computer Music Concert.

## **Stamitz and the Viola d'Amore**

**Monica Johnston**, Music - Senior

Mentor: Dr. Constance Gee, Music

The Viola d'Amore is an instrument that was popular during the Baroque period. It has fourteen strings, seven of which are played, and though it has fallen out of favor over the centuries, it is a fascinating instrument that has not been forgotten. I traveled to Prague with my professor and mentor, Dr. Constance Gee, to research the music of the Viola d'Amore, specifically that music written by Karl Stamitz, one of the most prolific composers for the instrument. Dr. Gee wrote her dissertation on the Stamitz family and knew of manuscripts housed in the Národní Muzeum &#268;eské Muzeum Hudby in Prague. We were able to pull music from the archives and view scores and manuscripts for works written by Stamitz for both the Viola d'Amore and the viola, and were able to bring back copies of this music to USC. I also had the opportunity to participate in the Tafelmusik Baroque Summer Institute in Toronto, Canada, which focuses on performance practices of the music of the Baroque period. I studied the Viola d'Amore with Tom Georgi, one of the world's leading performers and scholars of the instrument. My project exposes the USC community to the Viola d'Amore, which is a beautiful and rarely heard instrument of the Baroque period.

## **Coming and Going: A Military Family Before, During and After Deployment (Slideshow with Audio)**

**Sarah Langdon**, Visual Communications - Senior

Mentor: Prof. Denise McGill, Visual Communications

In order to fulfill the Honors College's Senior Thesis requirement, I spent nearly a year documenting the lives of the Cashion family of Ridgeway, South Carolina through photography and audio, ultimately producing an audio slideshow and written article to tell their story. Sergeant Joe Cashion, an Army Public Affairs Officer, was deployed to Kandahar, Afghanistan a deployment for which he volunteered. Before, during and after his deployment, I followed the life of his wife,

Lindy, and their two daughters. I wanted to document the struggles a soldier's family faces during his deployment, to share the story of the Cashion family and their unique experience, and to give viewers a better understanding of the life of a soldier's family. Throughout the course of the project, I followed Lindy and her family through their daily lives, photographing both the simple moments and the big events all families experience. This is a relevant and interesting topic in light of the current times. I think many Americans are interested in how U.S. military families are dealing with this war. This is also an important topic for South Carolinians as it involves a local family that has lived in South Carolina for generations. I hope that this project will give viewers an inside look into the life of a military family.

### **A Comparison of European and American Pedagogical Techniques as Applied Specifically to the Oboe**

**Briana Leaman**, Music Education - Sophomore

Mentors: Dr. Clifford Leaman, Music

Dr. Rebecca Nagel, Music

**Motivation:** My motivation for this project was to better understand the history of the American oboe school of training and performance and to incorporate ideas that might have been "lost in translation" between the European and developing American oboe pedagogy in order to better understand how the instrument is most effectively taught and played. **Problem Statement:** What are the differences and similarities between the American and European pedagogical techniques as they are applied to the oboe? **Approach:** During the summer of 2010, I traveled to four different cities in Spain and France and took lessons from four very prominent oboe teachers and orchestral players. I received one lesson each from Francisco José, Disa English, Sebastien Giot, and Olivier Doise. **Results:** The results of these lessons and my studies with the teachers in Europe were an increased manifestation of the knowledge of how the oboe can be approached and taught with the same basic ideas but can be played so differently and uniquely.

**Conclusions:** I discovered that it is difficult to tell from one lesson how teaching the oboe is approached differently in another country. It was easy to hear and see the difference in timbres and reeds, but to actually grasp the distinctive teaching methods was hard because of the intricacy needed to discern between the foundational discrepancies and the mere teaching styles by those particular oboists. The differences I found between University and Conservatory life and expectations were in the organization of the programs and tuition.

### **From Within: Educating Schools on the Importance of Asian Culture through Music**

**Andre North**, Music Education - Senior

Mentor: Dr. Clifford Leaman, Music

This project is expanded research based on a 2009 Magellan Grant that involved the study of new saxophone music by Asian composers. From Within focuses on the many cultural, historical, and technological advances that were identified during the first project. The study will also cover a variety of methods that can be used in teaching this material to students in grades K - 12. Although music is just one aspect of the arts, the presentation will highlight how effectively the arts can be incorporated into the curriculum with music as one of many possibilities.

## **Learning to Act Shakespeare: Exploring the differences between American and British training styles**

**Mary Tilden**, Theatre - Junior

Mentor: Prof. Robert Richmond, Theatre and Dance

In the summer of 2010, I went to England to study Shakespeare's works in an intense acting training program where I learned from both British and American acting teachers. Through the process I observed and experienced different techniques to approaching acting Shakespeare's text in order to lift it from the page and bring it to life. I also worked with some well-known British actors who have worked continuously with Shakespeare throughout their careers and interviewed them on what they believe to be the differences between the ways Americans and British actors approach the works. Learning these viewpoints and techniques to add to my previous training from America with acting Shakespeare gave me a new perspective on how to approach Shakespeare from a more visceral approach to language rather than an academic one. The experience helped me to understand Shakespeare's words in my body rather than only in my head. The words "learning your words by heart" became much more meaningful to me, because I learned that the training in Britain with classical texts is often a lot more connected to the heart. While the academic approach to understanding Shakespeare is important, I learned that the British approach brings this text to life in a way I had never experienced before and a way that I feel needs to be expressed more often on the American stage.

# Business & Politics

## **Management Accounting**

**Michael Barry**, Finance - Senior

**Famatta Mensah**, Accounting – Senior

**Kenneth Smith**, Business Administration - Senior

Mentor: Prof. Stan Smith, Accounting

The Moore School of Business' undergraduate research team conducted a study of various decision tools used by companies across the state of South Carolina. The survey asked respondents to identify the management accounting decision tools used in four key areas: 1) planning; 2) profit analysis; 3) tactical cost control; 4) ad hoc decision making. The respondents were also asked to provide information concerning the following environmental factors including: company size, controller background and tenure, and sophistication of the company's information system. The team hoped to understand the level of sophistication of various techniques utilized in light of the environmental factors. In order to conduct the study, the team decided to develop a survey designed to capture the data needed to draw an analysis. The team used an electronic survey via Qualtrics software as a platform to reach statewide firms. The drafted survey was vetted by several prominent faculty members of the School of Accounting for completeness. To build awareness of the survey, the team implemented a marketing strategy that included development of relationships with key business partners. The team also met with local and statewide business entities to gain approval and endorsement. In addition, the team also created a website that included important information about the study and access to the survey. In gathering data, the research team used a combination of electronic surveys and personal interviews. The results were statistically reviewed in order to highlight correlations that were both significant and practically interpretable from an accounting stand point. The research team, along with its strategic partners, envisions a practitioner's publication of the results to be used as a benchmark for companies throughout South Carolina. Strategic Partners: South Carolina State Chamber of Commerce South Carolina Department of Commerce-Research Division.

## **Government Failure in Post Conflict Uganda: Land, Development, and Security**

**Blake Bersinger**, History - Senior

Mentor: Dr. Ronald Atkinson, History

Over a twenty year period from 1986 to 2006, conflict devastated the northern region of Uganda, especially the Acholi ethnic group. In order for northern Uganda to successfully recover from its post-conflict state, the government has to successfully: mediate the rising number of land disputes, promote development, and establish a real sense of lasting security. It looks at the government of Uganda's (GoU) efforts to bring the northern Ugandan poverty level to that of one consistent with the national average. It is clear that the Ugandan President, Yoweru Museveni has historically not had the North's best interest in mind, often focusing more on his personal war with the rebel leader, Joesph Kony, than the well-being of those residing in the North. This presentation examines the recent policies and programs by the GoU historically, in an attempt to identify if the GoU has ever provided the North with realistic opportunity of successful development and reintegration. The

thesis presentation been divided into five sections: a historical background to provide the reader with context for understanding the twenty year northern Ugandan conflict, an analysis of the development programs launched by the GoU, a breakdown of the GoU land policy, an assessment of attempts by the GoU to improve the sense security in the region, and finally a conclusion identifying common shortcoming of the GoU policies.

### **Pursuing Transatlantic Unity: NATO's Parliamentary Conference**

**Christian Buckson**, History - Junior

Mentor: Dr. David Snyder, History

In past treatments of the Suez Crisis, historians have often focused on the reactions in the international political and military spheres. Few, however, discuss how the topic was treated within the fledgling NATO Parliamentary Conference.

Established only two years prior, the Parliamentary Conference met less than two weeks after the debacle at Suez to discuss a wide range of issues integral to the weakened western alliance. Few historians have focused on the conference, seeing it as offering little of consequence. However, operating as it did within a general period of uncertainty for NATO, exacerbated by the Suez Crises, the NATO Parliamentary Conference sought an elusive transatlantic unity by bridging the gap between the dominance of the large NATO powers and the democratic yearnings of the smaller member states. Based on primary documents from the NATO Parliamentary Archives in Brussels, Belgium, this paper suggests that the early meetings of the Parliamentary Conference are a necessary component of the study of NATO history. The Parliamentary Conference documents reveal the extent of the vast divisions within the western alliance by the time of the Suez Crisis. The Conference offered a strategy of democratic debate and of including legislative representation within NATO as a remedy for the divisiveness of the period. Although, its impact was ultimately limited, the Conference itself witnessed a new attempt to incorporate democratic debate and discussion into an alliance dominated by just a few powers, especially the United States.

### **How Applying for a National Fellowship Helped Me Get Accepted to Law School**

**Jim Manning**, Mathematics - Senior

Last summer I worked with the Office of Fellowships and Scholar Programs to prepare an application for both the Rhodes and Marshall Scholarships. As a double major in mathematics and statistics, I was applying for an empirical program in Politics at Oxford. Given my interest in politics and related research, this MPhil would have enhanced my academic background prior to enrolling in law school. After meeting with the university nominating committee for each competition, they provided feedback on my application materials, allowing me the opportunity to improve them before final submission. I was ultimately named a finalist for the Rhodes Scholarship, but did not win. However, I was able to use much of my personal statement and resume in my law school applications. The time and thought that went into my national fellowship applications gave me a better understanding of myself and my academic development, while honing my future goals. I also learned how similar law school applications are to those for these national fellowships. The cliché is that applying is worth it even if you don't win. Those words proved true for me, as the application process was a great experience

in and of itself. Feedback and insights gained through competing for a national fellowship led to a great law school application cycle and a better sense of who I am.

### **Critical Mass and the Effect of Female Judges on Voting Patterns and Rate of Dissent in Alberta's Court of Appeal**

**Miroslava Radieva**, Psychology - Sophomore

Mentor: Dr. Donald Songer, Political Science

This study examines how the increase in the number of women serving on Alberta's Court of Appeal affects the votes of their colleagues and the rates of dissent. Alberta is ideal as a setting for this project because in the past 25 years its Appeal Court has transitioned from all male judges to a nearly even split between female and male judges. The Chief Justice of Alberta is a woman, a further indication of the gender diversity present in the Appellate Court. While there is considerable literature on how the judicial voting records of men and women differ, there is little research examining the effect that women's presence on courts impacts the behavior of their colleagues. Our data consists of random samples of cases from each year from 1982 to 2008. The judge, the judges' gender and vote as well as the category of the case was recorded. By analyzing if the patterns of judges' votes or occurrences of dissent change over time, it can be determined whether the presence of female colleagues influenced the votes of their colleagues. The results from this study can help predict what changes might occur in fields or settings as women's numbers in those areas increases.

### **"Students Allied for Better Immigrant Opportunities" promotes comprehensive immigration reform in US**

**Lisa Spawinski**, International Studies - Junior

**Estela Landaverde Luna**, English and Literature - Senior

**Olivia Reburn**, Comparative Literature - Senior

**Luis Arzaluz**, Business Economics - Senior

Mentor: Dr. Gabrielle Kuenzli, History

Since the fall of 2010, I have been working to raise awareness for the necessity of comprehensive immigration reform in the United States. Recently, as evidenced by the legislation passed in Arizona, immigration laws focusing on Hispanics has become extremely harsh and exclusionary, arguably focusing solely on the effects we see in the U.S. instead of addressing the issue in a bilateral manner. In January and February, South Carolina legislators have been attempting to pass Arizona-style immigration laws in this state, and I decided to increase my efforts in raising awareness about the matter. Last semester I hosted a film screening of *La Misma Luna*, gathered a group of students to sit in a Senate sub-judiciary meeting where citizens had the chance to express their views on the proposed legislation, and organized a speaker panel in which the presenters discussed various aspects of Hispanic immigration and its effects locally and nationally. This semester, USC grad student Anna Walton and I created a student group called S.A.B.I.O. To help raise awareness and foster conversation about these issues, SABIO has organized a series of events this semester. We have co-sponsored a film screening of the documentary *9500 Liberty* and brought the film's producer/director, Eric Byler, to campus to speak about the documentary and what it means for the U.S. As of the beginning of March, the legislation has not passed, and we are planning on

continuing to raise awareness about the issue in the hopes that it will not in the future.

# Education

## **Carolina Science Outreach: Investigating Methods of Advocating Science to the Public**

*Reginald Bain*, Physics - Junior

*Ronald (Jim) Talbert*, Baccalaureus Artium et Scientiae - Junior

*Samuel Johnson*, Biological Sciences - Junior

Mentor: Dr. Edward Munn-Sanchez, Honors College

Carolina Science Outreach (CSO) is an initiative to help promote scientific literacy in South Carolina. CSO currently offers a variety of presentation topics such as basic particle physics, principles of evolution, why students should major in the sciences, and wind energy initiatives in South Carolina. Over the course of the last year, we have made significant progress in designing fun and engaging presentations for elementary/middle/high school students, and adult organizations. In the process, we have learned a great deal about effective methods of breaking down the complexities of science into approachable and interesting presentations. We have thus far reached out to a number of schools and organizations and presented to hundreds of people ranging from third grade students to senior citizens. Recently, we have also recruited new members to help expand the program, and have settled into an office in the USC Center for Science Education in Sumwalt College. Using funding from the University of South Carolina's Magellan Scholar Program, our goal has been to help establish CSO as a lasting organization and to investigate effective ways to communicate science to the public. As South Carolina continues to demonstrate a need for increased scientific awareness, especially in its schools, CSO takes a novel approach to making science more accessible to everyone.

## **Learning About Learning: Cognitive Gaming as a Technology of the Self**

*David Corso*, Biomedical Engineering - Junior

Mentor: Prof. Randall Cream, English Language and Literatures

Video games make up a significant amount of our entertainment and culture. While their entertainment value is greatly valued and cherished, it is their educational value that is under appreciated. Video games allow an individual the opportunity to push the bounds of traditional education, and they provide a new median through which humans can develop and grow. My project, Learning About Learning, takes a look at the non-traditional ways video games can educate people.

## **Pre-Service Teachers' Attitudes toward Dialect Diversity in the Classroom**

*Lauren Fowler*, Psychology - Senior

Mentor: Dr. Tracey Weldon, English Language and Literatures

While students enter the schools speaking a number of different dialects of English, teachers are responsible for helping them all emerge proficient in standard English. Since teaching methods that take into account the systematicity and utility of all dialects have been shown to yield positive achievement outcomes, teacher education programs are positioned to impact student success by increasing pre-service teachers' linguistic awareness. This study has collected information about pre-service teachers' familiarity with and attitudes toward dialects commonly found in the southeastern United States. 115 University of South Carolina College of Education students were surveyed about their linguistic

attitudes and awareness, as well as their training and demographic information. The data is being analyzed to see if correlations exist between students' training or personal traits and their language attitudes and knowledge. Preliminary findings indicate that participants consider a nonstandard dialect construction that is natural in their own speech to be more acceptable than nonstandard constructions unnatural for them to say. The majority of participants indicated that standard English provides greater opportunities for students' academic and professional success, but that it is advantageous for an individual to be able to speak both standard and nonstandard dialects. The full results will be shared with USC faculty so that the information may be used to help prepare pre-service teachers for linguistic diversity in the classroom.

### **Brain Awareness Week 2010: Small Group Based Elementary School Activities**

***Eric Robinson***, Chemistry - Senior

Mentor: Dr. Sarah Sweitzer, Pharmacology Physiology and Neuroscience

Neuroscience education can provide practical tools with which a student can better understand the way in which he/she interacts with the world. The pedagogical tools to aid this understanding are largely not in place before secondary and tertiary educational levels. However, Brain Awareness Week provides a perfect opportunity to be a guest educator at all levels. Brain Awareness Week 2010 was celebrated in five days of activities designed for K-5th grades which promoted a functional understanding of neuroscience. Standard and novel pedagogical tools were developed and employed to show the relevance of neuroscience as more than a pedantic exercise. These activities took place at The Center for Knowledge, a public magnet elementary school in Columbia, South Carolina. Every day began with an introductory lecture, followed by small group hands-on activities led by undergraduate and graduate students. After the students cycled through each station, the day was concluded with a review of the information, a presentation of collected data and explanation of trends, or the reading of a children's book related to the activities. Kindergartners explored the comparative anatomy of skulls from carnivores, herbivores, and omnivores and reinforced healthy eating for strong bones and helmet safety. First grade examined the critical role that the brain plays in understanding the perception of our five senses. Second grade did comparative neuroanatomy by measuring brain weights and sizes from different animals. Third grade built on their knowledge of neuroanatomy by learning about neurons, neurotransmission, and neural circuits as well as completing a ruler drop experiment to calculate nerve conduction velocity. Fourth grade went on to explore the effect of neurotoxins from spiders, puffer fish, and snakes in a hands-on demonstration of neurotransmission. Fifth grade was introduced to the hippocampus, learning and memory, and how to use tricks to improve memory. The specific topics for each grade were chosen to integrate into the Core Knowledge Curriculum that is taught at The Center for Knowledge.

## **A Call to Action: National Hunger and Homelessness Awareness Week Campaign**

**Laura Simpson**, Biological Sciences - Junior

Mentor: Mrs. Michelle Peer, Community Service

As the Director of Special Programs for the student organization Carolina Service Council, I was tasked with creating, organizing, and supervising an awareness campaign for University of South Carolina students. Although a very prevalent issue, after spending two years in the city, I have noticed the homelessness issue get swept under the rug by officials and stereotyped by students. It was for this reason that I set out to create an awareness campaign that would not only educate students but motivate them to act. I organized a campus-wide clothing drive benefiting United Way of the Midlands, hosted a guest speaker at the Carolina Service Council meeting, and facilitated three volunteer opportunities for students at a Harvest Hope Food Bank, Family Shelter, and Salvation Army Soup Kitchen. The culmination of the campaign was a Faces of Homelessness Panel, a discussion panel about the issue of hunger and homelessness in South Carolina. Students listened to the stories of three homeless or formerly homeless individuals and had the opportunities to ask questions. The event was led by an employee of the Upstate Homeless Coalition who provided attendees with thought provoking facts and information about what could be done to alleviate the plight of the homeless. It was a compelling and poignant addition to a campaign that fulfilled its duty in raising awareness about hunger and homelessness in South Carolina.

## **Immunis**

**Collin-Jamal Smith**, Biological Sciences - Junior

**David Corso**, Biomedical Engineering - Junior

**William Hoskins**, Computer Science - Sophomore

Mentor: Dr. Jennifer Guiliano, English Language and Literatures

Immunis is a real time strategy game that immerses the player in the world of microbiology and immunology. The player takes charge of several leukocytes with unique abilities and fights against an onslaught of bacteria. We originally had this idea while taking a gaming class. Later during our undergraduate career, we decided that we wanted to take the idea further and make a real game. We worked with various professors in the Center for Digital Humanities and peers to design and program the game. We developed a true appreciation for the complexity and sophistication of the human immune system. We transformed this knowledge into an educational and compelling game. Videogames have the inherent ability to teach and educate while providing a fun and entertaining medium through which to learn. Immunis is a synthesis of education and entertainment. If successful, we could begin a new effort to incorporate gaming into standard education.

# Humanities

## **Influence of the 1980's on Fashion**

**Danielle Billings**, Retailing - Senior

Mentor: Dr. Sallie Boggs, Retailing

I have researched the economy, history, and pop culture of the 1980's and how it has affected fashion in this decade. My presentation will include information as well as pictures of what I have found to be the most pertinent information of the decade. Womenswear, menswear, childrenswear and accessories will be covered in my powerpoint.

## **Hamlet: The Food Paradox**

**Leigh Eleazer**, English - Senior

Mentor: Dr. Nina Levine, English Language and Literatures

This thesis will explore the implications behind what might be called Hamlet's "anorexia." In Spring 2010, as I read Hamlet for the first time, I found myself fascinated with the question of food and appetite in the play. The food paradox for Hamlet is simply that he needs food but does not desire it. As an intellectual, he believes that basic functions, especially eating, are below him, and that in giving in and admitting to this need, he is no better than an animal. Food, though meant to be nourishing and life giving, is presented in its most excessive, harmful forms in the play. Gertrude's sexual appetite only grows larger as she feeds upon Claudius, making her only more "hungry" instead of satisfying her. Claudius drinks to excess, finding himself either "in [a] rage" or "drunk asleep" (III.iii.89). With such examples, Hamlet refuses food and drink because he sees them as mentally and physically poisonous. Poison itself only furthers this paradox. It presents itself as wine, a favorite of Claudius, and looks pleasurable to drink, when in fact, instead of nourishing life, it destroys it. Hamlet is going through a very chaotic time in his life. Though he is unable to control the events taking place around him, he can control what he eats, or more accurately, does not eat. In addition to working closely with the play itself, I will be doing research on this topic with many outside sources, specifically from within the last 25 years. By doing so, I hope to provide a psychoanalytical analysis of Hamlet that goes beyond the 20th century focus on the Oedipal complex.

## **Study of Ancient Friendship, the Mind, and Imitation in Paul's Letter to the Philippians**

**Lara Grantham**, International Business - Senior

Mentor: Dr. Erin Roberts, Religious Studies

Ancient Greek and Roman texts exhibit common literary themes and techniques to illustrate and strengthen the writers' messages. This extends even to early Christian texts like the works of the apostle Paul. For example, Paul uses rhetorical techniques such as paraenesis (reminding of past instruction), parrhesia (harsh or bold speech), and the use of moral exemplars to encourage, guide, and instruct his audiences. Specifically, within his letter to the Philippians, Paul exhorts the Philippians towards specific goals that focus on unity in mind through mimesis (imitation). In doing so, Paul also replicates concepts that are indicative of ancient Greek friendship. My senior honors thesis research reveals that Paul utilized rhetorical techniques to exhort the Philippians into mimesis of Jesus Christ, the

exemplar of ancient friendship, illustrating how acquiring unity in the “mind of Christ” (MOC) via partnership with God can transform and benefit the Philippians individually and as whole. My researching began by studying the ancient roots of the modern Christian concept of discipleship, a concept whose origins are usually traced to Paul. As I closely studied Paul’s letter to the Philippians and compared my findings with current research in Early Christianity and Classics, the concept of ancient friendship was underscored instead. As I gained a better understanding of the use of ancient friendship, mimesis, and rhetorical techniques within Paul’s letter to the Philippians, I realized the apostle’s exhortations impact a wide audience, challenging the practice of friendship in both the ancient and modern worlds.

### **Inter-Vocalic Plosive Degradation in Western Germanic Languages**

**Kevin Kinsey**, English - Senior; USC Aiken

Mentor: Dr. Eric Carlson, English; USC Aiken

This study examines the changing nature of plosives, consonants formed by storing and then expelling a breath of air in the mouth, when found in phonetic situations wherein they are surrounded by two vowels. Of primary concern to me is the behavior to be expected when particular vowels surround the plosives in question-high-low, front-back. Particularly striking thus far is the tendency for most plosives to become voiced and finally fricativized, that is become fricative versions of the plosive. My exploration is in two parts. First, I establish a historical background of this linguistic change, paying attention to the phonological changes that have occurred to English as a language as it has solidified itself as an individual from Indo-European, Proto-Germanic, and finally the West Germanic languages. In doing so, I hope to provide a precedent from which to describe this change and understand what the tendencies towards change are. Second, I perform a series of trials in which I devise situations in which this change might naturally occur otherwise (particularly faster pronunciation), and record several people pronouncing these words and/or linguistic situations with audio-visual equipment. Using this information, I will explain why this change occurs. Focusing on the manners and places of articulation in these linguistic situations, both expected and actual- using evidence from the audio-visual evidence, I describe how ease of articulation and pronunciation allows for words to change in certain situations, and why certain phonetic situations, particularly those with certain vowel configurations, do not lend themselves to change.

### **Fashion History: 1960’s Fashion Revolution**

**Logan Phillips**, Fashion Merchandising - Senior

Mentor: Dr. Sallie Boggs, Retailing

Motivation: My motivation for this presentation is to educate my audience on how much of an impact the 1960’s truly had on fashion. The 1960’s was a year full of new things that came along and I want everyone to be knowledgeable about this. I want to put a fun and interesting twist in my presentation to keep people interested and wanting to know more. Approach: My presentation is definitely going to be one that no one will want to miss. I plan on making a PowerPoint presentation. I want to incorporate music, video clips, pictures, and clothing into my presentation. That way everyone does not get bored just listening to me talk. By incorporating all this different elements the audience gets something different.

Conclusion: In conclusion I really want everyone walking away from my presentation feeling like they just traveled back in time. I want my presentation to be fun and interesting. Most of all I really want everyone that came to have learned at least one thing about the fashion revolution of the 1960's.

### **The Epistemological Crisis of Knowing the Other in Virginia Woolf's Characterological Experiments**

**Brandon Truett**, English - Senior

Mentor: Dr. Debra Rae Cohen, English Language and Literatures

Virginia Woolf's narrative experiments posit different theories of identity formation and selfhood in order to grapple with the problem of how a social self relates to one's many subterranean selves. One's self may cohere in a community of others, which culminates in an ethereal image of the interconnectedness of life; but, this social self also conflicts with one's unknowable interior self, which Woolf maintains, is simultaneously destabilized in the social realm. Grappling with this contradiction, Woolf enacts an ebb and flow between states of knowability and unknowability. Using the familiar image from "Mr. Bennett and Mrs. Brown" of a stranger sitting opposite in a railway carriage, in "An Unwritten Novel," Woolf creates a writerly narrator attempting to pin (or pen) down a character, enacting in miniature what she engages throughout her oeuvre. Here, the Woolfian narrator grapples with the fleetingly knowable exterior of "Minnie Marsh." Woolf revisits this mode of outwardly approaching an unknowable character in Jacob's Room. Here, she advances a forlorn epistemology: one never truly arrives at the essence of another. Instead, our sense of another's reality is tenuously constructed of capricious impressions. A scene between Mrs. Norman and Jacob-as-stranger in a railway carriage reestablishes this unknowability, but later, the narrator glimpses a momentary experience of shared essence between Jacob and Simeon. Not only on the level of character, the narrator also succumbs to the problem of summing up by inhabiting the minds of characters who cannot grasp Jacob.

# Humanities & Social Sciences

## **Worlds Apart: Monastic Seclusion and Witness**

**Erik Grayson**, Religious Studies - Senior

Mentor: Dr. James Cutsinger, Religious Studies

Christian monasticism is broad and varied, yet a common denominator of monastic life is retreat from the world. However, if a monastery is to follow the biblical command to be the salt and light of the Earth, a degree of interaction between world and monastery is necessary. These two priorities - seclusion and openness - are opposing poles in the monastic community. This question is significant because it represents both the monastery's adherence to traditional values and practices and its place on the fringes of an ever-changing world. In my Magellan funded senior thesis, I was able to explore the monastery's seclusion and openness through a comparison of daily life in three theologically distinct monastic communities. St. Anthony's Greek Orthodox monastery, the Roman Catholic Abbey of Gethsemani, and the ecumenical Community of Taizé afforded unique opportunities to compare such categories as monastic resources, the program and services provided to guests, and expectations of the community for the pilgrim. I explored these questions through observations and interviews. My research revealed two primary conclusions. First, expressions of the above categories are a reflection of the community's specific orientation toward visitors from within the community's religious tradition. Second, monastic communities have little they can do to "change" or "adapt" to meet the needs of a changing society if they exist within an established tradition without jeopardizing their identity.

## **Negotiating Leadership in Male LGBTQ Communities**

**Marc Guest**, Anthropology - Sophomore

Mentor: Dr. Drucila Barker, Womens and Gender Studies

The assumed roles of the LGBTQ population within a community is often homogenized into various stereotypical roles which remove them from being active and engaged members of the community. This tends to leave out the impacts, both positive and negative, they make on the community in which they are located, as well as the complex social structures that operate within the LGBTQ community to create the need for leadership and the positions of leadership. The aim of this research study is to explore the relationship between the way gay males in Columbia, South Carolina navigate between their sexual identity and their position of leadership, or power, within the community. This requires exploring how geographic location, socioeconomic background, race, field of work, and age all intersect to create the individual. Through semi-structured one-on-one interviews and active involvement in a variety of primarily social and political organizations which cater to, and work directly with and for this segment of the population, it is possible to begin to understand the culturally constructed identity formations which both allow and deny for leaders to develop and to mature within the LGBTQ community. As well, for an opportunity to view the impacts those leaders who do develop have on the community, both LGBTQ and at-large, in order to provide accurate information in order to make informed decisions relating to their affect on the community. This presentation will report on the early observations of an ongoing research project.

## **Glass Tool Use by Native Americans in the 18th Century Savannah River Valley**

**Keely Lewis**, Anthropology - Senior

Mentor: Dr. Charles Cobb, Anthropology

Glass shards from two early 18th century Native American sites in the Savannah River Valley are identifiable as expedient glass tools through analysis of use wear patterns and comparison to experimental assemblages. Morphological characteristics were observed macroscopically and then any potential use-wear was examined through low-power magnification. The results were tested against post-depositional factors through comparison to experimental assemblages. The presence of expedient glass tools at these sites represents a cross-cultural material interaction between Native American and European traditions.

## **SEA Semester Study Abroad Experience: My Adventures as a Pirate-Scientist**

**Kyra Marsigliano**, Marine Science - Sophomore

When I first considered studying abroad through SEA Semester, I thought it was too alternative, and feared I might sacrifice the typical study abroad experiences of being immersed in a foreign culture, learning a new language, trying unusual foods, and appreciating my life and America differently. Who knew being surrounded by Americans and only setting foot on foreign sand for four days would be the greatest cultural experience of my life? In November 2010, I set sail with a group of twenty-six students on an adventure that opened my eyes to cultural and global learning in ways I never could have imagined. There was a new language—heads, throats, and soles have nothing to do with body parts at sea—and a new, efficient means of communication (i.e. repeating every command spoken). I embraced new customs—forget siestas, we slept whenever we could between watches. There was a new, uncomfortable definition of personal space, or rather, lack thereof, on the 134' ship with thirty-eight sailors. And all this while conducting original oceanographic research and learning to navigate using a combination of modern technology, the stars, and ancient Polynesian techniques. I plan to share this once-in-a-lifetime experience studying abroad through SEA Semester with my peers in order to encourage study abroad, particularly with non-traditional programs. I hope to persuade other students to sail into the wind, because if you hit an opposing force at the right angle, you can make it work for you and drive you ahead.

## **Language and Cultural Identity**

**Elizabeth Murray**, Business Economics - Senior

Mentor: Dr. Nina Moreno, Languages, Literatures and Cultures

I am researching how Spanish language maintenance and proficiency impacts cultural identity among first- and second-generation Spanish-speaking immigrants in Norcross, GA. In Northern California, Susana Rivera-Mills (2000) explored intra-ethnic attitudes within three generations of Hispanics in Fortuna, CA. According to Rivera-Mills, the percentage that agreed with the claim that “to be Hispanic you must speak Spanish” dropped drastically from first- to third-generation. I will use Rivera-Mills' study as a guide for my design, but I will apply it to the population I described above: first- and second-generation immigrants in Norcross. Most of the research has been carried out in areas with densely populated Hispanic communities. In 2009, Norcross' Hispanic population made up 16.62% of the total

population, out of which 52.13% is of Mexican descent (Claritas 2010). Through my research, there will be greater understanding of how Spanish-speakers in the southeast view their mother tongue, their cultural heritage and the relationship between both. The present study's objective is to bridge that gap in the literature by investigating how Spanish language maintenance and proficiency impact cultural identity among first- and second-generation Spanish-speaking immigrants in Norcross, GA. A total of 30 first- and second-generation immigrants from Mexico, El Salvador, and Colombia, living in the Norcross, GA, will be voluntary participants who will engage in a series of 45-minute interviews and a questionnaire. After coding the data and analyzing them, the researcher will be able to draw conclusions regarding the relationship that illustrates a greater language loyalty will be found among first-generation immigrants than among second-generation immigrants.

### **Promoting Intelligent World Citizenship through Service: An Alternative Spring Break to the DR**

***Katharine Parham***, Political Science - Senior



As Director of Alternative Break Programs for Carolina Service Council I made the decision to expand University offerings for the first time to an international venue. Beginning in June 2010, I began planning the trip that took place March 6-12, 2011. I organized an experience that would offer 9 students (including myself) and one staff member the opportunity to spend a week volunteering with a local non-profit in the Dominican Republic, known as the Sister Island Project. Our team spent the week working in the community center garden, rebuilding local homes, and working with children in after-school programs. We also were able to donate several bags of school and medical supplies to the Cruz Verde community. Throughout the week of service, our team was not only able to give back to the community through volunteer projects, but also had the opportunity to experience complete immersion in a new culture. Our team of 10 lived with host families, enjoyed authentic, home-cooked local cuisine, learned the art of making chocolate from the cacao bean, took a tour of historic Santo Domingo, and engaged with community members in relaxing, evening activities. Providing an opportunity for undergraduate students to enhance their learning at Carolina through volunteer service in other cultures is critical to broadening social, economic, and cultural perspectives. The augmentation of further international service trip offerings at the University is critical to continuing extracurricular education of this kind.

# Public Health & Health Sciences

## **Motivation and health behaviors associated with adoption of more Plant Based Diets (PBD) among college aged students**



**Sarah Ali**, Public Health - Senior

Mentor: Dr. Christine Blake, Health Promotion Education and Behavior

The USDA currently recommends a plant based diet (PBD) in which choices are varied to include many different vegetables and fruits. PBDs are not only high in vitamins, minerals, and fiber, but they also tend to be lower in saturated fats and overall calories. Many observational studies have shown that PBD's convey numerous health benefits. Many diets linked with these positive health outcomes are PBD's that do not necessarily omit all animal products, including the Dietary Approaches to Stop Hypertension (DASH). Some have suggested that adoption of other health behaviors in addition to PBDs may help explain some of the observational findings. The purpose of this study was to examine what motivates individuals to adopt a PBD, what other positive health behaviors tend to accompany adoption of PBD's, and the order of adoption of these different positive health behaviors. A survey was conducted with 50 University students who reported having adopted a more PBD. The survey assessed eating habits and other health behaviors using newly developed questions and tools from the National Cancer Institute (NCI) and the Behavioral Risk Factor Surveillance System (BRFSS). A combination of open-ended and closed-ended questions were included in the survey. Data were analyzed using chi-square and t-tests as appropriate. Findings from this study provide insights into diet and other health behaviors, changes made to these behaviors, order of health behavior change, and motivation for adopting more PBD's that are useful for development of future nutrition interventions.

## **Children, the promise of a future: A debilitating disease cured with an innovative approach**

**Natalie Brenders**, Exercise Science - Sophomore

Mentor: Dr. Juan Campos, Pharmaceutical and Biomedical Sciences

The disease achalasia is one of several subtypes of esophageal motility disorders. It is characterized by the absence of muscular contractions in the lower half of the esophagus and by failure of the valve at the bottom of the esophagus to open and let food into the stomach. There are two procedures that can fix achalasia by cutting the muscle around the esophagus. To perform the surgery traditionally, the surgeon makes large incisions for his hands and cuts the muscle manually. With Minimal Invasive Techniques the physician may use the Da Vinci machine, which makes small incisions for its mechanical arms that the surgeon can move freely inside of the patient. My project was to retrieve patient data from a database and then determine and record the width of the esophagus at the widest part as indicated on esophagograms. This was done to see if we could determine any complications from either procedure. We were able to see a correlation between a 100% lack of complications and faster recovery time when the procedure was done with the Da Vinci machine. Small children do not have the patience for a long recovery and shouldn't be confined to a hospital bed. This study will have a huge impact on the children diagnosed with achalasia. Because of our research, there is proof of the best way to perform the procedure to rectify the condition of achalasia

for good, and that is to use the new robotic assisted technique with the Da Vinci machine.

### **“The Gospel of Health on Wheels:” Commentary on an Early American Public Health Campaign**

**Christina Galardi**, Public Relations - Junior

Mentor: Dr. Mindi Spencer, Health Promotion Education and Behavior

Long before the Internet revolutionized the dissemination of information, public health officials struggled to provide knowledge about health practices and disease to the masses. The need was particularly great in Southern and rural locales, which often suffered from slow economic development and poor health outcomes. In 1910, Dr. Oscar Dowling of the Louisiana State Board of Health chose to create a traveling public health exhibit on a rail car to educate the state’s residents on crucial health topics of the time, including sanitation, nutrition, and infectious disease. A brief note about the campaign in one of the required texts for the South Carolina Honors College course “Southern Discomfort: Public Health in the American South” piqued my interest; through a further review of archived newspapers, books, and literature, I pieced together the story of this public health education journey as a supplementary research project for the class. One of the most important components of any public health campaign is making an effective appeal to the intended audience. While journalists and medical professionals of the time lauded the health train initiative, its influence on the target population may not have been as monumental as hoped, providing an important background for development of public health campaigns today.

### **Barriers to Healthy Eating and Obesity in Underserved Adolescents**

**Melissa Laitner**, Psychology - Senior

**Tyrell Singletary**, Public Health - Sophomore

Mentors: Dr. Dawn Wilson-King, Psychology

Ms. Hannah Lawman, Psychology

The increasing rate of childhood obesity is a major public health concern that has been widely publicized in the last decade. Rates of childhood obesity have more than tripled in the last three decades. While studies of obesity have become increasingly prevalent, little is known about obesity and nutrition in under-served youth today. This study includes overweight and low-income minority children ages 10-17, and will evaluate how their body mass index (BMI) is a function of barriers to healthy eating in their home environment. Participants were recruited in a cross-sectional study from a local community pediatrician’s office. Anthropomorphic measures (weight, height, waist circumference) were taken from 41 children and their guardians and used to calculate BMI. Information about barriers to healthy eating was taken from a psychosocial, self-reported parental survey, with questions based on Tom Baranowski’s three-point scale assessing the extent of barriers to healthy eating in the home. From preliminary analysis of the data, it appears that male adolescents have a higher average number of barriers to healthy eating than females, as do adolescents in the 14-17 age range (when compared with adolescents aged 10-13). However, the number of barriers to healthy eating does not seem to increase in relation with BMI in obese participants. The results from this study could help us to clarify and understand how nutrition and obesity are linked in under-served adolescent populations.

## **Resveratrol effect in Duchenne Muscular Dystrophy (DMD)**

**Patti Weed**, Exercise Science - Senior

Mentor: Dr. Matthew Kostek, Exercise Science

Duchenne muscular dystrophy (DMD) is an X-linked genetic disease characterized by progressive muscle degeneration and premature death. The progressive muscle loss of the disease is partly caused by the lack of a functional muscle protein, dystrophin. Chronic inflammation and accumulation of collagen in the muscle inhibits muscle repair in the disease. Research has shown that inflammatory factors involved in the IL-6 and TGF- $\beta$  pathway activates collagen formation and replacement of skeletal muscle by fibrotic tissue. Pharmaceutical drugs can help to decrease muscle inflammation, which allow for an increase in muscle repair. Yet, none are currently effective in treating DMD. Resveratrol is a naturally occurring, nonflavonoid polyphenolic compound found in grapes and red wine. Because of resveratrol's antioxidant and anti-inflammatory properties we hypothesize that it will protect skeletal muscle from damage and prevent muscle fibrosis. Therefore, this study examines the effects of resveratrol on fibrosis and the fibrotic pathway in a DMD mouse model (mdx). Twenty, 5-week old mdx mice were treated with resveratrol or placebo for 10 weeks. After finishing treatment, the mice were sacrificed and muscles removed and frozen. One frozen gastrocnemius muscle from each animal was transversely sectioned and stained to quantify resveratrol's effect on accumulation of collagen and muscle fibrosis. The second muscle was homogenized and qRT-PCR is being performed to examine the levels of IL-6 and TGF- $\beta$ . Completion of this study will identify the effectiveness of resveratrol in treating the characteristics of DMD to further develop effective treatment strategies for the disease.

# Science, Computing, & Engineering

## **Crystal Growth of Rare Earth-Containing Lithium and Gallium Oxides**

**Jacqueline Cantwell**, Chemistry - Junior

Mentor: Dr. Hans-Conrad zur Loye, Chemistry and Biochemistry

Research targeting phosphors for LED based light sources has intensified recently due to the LED's longer lifespan, greater energy efficiency, and lower environmental impact compared to other light sources. Studying the relationship between the structure and the properties of the crystals allows me to target novel compositions and to optimize their optical properties for these applications. My project focused on synthesizing novel lanthanide-containing metal oxides using the hydroxide method of single crystal growth. The molten hydroxide flux allows crystals to form at lower temperatures than traditional solid state methods which makes accessible some compositions which had not been prepared before. Lanthanide cations are ideal for this application because of their unique intra-4f optical transitions. Also, because lanthanum does not have intrinsic fluorescence, it can be effectively used as a host structure for doping with other lanthanides. Lithium oxides and gallium oxides were the primary focus of this study. I was able to grow crystals of  $\text{La}_4\text{Ga}_2\text{O}_9$ , which had only been previously made by powder, as well as  $\text{La}_3\text{GaO}_6$ , which is a novel composition. I was also able to dope these structures with optically active lanthanides and characterize their fluorescent properties. Additionally, I was able to grow crystals of  $\text{LiLnO}_2$  which had only previously been made by powder. The characterization of the crystal structure and optical properties has recently been accepted for publication in the Journal Solid State Sciences.

## **Application of Supramolecular Boronates Towards Selectively Sequestering and Detecting Benzene**

**Jennifer Link**, Chemistry - Senior

Mentor: Dr. John Lavigne, Chemistry and Biochemistry

This project focused on the use of boronate ester coordination materials for the sequestration and detection of small, aromatic molecules such as benzene. Benzene is a volatile and highly carcinogenic compound often associated with the petroleum industry, thus making its detection and adsorption of vital importance for safe working conditions. In the system reported here, coordination of boronate diesters produced bi-morphic material with a solvent-dependent structure. Synthesis in benzene yielded a polymeric structure, while synthesis in toluene yielded a macrocyclic structure. The polymer was found to retain benzene from its original synthesis and to repeatedly allow benzene removal and reloading without losing crystallinity. Furthermore, the polymer adsorption was selective for benzene over other benzene derivatives. This material can therefore be used for sequestration and storage of benzene from the environment. The macrocycle likewise retained toluene from its initial synthesis, although it did not exhibit toluene reloading capability. However, exposure of the macrocycle to benzene liquid or vapor caused a dramatic change in color and morphology, which was not observed with exposure to other benzene derivatives. The macrocycle therefore acts as an optical sensor specific for benzene. In this project, a system has been developed that demonstrates applications for both storage and detection of benzene.

## **Can Codon and Amino Acid usage be used to recognize Prophage genetic elements and horizontally transferred genes in Bacterial Genomes?**

**Yasser Shalabi**, Computer Engineering - Senior

Mentor: Dr. John Rose, Computer Science and Engineering

During the past two years I worked with Dr. John Rose on the development of an algorithm and application to predict foreign elements within genomes. I worked on developing a versatile application that would allow for fast and efficient gathering of statistical information from a genome. This application was critical in order to solve and verify our research question on whether the codon usage frequencies of genes can serve as an indicator of gene origin. Foreign elements in bacterial genomes can include pro-phage material that was rendered inert or laterally transferred bacterial genes from another bacterium. Historically these elements have been found using NCBI's BLAST (or variants). BLAST basically aligns genes of one genome with that of other genomes in order to find similarities. This method easily identifies foreign elements when the source is known. If the source is not known, it is then limited to cases where enough data exists to support a comparative genomics approach. We are interested in finding a set of amino acid and codon usage measures that when combined with clustering analysis, augmented by self-similarity scoring techniques, would successfully predict the foreign elements that BLAST comes up with without relying on direct string matching. The project is still underway, and the results look promising. If we are successful this could provide insight into how foreign elements within a bacterial genome contribute to its evolution and how Phage viruses work.

## **Determination of Electron--Neutrino Detection Efficiency in a 150,000 Ton Cherenkov Detector**

**Andrew Svenson**, Physics - Sophomore

Mentor: Dr. Sanjib Mishra, Physics and Astronomy

In order to support the efforts of the Long Baseline Neutrino Experiment (LBNE) collaboration, at Fermi National Accelerator Lab, a Monte Carlo simulation was run to determine the production efficiency of charged current, electron neutrinos in a Water Cherenkov detector. There is sizable evidence to suggest that this style detector would provide the most reliable result for LBNE – an endeavor that seeks to answer some of the most pressing questions in high energy physics.

## **Personal Automated Scheduling System (PASS)**

**Matthew Zimmermann**, Computer Engineering - Junior

**Breland Miley**, Computer Engineering - Junior

**Will Reade**, Computer Science - Junior

Mentor: Dr. Csilla Farkas, Computer Science and Engineering

Under the current system, students are required to attend advisement by their faculty mentor in order to choose classes before they select and schedule their classes by sorting through the master schedule. Finally, they must register through VIP at the earliest possibility to ensure seat availability. Seeing the inefficiency of this process motivated us to develop applications to automatically register for classes, check for openings in closed sections of classes that we wish to register in, and also to give graphical aid in selecting classes for each semester. The early stages of development brought up many questions and obstacles that motivated us to pursue a Magellan Scholarship to continue the research and development

process of what became the Personal Automated Scheduling System (PASS). The ultimate goal of the PASS project was to develop a web-based system to streamline the process of student enrollment and registration at the University of South Carolina. In the development of this system, our team has gained an understanding of the rigorous software engineering process, experience in the development of web-based applications, and perspective on the security and privacy needs of such applications. The final application allows students to receive an advised schedule of classes based on their school's curriculum and then cycle through the different options that they have for graphical schedules by using each possible sections of each class. The student can then be automatically registered for their selected classes if they are available at their given registration time. This system greatly simplifies and streamlines the current advisement and registration process and we hope to receive approval from the University for further testing and implementation.

# Science, Engineering, & the Environment

## **Determination of Microbial Diversity and Abundance in Turbidity Maxima using Pyrosequencing Techniques**

**Justin Brady**, Chemistry - Senior

Mentor: Dr. Richard Long, Biological Sciences

Estuarine Turbidity Maxima (ETM) have been shown to be areas of increased microbial abundance in tidal estuary systems. One such system is an artificial confluence of the Ashepoo and North Edisto rivers ("Fenwick Cut") in the ACE Basin National Estuarine Research Reserve. This study sets out to determine bacterial community composition and abundance in this ETM as compared to locations both upstream and downstream of the ETM. Water samples were taken 1 meter from the estuarine floor at depths ranging from 1.5-4 meters in 6 locations within the ETM. A sample was also taken from the surface of the ETM for comparison. Samples were subsequently collected from locations both up and downstream of the ETM in the same fashion. Samples were partitioned to isolate free-living or particle-attached bacterial communities. These samples will be subjected to genomic DNA extraction followed by Roche 454 pyrosequencing by Engencore to sequence the 16S rRNA gene which has been shown to be an effective fingerprinting gene. This data will be compared to NCBI databases (of 16SrRNA genes) bioinformatically to determine community diversity and relative abundance. This information will then be used to characterize the system as well as determine the abundance of potentially pathogenic bacteria and assess their role in the ETM environment.

## **Variation in Life History Patterns of the Eastern Newt (*Notophthalmus viridescens*)**

**Marvin Brown**, Biological Sciences - Freshman; USC Salkehatchie

Mentor: Dr. Eran Kilpatrick, Biological Sciences; USC Salkehatchie

The eastern newt (*Notophthalmus viridescens*) occurs across a broad geographic region of the eastern United States. Of the four recognized subspecies of *N. viridescens* that occur in the southeast, three of these occur in South Carolina. The red-spotted newt (*N. viridescens viridescens*) occurs throughout the Blue Ridge, Piedmont, and Sandhills physiographic regions. The central newt (*N. viridescens louisianensis*) occurs in the Coastal Plain east of the Santee River, and the broken-striped newt (*N. viridescens dorsalis*) occurs in the Coastal Plain west of the Santee River. Although paedomorphosis occurs in some populations, the typical life cycle includes progression through an aquatic larval, terrestrial eft, and aquatic adult stage. Variation in site occupancy exists across the major physiographic regions of South Carolina. Red-spotted newts in the Piedmont occur in long hydroperiod marshes associated with riparian zones, beaver ponds, and man-made impoundments. Mature aquatic adults of the red-spotted newt can remain in Piedmont wetlands for several years. In contrast, central and broken-striped newts of the Coastal Plain occur in seasonally flooded isolated wetland habitats. Both subspecies migrate to seasonal wetlands to breed during the winter when the wetlands fill and leave the wetlands during the warmer months when water temperature, dissolved oxygen, and water levels are no longer favorable. Additional predictors for central and broken-striped newts in the Coastal Plain include the absence of fish and heavy accumulations of leaf litter. Central and

broken-striped newts appear to follow a life history pattern used by other Coastal Plain pond breeding salamanders.

### **Assessment of Reptile and Amphibian Habitat Components at Red Bluff Lodge in Allendale County, South Carolina**

**Keith Browning**, Biological Sciences - Freshman; USC Salkehatchie

Mentor: Dr. Eran Kilpatrick, Biology; USC Salkehatchie

Reptile and amphibian (herpetofauna) habitat components were assessed at 10 locations at Red Bluff Lodge in Allendale County, South Carolina. Red Bluff Lodge is a 2,833 ha tract in the Savannah River watershed of the Inner Coastal Plain. Twenty 0.01 ha transects were used to sample plant community composition, down woody debris, and forest floor depth in bottomland hardwood forest, cypress pond, oxbow lake, stream, impoundment, and upland pine plantation habitats. A total of 176 vascular plant species occurred in survey transects. Graminoids and forbs constituted 47% of species, followed by trees and shrubs (36%), vines (12.5%), and ferns (4.5%). Species diversity was highest in the impoundment and cypress pond sites and lowest in bottomland hardwood and stream sites. Two rare species, *Epidendrum magnoliae* (green-fly orchid) and *Stillingia aquatica* (water toothleaf), were observed on the property outside of the survey transects. Variation in plant community composition across the study sites can be attributed to differences in land use history, soil type, and hydrologic patterns. The mosaic of alluvial and non-alluvial wetlands interspersed with upland forest provides a diversity of ecological habitats. These areas should continue to be managed in a way that maintains their structural, floral, and faunal diversity.

### **Engineering the Climate: Technology, Research, and Policy**

**Chase Dunn**, Mechanical Engineering - Senior

Mentor: Dr. Ann Johnson, History

Climate change has become a significant global concern in the 21st century. Models indicate serious threats to the planet's habitability if carbon emissions continue on their present trajectory. "Green" emissions-control technologies are one route explored to solve these problems, though solutions will be limited by availability and cost-effectiveness. Our options can be expanded by research and development motivated by environmental policies, market conditions, and scientists' and engineers' creativity. Yet new technologies will complicate national and international policy-making. The complex interactions between policy, technology, and research forms a three-body problem, where predicting the effects of any one element requires that certain assumptions be made about the others. A more nuanced understanding of this triad is needed. Climate science is inherently complex and focused on system interactions. The climate system is an intricate network of dynamic systems. There are several sources anthropogenic contribution to climate change including industry, automobiles, and other taxing human activities. Investigating one of these – namely vehicle emissions – and focusing on Automobile Emissions Control technologies in terms of the history of device development offers an excellent case study to demonstrate the interactions policy, technology, and research. The automobile itself is a system of systems and the output of those systems affects the complex global climate system. By taking a technical approach in detailing the history of Automobile Emissions Control



devices and describing what technologies were developed to address which emissions and how those changes propagate throughout the vehicle and on into the atmosphere, a more nuanced understanding of system interactions surfaces.

### **Adsorption of bisphenol A and 17 $\alpha$ -ethinyl estradiol on single walled carbon nanotubes from seawater and brackish water**

**Lesley Joseph**, Civil Engineering - Senior

Mentor: Dr. Yeomin Yoon, Civil and Environmental Engineering

Over 1 billion people are without clean drinking water, and approximately 2.3 billion people (40% of the world population) live in regions with water shortages (Service, 2006). Both desalination and water reuse using reverse osmosis (RO) have been successfully incorporated to provide additional fresh water production for communities using conventional water treatment and fresh water resources. One of the major problems for RO is membrane fouling associated with natural organic matter (NOM). In addition, emerging micropollutants including endocrine disrupting compounds (EDCs) have become a concern in wastewater reclamation. EDCs have recently emerged as a major issue that threatens to compromise drinking water quality all over the world. These micropollutants are mainly synthetic pharmaceuticals that are excreted from humans at low concentrations and discharged into the waterways and wastewater streams (Kolpin et al., 2002). Commonly researched EDCs in drinking water and wastewater treatment are bisphenol A (BPA) and 17 $\alpha$ -ethinyl estradiol (EE2). Carbon nanotubes (CNTs) have received a significant amount of attention from researchers in water treatment due to their adsorptive capabilities, and can potentially be utilized to remove EDCs from surface water and wastewater. The objective of this study is to investigate the adsorption of BPA and EE2 in seawater and brackish water by single walled carbon nanotubes (SWCNTs).

### **Solar Splash 2011 USC Solar Boat Team**

**Dylan Summer**, Mechanical Engineering - Senior

Mentor: Dr. Jeffery Morehouse, Mechanical Engineering

All mechanical engineering seniors are required to participate in a real-world engineering project. Our team members, Nathaniel Pelletier, Kevin Romito, Matt Shrubbs, and Dylan Summer, were each requested to be on and were assigned to the USC Solar Boat Team for the Solar Splash competition. This project culminates four years of engineering education into practical application in an industry-like team environment. We are required to completely design the boat ourselves which demanded knowledge beyond our schooling, and we therefore began learning on our own and seeking out experts for advice just as we would do in an industry design team position. We have been solely responsible for seeking out funding and sponsorships to purchase the equipment and components needed. We are required to build the design that we create and must fully understand how each system operates. Finally, we must run tests on this boat and fix any problems that may be necessary to address. This is a complete connection to the real work that is done in the engineering industry and is an excellent opportunity to learn about sustainable engineering practices. Our progress thus far has involved designing our motor configuration, recoating the boat used in previous years, mapping our electrical configurations, decided on propeller needs and sizes, and



the purchasing of equipment and materials necessary to finish building the boat. We have mapped out our time so the entire month of April will be for test driving.

# Sciences: Biomedical & Neuroscience

## **Separation of tumor cells with dielectrophoresis-based microfluidic chip**

**Mohammed Alshareef**, Biomedical Engineering - Junior

**Nicholas Metrakos**, Biomedical Engineering - Junior

Mentor: Dr. Guiren Wang, Mechanical Engineering

This project demonstrates the use of dielectrophoresis (DEP) lab-on-a-chip device in effectively separating cancerous epithelial cells. The objective of this study was to demonstrate the ability of DEP to distinguish human breast cancer (MCF-7) and colon cancer (HCT-116) cell lines from each other. The DEP responses for each cell type were measured against frequency changes in solutions with different conductivities (0.025X PBS, 0.05X PBS, and 0.1X PBS). It was determined that increasing the conductivity directly correlated with an increasing frequency for the first zero-cross (no DEP force) point. Both HCT-116 and MCF-7 cells were found to experience no DEP force at a frequency of 250.0 kHz in a 0.025X PBS solution. However, in the solution of 0.1X PBS, the zero-cross points of HCT-116 and MCF-7 were at 4.0 MHz and 10.0 MHz, respectively. This difference in the zero-cross point for different cells was leveraged to determine the frequency at which the two cells would experience significantly different DEP forces for separation. Using a microfluidic DEP sorter having optically transparent electrodes, MCF-7 and HCT-116 were successfully separated from each other under a 3.0 MHz frequency in a 0.1X PBS solution. Further experiments were conducted to establish the relationship between separation efficiency (enrichment factor), voltage, and flow rate. This work shows the high specificity DEP has in distinguishing cells with similar morphologies for potential diagnostic applications in circulating tumor cell (CTC) enrichment.

## **Kainate Receptor Subunit Physiology**

**Matthew Fisher**, Biological Sciences - Senior

Mentor: Dr. Janet Fisher, Pharmacology Physiology and Neuroscience

Most fast excitatory neurotransmission occurs through ionotropic glutamate receptors which include the kainate receptors. These receptors are tetramers comprised of 5 possible subunits: GluR5, GluR6, GluR7, KA1, and KA2. GluR5 subunits are found in multiple brain regions as modulators of excitatory neurotransmission. GluR5 subunits form homomers or can be paired with a KA subunit to form heteromers. The addition of a KA1 or KA2 subunit changes glutamate sensitivity and desensitization. To examine the functional contribution of the GluR5, KA1, and KA2 subunits, a glutamic acid738 residue located in the ligand binding domain of the GluR5 subunit was mutated to disrupt glutamate binding to the GluR5 subunit. We measured responses to glutamate using the patch clamp method of electrophysiology with transfected HEK-293T cells. We found that addition of either KA1 or KA2 to GluR5 increased glutamate sensitivity compared to homomeric GluR5. Mutation of GluR5 did not affect the activation of GluR5/KA2 receptors by glutamate but did reduce the sensitivity of GluR5/KA1 receptors. These data suggest that the KA2 subunit plays a driving role in channel opening but that the KA1 subunit may not share this characteristic.

## **Gold Nanospheres as Inhibitors of Amyloid-Beta Protein Aggregation Involved In Alzheimer's Disease**

**Mihyun Lim**, Biological Sciences - Junior

Mentors: Dr. Melissa Moss, Chemical Engineering

Dr. Deborah Soto-Ortega, Biomedical Engineering

Alzheimer's disease (AD) is a progressive neurodegenerative disorder that results in memory loss, unusual behavior, inability to reason, and, eventually, death. This devastating disease is thought to be caused by amyloid- $\beta$  protein (A $\beta$ ), which aggregates into  $\beta$ -sheet structure to form fibrils that deposit in the brain as insoluble plaques. Finding inhibitors that prevent or reduce A $\beta$  aggregation would be one therapeutic strategy for fighting this disease. Gold nanoparticles are ideal candidates for this therapeutic strategy. Nanoparticles are small enough for human cells to uptake but won't induce cell death. Nanoparticles can also cross the blood-brain barrier at low concentration and are utilized to deliver drugs to brain. We investigated the inhibitory capabilities of gold nanoparticles by performing monomer aggregation assays using gold nanospheres with three different coatings: citrate, polyacrylic acid (PAA), and poly (allylamine) hydrochloride (PAH). A $\beta$  monomer was incubated in the presence or absence of nanospheres and agitated to promote aggregation.  $\beta$ -sheet aggregates formed were monitored using thioflavin T, a fluorescent dye that binds the  $\beta$ -sheet structure of A $\beta$  aggregates but not monomer to yield an enhanced signal. Results demonstrate that gold nanospheres with a negative surface charge (citrate and PAA) have an inhibitory effect on aggregate formation. Further experiments showed that PAA-coated nanospheres can inhibit aggregation of 40  $\mu$ M A $\beta$  when present at a concentration as low as 0.02 nM. In addition, while 8-nm and 18-nm nanospheres inhibited A $\beta$  aggregation, 40-nm nanospheres could not, indicating that nanosphere size plays an important role in inhibition of aggregate formation.

## **The Cellular Response to DNA Damage: p53 Promoter Activity Following Treatment with UV Light**

**Britt Logothetis**, Chemistry - Senior

Mentor: Dr. David Reisman, Biological Sciences

One of the best characterized cell cycle control genes found to be mutated in over 60% of human skin cancers is p53 which participates in several stress response pathways including cell cycle arrest, apoptosis, DNA repair, and cellular senescence. p53 acts as a tumor suppressor, functioning as a sequence-specific transcription factor that regulates the expression of downstream genes required for the homeostatic pathways mentioned, ultimately preventing damaged DNA from further replication. When cells are exposed to a DNA damaging agent, such as UV radiation, wild-type p53 encodes DNA binding transcription factors which in turn stimulate either a G1-phase cell cycle checkpoint or programmed cell death. Upon mutation in the p53 gene, growth suppression as well as apoptotic functions are inactivated, resulting in higher cell proliferation rates and corresponding tumorigenic properties. In our lab we focus our work on several deletions of the promoter region of the p53 gene in murine fibroblasts in order to study the earliest cellular response to UV light. With the use of luciferase reporter assays, we hypothesize an increase in p53 promoter expression following UV light exposure. Moreover, it is our goal to find the specific region of the p53 promoter that acts as a UV-response element in p53 transcription. Although the key p53

response is post-transcriptional, knowledge of the promoter activity will certainly enhance our understanding of components of the p53 pathway that are susceptible to UV-induced mutations and thus the origin of human skin cancers.

### **Vascularization of Skeletal Muscle Myoblasts Grafts in Infarcted Hearts: Does It Happen?**

**Amartha Ogburu-Ogbonnaya**, African American Studies - Junior

Mentor: Dr. Charles Murry, Center for Cardiovascular Biology

Purpose: Myocardial infarctions occur during the occlusion of one or more blood vessels supplying the heart. This significantly decreases the supply of nutrients and oxygen to specific regions to the heart and results in necrosis of heart tissue. Injection of cells to repair or replace lost tissue may be one way to restore heart function. Our objective is to determine whether the host vasculature grows into grafts that have been injected into infarcted hearts by studying graft vascularization through histology. Methods: C2C12 skeletal myoblasts expressing nLacZ were injected into infarcted mouse hearts of C3H mice on day 0 (20,000 or 200,000 cells per heart). Mice were sacrificed 5 days or 4 weeks after the procedure. Hearts were removed, processed in 30% Sucrose, embedded in OCT medium, frozen, and sectioned. Sections were stained with H&E and #946;-Gal Assay. Immunostaining was performed for Embryonic Myosin (F1.652), Adult Myosin (MY32), and CD31. Results: H&E, #946;-Gal Assay, Embryonic and Adult Myosin Staining, and CD31 Staining were performed in identify graft cells and vasculature. H&E results for the seven of the 5-day mice showed evidence of graft presence, while all 4-wk slides were negative. nLac-Z expression was observed in 5-day mice sections through the #946;-gal Assay, providing evidence of graft presence. 4-week mice were again negative. Embryonic Myosin Staining results for 5-day mice showed positive staining; 4-week mice did not have embryonic-myosin positive grafts. Two 5-day mice displayed positive staining in the adult myosin staining; the rest displayed negative staining. 4-week mice displayed evidence of possible calcification within the sections. CD31 Staining was completed in order to visualize blood vessel formation through endothelial cell staining and showed that vessels were present in the grafts at 5 days. Conclusion: nLac-Z+ grafts were present in 5 day but not 4 week mice. This is likely because graft cells were rejected and killed by the 4 week time point. Grafts had vasculature ingrowth at 5 days, but a different study design will be necessary to determine the vascularization of grafts at later time points.

### **Means, Members, and Mid-Range**

**Anne Payne**, Biological Sciences - Sophomore

**Krystin Bourdua**, Exercise Science - Sophomore

Mentor: Dr. Melanie Palomares, Psychology

Limited attention capacities necessitate statistical summary representation – such as statistical averaging. While many have found that average size is accurately represented (e.g., Ariely, 2001), two topics remain unresolved: (1) How similar should the elements be in order to be averaged? (2) What computation mediates statistical averaging? Does accurate representation of average size involve the formal computation (i.e. (Item1+ Item 2+... Item n)/n) or some other informal heuristics? We investigated how sets represented. We presented squares or lines for 133 ms. We then presented two items, and asked participants to either identify

the average item (mean identification) or a member item (member identification). In Experiment 1, observers viewed lines ( $n=2,3,4,9$ ) that were uniformly vertical or randomly oriented. We found that ability to identify the mean was more accurate than ability for member-identification across all set sizes. We also found no effect of orientation variability on either task. In Experiment 2, we only presented 9 squares, and varied the ratio of large to small items in the set (8:1, 7:2, 6:3, and 5:4). We varied the choices and the ratio of the distribution in two condition: (1) The correct response was pitted against the midrange  $((\text{minimum}+\text{maximum})/2)$  or (2) the mean was always pitted against the member. In condition 1, we found that with increasing ratio, mean and member identification increased in accuracy. In condition 2, ratio had no effect. Together, our results show that the mean identification is superior to member identification and that a statistical summary representation is flexible yet imperfect.

# —Poster Presentations—

*Discovery Day 2011*

*A forum for student ingenuity*

# Arts & Humanities

## **The Chronological Significance of the Archaeological Site Khirbet Qeiyafa**

**Jacob Damm**, Classics - Senior

Mentor: Dr. Katja Vehlow, Religious Studies

The intent of this project is to contextualize the archaeological data from the site of Khirbet Qeiyafa by synthesizing it with current scholarship on the immensely controversial transition from the Iron I to Iron IIA in Israel. This transition is significant as it represents the change in Judea from a pastoral society to a strong centralized authority of the sort depicted in the biblical narratives of the Davidic period. The traditional date of 1000 BCE, known also as 'high chronology', would mean that the cultural potentialities of the Judean people would correlate closely with the biblical narrative. However, if the archaeological evidence at Khirbet Qeiyafa points towards the late date of 925-900 BCE (the so-called 'low chronologies'), then the narratives of the United Monarchy must be understood as highly mythologized. After spending two summers in the field at Qeiyafa, as well as after having closely examining the existing chronological theories, it seems that the most plausible dating systems are those that favor an earlier transition in the period of about 1000-980 BCE. The data from Khirbet Qeiyafa falls rather seamlessly into this time frame, whereas it proves rather problematic to the low chronologies. Consequently, once Qeiyafa is interpreted in light of high chronology, one can revisit the efficacy of biblical narratives in shedding light on archaeological interpretation. The ramifications of this understanding of chronological theory then are quite vast, as they lend credence to at least some sort of historical kernel in a text sacred to so many.

## **Traditional South Carolina Dishes: Local vs Conventional**

**Tyler French**, Baccalaureus Artium et Scientiae - Sophomore

Mentor: Prof. William Knapp, Hotel Restaurant and Tourism Management



Why eat locally? We hope to answer this question by comparing historic and contemporary preparations of three traditionally South Carolina dishes (Chicken Bog, cornbread and pickled okra) in order to examine the differing food systems involved in bringing the ingredients from the farm to the table. The traditionally prepared dishes allow a sensory understanding of South Carolina cuisine 150 years ago while the contemporary incarnations allow an examination of what we may have gained and lost over those 150 years. We will be attending two of the Healthy Carolina farmers markets on Greene Street to hand out samples of the dishes, one prepared with ingredients shipped from all over the country to the supermarket and the other prepared with ingredients grown and processed locally. Consumers will be asked to compare the two dishes and take a survey to measure their perceptions of local food and why they may favor one food distribution system over the other. Is it price? Convenience? Variety? By presenting consumers with traditional South Carolina dishes prepared with local, indigenous products we hope to demonstrate the importance of developing a shared set of culinary practices that begins and ends nearby. Choosing what to eat has consequences.

## **Eyes of Ethnology: A Visual Anthropology Study of the Bai Peoples of Shaxi, Yunnan, China**

**Chelsea Goldstein**, Anthropology - Senior

Mentor: Prof. Dawn Hunter, Art

I am curating a photographic exhibit supported by several months of field work in Yunnan, China. In this exhibit, I curate photographs taken by the local population of Shaxi, Yunnan, China in direct juxtaposition with photographs taken by the Shaxi Rehabilitation Project (SRP). The SRP is an international aid project focused on cultural heritage conservation and endogenous sustainable development between the Swiss Federal Institute of Technology (ETH) and the People's Government of Jianchuan County. The perspective of the local population converges with those of ETH and the local government to present a holistic and unique visual understanding of a changing rural village in twenty-first century China. The aesthetic duality of documentary photography and creative expression within these photographs presents a unique lens through which one is able to comprehend cross-cultural perspectives between China and the West in an increasingly modernizing global society, as well as visualize the implications of the interaction, or lack thereof, between a foreign international aid organization and the local, settled community. I cultivate this issue in *Eyes of Ethnology* by visually acknowledging the emblematic representations of the Bai people of Shaxi, as well as the peoples' interpretations of their own identities to create a cumulative, panoramic perspective of such cultural interactions.

## **CD of Transcriptions**

**Lauren Pierce**, Music, Performance - Senior

Mentor: Dr. Craig Butterfield, Music

My project was to transcribe music for the bass to add music to the repertoire. A transcription is a piece of music originally written for another instrument and then adapted for another. Not only was this project a goal to add to the slim amount of repertoire written for bass, but to take on another problem bass players have in their music, which is the difficulty level of music. Most of the standard repertoire for bass is not written by major composers. This leads to trite melodies, uninteresting harmonies, and a low level of difficulty because of the lack of understanding of what the instrument can do. By striving to play challenging music written for other instruments, I am aiming to raise the technique and musicianship of the average bass player. The way I went about this project was to record a CD of three original transcriptions – *Le Grand Tango* by Astor Piazzolla (originally for cello), *Zigeunerweisen* by Pablo Sarasate (originally for violin), and *Violin Sonata in A Major* by Cesar Franck. The reason I chose to record the music is because I believe hearing the music is more important than seeing it on paper. Anyone can simply write down the notes of a transcription without knowing it will work (which I have done and have not been successful!) but actually hearing someone play a piece of music that before may have been thought of as impossible on the bass is encouraging and inspiring for others to take on the challenge of learning that music.

## **Exploring the literary marketplace and zine culture in NYC**

**Olivia Reburn**, Comparative Literature - Senior

Mentor: Dr. Janette Hospital, English Language and Literatures

My research involved working as an intern in New York City at the Elaine Markson Literary Agency and independently creating and distributing a zine, which is independently created publication, made by hand, then mass-produced via photocopiers and distributed in a community. From these literary endeavors, I hoped to explore the creative processes of independent publication. An important part of this project was establishing good relationships with other people involved in both literary publication and independent zine culture. The creation of my own zine was a learning experience of self-discovery, as zines are an important form of expression, social consciousness, and creative exchange. Zines deserve academic credibility, as they are evidence of a culture of thought relatively unknown to the public. There is an entire underground world of zine creation and readership, and I think it was worthwhile to explore and become involved in it. I want to share my experiences with others who also want to be published as well as bring zines into an academic light. With the recommendation of Dr. Janette Turner Hospital, I secured an internship in New York City with the Elaine Markson Literary Agency. While working for Ms. Markson, I read and edited material and established professional contacts within the literary marketplace, as well as forming relationships with other zinesters and gathering materials for my own zine, which is a students' guide to living and working in New York City and DIY tips to getting published or self-published. On Discovery Day, I intend to pass out copies of my zine and raise awareness of do-it-yourself literature and community. I would like to expand upon the project, and continue making and distributing zines regularly to share my experiences with others who are interested in creative exchange.

## **Using Biofeedback to Reduce Tension in Musicians**

**Susan Riley**, Music, Performance - Senior

Mentor: Dr. Robert Jesselson, Music

Tension is a problem that every musician struggles with and is constantly striving to reduce. In our research we used a monitor placed on the ear lobe to measure heart rate variability and pulse both while playing cello and away from the cello. In this project we were able to reduce tension by using breathing exercises and watching the effects on a computer screen as shown in the heart rate and pulse.

## **Curating at the McKissick Museum: The Rise of Southern Pottery in the Twentieth Century and The Business of Shearwater Pottery in Ocean Springs, Mississippi**

**Kaitlin Smith**, Art History - Junior

Mentor: Dr. Lana Burgess, Art

After spending a semester in an independent study course doing research on Shearwater Pottery in Ocean Springs, Mississippi, to write an exhibition proposal and studying museum protocol at the McKissick Museum, I had the opportunity to extend my independent study another semester and actually curate my own show. The emphasis of my exhibition is twentieth century pottery from North Carolina and Mississippi. Working with some of the pottery that arrived with the special exhibition currently on display at the McKissick Museum featuring artist Walter Inglis Anderson, I was able to write and design a show featuring his pottery in

conjunction with pieces from the permanent collection at the museum. Being able to create an extension to the special exhibition allowed me to highlight pieces in the museum collection that are not on display otherwise, which gives the community the opportunity to view different objects and make connections between regional variations of pottery created during the same time period. The process of curating an exhibition involves a lot of independent research in order to write the text panels and object labels for the show. I also had to look through the permanent collection of pottery in the museum to choose the pieces that I wanted to put on display. Curating also involves design elements, such as the graphic layout for the text panels and the placement of objects in the display cases in order to achieve an aesthetically pleasing arrangement. The final step was the actual installation of the show.

**Rediscovering Lost Scholarship: R.D. Thornton, James Currie & Robert Burns  
Mark Taylor**, Biological Sciences - Sophomore

Mentor: Dr. Patrick Scott, English Language and Literatures

Upon his death, Robert Thornton's manuscript James Currie's Robert Burns passed into the custody of his widow, existing in only three copies. Robert Thornton was an internationally renowned Burns scholar, and after his death USC's Special Collections launched a project to publish the manuscript. To a pre-medical history major, a study of Dr. James Currie (1756-1805) and his historical milieu represents an ideal amalgamation. The project involves the processing of the manuscript and its publication as an open-source e-book. The Thornton project illustrates the changing media of academic literature, and contributes to USC's exemplary Scottish literature collection.

**Exploring Japanese Musical Traditions**

**Christian Traylor**, Music - Senior

Mentors: Dr. Youko Brooks, Languages Literatures and Cultures  
Prof. Sonia Jacobsen, Music

During the 2009-2010 academic year, I studied abroad at Kansai University in Osaka, Japan. Prior to this, I was a music composition major and had studied Japanese for a year. Being very interested in Japanese traditional music, I wanted to be able to better understand this music and integrate it into my own compositions. I met Ms. Lisa Kataoka, a world-renown koto performer, and I was fortunate to be able to study repertoire and performance techniques under her mentorship. I collaborated and discussed Japanese instruments and interpretation with a professional taiko drummer, and I also conversed with numerous Japanese composers and performers at various concerts throughout the country. In two separate concerts, I performed standard solo koto repertoire for large audiences. Upon my return to America, I composed, performed, and recorded a composition for koto, piano, violin, and cello, titled "Not Going Back". I am currently working on a composition for solo piano, as well as an electronic composition, using sounds and recordings from Japan. These works will also incorporate elements gained from my insight into Japanese music. Incorporating non-Western musical ideas and philosophies into my own music has allowed me to gain a greater perspective about music in general. These experiences have given me the ability and desire to explore even more diverse musical traditions, and they have also allowed me to better understand my role as a musician in the world.

## **Musicology in the Twenty-first Century—Assessing Ideologies in Contemporary American and European Art Music**

**Walid Yaghy**, Baccalaureus Artium et Scientiae - Senior

Mentor: Dr. Martin Donougho, Philosophy

Since the 1990s, conventional notions as to what is “proper” in the field of musicology have been undermined by an ideological shift termed “New Musicology,” which places more emphasis on criticism and situating music within its larger cultural context. This project has been an exploration of “New Musicology” through an active engagement of it. In recent scholarship, several European musicologists have pointed out that a certain mode of musical modernism is seemingly ignored by most American musicological research. I wanted to investigate this trend more deeply and come to an understanding of how and why it has come to be. In doing so, I wanted to highlight certain ideological assumptions that may be in place, so that it may better understand its own in the contemporary world. The method employed to carry out this task involved a survey of the literature by musicologists currently working on similar questions. Additionally, I gained valuable knowledge in attending the 2010 Darmstadt Summer Courses for New Music, which has important historical links to the assessment and development of musical modernism in the post-war world. I hope that, by giving voice to what I perceive to be lines of thought absent from the larger dialogue, the relationship between the academic study of culture and contemporary culture itself can be redefined so as to become more relevant.

# Biology & Biomedical Sciences I

## **Mechanisms of Intraplaque Angiogenesis in Atherosclerotic Plaque Rupture**

**Rahoul Ahuja**, Baccalaureus Artium et Scientiae - Sophomore

Mentor: Dr. Susan Lessner, Cell Biology and Anatomy

Atherosclerosis is a chronic inflammatory disease characterized by development of lipid-rich lesions, known as plaques, on the inner wall of major arteries.

Atherosclerotic plaque rupture is a leading cause of acute cardiovascular events such as heart attack and stroke. Evidence to date suggests that plaque rupture results from an adverse interaction between biomechanical and biological factors. Research in our lab focuses on understanding both these types of factors and their interplay, in order to develop improved methods to reduce the incidence of plaque rupture. Among one of the observed phenomena of plaque build up is the growth of blood vessels within the plaque: intraplaque angiogenesis. More specifically, the growth of blood vessels within plaque leads to plaque instability, which increases the odds of a stroke. Typically, intraplaque angiogenesis is more commonly seen in the carotid artery, or the artery connected to the brain. This research investigated the extent of intraplaque angiogenesis in apoE knockout mice in two different anatomic locations: thoracic and abdominal aortas. Research will also take into account the number of capillaries per plaque in the aortas at two time points of six and eight months. Because the plaque derives from lipids, the research uses a diet-induced atherosclerosis model that follows the Western diet (mostly fats). A special breed of mice, apoE knockout mice, were put on a diet consisting of 42% lipids, or a typical Western diet, for 8 to 9 months. Afterwards, their aortas were isolated and dissected. After sectioning the aorta in agarose gel, sectioning the samples, the samples were viewed under a confocal microscope. They were also previously injected with a fluorescent marker (when alive) to stain for the blood vessels and endothelial cells so that they would show up brightly on the confocal image. Over the course of this research project, more than 20 specimens were observed in order to investigate the extent of capillaries in the coronary model. No immediate blood vessels were found within the plaque, but this research project was able to make correlations between diet length and plaque size. It was also able to make correlations related to fluid models and the fluid dynamic model of an aorta. And by observing many of the physiological factors in rodents, we have been able to make conclusions based on what was seen in the images: that is, the percentage of lipids in a diet has an important influence on the growth of blood vessels in the coronary model.

## **Deleterious SNPs in Rb1 Gene**

**Eeshwar Chandrasekar**, Baccalaureus Artium et Scientiae - Sophomore

Mentors: Dr. Richard Showman, Biological Sciences

Ms. Hema Kasisomayajula, Biological Sciences

Retinoblastoma is the most common intra-ocular pediatric tumor, with a frequency between 1 in 13,500 to 1 in 20,000 live births, and can be either hereditary or sporadic. Hereditary retinoblastoma usually presents as bilateral retinoblastoma and shows multifocal tumors. Retinoblastoma is caused by mutations in the Rb1 gene. The Rb1 gene product, pRB, is a protein involved in negative regulation of the cell cycle. When a mutation is present in the gene, a dysfunctional protein may lose its restraint on the cell cycle. In hereditary

retinoblastoma, mutation in one allele of RB1 in the germline cells predisposes an individual to the risk of developing retinal cancer. The second deleterious loss of function mutation renders the protein product of RB1 dysfunctional which then causes retinoblastoma. Screening methodologies are used to detect the presence of mutation in the alleles as the gene has 27 exons and spans nearly 180 kb of the genomic DNA. The peripheral blood cells are heterozygous for the condition and can be used for heteroduplex analysis for screening mutations in the gene. Those exons showing aberrant band patterns on agarose gels after amplification were sequenced and mutations were detected. Mutation detection of the proband and the parents can be utilized for assessing the risk in other close relatives to develop retinoblastoma. The results indicate that in the patient case, a mutation was present in Exon 3 at basepair 268. Future clinical application of mutation analysis includes prenatal diagnostic testing to scan for mutations.

### **Estrogen Receptor- $\alpha$ ; and Epigenetics in Human Female Skeletal Muscle** *Laurie Graves*, Biological Sciences - Senior

Mentor: Dr. Matthew Kostek, Exercise Science

This research explored patterns of promoter methylation in the estrogen receptor- $\alpha$ ; (ER) gene in human female skeletal muscle. DNA promoter methylation, a type of epigenetic modification, plays a critical role in gene regulation, often resulting in decreased gene expression. Furthermore, it occurs at a higher frequency with increasing age. ER methylation was of interest to study in skeletal muscle because it could relate to muscle atrophy common with increasing age, since ER is expressed in human skeletal muscle and estrogen affects muscle loss with age. Additionally, it is important to understand ER methylation, as it is prominent in many types of cancers and vascular diseases in tissues throughout the body. ER methylation occurs with age in every tissue in which it has been studied, but until this point, it had not been examined in human skeletal muscle. The aims of this study were to (1) to examine differences in methylation status of the estrogen receptor promoter in skeletal muscle between young and elderly females and (2) to examine the influence of promoter methylation on gene expression of the estrogen receptor in human skeletal muscle. We hypothesize that the ER promoter will have greater methylation in the elderly female samples as compared to the young and furthermore the ER gene expression will be inversely related to ER methylation. Samples have been collected and analysis is currently in progress.

### **Identification of Novel Biomarkers of Mercury-Induced Immunotoxicity in Humans**

*Jonathan Motts*, Biological Sciences - Senior

Mentor: Dr. Jennifer Nyland, Pathology, Microbiology, and Immunology

Mercury (Hg) is a known toxicant showing both neurotoxicity and immunotoxicity. Properties of Hg which at least partly account for this toxicity include its high electro-positivity, and its affinity to react with sulfur, ammonia, amines, halide ions, phosphates, and cysteinyl and histidyl side chains. Previous studies have shown a correlation between high serum titers of certain autoantibodies (antinuclear autoantibodies, ANAs) and elemental Hg exposure from artisanal mining as well as to the consumption of methyl Hg contaminated fish. The goal of this research project was to identify possible novel serum biomarkers of Hg-

induced immunodysregulation. We analyzed archived human serum samples from miners working in Amazonian Brazil with Human Protein Microarray (ProtoArray). We mined these data for correlations between high Hg exposure and elevated autoantibody titers. Any statistically relevant antibodies were then analyzed using a pathway analysis program (Ingenuity Pathway Analysis). We focused on immune system pathways and molecules that showed a possible chemical affinity to Hg. Three new novel biomarkers were chosen for further evaluation: TNF receptor-associated protein 1 (TRAP 1), glutathione peroxidase 1 (GPX 1), and Wiskott-Aldrich syndrome-like (WASL). In future studies, these proteins will be expressed in a bacterial system and the full archived serum sample cohort tested for autoantibodies to these proteins with enzyme linked immunoabsorbent assay.

### **To Investigate if PKR Activation is Involved in Tunicamycin-induced Apoptosis in a Neuronal Cell Line.**

**Sarah Mushtaq**, Biological Sciences - Junior

Mentor: Dr. Rekha Patel, Biological Sciences

The goal of this project is to determine if PKR activation in response to tunicamycin plays an essential role in apoptosis of a neuronal cell line SK-N-SH. We generated a stably transformed SK-N-SH cell line that over-expresses a trans-dominant negative mutant of PKR (K296R). Mutation of the crucial lysine 296 involved in ATP-binding renders PKR inactive. Over-expression of K296R mutant inhibits the endogenous PKR activity. The stable SK-N-SH line that over-expresses K296 mutant is designated as K11. The control cell line that was stably transfected with empty vector is designated as V. The apoptosis in response to tunicamycin treatment was measured in V and K11 cells. In neuronal cells, Amyloid beta (Ab) peptide causes PKR activation, and activates unfolded protein response (UPR) to trigger the onset and progression of Alzheimer's disease, resulting in apoptotic cell death. Tunicamycin blocks protein glycosylation in the endoplasmic reticulum (ER) and induces UPR response by accumulation of improperly folded unglycosylated proteins in the ER. My previous research (SURF grant) showed that the V cells had a greater rate of apoptosis than the K-11 cells, thereby indicating that inhibition of PKR activity protects the cells from apoptosis. I am currently investigating the role of PKR activation, and caspase-4 activation in the V and K11 cells. By understanding the molecular processes attributed to Alzheimer's disease and its progression, it is possible for newer therapeutic treatments to treat this disease. Using further experiments I can determine if PKR and caspase-4 activation is involved in inducing apoptosis.

### **Role of Polyphenols in Inhibiting Amyloid- $\beta$ Induced Activation of Human Umbilical Vein Endothelial Cells (HUVECs)**

**Apoorva Srivastava**, Baccalaureus Artium et Scientiae - Senior

Mentor: Dr. Melissa Moss, Chemical Engineering

Deposition of amyloid plaques within the cerebrovasculature, consisting mostly of insoluble fibrillar amyloid- $\beta$  protein (fA $\beta$ ) aggregates, is a pathological feature in 82-98% of Alzheimer's disease (AD) brains. Polyphenols such as resveratrol, myricetin and quercetin, have been considered promising in disease modifying therapy for AD as they are capable of inhibiting formation of AD fA $\beta$  or disassociating preformed fA $\beta$ . In this study, we tested the effects of a new group of

polyphenols – apigenin, luteolin, 3',4'- dihydroxyflavone, and 5,7,3',4',5'-pentahydroxyflavone – on fA $\beta$  dissociation.

Thioflavin T (ThT) is a fluorescent dye that gives a characteristic fluorescence emission and excitation when attached solely to the cross  $\beta$ -sheet conformation of fA $\beta$ , as opposed to A $\beta$  monomers, dimmers, or oligomers. Therefore, the fluorescence changes were used to detect changes in A $\beta$  morphology upon the addition of polyphenols. A significant drop of ThT fluorescence, not consistent with the stable structure of fA $\beta$ , was observed in the presence of polyphenols. Further testing by our lab through circular dichromism (CD) and transmission electron microscope (TEM) imaging showed that fA $\beta$  was actually not disassociated by these polyphenols. These results suggest that polyphenols do not actually disassociate fA $\beta$ , but do bind them. This binding action of polyphenols may have implication in disrupting fA $\beta$  induced cellular damage in the AD brain.

### **Maximizing Embryonic Development in *Peromyscus maniculatus***

**Lauren Talley**, Biological Sciences - Junior

Mentor: Dr. Gabor Szalai, Biological Sciences

Research focused on oocyte and embryonic collection for the purpose of improved understanding of human reproductive physiology. *Peromyscus* females were superovulated through injections of several hormones that ultimately created a predetermined schedule of their reproductive cycles. The cells were cultured to the blastocyst stage, which is optimal for implantation in the uterus, and allowed for transfer of these embryos to pseudo-pregnant females. After a minimum of 24 hours, embryos were cultured to the blastocyst stage in micro-droplets of M16 medium that were placed in a mineral oil solution contained within a petri dish at specific conditions. Factors that influenced the viability and development included temperature, pH, and micro-drop volume in culture. Identifications of conditions that mimic the natural environment for which implantation of blastocysts in the uterus occur and the production of a pseudo-pregnant state in foster females represent our current research efforts.

### **Role of HOXA9 in NF-kB Dependent Cellular Inflammation**

**Daniel Weinberg**, Biological Sciences - Senior

Mentor: Dr. Chandrashekhar Patel, Cell Biology and Anatomy

For over thirty years, Nuclear Factor-kappa Beta (NF-kb) has been known to play a critical role in a variety of cellular inflammatory responses, particularly endothelial cell (EC) activation in the development of atheromas. Pro-inflammatory cytokines including tumor necrosis factor alpha (TNF $\alpha$ ), Interleukin-1 beta (IL1b), transforming growth factor beta (TGFb), and lipopolysaccharide (LPS) are primary activators of NF-kb. EC activation by TNF $\alpha$  has been shown to specifically induce NF-kb dependent transcription of endothelial leukocyte adhesion molecules ICAM-1, VCAM-1, and E-Selectin. These ELAMs are essential for vascular inflammation and atheroma formation. The classical NF-kb pathway, induced by TNF $\alpha$ , is characterized by the transient Ikb-dependent shuttling of NF-kb between the cytoplasm and nucleus. Signaling to NF-kb via Ikb and other upstream components is highly regulated. This lab has shown previously that downregulation of homeobox transcription factor HOXA9 is essential for TNF $\alpha$ -induced activation of EC, indicating that HOXA9 plays an inhibitory role in basal

maintenance of NF- $\kappa$ B. We have further seen that HOXA9-mediated inhibition of NF- $\kappa$ B dependent transcription occurs downstream of NF- $\kappa$ B nuclear translocation. Our data has also revealed that while HOXA9 overexpression inhibits transcription of ELAMs, it does not inhibit NF- $\kappa$ B dependent transcription of I $\kappa$ B in ECs or HEK 293T cells. These results indicate that HOXA9 acts to inhibit transcription of tissue-specific NF- $\kappa$ B target genes, but has no effect on ubiquitous NF- $\kappa$ B target genes. This suggests that HOXA9 does not inhibit NF- $\kappa$ B activation, but instead may inhibit NF- $\kappa$ B dependent expression of tissue specific genes.

# Biology & Biomedical Sciences II

## **Induction of apoptosis through HIV-1 tat-dependent expression of pro-apoptotic Bax**

**Angela Arthur**, Biological Sciences - Senior; USC Aiken

Mentor: Dr. William Jackson, Biology/Geology; USC Aiken

Therapeutic treatments have been developed to decrease HIV-1 replication and reduce the viral load, but these treatments cannot eliminate virally infected cells. In this project, we investigated induction of apoptosis as a way to eliminate HIV infected cells. Research has shown that apoptosis can be induced by the Bcl-2 associated X protein (Bax); therefore, over-expression of Bax should induce apoptosis in HIV infected cells. We hypothesized that the HIV transcriptional regulatory mechanisms could be used to induce over-expression of bax in infected cells. This mechanism requires the expression of a small viral regulatory protein, tat, to efficiently transcribe viral genes from the HIV-1 promoter, which consists of the U3, R, and U5 regions. The U3 region contains the viral enhancer/promoter while R contains TAR. Transcription of TAR forms a stem loop structure that is bound by the tat protein. This interaction is required to produce a productive viral infection. To utilize this regulatory mechanism, a heterologous expression cassette (pU3RBax), in which the HIV-1 U3R promoter controls Bax expression, was created. A positive control, pU3ReGFP, was created to confirm tat-dependent expression from the U3R promoter. Our studies have verified that our plasmid, pU3RBax, is able to induce apoptosis in 293T (human embryonic kidney) cells when co-transfected with pCMV-Tat. DAPI nuclear staining was used to visualize apoptotic nuclei of these cells using fluorescent microscopy. Currently, apoptotic assays including DNA laddering and nuclear staining are being used to detect apoptosis in Jurkat-tat cells (human T-cells) transfected with pU3RBax or pU3ReGFP.

## **Genetic analysis of the Peromyscus Hairless gene**

**Michelle Forehand**, Biological Sciences - Senior

Mentor: Dr. Gabor Szalai, Biological Sciences

Peromyscine species represent the most widespread mammals in North America. Within the species group a wide genetic variation exist, including metabolism, reproduction and fur characteristics. Two mutants of the collection of the Peromyscus Stock Center are hairless. Alopecia is a common disorder in humans. The gene "Hairless" or Hr has been shown to account for baldness in humans and a naked phenotype in mice. This study investigates whether the Peromyscus homolog of the Hr gene is responsible for the observed hairless phenotype in deer mice.

## **Inhibition of matrix metalloproteinase-7 (MMP-7) expression by interferon via transcriptional regulation**

**Christine Gennosa**, Biological Sciences - Junior

Mentor: Dr. Rekha Patel, Biological Sciences

It is known that the colorectal carcinoma cell line HT-29 expresses MMP-7 gene and that the MMP-7 expression is inhibited significantly by treatment of cells with interferon-beta. Interferon-beta is an anti-viral cytokine that also possesses anti-cancer and anti-proliferative activities. In order to understand the mechanism of

interferon mediated down-regulation of MMP-7 promoter, my research has worked to identify the regions within MMP-7 promoter that are required for the interferon's inhibitory actions using firefly luciferase reporter constructs. Once these sequence elements are identified, the factors that bind to them and bring about transcriptional repression can be studied further. By understanding the mechanism of this regulation, we will be better able to treat and prevent spreading of cancer. In addition, many transcriptional regulatory pathways have similarities at the mechanistic level, so by better understanding the regulation of MMP7 promoter we can further our knowledge of genetics and molecular biology as a whole. In future years, this will help in treating several diseases that manifest by enhanced cell migration due to overproduction of MMPs. Based on my previous research with the MMP-9 promoter, it is expected to see that IFN-beta inhibits transcription via the AP-1 binding site in the promoter.

### **Differentiation of West African Ethnic Groups Using Y-SNPs**

**Sidney Jarido**, Biological Sciences - Senior

Mentor: Dr. Bert Ely, Biological Sciences

Y-SNPs have been widely used in applications such as the establishment of paternity, but they have been particularly helpful in the study of human migration and evolution patterns. Because different ethnic groups have distinctive gene pools, studying the distribution of a particular Y-SNP may help to demystify the migration patterns of a particular group of interest. Previous studies have classified many of the ethnic groups of Africa as belonging to either the E1b1a\* or the E1b1a7\* subclade of the major African haplogroup, E1b1a. However, the use of only two subclades doesn't allow for much differentiation between ethnic groups. Three more SNP markers (E1b1a8\*, E1b1a8a\*, and E1b1a8a1\*) help in further differentiation of the E1b1a haplogroup into smaller subclades. In this study, we used a sample of 214 individuals from 5 West African countries (Benin, Equatorial Guinea, Ghana, Sierra Leone, and Cameroon). To determine which SNP was present in each sample, we used a combination of PCR (polymerase chain reaction) and restriction digest techniques. We found that certain subclades were more common in the samples taken along the coast of the Gulf of Guinea than the samples taken further inland in Cameroon or in Sierra Leone. The newly tested SNPs help to show population differentiation and can be used to provide better differentiation among West African ethnic groups.

### **Electrospinning Fibrous 3-D Scaffolds for Bone Regeneration**

**Ankur Kumar**, Chemical Engineering - Sophomore

Mentor: Dr. Esmail Jabbari, Chemical Engineering

The current treatment method for bones broken beyond the point of repair is prosthetics. Prosthetics, however, provide a limited range of motion and poor quality of life. Recent efforts have focused on using tissue engineered bone as treatment. Bone is a fibrous tissue uniformly distributed with cells; it contains peptide ligands that cells recognize with specificity. Tissue engineering scaffolds must mimic these characteristics. It was hypothesized that using a modified electrospinning assembly to generate a poly(lactic-co-glycolic acid) (PLGA) scaffold modified with an Arginine-Glycine-Aspartic acid (RGD) peptide sequence and hydroxyapatite crystals would create a successful scaffold for bone regeneration. Electrospinning is a process by which a polymer solution is pulled

into nanofibers by a strong electric field. By manipulating the electric field, the placement of PLGA nanofibers was controlled, thus allowing pore distribution to be dictated throughout the scaffold; controlled pore distribution is essential for uniform tissue development. Next, an RGD peptide sequence was attached to the nanofibers by dissolving it into the electrospinning solution; RGD peptide enhances cell attachment to the nanofibers. Next, the scaffolds were dipped into a simulated body fluid solution to allow hydroxyapatite crystal formation on the nanofibers; these crystals help simulate the setting of bone cells. The scaffolds were tested by seeding them with bone marrow stromal cells and analyzing cell attachment and morphology. Preliminary results show that PLGA scaffolds with controlled pore distribution can be created and the RGD peptide sequence can be attached to the scaffold.

### **Characterizing MAP Kinase Complexes in Tomato Plants**

**Sarah Pulliam**, Biological Sciences - Senior

Mentor: Dr. Johannes Stratmann, Biological Sciences

Plants have evolved a variety of responses to defend against and respond to stress. I studied the effects of stresses on plants to better understand the molecular processes underlying defense strategies. Ultimately, my long-term goal is to increase plant resistance to diseases and pests in crop plants; this will aid in the search for hardier, more adaptable crop plants with the goal of alleviating world hunger. The MAP kinase proteins are essential enzymes that are important for signaling during defense responses in plants. In order to elucidate the molecular mechanisms regulating MAPK signaling, protein was separated by size exclusion chromatography (gel filtration). I discovered that the MAPKs MPK3 and MPK6 are present as both a stable, high molecular weight MAPK-containing multi-protein complex and as monomeric low molecular weight proteins. Such a complex has not been identified before in plants, and constitutes a novel discovery. My next goal was to further characterize the complexes. I found that in plants treated with different forms of stress, the MAPKs did not shift between their complex and monomeric forms; however, active MAPKs were only found in their monomeric form. These discoveries are both novel and interesting, and this research contributes to our understanding of MAPK signaling in plants. Since MAPKs play a role in many stress responses as well as plant developmental processes, further research is being conducted to characterize this MAPK-containing complex. My data were also critical for a grant proposal, and will soon be published in a research journal.

### **Determining Optimal Cell Density and Oxygen Concentration for Encapsulated Tissue**

**Denise Sullivan**, Biomedical Engineering - Senior

Mentor: Dr. James Blanchette, Biomedical Engineering

Type I diabetes mellitus is an autoimmune disease affecting 1 million Americans that results in the destruction of the insulin producing cells located in the islets of Langerhans of the pancreas. Islet transplantation is one possible treatment for diabetes. It involves the removal of pancreatic islets from a donor and infusing them into the patient's liver. Some challenges to successfully transplanting islets include isolation and preservation of islets. Islet encapsulation provides a protective physical barrier that allows small molecules to diffuse into the tissue

and prevents larger molecules from entering. To determine the parameters required for successful islet transplantations, murine immortalized pancreatic  $\beta$ -cells (MIN-6) were used to model an encapsulation system in various conditions. Different concentrations of MIN-6 cells were encapsulated by a hydrogel material formed from polyethylene glycol (PEG). The MIN-6 cells were stimulated with glucose concentrations daily to test for insulin release. Encapsulated cells were placed either in a 1 or 20% incubator to test the effect of oxygen levels on viability. ELISA assays were performed to test insulin release and LIVE/DEAD assays were performed to test cell viability. Results showed that the ideal concentration for MIN-6 cells in the 20% oxygen incubator was between 200,000 and 400,000 cells per mL, allowing for maximum insulin release while minimizing cell death. The optimal density was less than 200,000 cells per mL in the 1% oxygen incubator. In the future, these results will be used to set parameters in order to better test the encapsulation of human islet encapsulation.

### **Effects of muscadine grape extract on intestinal inflammation in the ApcMin/+ mouse**

**Tara Tae**, Exercise Science - Senior

Mentor: Dr. Mark Davis, Exercise Science

Inflammation plays a necessary role in the development and progression of colon cancer. Muscadine grapes contain relatively high concentrations of many bioactive components with anti-inflammatory activity. Anti-carcinogenic activity of individual bioactive components of muscadine grapes has been researched, yet few studies have examined whole muscadine grape extracts. Purpose: The purpose of this study was to determine the effects of muscadine grape extract (MGE) on inflammation in a mouse model of intestinal tumorigenesis. Methods: Female ApcMin/+ mice were randomly assigned to placebo (P) or MGE (n=12/group) groups. Mice were given P or MGE (5%) diet from 11-18 weeks of age. This treatment was designed to determine the effects of MGE on inflammation in mice that already have polyp development (i.e. intervention). Tissues were collected at 18 wks of age and intestines were analyzed for polyp number and size in sections 1, 4 and 5 and for inflammatory cytokine mRNA expression and protein concentration in section 2. Results: MGE decreased mRNA expression of MCP-1, IL-1 $\beta$ , IL-6 and TNF- $\alpha$ ; in the mucosal tissue (P<0.05) but not in the polyp tissue. There was no effect of MGE on cytokine protein concentration in the mucosal tissue or polyps. As expected there was no effect of MGE on polyp number or size using this treatment regime; ApcMin/+ mice have already developed polyps by 11 wks of age. Conclusion: The data suggest that dietary MGE given as an intervention treatment (i.e. mice already have polyps) can reduce mRNA expression of inflammatory mediators in intestinal mucosal tissue.

# Chemistry

## **Analysis of caffeine in soft drinks using cleanup tips with UV/vis spectroscopy and GC/MS**

**Joshua Ferring**, Chemistry - Senior

Mentor: Dr. Stephen Morgan, Chemistry and Biochemistry

The purpose of this work was to develop a fast and efficient method for the extraction of caffeine from a variety of soft drinks for an undergraduate experiment in a chemistry laboratory as well as for quality control testing purposes. The extraction of caffeine from a low volume of a drink using Disposable Pipette Extraction (DPX) is described. DPX is a solid-phase extraction (SPE) device that uses loosely contained sorbent inside a pipette tip fitted with a screen. This device provides faster extraction times because conditioning steps are not required. In this study, the DPX used a sorbent containing weak anion exchange (DPX-WAX) mechanism for the removal of the matrix and retention of caffeine. The extractions were manually performed through a syringe attached to the DPX tip and caffeine extracts were analyzed using both UV-VIS spectroscopy and gas chromatography/mass spectrometry (GC/MS). In this study, method development involved finding appropriate solvents that are effective, safe, and inexpensive. It was found that commercially available rubbing alcohol (70% isopropyl alcohol) is the optimal solvent to elute caffeine from a panel of several soft drinks. Recoveries of caffeine were greater than 85% and RSDs less than 10%.

## **A New PBI Membrane for High Temperature Fuel Cells**

**Taylor Gaines**, Chemistry - Senior

Mentor: Dr. Brian C. Benicewicz, Chemistry and Biochemistry

Poly(5,2''-(2-[4-(1H-benzimidazole-2-yl) phenyl] 5',5''-bibenzimidazole) investigated as a proton exchange membrane used in high-temperature proton exchange membrane (PEM) fuel cells. High molecular weight polymer was synthesized via the Polyphosphoric Acid (PPA) process. The PPA served as a polycondensation agent as well as a polymerization solvent. The final polymerization solution was cast into films and the subsequent hydrolysis of the PPA to phosphoric acid (PA) induced a sol-to-gel transition and allowed for the direct doping of the polymer membranes. Membrane composition was determined by titrating the PA content in the final membranes and yielded doping levels as high as ~80 moles of PA per PBI polymer repeat unit. Thermal stability of the polymer was investigated by using differential scanning calorimetry and thermogravimetric analysis. The temperature dependence of the proton conductivity was measured and determined to be as high as 0.34 S cm<sup>-1</sup> at 180°C. Fuel cells were made and tested at 160°C which showed performance levels of 0.68 volts at 0.2 A/cm<sup>2</sup> with hydrogen and oxygen gases demonstrating that the new PBI chemistry has great potential for use in PEMFCs.

## **Synthesis of Renewable Biodegradable Polymers from Pine Trees**

**James Lee**, Chemistry - Senior

Mentor: Dr. Chuanbing Tang, Chemistry and Biochemistry

There is growing consensus that new polymeric materials derived from renewable natural resource would potentially and partially replace environmentally and energy unfavorable plastics derived from petroleum chemicals. In this project I



aim to develop a new class of renewable polymers derived from gum rosin. Gum rosin, an exudate from pine trees, are produced more than 1 million tons with relative low cost annually. The major components of gum rosin are resin acids which have characteristic large hydrophenanthrene ring structures, similar in rigidity to petroleum-based cycloaliphatic or aromatic compounds. Although rosin-derived polymers have a variety of applications, non-degradability of all-reported existing polymeric system limits their use as environmentally benign green plastics. In this project we combine rosin acids and polyesters to prepare the first fully degradable hydrophobic rosin-containing polymers. Specifically, we prepare rosin-substituted polycaprolactone (PCL) through a combination of ring-opening polymerization (ROP) and click chemistry. This novel strategy can allow low-cost raw rosin materials to be an integral part of degradable polymers.

### **Investigating the Activity of Au Nanoclusters on Titania as Model Catalytic Systems**

**Brian Molesky**, Chemistry - Senior

Mentor: Dr. Donna Chen, Chemistry and Biochemistry

According to reports in the literature, Au nanoclusters supported on titania have good activity as catalysts in oxidation reactions such as propylene epoxidation and CO oxidation, despite inactivity of bulk Au surfaces. Although the exact reasons behind this chemistry are not fully understood there is evidence in the literature that the Au-titania interface is the active site. In our experiments, Au clusters were deposited on single-crystal rutile TiO<sub>2</sub>(110), a surface well characterized in the literature and shown to be an interesting catalytic support. All experiments were conducted under ultra high vacuum conditions (P1.0E-10) to ensure control of surface composition and prevent contamination on the atomic level. In temperature programmed desorption (TPD) experiments, methanol was dosed onto a clean titania or Au-titania surface before subjecting the sample to a gradually increasing, linear temperature ramp, resulting in the desorption of gaseous products for detection by a quadrupole mass spectrometer.

Formaldehyde was found as the major product of methanol reaction on the Au nanocluster systems studied, although Au surfaces are known to be completely inactive. Results suggest that the most active surfaces are those with Au coverages that maximize the number of Au-titania interfacial sites, supporting the idea that reaction occurs at the Au-titania interface. TPD experiments involving deuterated methanol indicate that the role of titania is to initiate reaction by facilitating scission of the hydroxyl O-H bond, yielding a methoxy intermediate. TPD experiments involving methanol reaction on titania previously oxidized with 1802 show that lattice oxygen from titania participates in the reaction.

### **The Role of Solvent Acceptor Number in Methylene Violet Solvatochromism**

**Jessica Moore**, Chemistry - Senior; USC Aiken

Mentor: Dr. Monty Fetterolf, Chemistry; USC Aiken

The organic dye molecule methylene violet exhibits changing colors in response to the local environment established by different solvents. The color is quantitatively measured as the wavelength of light that is absorbed by the solution to the greatest extent. This wavelength,  $\lambda_{\text{max}}$ , has been observed to shift to higher or lower wavelengths for various solutions of methylene violet, depending on the solvent used. In particular,  $\lambda_{\text{max}}$  shows a linear relationship when plotted versus a

property of the solvent known as Solvent Acceptor Number, or SAN. SAN is a measure of Lewis Acidity, which is the ability of the solvent to act as an electron acceptor. Absorption data will be presented as it correlates to SAN for solutions of methylene violet in over thirty different solvents. Computational energy level data which correlates with the experimentally observed trend will also be presented. This work was made possible by a Magellan Scholar Grant.

## **2Grx-hBola1 and 2Gr-hBola3 in Iron homeostasis in cells**

**Payal Patel**, Public Health - Junior

Mentor: Dr. Caryn Outten, Chemistry and Biochemistry

In summer 2010, I worked in a biochemistry lab at the University of South Carolina, working on a project with Monothiol Glutaredoxins (Grx) and hBola proteins in Iron Homeostasis. Iron homeostasis is critical in cellular activity because it serves as a cofactor for many proteins. It is also very important because too much iron can be toxic to the cell, and too little can inhibit the critical metabolic processes for the cell to survive. In Dr. Outten's lab, the research focuses specifically what the mechanism is for how exactly iron homeostasis is regulated. I specifically worked with co-transformation and expression of the proteins: 2Grx and hBola1 and hBola3 into *E. coli*. The purpose of my portion of the project was to try to co-transform the hBola1 with the 2Grx proteins and also co-transform and express the hBola3 with the 2Grx proteins. The clusters that were formed with the hBola2 and 2Grx proteins showed significant influence on iron homeostasis in cells, and the hBola1 and hBola3 are similar proteins in human cells, thus their purpose in iron homeostasis needed to be studied as well. With this project, I learned many of the fundamental principles of laboratory research because I began this project with simply my hBola1 plasmid and my hBola3 plasmid. Both the hBola1 and the 2Grx and the hBola3 and the 2Grx were co-transformed and expressed. During the project, many different procedures were used such as DNA purification, PCR, DNA precipitation and extraction, transformations, and SDS-Page gels.

## **Automated analysis of anabolic steroids in human urine using cleanup tips and GC/MS**

**Eric Reichard**, Chemistry - Senior

Mentor: Dr. Stephen Morgan, Chemistry and Biochemistry

Doping control analyses of anabolic steroids are mainly carried out in urine because it usually contains relatively high concentrations of drugs and/or their metabolites. The extraction of steroids from a low volume of urine using Disposable Pipette Extraction (DPX) is described. DPX is a solid-phase extraction (SPE) device that uses loosely contained sorbent inside a pipette tip fitted with a screen. This device provides faster extraction times because conditioning steps are not required. In this study, the DPX used a sorbent containing weak anion exchange (DPX-WAX) mechanism for the removal of the matrix and retention of anabolic steroids. The extractions were performed completely automated using a dual rail GERSTEL MPS-2 instrument interfaced to an Agilent 6890 GC/MS instrument. The automation allows the analysis to be non-tedious and improves sample integrity by minimizing manual sample handling. In this study, analyses of a panel of 8 anabolic steroids (Boldenone, Methenolone, Androstenedione, Trenbolone, Methyl-testosterone, Oxandrolone, Bolastrinone, and Testosterone) in

human urine were shown using the cleanup tips. Recoveries were greater than 85% and RSDs less than 10%. My Magellan research extends across a wide range of analytical chemistry. My involvement with this research has prepared me for graduate school and I look forward to making an impact on the rapidly changing field of forensic chemistry. My research will bring me one step closer to my career goal of becoming a forensic chemist.

### **Study of intermolecular interactions using a molecular balance**

**Victoria Samples**, Chemistry - Senior

Mentor: Dr. Ken Shimizu, Chemistry and Biochemistry

The focus of this project was to design a small molecule to accurately measure and study the weak attractive non-covalent interactions between molecules. These attractive non-covalent interactions occur in proteins and drive their conformational change from a folded to an unfolded state. Isolating and measuring the non-covalent interaction that drives the folding/unfolding process of proteins is challenging. Our specific goal was to design small molecules which have the ability to form well defined arene-arene interactions, and to measure the strengths of these interactions for arene surfaces bearing different electron donating (-Me, -OMe) and withdrawing (-CO<sub>2</sub>Me, -CN, -NO<sub>2</sub>) groups. These 'molecular balances' are in equilibrium between a folded and unfolded conformation in which the arene-arene interactions are formed or broken. Thus, by measuring the folded/unfolded ratio by <sup>1</sup>H NMR the strength of the respective intramolecular arene-arene interactions can accurately be measured. Presented will be the synthesis of a series of molecular balances and Hammett plot analyses of the folding energies. The data show the electrostatic folding trends observed in our systems were due to attenuation of the arene-arene interaction. In addition, studies of these balances, in different solvents, revealed the previously observed solvent trends were due to differences in solvation of the polar groups and not the solvophobic interactions of the arene surfaces.

### **Incorporating Lithium in the NaTiO<sub>4</sub> Structure**

**Chavis Stackhouse**, Chemistry - Junior

Mentor: Dr. Hans-Conrad zur Loye, Chemistry and Biochemistry

Previously the zur Loye group has grown single crystals of the phase NaLnTiO<sub>4</sub> (Ln = La, Pr, Nd). The compound possesses a layered structure crystallizing in space group P4/nmm of the tetragonal system. The Ti atoms are six-coordinate with a distorted octahedral environment. The layers of TiO<sub>6</sub> pseudo-octahedra are separated alternately by double layers of Ln or Na atoms. Both the Ln and Na atoms are bonded to nine O atoms with a trigonal prismatic, square face tri-capped geometry. The goal of this research project is to synthesize rare-earth lithium titanium oxides that have either the same structure type as the sodium analog, or with an entirely new structure type. Single crystals will be grown from the rare-earth oxides and titanium oxide in a lithium hydroxide/potassium hydroxide (1:2) eutectic flux. Predetermined amounts of reagents will be weighed out and added to silver tubes that are then sealed and placed into a furnace. The temperature profile of the reaction is programmed into the furnace and upon completion, the tubes are removed and crystals are isolated by sonication in methanol or water and subsequent vacuum filtration. Currently, reactions are being performed to determine the ideal conditions that will allow for the lithium incorporation. Once

the desired products are isolated, the reaction conditions will be manipulated further to improve the quality of the single crystals. Single-crystal X-ray diffraction will be performed on the products to determine the structure.

### **Methodology Development for the Asymmetric Silylation of Secondary Alcohols**

*Jessica Taylor*, Biological Sciences - Junior

Mentors: Dr. Sheryl Wiskur, Chemistry and Biochemistry

Mr. Cody Sheppard, Chemistry and Biochemistry

Kinetic resolutions are effective ways to produce enantiomerically pure molecules that can be used in pharmaceutical applications. Previously, in Dr. Wiskur's lab, the development of a methodology for the silylation based kinetic resolution of secondary alcohols showed that the catalyst, (-)-tetramisole yielded the highest selectivity factor ever achieved for this system. In an attempt to optimize this methodology and further understand the mechanism of this reaction, various conditions were explored. Isothiourea derived catalysts were synthesized and screened to determine the structure activity relationship. The substrate scope was also expanded as well as various silyl sources containing electron-donating and electron-withdrawing functionalities. Here we present the results we've obtained thus far.

# Chemistry, Physics, & Math

## **Signal efficiency of the Water Cherenkov Detector**

**Tyler Alion**, Physics - Freshman

Mentor: Dr. Sanjib Mishra, Physics and Astronomy

There exist two possible detectors for the Long Baseline Neutrino Experiment (LBNE): Water Cherenkov and Liquid Argon. There exist two types of Water Cherenkov neutron detection events: 'signal' electron-neutrino events and 'background' muon-neutrino events. By using a computer simulation we determine an algorithmic method for scanning these detections and then apply that method to large samples of detected events. With that data we find the 'significance' of Water Cherenkov detections, defined as the efficiency of the signal events divided by the square root of the efficiency of the background events. The unprecedented sample size, which we analyzed, reveals that the factor between Liquid Argon significance and Water Cherenkov significance will be shown not to be '6', as currently accepted, but to be about '2.7', which will have great effect on LBNE's choice of detector.

## **ATLAS and the Search for Supersymmetry**

**Reginald Bain**, Physics - Junior

Mentor: Dr. Milind Purohit, Physics and Astronomy

Buried deep underground beneath beautiful Geneva, Switzerland lies the world's most powerful particle accelerator, the Large Hadron Collider (LHC). The LHC is currently humanity's most powerful tool for studying the most basic constituents of nature—elementary particles. One of the primary goals of the ATLAS project (A Toroidal LHC Apparatus) at the LHC at CERN Labs is the discovery of never-before-seen particles. I am working as a part of the ATLAS project to develop data analysis techniques that are more efficient at identifying and studying the signatures of a certain class of these new particles. Currently, my work deals with developing multivariate statistical analysis techniques and a kinematic based technique called ALPine to identify and study particles predicted by a theory called supersymmetry. The discovery of supersymmetric particles would be a monumental advancement in our knowledge of the universe and would help to explain the make-up of dark matter, constrain the mass of the Higgs boson (the carrier particle of mass), and bring physicists closer to developing a grand unified theory—a theory that would outline a single principle as being behind all physical laws. Multivariate statistical techniques are well-established methods of signal and background data separation and I have shown that they are significantly more powerful than the standard methods of separation used today. I have also been developing a separation technique called ALPine, which uses an idea in mathematics called "the curse of dimensionality" to separate signal and background particles based on correlations between supersymmetric particle masses.

## **Investigations of dye and fiber degradation resulting from environmental exposure by LC/MS**

**Molly Burnip**, Chemistry - Senior

Mentor: Dr. Stephen Morgan, Chemistry and Biochemistry

Textile fibers have become an important aspect of forensic science due to their abundance at crime scenes. However, fibers are rarely found in pristine condition.

The degradation of fibers and dyes can complicate the forensic comparison between questioned and known fiber samples, particularly if only one sample has been weathered. Although ultraviolet (UV)/visible and fluorescence microspectrophotometry allows direct and nondestructive analysis of a fiber of few mm in length, a more selective and sensitive technique such as liquid chromatography/mass spectrometry (LC-MS), is required to characterize diminutive amounts of dye (2-200 ng) present on forensically relevant analytes. Fabric samples of the most commonly used synthetic substrates (nylon, acrylic, polyester) were dyed with the most commonly used dyes (acidic, basic, and disperse), and submitted to an array of environmental conditions. Fabric samples were exposed to outdoor weathering (Arizona and Florida) and accelerated outdoor weathering (EMMA and EMMAQUA equivalent to 3, 6, 9 and 12-mos. in hot-dry and hot-wet environments). Textile samples were retired from exposure at predetermined time intervals of exposure, and analyzed with liquid chromatography-mass spectrometry (LC/MS) for degrading effects. The analysis of environmentally exposed samples by LC/MS allows investigators to examine the loss of dyes from textiles and the addition of extraneous contaminants from the environment, as well as to profile degradation products from both fibers and dyes. This wealth of information could contribute to the interpretation of environmental effects on fiber evidence and determination of their forensic relevance.

### **Synthesis of Cobaltocenium-Containing Polymers for Redox Applications**

**Deon Doxie**, Chemistry - Senior

Mentor: Dr. Chuanbing Tang, Chemistry and Biochemistry

Among metallocopolymers, metallocene-containing polymers have attracted significant attention since they have great potential in catalytic, optical, magnetic and biological applications due to their unique geometries and physicochemical properties of metallocenes. However, a largely missing part from current efforts is to develop side-chain cobaltocenium-containing polymers. Significantly different from widely studied non-ionic hydrophobic ferrocene (18-e)-containing polymers, isoelectronic-cobaltocenium (18-e) polymers are a class of cationic polyelectrolytes. Given the potential electrostatic interactions, high stability (both thermally and chemically), unique solubility (e.g. water soluble) coupled with high redox potentials of cobaltocenium cations, cobaltocenium-containing block copolymers are expected to exhibit intriguing properties. This class of organometallic polymers may find new applications in the areas of biosensors, anticancer drugs, and use as precursors for advanced materials. This project focused on the synthesis and characterization of polymers with cobaltocenium located in the middle of polymer chains. We tried to synthesize cobaltocenium derivatives from cobaltocenium acid via esterification, and obtained the cobaltocenium-containing initiators, which were used for atom transfer radical polymerization (ATRP). The polymerization of different type of monomers like tert-butyl acrylate (tBA) and styrene (St) initiated by these initiators was successful and confirmed from proton Nuclear Magnetic Resonance (HNMR) and Gel Permeation Chromatography (GPC) analyses. All polymers exhibited low polydispersity indexes and controlled molecular weight. The cobaltocenium-containing polymers showed reversible redox properties, which might be used as redox-based biosensors. Thermal properties of this type of polymers were also characterized.

## **Perpetual motion of magnetic moments in Spin-Transfer systems**

**Phillip Keck**, Physics - Senior

Mentor: Dr. Yaroslav Bazaliy, Physics and Astronomy

Spin-transfer torque is created by the change in the spin direction of the electrons when a current passes through a system of magnets with non-collinear magnetic moments. The change in the angular momentum (spin) of the electrons leads to a torque acting on the magnetization. We are solving the approximate version of the Landau-Lifshitz-Gilbert equation describing the magnetization dynamics of two free layers influencing each other through the spin torque. The goal of the study is to find and characterize the regime of perpetual motion of both moments. This dynamic regime can be achieved due to energy influx from the current driven by the external battery.

## **Thresholds for Permutation Patterns**

**Joshua King**, Mathematics - Senior

Mentor: Dr. Joshua Cooper, Mathematics

We address a conjecture of Noga Alon concerning permutation patterns. Let  $[n]$  denote the set  $\{1, \dots, n\}$ , and consider permutations as bijections from  $[n]$  to itself. The quantity  $n$  is then referred to as the "length" of the permutation. One says that a permutation  $\tau$  occurs "as a pattern" on a subset  $S$  of  $[n]$  in a permutation  $\sigma$  if, for each  $i$  and  $j$  in  $S$ ,  $\tau(i) < \tau(j)$  if and only if  $\sigma(i) < \sigma(j)$ . The conjecture states that, given an integer  $k$ , for permutations  $\sigma$  of length  $n$  chosen uniformly at random, the threshold for the event that  $\tau$  occurs in  $\sigma$  for every permutation  $\tau$  of length  $n$  is  $k^2/4$ . We provide a number of rigorous results through mathematical lemmas that get closer to resolving Alon's question, relating pattern packing density, thresholds for the appearance of patterns, and the relative prevalence of various patterns. We also provide several types of numerical evidence which help to illuminate the situation. This work is being done through a combination of computer programs and rigorous mathematical concepts. Apart from the reason of providing a conclusion to Alon's conjecture, this problem also has the potential to impact a number of real-world applications such as improving the reliability of network routing algorithms, or to functional magnetic resonance imaging (fMRI) studies. This is joint work with Dr. Joshua Cooper of USC Department of Mathematics.

## **Effects of a Confined Environment on Photochemical Reactions**

**Rohail Rashid Kazi**, Chemistry - Junior

Mentor: Dr. Linda Shimizu, Chemistry and Biochemistry

The properties of the products of chemical reactions can be altered by adjusting the reaction conditions. Examples of reaction conditions that can be adjusted include the reaction temperature, type of solvent used, dilution, and reaction environment. This project explored the effects of a confined environment on the properties of the products of specific photochemical reactions. By using specifically designed confined environments in which to run reactions, the level of selectivity of the product of that reaction can be increased. This has significant applications in industrial synthetic chemistry, because by increasing the yield of a particular target isomer, its production in large quantities becomes more efficient and less expensive. This project specifically employed the use of porous crystalline ring structures known as macrocycles. These macrocycles self-assemble to form

tube-like structures that serve as the confined environment in which to run photochemical reactions in. The photochemical reaction that was tested was the photodimerization [2+2] of thymine. The substrate was loaded into the macrocycle by soaking in suitable solvent. The loaded macrocycle was exposed to intense UV radiation in a photoreactor. The product was tested via H-NMR spectroscopy to determine selectivity. Preliminary results indicate that photodimerization of thymine shows greater product selectivity inside this confined macrocycle environment compared to the same reaction run unconfined.

### **Receiver Operator Characteristic Graphs for Validation of Forensic Decision-Making**

**Patrisha Shelley**, Chemistry - Senior

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

The lack of statistical reasoning and quantitative decision-making in forensic science, particularly in comparisons of trace evidence, has been cited recently by the National Academy of Sciences (1). To make an informed decision based on the data using decision theory concepts, concern rests with how choices are to be made under situations of uncertainty such that loss from erroneous decisions is reduced. The objective of our work is to evaluate the use of receiver operating characteristic (ROC) graphs for decision-making in forensic trace evidence examinations. ROC graphs have been commonly used in signal processing and in clinical medical decisions to describe test performance (2). We have used the ROC concept to assess reliability of trace fiber examinations based on infrared and UV/visible microspectroscopy. The most common forensic decision in such cases is whether or not a match exists between a questioned fiber (e.g., one found at a crime scene, but of unknown origin) and a known fiber (e.g., a comparison fiber taken from the crime scene or the environment of either the suspect or the victim). Several forensic examples will be shown that illustrate the value of ROC curves for interpreting and validating classification decisions for trace evidence data. 1. National Research Council of the National Academies. Strengthening Forensic Science in the United States: A Path Forward, The National Academies Press: Washington, DC, 2009, p. 163. 2. Zweig, M. H.; Campbell, G. (1993) "Receiver-operating characteristic (ROC) plots: A fundamental evaluation tool in Clinical medicine," Clin. Chem. 39(4) 561-577.

### **Coherent Rho-Meson (CohRho) Production In Neutrino Neutral-Current (NC) Interactions**

**Luis Suarez**, Physics - Sophomore

**Kayla Hasbrouck**, Physics - Freshman

Mentor: Dr. Sanjib Mishra, Physics and Astronomy

The universe is composed of matter particles (Fermions) and carrier particles (Bosons) that mediate forces between Fermions. The neutrino is the lightest, most abundant of matter particles. It is also the least understood, since it rarely interacts with matter. When it does interact, the end product is either (1) an outgoing charged lepton resulting from a charged-current (CC) process,  $\nu + N \rightarrow \mu^\pm + X$  (where  $X$  represents hadrons such as protons, neutrons, mesons, etc.), or (2) an outgoing neutrino resulting from a neutral-current (NC) process,  $\nu + N \rightarrow \nu + X$ . The coherent or diffractive production of mesons in neutrino-nucleus ( $\nu$ - $N$ ) interaction is a fascinating process: A high-energy neutrino impinges on a

stationary nucleus, and a single high-energy meson (typically the lightest pion,  $\pi$ ) emerges, collinear with the incident neutrino. The nucleus remains intact throughout this process (e.g.  $\nu+N\rightarrow\nu+\pi+N$ ). It is akin to shooting a melon with a very high-powered rifle, resulting in a berry (pion) popping out while the melon (nucleus) remains undisturbed! Such an interaction is an essentially quantum mechanical process. The neutrino production of coherent pions has been observed, although it is poorly understood. The most precise measurement of Coh  $\pi$  is by Mr. Chris Kullenberg, a USC graduate student in Prof. Sanjib Mishra's group. Our research project is a search for the coherent/diffractive  $\rho^0$ -meson production in NC-interaction,  $\nu+N\rightarrow\nu+\rho^0+N$ . This process is essentially that described above, where the pion has been replaced by the more massive  $\rho^0$  particle. There have been hints of charged  $\rho$  production in CC, but the neutral  $\rho^0$ -meson has not been observed in NC.

# Computer Science & Engineering

## **Making the Web More Open: Building An Accessible Future**

**Cory Bohon**, Computer Information Systems - Junior; USC Upstate

Mentors: Dr. Tina Herzberg, Special Education; USC Upstate

Dr. George Williams, Languages Literature and Composition; USC Upstate

This project has a central goal of designing an interface with the needs of users who are visually impaired at the center of decisions. In particular, plug-ins have been developed that work with the Omeka content management system developed by the Center for History and New Media at George Mason University as well as with WordPress, the commonly-used blogging platform. Both Omeka and WordPress are free, open-source tools, and anything developed will be made available to others under the same license. Users with visual impairment often access digital information through a variety of alternatives, not primarily using traditional visual cues presented from the standard graphical user interface. For example, many such users navigate information by listening to a synthesized voice reading textual material aloud to them. The software that generates such a voice is known as a "screen reader." To make navigation easier for these users, the "Access Keys" plug-in allows users to get from page to page and section to section by pressing an easy-to-remember combination of keys. Other users require text enlargement, and the "Text Zoom" plug-in changes the size of the text to suit their needs. Future work will refine these existing plug-ins and develop additional ones for users to customize such elements as color and contrast.

## **msACTIVE: an algorithm for active site identification that eliminates assumptions inherent in existing algorithms.**

**Parker Bush**, Computer Science - Senior

Mentor: Dr. Homayoun Valafar, Chemical Engineering

An enzyme contains an active site, which is a collection of atoms that interact with another molecule in the reaction. Current active site location algorithms predict the location of the active site by making assumptions of how the active site should look; however, not all active sites conform to these assumptions. msACTIVE aims to locate active sites without making these assumptions. First, we developed the msTALI algorithm to score multiple structure alignments. Since the atoms involved in an active site must be brought together into specific positions in space to activate, it is natural to assume that the active site atoms of several homologous enzymes will be among the most spatially conserved. We therefore created the msACTIVE program to calculate active sites based on scores from similar enzymes.

## **SMEE: A tool to extract sorting motif data from PubMed Central abstracts and full text documents**

**Lewis Cawthorne**, Computer Science - Senior

Mentor: Dr. Jianjun Hu, Computer Science and Engineering

Data from biological research experiments is being posted online at a phenomenal rate. Even in a fairly narrow topic, one can easily become overloaded trying to keep up with information relevant to a single researcher. An automated method for analyzing and presenting this data is the key to conducting efficient and fruitful research in any biological field. Before now, there has not been a freely available semi-automated protein sorting motif text mining solution. This poster describes a

work in progress to create a novel procedure for text mining protein sorting motif data from both full text documents and abstracts retrieved from PubMed Central. A full set of processing stages are currently implemented and early results are promising. We expect further work to yield a valuable tool to be made freely available for the community.

### **An Exploration of Privacy Tools on Social Networking Sites**

**Tierra Gooding**, Business Administration - Junior; USC Aiken

Mentors: Dr. Leanne McGrath, Business Administration

Dr. Ravi Narayanaswamy, Business Administration

Online social networking sites have a significant impact on how personal information is displayed and shared among individuals on the Web. User privacy has rapidly become a major concern on various social networking sites. This research project conducted an in-depth analysis of the privacy controls used by social networking sites. A rubric was developed to capture various privacy mechanisms available on social networking sites. Further, this study examined the degree of control available for each privacy tool and the ease of use for each privacy tool. Data was collected from 50 popular social networking websites. Both degree of control and ease of use were measured using a 7-point Likert scale. Preliminary results indicate that privacy tool availability is highest among the following sites: Facebook, meinVZ, BlackPlanet, LinkedIn, and MySpace. Across all sites, mostly available were privacy tools regarding personal information, such as gender, name, biography, interests. This research study extends the current body of knowledge by developing a specific rubric, which can be used by future research to assess online privacy. In addition, the ease of use and degree of control provides direct information to users about what to expect from service providers. From a user perspective, the results show where various social networking sites stand in comparison to others in the industry, which can have a major impact on the user's choice of social networking sites, depending upon the degree of privacy sought.

### **Using Smartphones to Monitor Wireless Network Health**

**Jason Isenhower**, Computer Science - Sophomore

Mentor: Dr. Srihari Nelakuditi, Chemical Engineering

Wireless networks are expected to be accessible at all times and all locations. However, there are a number of environmental factors that can interfere with the network, reducing or eliminating its usability. Some of these factors include thick walls, movement, and weather. This project sought to monitor all external conditions possible using the sensors available on the phone. A program was written to periodically collect data about the phone's location, battery state, signal strength (both cellular and wifi), and readings from the accelerometer, magnetic field, orientation, light, and proximity sensors to see if any patterns could be detected. The data from the sensors were analyzed to detect patterns that could relate the sensor readings to signal strength. In addition, a map of signal strength to location was created. This project is ongoing and will continue to seek patterns as phones are released with additional sensors such as gyroscopes and barometers.

## **Decision Support Model for Generating Clinical Knowledge of Patient Diagnosed with Chronic Diseases**

**Brett Michaud**, Mathematics - Junior; USC Upstate

Mentor: Dr. Wei Zhong, Mathematics & Computer Science; USC Upstate

Chronic diseases are among the leading causes of disability and death in the United States. This project focuses on the five most prevalent chronic diseases:

hypertension, heart disease, diabetes, cancer and stroke. Despite dramatic improvements in therapies and treatments, the rate of chronic diseases has risen dramatically. The rising rate of chronic diseases is a crucial but frequently ignored contributor to rising medical expenditures. Costs of treating chronic diseases increase disproportionately for Medicaid and Medicare programs. Researchers often construct data mining models from small and localized datasets in order to study the escalating costs in health care. Interesting patterns and knowledge generated by the data mining model developed from such localized data sets are used by the individual health care system to analyze costs and to apply cost reduction methods. We will be analyzing the Healthcare Cost and Utilization Project (HCUP-3) databases to build a decision support model for generating clinical knowledge of patients diagnosed with chronic diseases. We use Support Vector Machines (SVMs) as our prediction module and the clinical knowledge generator. For example, the prediction module and clinical knowledge generator may generate certain interesting knowledge such as African American females with type-2 diabetes have shorter lengths of stay but are charged more than other ethnic and gender groups. After applying our model, researchers will be able to analyze specific costs as well as the length of stay for the general population. This data will also allow researchers to study specific groups of the general population.

## **A Dynamic 3-D Indoor Radio Propagation Model**

**Robert Player**, Biological Sciences - Senior; USC Beaufort

Mentor: Dr. Yiming Ji, Computer Science; USC Beaufort

The proliferation of indoor sensor infrastructure has created a new niche for communications technology to exploit, yet research in this field has not produced a pervasive dynamic indoor location system which utilizes this latent resource. Studies reviewing and modifying previously developed systems employing active RFID tags, sensor-assisted WiFi, or a combination of the two have produced only slightly improved variations of the existing mechanisms whose effectiveness is not directly compared within the context of a single model. Therefore, we established a realistic 3D radio propagation model to accurately approximate signal strengths at various locations within a desired indoor environment. These field measurements, in two different buildings, and estimated measurements employing both WiFi and RFID tags were respectively collected and juxtaposed. We found that: a) WiFi radio transmits a larger range and is much more stable than RFID, consequently an indoor wireless application using this WiFi technique would require less sensor devices and deployment efforts, b) compared to regular dry wall, floor partitions significantly attenuate radio signals between neighboring floors, thus making RFID ineffective, if not impossible, for multi-floor 3D applications, c) radio signal attenuation from multiple wall partitions is not linear, and therefore there exists no simple wall/distance-signal strength relationship in an indoor environment, d) with a 3D ray tracing technique, this research effectively estimates signal strength values at an error rate of around 5% ~ 10%, with slightly better performance

estimating WiFi signals. As a result we believe this research holds real potential for indoor wireless applications.

# Engineering

## **Hydrolysis of Sodium Borohydride at Elevated Pressure**

**Christopher Boyd**, Chemical Engineering - Senior

Mentor: Dr. Michael Matthews, Chemical Engineering

Sodium borohydride ( $\text{NaBH}_4$ ) reacts with water vapor to produce hydrogen gas in the following reaction:  $\text{NaBH}_4 + (2+x)\text{H}_2\text{O} \rightarrow \text{NaBO}_2 \cdot x\text{H}_2\text{O} + 4\text{H}_2$ . The coefficient  $x$  represents the water of hydration, or water trapped (and therefore unavailable for reaction) in the crystalline structure of the solid byproduct, sodium metaborate ( $\text{NaBO}_2$ ). The efficiency of the system therefore, decreases as the coefficient  $x$  increases. This research project tests the hypothesis that the efficiency of hydrogen production can be increased by conducting hydrolysis with water vapor at pressures above one standard atmosphere and temperatures above  $150^\circ\text{C}$ . The reaction is conducted in a sealed bomb reactor with powdered sodium borohydride and liquid water. As the system is heated, the evaporated steam contacts the sodium borohydride. The reactor pressure increases because of evolution of the hydrogen gas and the evaporation of liquid water. The measured reactor pressure is compared against a theoretical calculation of expected pressure to determine the extent of reaction. The hydration state of the metaborate and the extent of reaction are further confirmed by XRD and B-NMR analysis. Although the pressures alone cannot determine the extent of reaction, other analyses indicate high conversions of sodium borohydride with decreased values for  $x$  under the right conditions. The increased efficiency of the system means that less water, and therefore less weight, may be required for complete reaction.

## **Novel Anode Material for Solid Oxide Fuel Cells**

**Dustin Bunt**, Mechanical Engineering - Senior

Mentor: Dr. Frank Chen, Mechanical Engineering

The goal of this research was to investigate various anode materials which possess properties that enhance any type of SOFC. The objective was to compare previous anode materials researched and current anode materials being researched to implement new possible material compositions that improve fuel cell performance. Fuel cells offer the possibility of zero-emissions electricity generation and increased energy security. The development of a new anode material, that eliminates current anode flaws, can increase SOFC performance and energy production resulting in drastically increasing the use of fuel cells as an alternate source of energy in everyday life. The research was conducted by first synthesizing (creating) the material to be tested. This material was then prepared for numerous tests, such as testing for single phase and testing the conductivity of the material. The results were then analyzed and adjustments were made if needed. Through many synthesizing processes and tests, it was found that the anode material SFM can possibly be an improved fuel cell anode material by decreasing the Strontium by a factor of 0.1 or by decreasing the Iron by a factor of 0.1.

## **Identifying Human Falls Using Structural Vibrations**

**Benjamin Davis**, Civil Engineering - Sophomore

Mentor: Dr. Juan Caicedo, Civil and Environmental Engineering

One of the leading causes of death, accounting for more than 50% of all injury-

related deaths of the elderly, is quite simply – a fall. Thus strides in the field of fall detection have been made producing products such as Life Alert, where a person pushes a pendant when they fall. However, this is not an ideal solution as it relies on the patient's ability to press the pendant in each instance. A detection system should ideally monitor the environment (patient does not wear devices) while maintaining low cost and low maintenance. This poster discusses a potential solution by monitoring the acceleration of the floor of a residence or hospital room and measuring the acceleration's characteristics. Using algorithms designed to differentiate between structural vibrations by relating the vibrations to the amount of force delivered upon impact, a fall can be reliably detected. The impact data can then be used to determine the location of the event and aid medical professions in treatment. This research is currently being performed by a group of researchers at Palmetto Health and the University of South Carolina.

### **Synthesis and Characterization of Functional Self Assembled Nanoparticles**

**Richard Doe**, Biomedical Engineering - Junior

Mentor: Dr. Esmail Jabbari, Biomedical Engineering

Nanoparticles (NPs) are being used heavily for tumor drug delivery. Because of their size, protection of the encapsulated species, and biodegradability they have proven to be extremely beneficial to the medical world. The objective of this work was to synthesize a nanoparticle that uses a peptide within its structure to reduce particle size distribution and enhance NPs properties. To achieve this, a polymer was conjugated to a peptide sequence that is known for self-assembly in an aqueous solution. Surface chemistry, size distribution and mass loss showed that the peptide conjugated, that nanoparticle size was effectively reduced, and that degradation properties varied according to composition. The results of this work showed that our nanoparticles could be used for bone tissue regeneration, tumor delivery, and nanoscale applications.

### **Improving Dangerous Horizontal Roadway Curves: Recommendations for Superelevation Design on Steep Vertical Grades**

**Jack McFadden**, Civil Engineering - Senior

Mentor: Dr. Nathan Huynh, Civil and Environmental Engineering

Every day, millions of people use roads for travel. A significant amount of travel happens on highways or interstates. On large volume roadways such as interstates, where speeds are high, problems can occur at locations where there are sharp horizontal curves on steep grades. Common examples of this include: interchange ramp movements, curves on mountainous roadways, etc. At locations such as these the various factors of incline, pavement slope, and friction fully tax the driver's ability to control the vehicle. A Federal Highway Administration document states "In a typical year, more than one-quarter of all fatal highway crashes in the United States — 10,427 in 2007, for example — occur on curves" The goal of this project is to develop design recommendations for superelevation on sharp horizontal curves in steep grades. As superelevation is added, the cross slope angle at which a vehicle travels increases. There is currently a lack of tangible criteria when it comes to the use of superelevation on horizontal curves with steep downgrades/upgrades and my aim to help fill that gap by obtaining quantitative evidence from analytical methods and simulations. After careful consideration of many software packages, the FHWA's Interactive Highway Safety Design Model was selected as

the most appropriate tool to use. The IHSDM is a free software suite that allows users to evaluate safety, geometric design and operations on highways based on user input. Specifically this software is helpful because it predicts crash rates on highways. This project bases better design on steep horizontal curves by lowering the crash rate (crashes per million vehicle miles). Results of the experiment were achieved, but further research is strongly recommended.

### **Single Cell Fuel Cell Testing Device**

**Kevin Romito**, Mechanical Engineering - Senior

Mentor: Dr. Kevin Huang, Mechanical Engineering

I am designing a novel single cell testing device primarily to replace the current testing device used for testing fuel cells. An initial prototype has been designed and will be fabricate. Variations to the initial designs exhaust system will be designed in order to improve efficiency of testing device. ProE will be used to model the designs; Comsol Multi Physics Software will be used to determine the most efficient design.

### **Modeling and Estimation of an Experimental Pressure Tank System**

**John Thompson**, Chemical Engineering - Senior

Mentor: Dr. Ed Gatzke, Chemical Engineering

The first objective of this research is to apply principles of process modeling to a lab scale pressure tank system. Actual pressure data is taken while varying control valve positions over several hours. Certain parameters that are not measurable are estimated using numerical optimization techniques. These include valve coefficient values and the power dependence of the governing mass balance equations. The development of accurate models is useful in many engineering purposes, especially in understanding process control. A second objective is to use a statistical method called Kalman Filtering to estimate the effects of unknown interruptions called fault diagnosis.

### **Chalcogenide Semiconductors for Radiation Detectors**

**Justin Williams**, Electrical Engineering - Junior

Mentor: Dr. Krishna Mandal, Electrical Engineering

The layered anisotropic chalcogenide semiconductors GaSe and GaTe single crystals have been grown by a modified vertical Bridgman technique using high purity Ga (7N) and zone refined (ZR) precursor materials (Se and Te). The grown crystals are harvested from ingots of up to 10 cm length and up to 1" diameter and have been characterized by measuring resistivity through current-voltage (I-V) characteristics and bulk carrier concentration and mobility through Hall effect measurements. Scanning electron microscopy, etching characteristics, and contact resistivity studies have also been performed to further characterize the grown crystals. Radiation detectors have been fabricated and characterized for hand-held X-ray and gamma ray detection for Homeland security, medical imaging, and nuclear power plant applications.

# Environmental Sciences I

## Bioavailability of P Across an Oxidic/Anoxic Boundary

**Melissa Bennett**, Marine Science - Senior

Mentor: Dr. Claudia Benitez-Nelson, Earth and Oceans Sciences

Phosphorus (P) was measured within sinking particles in the Cariaco Basin, Venezuela, a region that contains both oxygenated and anoxic waters. Samples were collected using sediment traps at 5 depths (150-1200m) from 2005 to 2006 and analyzed using SEDEX, a sequential extraction method that separates various P phases by chemical reactivity. Results indicate that while total P decreases significantly with depth, not all P phases were present in equal amounts, nor did they decrease at the same rate, if at all. Organic P dominated the P pool ( $20.81 \pm 1.12 \mu\text{moles P g}^{-1}$ ) followed by oxide associated ( $17.37 \pm 3.04 \mu\text{moles P g}^{-1}$ ), loosely-bound ( $9.54 \pm 0.3 \mu\text{moles P g}^{-1}$ ), authigenic ( $2.92 \pm 1.68 \mu\text{moles P g}^{-1}$ ), and detrital P ( $0.72 \pm 0.04 \mu\text{moles P g}^{-1}$ ). While organic and authigenic P phases decreased rapidly only in the oxic waters, loosely bound and oxide associated P decreased throughout the water column. Detrital P remained relatively constant with depth, consistent with its hypothesized low reactivity. These results suggest that P composition is critical to understanding the magnitude of P recycling in the water column with depth and under both oxic and anoxic conditions.

## Mapping Physiological and Metabolic Responses to changes in Environmental Conditions

**Daniel Brown**, Biological Sciences - Junior

Mentor: Dr. Jeff Dudycha, Biological Sciences



One of the model organisms for studying genomics and evolutionary changes is a small water crustacean called Daphnia. Daphnia are the dominant herbivore in many lakes and ponds and it is important to understand how changes to that environment would affect them. Numerous studies have looked at the effect of different environments and genotypes on growth rate, but very few have been extended to include metabolic rate. I wanted to extend our knowledge of Daphnia to relating growth and metabolism. To accomplish this I tested the sensitivity of two different genotypes to changes in food concentration, measuring both growth rate and respiration rate. This allowed me to test the hypothesis that there should be a positive correlation between metabolism and growth, but that the correlation may not be the same in all genotypes. Measuring the respiration rate gives a direct measurement of metabolic rate. I used two genetically different clones of Daphnia magna. I grew the Daphnia for four days under four different food concentrations of 5,000 cells/ml, 10,000 cells/ml, 15,000 cells/ml, and 20,000 cells/ml. After the growth period, Daphnia were collected and I measured oxygen consumption of each individual specimen using a microrespirometer. The Daphnia were then weighed to determine growth rate. The genotypes had different slopes for growth rate, showing that they have different sensitivity to food level, as predicted. Also, there is a positive correlation between respiration and growth rates, showing that accelerated growth is linked to higher metabolism.

## **Methods for measuring the effects of weather and climate change on body temperatures of a climate sensitive predator-prey pair**



**Rachel Herrin**, Biological Sciences - Senior

Mentor: Dr. Brian Helmuth, Biological Sciences

For my Magellan Research Grant, I worked in the Helmuth lab, whose overarching goal is to develop biophysical models that help to predict how biodiversity will change in marine environments as a result of the changes in global climate. More specifically, the Helmuth lab focuses on the relationship between the seastar predator *Pisaster ochraceus* and its prey, the mussel, *Mytilus californianus*, in the rocky intertidal zone. During my time in the lab, I collected data from *Pisaster ochraceus* in the field and ran laboratory trials testing a sea star model developed by the Helmuth lab. At a field site in central Oregon, I deployed commercially available dataloggers (tidbits) embedded within sea star models in different tidal heights to compare these temperatures against the temperatures of actual sea stars in those corresponding areas. In the lab, I used these sponge models to mimic the body temperature changes in *Pisaster ochraceus* in three different conditions—constant wind and heat, intervals of changing wind and heat, and pseudo-natural conditions. I found that in the constant conditions, there was not a significant difference between the live sea stars and the sensors when the wind was at medium speed. Under fluctuating conditions, the high wind setting was the only one to produce no significant difference. Only one out of the three pseudo-natural conditions produced data with significant differences. These results suggest that while the physical model being tested mimicked real animals under some conditions, it still requires further testing and improvement before it can be used to measure temperature patterns in the field.

## **Phylogenetic Relationships of an Imperiled Undescribed Species of Madtom (Genus *Noturus*)**

**Alexandra Hooks**, Marine Science - Senior

Mentor: Dr. Joseph Quattro, Biological Sciences

The genus *Noturus* contains 28 described species of endemic North American catfishes and at least eight putative species that have yet to be described formally. All are small, stream-dwelling species referred to colloquially as ‘madtoms’. The ‘broadtail’ madtom is one such undescribed species that occurs in coastal river drainages in North and South Carolina (Cape Fear, Pee Dee, Edisto rivers). Despite not having been formally described, the broadtail madtom is considered a ‘species of concern’ by the federal government, a ‘species of special concern’ in North Carolina and considered ‘critically imperiled’ in South Carolina. The distribution and abundance of broadtail madtoms is of concern since, despite repeated attempts, specimens have not been sampled in the Edisto River and in portions of the Pee Dee River (Lake Waccamaw) in recent years. The purpose of this study is to further understand the phylogenetic relationships of this undescribed species of madtom across disparate river drainages. Specifically, we use phylogenetic analyses on multiple unlinked loci to test the monophyletic status of broadtail madtoms across drainages. This designation is a key component of comprehensive species recovery plans.

## **Implementing a Plan for an Edible Orchard at the Green Quad through Sustainable and Permaculture Practices**

**Austin McNeilly**, International Business - Senior

**Brandon Truett**, English - Senior

Mentor: Dr. David Whiteman, Political Science



Recent population growth is due, in part, by advances in technology including food production methods. Often these advances involve the use of nitrogen-based fertilizers, which cause detrimental impacts on the environment. Addressing these impediments to sustainability, this research project sought to determine the feasibility of an edible fruit garden in an urban area using strictly permaculture practices. Permaculture utilizes natural methods of modifying the soil; this includes physical aeration and improvement of the nutrient content. The ultimate goal was to create a system that was completely self-sustaining, food yielding, and requiring little maintenance. Overall, permaculture methods have incredible potential in yielding a food supply bereft of harmful byproducts of popular farming techniques. We conducted this project on a plot of land composed of poor quality fill dirt with very small amounts of essential nutrients. We improved the soil through organic and permaculture methods and planting fruit trees. In order to test the soil, we sampled the soil already present, soil within the perimeter of the garden, and soil around the trees. A lab analyzed these samples for organic matter content as well as several vital nutrients. The results showed that soil quality was indeed improved, and our hypothesis was feasible. However, we concluded that the initial, excessively poor quality of the soil as poor played a larger role than anticipated, and the soil improvement techniques needed more time to function than anticipated. Hence, the trees required much greater care to survive, and a number of trees died.

## **Using MAP Kinase Activity to Determine Responsiveness to Herbivore-Derived Elicitors in the Solanaceae Family**

**Azka Nazir**, Biological Sciences - Senior

Mentor: Dr. Johannes Stratmann, Biological Sciences

Plant herbivores hamper the growth of plants as they feed on them. As a consequence, plants have evolved defense mechanisms to protect themselves. Insect saliva contains active components that activate defense proteins in the host plant. Fatty acid-amino acid conjugates (FACs) have been identified as one of the active components in the insect saliva. FACs have been shown to be active in egg plant, but inactive in tomato plants (Schmelz et al., 2009). The Solanaceae family includes plants like tomato, egg plant, bell peppers, tobacco and potato. We wanted to broaden this analysis and test whether tomato was the exception or the rule, within the Solanaceae. I tested whether plants of the Solanaceae family are sensitive to three different FACs by using the activation of mitogen-activated protein kinases (MAPKs) as a diagnostic tool. Different species of Solanaceae family were grown under controlled conditions, and FACs were applied to artificially generated wound sites. Our results indicated that the application of FACs activated MAPKs in some plants like eggplant (*Solanum melongena*), bell pepper (*Capsicum annuum*), petunia (*Petunia x hybrida grandiflora*), and the close tobacco relative *Nicotiana benthamiana*, but they were inactive in tomato (*Solanum lycopersicum*), and tobacco (*Nicotiana tabacum*). This experiment

suggested that sensitivity to FACs seems to be independent of evolutionary relationships among the tested plants.

### **Phylogenetic analysis of bacterial isolates utilizing sucralose as sole carbon source**



**Kennerly (Clint) Patrick**, Biological Sciences - Senior

Mentor: Dr. Richard Long, Biological Sciences

With the widespread commercial use of sucralose (Splenda®) as a substitute for sugar, the potential influence on the aquatic ecosystem requires investigation. Over 90% of sucralose consumed, a chlorinated disaccharide synthesized from sucrose, is released unchanged into wastewater. We tested the hypothesis that specific bacterial species can be identified and exploited as efficient catalysts for biodegradation of sucralose into non-toxic metabolites to overcome accumulation of the sweetener. While any toxic implications of sucralose have not been specifically established, chlorinated compounds frequently carry environmental risks. Bacteria have now been identified which utilize sucralose as a sole carbon source. These bacterial isolates have been collected off the beaches of Sullivan Island and Isle of Palms, SC and have demonstrated the capacity to metabolize sucralose. This project is aimed at phylogenetically identifying 11 bacterial isolates by targeting the 16S ribosomal gene for DNA sequencing. DNA sequences of each bacteria are compared to sequences from the community NCBI database. In view of the unknown effects of sucralose on aquatic ecosystems, this investigation offers important fundamental insight into long-term consequences of ever-increasing concentrations of sucralose in the water supply and the role of microorganisms to clear the environment of this halogenated industrial sweetener.

### **The Genetic Structure's Link to the Differential Expression of Hemomucin in *Daphnia pulex* and *Daphnia pulex***

**Madeline St. Julien**, Biological Sciences - Senior

Mentor: Dr. Jeffrey Dudyca, Biological Sciences

Hemomucin is an immune system protein found in the guts and other areas of arthropods and it also contains an evolutionarily conserved protein sequence for strictosidine synthase. This gene was found to be highly expressed in *Daphnia pulex* in comparison to *Daphnia pulex* through a microarray experiment. The expression level differences can be an indication of altered gene sequence which could explain a mechanism in ecological divergence. This study is to determine whether the difference in expression between *Daphnia pulex* and *Daphnia pulex* is linked to variation in the structure of the hemomucin gene. This study was designed to answer the following questions: Is the probe from the microarray that is highly expressed in *Daphnia pulex* structurally different than that of *Daphnia pulex*? What other aspects of this gene make *Daphnia pulex* structurally different from *Daphnia pulex*? To answer these questions, I am amplifying five specific DNA fragments of this gene, including a fragment containing the probe, to determine their size and sequence. This study enhances our understanding of the evolution of hemomucin that may be associated with ecological divergence and genetic structure. Future studies will quantify expression levels of this protein's mRNA in both species to determine how structural variation leads to expression variation.

# Environmental Sciences II

## **The Role of Nectar Inhabiting Yeast in the Floral Scent of *Silene Caroliniana* Plants**

**Jonathan Freeman**, Pharmacy - Sophomore; USC Lancaster

Mentors: Dr. Annette Golonka, Biology; USC Lancaster

Dr. Bettie Obi-Johnson, Chemistry; USC Lancaster

In insect-pollinated plants such as *Silene caroliniana*, a plant native to South Carolina, floral nectar is known to contain a variety of microorganisms including yeast. The impact of these organisms on floral scent and their contribution to pollinator attraction has not been well studied. The objectives of this project are to determine the volatile organic compounds generated by cultured yeasts present in the nectar of *S. caroliniana* plants, to determine the volatile organic compounds present in the nectar of *S. caroliniana* plants, and to evaluate the combined results to assess the overall impact of yeast on floral scent in this plant species. To evaluate the volatile organic compound profiles, a solid phase micro-extraction and gas chromatography-mass spectrometry (SPME GC-MS) method was developed which would allow these compounds to be separately detected and identified. Techniques for growing the cultured yeast samples in pseudonectar solutions were developed and optimized. Headspace SPME GC-MS analysis of *Metschnikowia* and *Candida* species grown in pseudonectar commonly produced the following volatile compounds: ethanol, 2-methyl-2-propanol, 2-ethoxy-2-methylpropane, 2-methyl-1-butanol, and 3-methyl-1-butanol. All of these compounds have detectable scents that potentially impact nectar scent. Evaluation of nectar samples from *S. caroliniana* plants is ongoing. The results of this study will provide a valuable contribution to our overall understanding of the impact of nectar-inhabiting yeasts on plant-pollinator dynamics.

## **Effects of Crude Oil Concentrations on Estuary Phytoplankton Community Structure and Function**

**Kailen Gilde**, Marine Science - Junior

Mentor: Dr. James Pinckney, Biological Sciences



Crude oil is known to have widespread impacts on marine systems, but its specific effects are often not well understood. Among these effects is crude oil's impact on phytoplankton community composition and overall productivity. Because of the importance of phytoplankton production to marine systems, the impacts of spill events cannot be fully understood without taking into account how the phytoplankton are affected. In order to address this question, bioassays were conducted at Clambank in North Inlet, SC, to expose natural estuary phytoplankton communities to crude oil. Oil from the BP Deepwater Horizon oil spill was used to study the probable effects of that event, along with unweathered crude oil as a comparison. Phytoplankton were exposed to oil concentrations of 10, 50, and 100  $\mu\text{L/L}$  in order to investigate whether oil concentration played a role in its toxicity. Subsamples of the bioassays were then analyzed using HPLC technology to determine chlorophyll a concentrations (a proxy for primary productivity) and accessory pigment concentrations (which can give an estimate of community composition). Preliminary results available at the time of this writing indicated that chlorophyll a concentrations significantly decreased when crude oil was present.

## **Cumberland Island National Seashore: Turtle Patrol**

**Victoria Jumper**, Marine Science - Senior

Mentor: Dr. Gwen Geidel, Marine Science

During the Fall of 2010, I applied and was accepted for a resource management internship position through the Student Conservation Association with the National Park Service located on Cumberland Island National Seashore, a barrier island off the coast of Georgia. As a Marine Science major, I was most excited to obtain this position because it provided me with the opportunity to work with the hundreds of Loggerhead sea turtles that make their nests and lay eggs on the island's beach each summer. The nested egg incubation period often extends into late fall, and during my time on the island, I was able to assist in gathering data and observing the nests of this protected marine species. I was entrusted with responsibilities which included monitoring the nests for predation and hatching success, as well as collecting data for [seaturtle.org](http://seaturtle.org), the Sea Turtle Stranding Network, and Georgia DNR. I also worked closely with the park's Wildlife Biologist regarding other animal life in the different environments, including a designated Wilderness Area containing a Maritime Forest. I gained a great deal of experience with the politics involved in natural resources, especially related to which type of resource is given priority when natural is pitted against historical, as well as new insights into a specific field of biological science and the hands-on approach to this field in which I intend to establish my career.



## **Undergraduate Driven Research at the Belle W. Baruch Institute for Marine & Coastal Sciences**

**Kyra Marsigliano**, Marine Science - Sophomore

**Emma Kelley**, Marine Science - Sophomore

*\*Representatives of Students Engaged in Aquatic Sciences (SEAS)*

Mentors: Dr. Claudia Benitez-Nelson, Earth and Oceans Sciences

Dr. Tammi Richardson, Biological Sciences

SEAS (Students Engaged in Aquatic Sciences) is a student organization associated with the Marine Science Program. As a group, we conduct research four times a year at the Belle W. Baruch Institute for Marine & Coastal Sciences, located near Georgetown, S.C. The purpose of these trips is to introduce students interested in Marine Science to research in different aquatic environments, such as marshes, beaches, and an estuary ecosystem. Experiments are designed to help undergraduate students learn field techniques and gain knowledge about how to conduct scientific experiments in various environments. This past year SEAS conducted: 1) a seining exercise to learn about the different species of fish present at that time of the year and about how different mesh sizes will catch different types of organisms, 2) a parasite survey of native snail populations in order to understand the health of the marsh system, 3) a study of the different types of zooplankton caught with a 153 micron mesh and a 365 micron mesh in both a marsh and open ocean environment to study the differences between the two habitats and differences between the two mesh sizes, and 4) a marsh clean up as a community service project. An overview of each of these projects will be presented, along with information about how to join SEAS and participate in undergraduate driven research.



## **Examination of local vs. systemic stress response in a simple animal, *Pisaster orchaceus*.**



**Katelyn Meade**, Biological Sciences - Junior

Mentors: Dr. Brian Helmuth, Biological Sciences

Dr. Sean Place, Biological Sciences

As the effects of global climate change (GCC) increase across the world, ecosystems on the coastline are believed to be one of the most vulnerable and are expected to show the earliest effects of GCC. In order to gain insight into the potential response of coastal ecosystems, it is vital to understand the tolerance of key organisms inhabiting these regions. Our study investigates the thermal response of the sea star *Pisaster orchaceus*, an important species of the rocky intertidal because it plays a dominant role as a keystone predator. Previous studies have shown that *P. orchaceus* live very close to their thermal tolerance limits, suggesting any small change in temperature could have significant implications for their populations. When environmental temperatures peak, an organism may experience thermal stress, resulting in the production of heat shock proteins (Hsps), a common cellular response within intertidal organisms. This response can vary in both magnitude and timing depending on the species and the duration of stress they are subjected to. Like many intertidal organisms, *P. orchaceus* is able to alter their cellular properties, including the production of heat shock protein (Hsps), in order to cope with short-term changes in temperature. However, little is known about the temporal nature of this response. Since sea stars are often considered a simple animal with respect to biological organization, we hypothesize that *P. orchaceus* will be unable to integrate the cellular response and Hsps synthesis will be localized instead of throughout the organism.

## **Physiological consequences of parasite infection in the burrowing mud shrimp *Upogebia pugettensis***

**Michele Repetto**, Marine Science - Senior

Mentor: Dr. Blaine Griffen, Biological Sciences

Despite the widespread abundance of parasites across a variety of ecological systems, our mechanistic understanding of parasite-host interactions is far less developed than that of other important interactions such as predation and competition. The negative effects of invasive parasites on hosts can be severe and evidence shows that the incidence of these biological invaders is generally increasing. The newly-described bopyrid isopod parasite, *Orthione griffenis*, was recently found plaguing populations of the thalassinid burrowing mud shrimp *Upogebia pugettensis*, an important ecosystem engineer in bays and estuaries throughout the Pacific Northwest. Concurrent with the arrival of this new parasite, populations of the shrimp host have declined throughout its range, and evidence suggests that interactions with the parasite are a likely cause. In order to further our understanding of the interaction between *U. pugettensis* and *O. griffenis*, we tested three possible predictions. First, we tested the prediction that infection increases with the volume of water pumped through the burrow, which should itself be positively correlated with shrimp size and inversely correlated with tidal height. Second, we tested the prediction that parasite infection negatively affects host energetic state. Third, we tested the prediction that parasites feminize male shrimp hosts, thereby eliminating reproduction in the host, and that the incidence of feminization increases with parasite size. Our results support the hypotheses

that infection increases with the volume of water processed by shrimp and that parasites negatively influence host energetic state. However, we found no evidence of feminization of hosts.

### **The Endeavor of Establishing the First Crustacean Cell Line**

**Charles Schumpert**, Biological Sciences - Senior

Mentors: Dr. Jeff Dudycha, Biological Sciences

Dr. Rekha Patel, Biological Sciences

Established cell lines are an intricate and extremely useful tool used in molecular biology. Not only do these cells allow researchers to investigate the effects that different experimental conditions have on the cells, the cells are immortal (unless they are eliminated during the course of experiments). Using molecular techniques, we tried to establish a cell line from *Daphnia pulex*. This freshwater crustacean is found almost ubiquitously across the Northern hemisphere in temporary ponds. Why is there any interest in establishing a cell line from these small invertebrates? As it turns out, these tiny animals share many genes in common with humans, making them critical candidates for model organisms when trying to investigate different human genes (in addition to various *Daphnia* genes). We systematically applied different conditions to cells collected both from the embryos and the guts of *Daphnia pulex*. These conditions included varying pH, nutrients, extracellular matrix components, enzymatic treatments, and degrees of homogenization to the tissues collected. Treating the early *D.pulex* embryos with collagenase for 13 minutes and gently homogenizing to release the cells, they then grew into a large clump 2 weeks after the initial harvest and treatment of the cells. This large clump didn't continue to grow after 2 weeks; however, other cells have been alive for 30 days, the longest a *Daphnia pulex* cell line has been in existence! Overall, many strides have been made and the development of a *Daphnia pulex* cell line is still underway.

### **Population Genetic Structure of *Daphnia obtusa* in Relation to Flooding Rate at Congaree National Park**

**Mathew Sebastian**, Biological Sciences - Junior

Mentor: Dr. Jeff Dudycha, Biological Sciences

*Daphnia obtusa* are small, planktonic crustaceans that are generally found in lakes and ponds, but not flowing environments. *D. obtusa* are commonly used in evolutionary and ecological experiments because: 1) they are important in that they are the dominant herbivore in the ecosystems they inhabit; 2) they are easily maintained in a laboratory and have short generation times; 3) they are cyclical parthenogens (reproduce sexually and asexually), and can be maintained clonally for an indefinite period under controlled environmental conditions. This experiment set out to 1. To determine if individuals of *Daphnia obtusa* from the same pond are more closely related (i.e., genetically similar) to each other than to individuals from other ponds. 2. To determine if populations of *D. obtusa* from one geographic region are more closely related to each other than to populations in another region. 3. To determine if the populations of *D. obtusa* in Fork Swamp (frequent flooding) are more genetically similar to one another compared to the populations near the Visitor's Center (infrequent flooding) of Congaree National Park. From the gathered Data, the p-values, and  $F_{st}$  values show that generally, the Fork Swamp populations are different from the Visitor's Center populations and

that in the Visitor's Center, the ponds Liana and Dino Tracks are different from one another despite close proximity to one another.

# Experiential

## **RecycleMania 2011**

**Christine Burke**, Anthropology - Sophomore

Mentors: Ms. Margaret Bounds, Housing

Ms. Celia Goetowski, Political Science



For the 2nd year in a row, USC participated in RecycleMania, an eight-week competition between three-hundred-and-sixty-three universities and college campuses across the country. The 2011 competition lasted February 6 through April 2; USC, with major support from the Green Quad Learning Center for Sustainable Futures, worked to collect recyclables with a focus on the Gorilla Prize competition, a special category that compares the sheer poundage of recycled materials produced by participating schools. The competition goals included raising awareness about recycling and encouraging minimizing waste among college students. Through a number of engaging public relations efforts and interactive, educational, and informational events, the Green Quad was able to boost awareness and promote further competition goals.

In order to achieve greater student awareness of the competition, this being only the 2nd year that USC participated, the Recycling Team at the Green Quad Learning Center, with help from the student organization Students Advocating for a Greener Environment (SAGE) and the RHA Eco-Reps, created over 75 special posters that were displayed across campus. In addition, the team designed a banner on Greene Street, decorated the large-scale display board in the Russell House with important recycling information, worked with dining facilities and Thomas Cooper Library to distribute competition information, and hosted multiple campus events, including: Caught Green-Handed, the Sustainability/RecycleMania informational fair, an Resident Mentor bulletin board competition, and Recyclympics. Our efforts sought to provide a visual, interesting, and informative presence on campus for students to learn about the importance of recycling.

## **Research Assistantship with The Eliza Lucas Pinckney Papers Project**

**Nicolette Calhoun**, English - Senior

Mentor: Dr. Constance Schulz, History

During the Fall and Spring of 2010 – 2011 I worked with the Eliza Lucas Pinckney Papers Project through the History Department at the University of South Carolina. The Eliza Lucas Pinckney Papers Project is a project devoted to the creation of a digital scholarly edition of the writings of Eliza Lucas Pinckney, a South Carolina woman during the revolutionary period who was the first to plant the indigo plant in South Carolina and was the mother of two revolutionary figures. This project also focuses on the letters and writing of her daughter Harriott Pinckney Horry. As a writing intensive English major I came to this project hoping to learn about documentary editing and explore a career path in editing. I learned so much more than that. I had the opportunity to transcribe old documents into current typeface, write annotations about historical figures of South Carolina, and learn about the relatively new field known as the digital humanities.

## **Summer in Tours**

**Anthony Ciabrone**, International Business - Junior

**Molina Torres**, Marketing – Junior

**Bronwyn Lawrence**, Accounting - Junior

Mentor: Dr. Daniela Di Cecco, Languages Literatures and Cultures

The purpose of our presentation is to share with students our experiences in Tours, France and to hopefully encourage other students to study abroad and learn from other cultures. Our journey to the Loire valley took us into the heart of a rich cultural history very different from our own and allowed us to explore our French language skills with native speakers in a local environment. We will cover our many excursions to places such as the mysterious Mont Saint Michel and the beautiful gardens of Villandry in addition to our in depth language classes and our many a food experience. We will provide pictures from our trip and give each of our unique perspectives on our trip's impact on our summers and our lives.

## **Studying in the Czech Republic as a Gilman Scholar and Carolina Global Scholar**

**Morgan Henley**, Political Science - Junior

During the fall semester of my junior year, I applied for a Benjamin A. Gilman International Scholarship to enable me to study abroad in the Czech Republic. The Gilman Scholarship aims to aid U.S. students who are typically underrepresented in studying abroad, particularly those with limited financial means. The program requires that applicants are receiving a Pell Grant and asks for a Statement of Purpose and Follow-Up Project Proposal. As a recipient of the award, I was able to pursue my ambition of studying in Prague. Applying for the scholarship helped me prepare for my time abroad by establishing clear academic and personal goals before I left. As a political science student, being in a former communist country gave me an invaluable hands-on perspective of the development after the fall of the Iron Curtain. I was also able to develop a much deeper understanding of the realities of communism, something that is much better understood when seen in person to truly capture public opinion and day-to-day realities.

## **Ecualexperienca**

**Josh King**, Sport and Entertainment Management - Sophomore

**Drew McElwee**, International Business – Sophomore

**Chris Frantel**, Sport and Entertainment Management - Sophomore

**Lauren Stitzlein**, Broadcast Journalism - Sophomore

**Sydney Spence**, Public Relations - Sophomore

**Emily Ingram**, Nursing - Junior

Mentor: Dr. Patrick Hickey, Capstone Scholars

During May 2010, 20 Capstone Scholars and Honors College students traveled to Quito, Ecuador to engage in learning beyond the classroom. The group assisted with home construction in nearby villages, mentored children at “Centro Del Muchacho Trabajador” a street children ministry, and visited with young toddlers at a local orphanage. The students also explored the culture of Ecuador, shopping in local indigenous markets, learning about Quito's vibrant history and visiting with native Ecuadorians. Cultural excursions were included in the trip itinerary as well consisting of the majestic Galapagos Islands, the Equator, and zip lining through the Cloud Forest. Throughout the two action-packed weeks, the group

examined the impact of service on the person, group, and community. The students were able to experience learning on an international level and brought back an understanding of the importance of sharing their journey with others.

### **Studying Abroad in Buenos Aires**

**Eliza Lotozo**, Accounting - Junior

Mentor: Mr. Graham Stowe, English Language and Literatures

In the spring of 2010 I had the amazing opportunity to participate in a study abroad program at La Universidad de Belgrano, which allowed me to spend the semester in Buenos Aires. I was really excited about this experience because I am a Spanish minor, and although I had studied the language for years, I felt that traveling to a country where Spanish is the native language would be the best way to really improve my comprehension. Also, as a business student at USC, and with the everyday increase in globalization in the workplace, I knew the ability to understand and adapt to foreign cultures would be an extremely useful skill. International Studies Abroad, my exchange provider was very helpful when making my travel arrangements as well as helping me adapt to the local university. Looking back, I feel that my experience abroad was the most important experience of my college career. I had to adapt to a new way of living by learning that it was ok to be the minority (something which I had not experienced) and learning to let go of some of my personal boundaries that I was used to as a North American. I made a lot of connections with people from all over the world and I also learned a lot about myself: my strengths, my weaknesses, and my ambitions. I truly believe that studying abroad can be a vital experience for any college student, no matter their professional goals, skills, or educational aspirations.

### **IMPULSE - International Undergraduate Journal for Neuroscience at USC**

**Ryan Rambo**, Psychology - Junior

Mentor: Dr. Sarah Swe, Pharmacology Physiology and Neuroscience

IMPULSE is the first online, undergraduate, international journal for research publications in neuroscience. It consists of research articles submitted solely by undergraduates that are, then, reviewed and published by undergraduates. IMPULSE was started at the University of South Carolina Honors College by Dr. Leslie Jones in 2003 as an Honor's College course on scientific publishing. Today IMPULSE at USC is a student organization involved in scientific publishing, peer review, and numerous outreach activities. The student organization is one of seven reviewer training sites for IMPULSE including international reviewers from countries including India, United Kingdom, Greece, Canada, and South Africa. The IMPULSE chapter at USC meets monthly and holds around 50 members, including peer reviewers and editors. Every year, the IMPULSE chapter brings Brain Awareness Week to USC, which is a global campaign celebrated in March. The chapter members organize a week-long lecture series, a fundraiser trivia night, and an article series in the Daily Gamecock. IMPULSE's editorial board has been able to go to numerous national and international neuroscience conferences. With an increasing emphasis in universities and graduate programs on undergraduate research experience, IMPULSE provides a great educational source to those who seek to broaden their understanding of scientific research, the peer review process, and scientific literature. Overall, IMPULSE aims to enhance undergraduate

education through first-hand experience with scientific publishing and forming channels with faculty mentors and fellow students.

# Health & Medical Sciences

## **Maternal characteristics influence breast milk cytokine levels and IgA**

**Jessica Burch**, Chemistry - Junior

Mentor: Dr. Wilfried Karmaus, Epidemiology and Biostatistics

Maternal characteristics influence breast milk cytokine and IgA levels

Background: Maternal history of allergy (MHA) is considered a predisposition for allergic diseases in offspring; cytokines and IgA in breast milk may confer the risk.

Objective: To determine whether MHA affects cytokines and IgA in breast milk by controlling for confounders. Methods: Mature milk was obtained (n=105) and separated into fat and whey. Using the Bioplex analyzer and ELISAs, interferon- $\gamma$  (IFN- $\gamma$ ), IFN- $\alpha$  -induced protein 10 (IP-10), eotaxin, and transforming growth factor (TGF)- $\beta$ , immunoglobulin (Ig) A, interleukin (IL) 1 $\beta$ , IL-4, IL-5, IL-6, IL-8, IL-10, IL-12, and IL-13 were measured in duplicate. MHA (asthma, eczema, rhinitis), smoking, pelvic infection during gestation (PID), pet exposure, education, race/ethnicity, and offspring sex were ascertained in telephone interviews. General linear models were used to estimate the effect of MHA on cytokine and IgA levels, adjusting for confounders. Results: MHA was associated with lower levels of IL-6 in breast milk (p=0.01). A history of allergic rhinitis was linked to decreased levels of IL-8 (p=0.03) and IL-13 (p=0.02). Gestational smoking was related to increased levels of IFN- $\gamma$  (p=0.001), eotaxin (p=0.02), IL-4 (p=0.013), and IL-6 (p=0.04). African American women had higher IL-6 levels (p=0.0001), IL-8 (p=0.0002), IFN- $\gamma$  (p=0.02), and eotaxin levels (p=0.02) compared to Caucasians and Hispanics. Conclusion: MHA, with the exception of rhinitis, did not have an effect on cytokine levels and in the case of IL-13 was opposite of what expected. No breast milk study has yet controlled for smoking, race/ethnicity, and PID, which seems to affect breast milk cytokines.

## **Utilization Review of Geriatric Diabetic Patients at Palmetto Senior Care**

**Ushma Desai**, Pharmacy - Senior

Mentor: Dr. Karen McGee, Pharmaceutical and Biomedical Sciences

The American Diabetes Association Guidelines suggest that different goals are needed for the elderly population due to the dynamics of aging and disease progression. The American Geriatric Society Guidelines apply to ambulatory geriatric patients. While these guidelines are not as strict, they allow for a comprehensive assessment of geriatric syndromes associated with aging. This utilization review aims to determine how well Palmetto Senior Care centers are complying with both ADA and AGS guidelines in their frail elderly diabetic population. A retrospective chart review for 70 geriatric diabetic patients was performed and data was recorded from January 2010 to September 2010. Our inclusion was patients with Type 1 or 2 Diabetes at the four Palmetto Senior Care centers on an oral hypoglycemia agent or insulin and the exclusion included those patients who were diet controlled for diabetes management. After extensive result analysis, we were able to conclude that Palmetto SeniorCare (PSC) successfully follows American Geriatric Society guidelines (AGS) established for the care of diabetic patients. The research also supported that poly-pharmacy and multiple diagnoses impacts medication choices in geriatrics.

## **Evaluation of caffeine and the development of necrotizing enterocolitis**

**Nehal Hashem**, Pharmacy - Senior

Mentors: Dr. Brandon Bookstaver, Pharmaceutical and Biomedical Sciences

Dr. Christina Piro, Pharmaceutical and Biomedical Sciences

Purpose Necrotizing enterocolitis (NEC) is often seen in premature infants (gestational age 37 weeks), with very low birth weight ( 1500 g), and is associated with high rates of morbidity and mortality. While the exact etiology of NEC remains unknown, intestinal ischemia is a factor in the development of NEC. Literature suggests several medications, including caffeine, may cause changes in mesenteric blood flow, precipitating NEC. The objective of this study is to determine the association between the administration of caffeine and development of NEC in premature infants. Methods A retrospective, single-center, cohort study on all neonates admitted to the neonatal intensive care unit from January 1st through December 31st, 2009 was performed. All neonates were stratified into two groups based on caffeine administration (yes or no). Pertinent patient demographics data were collected. Logistic regression and time-to-event analysis was used to assess differences in incidence of NEC for the caffeine and no-caffeine groups while adjusting for confounders. Confidence intervals for relative risk were used to quantify the strength of the relationships. Results A total of 622 neonates were included during the study period. Of the 220 neonates evaluated to date, 11.8% (n=26) were identified as having NEC, 38% (n=10) of which classified as surgical NEC. Twenty-five percent (n=56) were administered caffeine, of which 39% (n=22) developed NEC [OR 8.74, 95% CI (1.56-49.03)]. Risk factors of statistical significance include: birth weight (p=0.059) and administration of total parental nutrition (p=0.045). Conclusion Based on preliminary data, there is a strong positive association between administration of caffeine and development of NEC.

## **Preventing Preterm Delivery Associated with Genitourinary Tract Infections: The Provider's Prospective**

**Cierra Jones**, Nursing - Senior; USC Aiken

Mentor: Dr. Jo-Ellen McDonough, Nursing; USC Aiken

Preterm delivery has increased 20% since 1990 (Martin et al., 2009).

Genitourinary tract infections have been identified as a risk for PTD (Reedy, 2007). The purpose of this qualitative study was to elicit the perceptions of prenatal care providers regarding the association between genitourinary tract infections (GUTI) and preterm delivery (PTD), as well as preventative strategies they believe reduce PTD. The study began with a limited literature review of recent studies related to GUTI in pregnancy and PTD. Next, a semi-structured interview guide was designed to conduct interviews with key informants (participants) involved in care of pregnant women. Informants consisted of midwives, physicians, and nurse practitioners. The interview guide consisted of 1. Demographic information; 2. Open-ended questions to elicit practitioner perceptions and experiences with PTD and genitourinary tract infections; 3. Open-ended questions to elicit clinical interventions and nursing practices recommended by participants to decrease the risk of GUTI and PTD. Interviews were transcribed verbatim. Data was collected, coded, and analyzed simultaneously using constant comparative method. Core categories were identified as they emerge from coded data. Finally, results were interpreted according to the essential features and patterns emerging. Final

interpretation of results is still in progress. Some themes that are emerging include lifestyle modification, medical treatment, and inadequate self-health promotion. The study has revealed several clinical nursing interventions categorized into these themes. These interventions can be used in addition to medical treatment to reduce the risk of GUTIs and in effect, reduce the risk of PTD.

### **The Effect of Bright Light Therapy on Postpartum Depression**

*Ji Y. Lim*, Insurance and Risk Management - Junior

Mentor: Ms. Shannon K. Cornelius, Exercise Science

Postpartum depression (PPD) affects approximately 13% of childbearing women. Symptoms include depressed mood, lack of interest in previously enjoyed activities, changes in sleep or appetite, fatigue, decreased concentration, and feelings of hopelessness and guilt. Many women are hesitant to take medications to treat PPD in fear that their newborn will be exposed to the drugs during breastfeeding; therefore, alternative treatment methods are needed. Bright-light therapy may be a possible alternative treatment option for women with PPD. Past studies have shown that bright light therapy is effective in the treatment of seasonal and non-seasonal depression. The aim of this study was to examine the effect of bright light therapy on symptoms of PPD. Four women with PPD (mean age 38) participated in this ongoing study. At baseline and follow-up, participants completed standardized questionnaires to assess mood, depression, and sleep. Participants also completed functional MRI (fMRI) scans to assess brain activity patterns before and after treatment. Preliminary results show that there was a greater reduction in total mood disturbance using bright light therapy on the Profile of Mood States (POMS) (severity score reduced 19 points vs. reduction of 9 points with placebo). Scores on the EPDS, STAI, and PSQI measures were similar for both bright light and placebo groups. Preliminary results suggest that bright light therapy may aid in improving mood in women with PPD. An increased sample size as the study progresses should shed light into other mechanisms by which bright light therapy may be beneficial as a treatment for PPD.

### **Determining if the Driving Health Inventory is an appropriate tool to assess patients' driving risks in a clinical setting**

*Elizabeth Messman*, Psychology - Sophomore

Mentor: Dr. Johnell Brooks, Psychology; Clemson University

During my freshman year, I got involved in a research study under Dr. Johnell Brooks to test the value of a driving assessment called the Driving Health Inventory. The Driving Health Inventory is a computer based assessment which measures high and low contrast acuity, leg strength and stamina, head / neck flexibility, short term and working memory, visualization of missing information, visual search with divided attention, and visual information processing speed. This program was designed to be a tool to serve as a screening measure for aging drivers. The Driving Health Inventory is a predictor of at-fault crashes with seniors. The test provides a relatively quick and reliable report of a driver's impairment (no apparent, mild, or severe) for each of its measures. While there are a variety of reasons while the Driving Health Inventory may not be appropriate for use in motor vehicle settings, this study sought to determine if it is an appropriate tool for occupational therapists to use in a clinical setting. I started training for the study during the spring semester 2010, and I was awarded SURF

grant through the Honors College to continue working on the Driving Health Inventory research study last summer.

### **Effect of delayed pharmacologic prophylaxis on venous thromboembolism (VTE) rates**

*Elisa Morgan*, Pharmacy - Senior

Mentor: Dr. April Miller, Clinical Pharmacy and Outcomes Sciences

Purpose: Pharmacological VTE prophylaxis decreases risk of VTE in hospitalized patients. However, potential bleeding risks or a perceived low risk of VTE often delay its initiation. Many doses are held for either administrative or clinical reasons. The effects of delays in therapy and missed doses on VTE rates are unknown. The primary objective of this study is to compare VTE rates in patients receiving early versus delayed pharmacologic VTE prophylaxis. The secondary objective is to compare VTE rates among patients with held or omitted doses.

Methods: This retrospective, case control study consists of fifty case patients with hospital-acquired VTE as a discharge diagnosis matched with 200 controls based on age and reason for admission. Medical records will be reviewed and the rate of early (within 24 hours of admission) versus delayed ( $\geq 24$  hours of admission) initiation of pharmacologic prophylaxis and the rate of missed doses will be compared. This sample size will provide 82% power to detect a 20% difference using a Chi square analysis. Results: To date, 18 of 48 case patients versus 41 of 128 control patients have had prophylaxis ordered  $\geq 24$  hours of admission. A further 23 case patients and 47 control patients had delayed initiation of prophylaxis. Currently data collection and analysis is in process and will be completed for timing of ordered prophylaxis. Conclusion: The results from this study could guide practitioners in balancing both bleeding and VTE risk in choosing when to initiate pharmacologic prophylaxis, while helping to raise awareness of the importance of administering all ordered doses.

### **Impact of a pharmacist-driven stewardship initiative on medication errors in hospitalized HIV-infected patients**

*Caitlin Musgrave*, Pharmacy - Senior

Mentors: Dr. Brandon Bookstaver, Clinical Pharmacy and Outcomes Sciences

Dr. Celeste Rudisill, Clinical Pharmacy and Outcomes Sciences

Background and Purpose: Published studies of HIV-infected inpatients have identified medication errors in up to 86% of patients. The goal of this study was to evaluate the impact of a targeted stewardship program implemented by infectious disease (ID) pharmacists on medication errors in hospitalized HIV-positive populations. Methods: Data were collected retrospectively for patients who received antiretroviral (ARV) therapy during admission to Palmetto Health Richland from July 2008 through July 2009, prior to initiation of the stewardship initiative. Prospective data collection was then performed from the beginning of pharmacy intervention in August 2009 through August 2010. The ID pharmacists were alerted to the initiation of any antiretroviral and assessed each patient's regimen for errors. The duration of each error was measured, and the prospective data were compared with the retrospective data to determine the impact of the pharmacy intervention. Results: After five months of data collection, a total of 156 inpatients were identified with an order for an antiretroviral or opportunistic infection agent. There was no significant difference in ARV error rates between

the pre-intervention (n=80) and post-intervention (n=76) groups (83% vs. 87%). The median length of time until an error was corrected was significantly shorter during the intervention phase (24 hours) as compared to the pre-intervention phase (144 hours) (p=0.0017). The acceptance rate of pharmacy interventions was 90%. Conclusions: Preliminary data analysis revealed that pharmacist interventions significantly reduced the duration of ARV errors in this hospitalized HIV-positive population.

### **Social Networks and Pathways to Transplant Parity for Black Hemodialysis Patients**

**Cassidy Shaver**, Social Work - Sophomore

**Olivia Jones**, Social Work - Junior

**Valerie Stiling**, Social Work - Junior

**Lesley Jacobs**, Social Work - Junior

**Sonya Davis-Kennedy**, Social Work - Sophomore

Mentor: Dr. Teri Browne, Social Work

This 3-year research project is addressing critical gaps in the scientific knowledge on kidney transplant disparity in South Carolina. Research has shown that black patients are significantly less likely than their white peers to be evaluated and listed for a kidney transplant, and a significant portion of this disparity remains unexplained. To answer the research questions a) What is the role of the various types of social networks in providing information about kidney transplantation to black hemodialysis patients?, and b) What is the relationship between this information transaction and a patient's likelihood of being placed on a kidney transplant waiting list?, the proposal will: 1) Describe black hemodialysis patients' knowledge about how to get a kidney transplant, and 2) Determine the association between black hemodialysis patients' knowledge and understanding about how to get a kidney transplant, black hemodialysis patients' social network composition, and the likelihood that these patients are listed for a kidney transplant. We will survey black hemodialysis patients age 18-65 within 90 miles of Columbia, SC. The project is also significant because the knowledge gained can provide suggestions for subsequent interventions that aim to ameliorate the public health problem of kidney transplant disparity. We have been working on Phase 1 of this project in 2010-2011, being trained extensively on research, social determinants of health, and kidney disease. This poster is an overview of our first year's experience on this project.

### **Descriptive Epidemiology of Injuries Occurring During Recreational Activities and Intramural Sports**

**Dillon Smith**, Physical Education - Senior

Mentor: Dr. Tom Dompier, Physical Education

**Objectives.** This study examined the frequency and nature of injuries that occur during recreational and intramural sports at the University of South Carolina. **Methods.** This study was cross-sectional in design. Five years of existing incident reports maintained by the Director of the Department of Campus Recreation were abstracted. Injury reports were completed by an athletic trainer or intramural staff at the time of injury. The variables collected included: gender, time of day, status (student, faculty, etc), sport (recreational activity, basketball, etc), facility (grass field, court, etc), injury location (body part), injury type (sprain, bruise, etc),

disposition (ambulance, walked home, etc). Results. Between 2004 and 2010 (6 years) there were 636 reported injuries. Of those, 81.1% (516) were male while the other 18.9% were female. The majority (98.1%) of the cases were generated by students. The most common injury was ligament sprains (40.2%) while the ankle was the most commonly injured body part (27.1%). The most common mechanism of injury was collisions with other participants (43.0%). Only 1.9% (12) injuries were recommended to have ambulance transport, but only 83.3% of those chose to accept ambulance transport. Flag Football and basketball accounted for the majority of injuries at 40.3% and 27.4%, respectively. Conclusions. Overall, males and students reported more injury incidents than females and non-students, respectively. Future research should consider including exposure data such that rates of injury across groups can be compared.

### **Micafungin use in a critically ill, morbidly obese patient**

**Elliot Turner**, Pharmacy - Senior

Mentor: Dr. Brandon Bookstaver, Pharmacy

A 40 year old, African-American female was admitted with septic shock secondary to lower extremity cellulitis and respiratory failure requiring mechanical ventilation. Her past medical history was significant for metabolic syndrome with morbid obesity (weight, 230kg; body mass index (BMI), 102kg/m<sup>2</sup>). She was treated aggressively with fluid resuscitation and appropriate antimicrobial coverage. On hospital day 23, she was febrile to 102°F and subsequently had a urine culture positive for *Candida glabrata*. Blood and respiratory cultures were obtained. Due to her compromised clinical status and co-morbid conditions, she was initiated on standard dose micafungin 100mg IV daily and broad-spectrum antimicrobial therapy. Although the only known source of fungal infection was the urinary tract, due to her dynamic condition, micafungin serum concentrations were obtained for dosing validation. On day 5 of therapy, serum micafungin concentrations at 4, 11 and 23 hours post infusion were 2.93mcg/mL, 1.96mcg/mL, and 1.36 mcg/mL, respectively (Fungus Testing Laboratory, San Antonio, TX). She completed a 2-week course of micafungin therapy resulting in clinical resolution. No dose modifications were made during the treatment course. Micafungin serum concentrations in our morbidly obese patient were 50-70% lower than previously published steady-state concentrations in subjects with normal body weight. Consideration should be given to dose increases in obese patients receiving micafungin, although specific dosing recommendations cannot be made from this single patient case. This patient case further highlights the need for pharmacokinetic evaluations in the obese population.

# Neuroscience & Experimental Psychology I

## **The Degree of Potentiation and Selectivity of Magnolol and Honokiol on the Subunits of the GABA(A) Receptor**

**Mikhail Alexeev**, Biomedical Engineering - Junior

Mentor: Dr. Janet Fisher, Pharmacology Physiology and Neuroscience

The National Center for Complementary and Alternative Medicine (NCCAM)

estimates that nearly 40% of adults in the United States use some form of alternative medicine. It is important to determine their mechanism of action so that they can be used safely and appropriately. Extracts from Magnolia tree bark have been used for centuries in traditional Chinese medicine to treat a variety of neurological diseases, including anxiety disorders. The active ingredients in the extract have been identified as magnolol and honokiol, and these isolated compounds have been shown to be modulators of the GABA(A) receptor. These receptors are ligand-gated ion channels which are activated by gamma-aminobutyric acid (GABA), the primary inhibitory neurotransmitter in the CNS. The subunit composition of neuronal GABA(A) receptor is heterogeneous, and the pentameric receptor can contain subunits from seven different families with multiple subtypes. The goal of these studies was to determine whether modulation by magnolol and honokiol was dependent upon the subunit composition of the receptor. We used patch clamp recordings from transiently transfected cells to measure the response of receptors containing each of the six different alpha subunits. Both magnolol and honokiol significantly enhanced the activity of all the receptors, regardless of the alpha subunit. Our data indicate that these two compounds are effective positive modulators of GABA(A) receptors and would be expected to reduce neuronal activity, reducing anxiety and seizure activity while producing sedation. They may also interact with other medications with similar actions, including alcohol.

## **Pair Bonding and Alcohol Consumption in Monogamous and Promiscuous Peromyscus**

**Anna Capps**, Psychology - Freshman

**Samantha Jones**, Psychology - Junior

Mentor: Dr. Sandra Kelly, Psychology

Peromyscus genus has among its species both monogamous and promiscuous rodents. Peromyscus polionotus (POs), show a paired partner preference unlike Peromyscus maniculatus (BWPs) which exhibit promiscuous sexual behavior. Hybrids of these two species can be created. Currently, no research has been performed examining the sexual behavior and pair bonding of the hybrid. Using a partner preference paradigm in which the experimental animal is placed with both a novel animal and the animal with which it has been breeding, the strength of the pair bonding will be examined in both species and hybrid. The amount of time spent in contact with the breeding partner will indicate the strength of pair bonding. Also a comparison of the amount of self-administered ethanol intake among the two species and the hybrid was conducted. Based from previous observations in humans, it is anticipated that the monogamous species of Peromyscus will demonstrate greater ethanol consumption in comparison with the promiscuous BW species. The amount of ethanol consumption within the hybrid subspecies was predicted to be less than that of the monogamous PO

species. The results of these studies could potentially be generalized to human behaviors, shedding light on both the genetics of pair bonding and social influence on consumption of alcohol. (Funded by the Department of Psychology, the South Carolina Honors College and NIAAA RO1 11566).

### **Evaluating the random-regular-numerosity-illusion across development**

**Breana Carter**, Psychology - Junior

Mentor: Dr. Melanie Palomares, Psychology

The ability to visually perceive numerosity has been correlated with general mathematical abilities; therefore deficits in perception can predict mathematics disabilities (Halberda et al., 2008). This project evaluated whether perceptual organization affects the perception of visual numerosity across typical development. When a group of randomly placed items is presented, there is the tendency to underestimate its numerosity. In contrast, a group of organized items is overestimated. This is the random-regular-numerosity-illusion (RRNI) (Ginsburg, 1980). We evaluated whether young children (8-10 years of age; 4-6 years of age) are susceptible to the RRNI. We asked our participants to determine which set of dots is more numerous. In Experiment 1, we displayed the sets of dots simultaneously and in Experiment 2, successively. The dots were arranged in a canonical or random pattern. The arrays contained 11, 13, 15, 17, and 19 dots, with varying ratios. When sets were equal, results showed that adults perceived an organized set as more numerous than a random set. Preliminary data showed that children between the ages of 8 and 9 perceived a random set as more numerous than an organized set, a pattern distinct from those of typical adults. This supports the hypothesis that the susceptibility to the RRNI is late-maturing; thus, a learned phenomenon

### **fMRI Naming Performance Predicts Overall Naming Ability in Persons with Aphasia**

**Caroline Clark**, Psychology - Senior

Mentor: Dr. Julius Fridriksson, Communication Sciences and Disorders

Aphasia is a loss of language abilities due to brain damage. It is diagnosed in 30-38% of individuals who have suffered an acute stroke. Currently, researchers are utilizing functional neuroimaging to understand the neural activation patterns underlying aphasia and aphasia recovery. The majority of these studies administer naming tasks, because anomia (an inability to name) is present in all cases of aphasia. Because functional neuroimaging is such a rapidly developing field, it is important to ensure that the tasks employed are valid indicators of the abilities they purport to measure. The purpose of this study was to determine if a particular naming task utilized during functional Magnetic Resonance Imaging (fMRI) in a study of aphasia recovery is a valid measure of naming ability. Extant data from 26 participants in an ongoing study in the Aphasia Laboratory under Dr. Julius Fridriksson was analyzed to determine the relationship between participants' fMRI naming scores and their scores on well-established measures of aphasia severity. Highly significant correlations were found between scores on the fMRI naming task and on the Philadelphia Naming Test, the Boston Naming Test, the Western Aphasia Battery, and the Apraxia Battery for Adults. There was also a highly significant correlation between each participants' scores across two fMRI scanning sessions. These results indicate that the fMRI task utilized in this study is

a valid and reliable measure of naming ability; thus, the neural activation patterns it elicits are true models of the neural processing of language in individuals with aphasia.

### **Changes in Left Hemisphere Activation as a Function of Food Intake and Left-Lateralized Task Demands**

**Daniel Hinson**, Biological Sciences - Sophomore; USC Lancaster

Mentor: Dr. Alissa Holland, Psychology; USC Lancaster

Functional cerebral systems that regulate food digestion reside in the left hemisphere. Tasks utilizing functional cerebral systems in the left hemisphere may vary with the requirement for dual concurrent processing demands. Food consumption was used as a left hemisphere stressor. It was predicted that dual task demands of regulating digestive stress concurrent with left frontal cognitive and motor task demands would result in diminished beta activation in the left hemisphere. Thirty undergraduate men and women were recruited for participation and fasted for a minimum of 4 hours prior to participation. Nine of the 30 participants completed the Controlled Oral Word Association task (COWAT) and Finger Tapping Task (FTT) before ingesting a sandwich containing 44-48 grams of carbohydrates. To assess beta activation in the pre-digestion and absorption phases, quantitative electroencephalography (qEEG) recordings were taken at the beginning of the procedure and 5 minutes after the cessation of eating. A main effect for Task was found ( $F(1, 28)=12.41, p.01$ ), indicating a decrease in beta magnitude across the left hemisphere electrode sites for the participants completing the COWAT and FTT. Further, a Task x Location interaction was found ( $F(1, 28)=18.26, p.01$ ), indicating an increase in beta magnitude a over the left posterior electrode sites for participants not completing the COWAT and FTT. The Task x Location interaction indicates that the left hemisphere may be differentially influenced by food absorption. The present findings provide initial support for the role of the left hemisphere in the initiation of food digestion under dual concurrent task demands.

### **Analyzing Lentiviral Vector-Mediated Transgene Delivery to Rat Hippocampal Neurons**

**Katherine McClellan**, Biological Sciences - Senior

Mentor: Dr. David Mott, Pharmacology Physiology and Neuroscience

Temporal lobe epilepsy (TLE) is associated with pathological alterations in the hippocampus. Kainate receptors, a subtype of glutamate receptors, contribute to excitatory neurotransmission and have been implicated in TLE. Therapeutic strategies targeting kainate receptors may therefore prove beneficial. One method through which hippocampus-specific kainate receptor subunits could be manipulated is viral-mediated gene transfer. First we must optimize expression of the viral vector. To this end this study attempted to optimize viral-mediated transgene expression in the rat hippocampus. We compared the effect of different promoters and stereotaxic injection strategies on neuronal expression of GFP. To compare promoters male Sprague-Dawley rats received hippocampal injections of titer-adjusted lentiviral reporter vectors bearing CaMKII, synapsin, CMV, or PGK promoters driving expression of GFP. Rats were injected with a single reporter vector into either one or two sites in the hippocampus. After four weeks, hippocampi from each animal were examined for GFP expression. Lentiviral

vectors with the PGK and CMV promoters produced the most robust expression. Vectors containing PGK transduced most neuron types, while CMV caused more robust expression in astrocytes. Comparison of injection strategies revealed different expression patterns with the double injection producing the greatest spread throughout the hippocampus. These findings indicate hippocampal-specific transgene expression can be achieved by lentivirus vectors. Future studies will evaluate the role of kainate receptors in TLE using this method. Supported by a grant from the University of South Carolina Magellan Scholar Program (KSM) and NIH grant NS065869 (DDM).

### **Limiting Central Nervous System Side Effects in Common Medications**

**Candler Paige**, Biological Sciences - Sophomore

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

Many current medications are notorious for their side effects of sedation and effects on motor coordination, both of which are mediated by effects in the central nervous system. In this project we investigated whether or not current medications can be manipulated in order to keep them from crossing the blood brain barrier and in effect limit their effects on the central nervous system. A common medication has been chemically modified so as to retain the chemical structure of the medication but limit the ability of the medication to cross the blood brain barrier. The hypothesis was that the modified compounds that did not cross the blood brain barrier would not cause motor incoordination. To assess effects on motor coordination we measured gait, stride, interstep distance and interlimb coordination. Thus far in the project the compound modifications appear to decrease medication induced motor incoordination. This suggests common medications can be chemically modified to limit penetration of the compounds into the central nervous system and prevent centrally mediated motor incoordination.

### **Predicting Anxiety in Fragile X Syndrome: Soothability and Maternal Stress**

**Kari Rizzo**, Psychology - Junior

**Sarah-Nell Lader**, Psychology - Junior

Mentors: Dr. Jane Roberts, Psychology

Ms. Ashley Robinson, Psychology

Fragile X Syndrome (FXS), which is caused by a single gene mutation on the X chromosome, is the most common genetic cause of mental impairment. Previous research has suggested that infants with FXS are at a higher risk for developing anxiety later in childhood, and additional research shows that two primary factors contribute to this development: early temperament and maternal mood disorders. Research within the field of FXS is expanding and our goal with this study is to contribute to the literature on early temperament and later negative behaviors in children with FXS. In typically developing children, soothability, defined as the rate of recovery from peak distress, excitement or general arousal, has been linked directly to "intrusive" maternal behavior – a behavior common in mothers with anxiety and depression. Putting together these pieces, we sought to discover if there is a relationship between soothability and maternal stress when predicting anxiety in children with FXS. If lower rates of soothability in children are related to maternal anxiety or depression, that mother-child relationship could be negatively affecting the child's development. Because of the genetic etiology of FXS, early intervention is possible and critical. Results of this preliminary study may have

important implications for maternal therapy. Teaching mothers how to deal with their anxiety in order to limit their “intrusiveness” could potentially decrease the child’s chances of developing negative behaviors later on.

# Neuroscience & Experimental Psychology II

## **Amelioration of HIV-1 Tat-induced neuronal injury by phytoestrogens**

**Tori Espensen-Sturges**, Psychology - Senior

Mentor: Dr. Rosemarie Booze, Psychology

Development of new strategies to prevent the neurobehavioral abnormalities associated with chronic HIV-1 infection is critical to the advancement of care of these patients. Our previous studies have indicated that estrogen and phytoestrogenic compounds, namely genistein and diadzein, may offer neuronal protection against HIV-1 Tat-initiated mitochondrial apoptosis via an estrogen receptor (ER $\alpha$ )-dependent mechanism. In this study, dose-response curves of neuroprotection provided by genistein and diadzein were generated. At the low concentration of 0.1  $\mu$ M, both genistein and diadzein provided neuroprotection (85% or higher) against Tat (50  $\mu$ M) toxicity. In addition, we found cytomorphological evidence for the ability of different phytoestrogens to ameliorate degeneration and promote rebuilding of neuronal dendrites following HIV protein (Tat)-mediated neurotoxic insults.

## **The Effect of Arousal on Perceptions of Attractiveness: An fMRI Study**

**Taylor Hanayik**, Psychology - Sophomore

Mentor: Dr. Jennifer Vendemia, Psychology

Abstract: We examined the effect of affective films on subsequent ratings of attractiveness and cortical activation in undergraduate students at the University of South Carolina (N=30). Participants viewed films containing neutrally-valenced stimuli (Prairie Dogs or Book Bindings) and negatively-valenced stimuli (Zombie attack); and then rated attractiveness of pictures of men or women (men rated pictures of women and vice versa). Behavioral results showed that participants' attractiveness ratings did not change based on the type of film viewed. However, cortical activation results showed that after watching a negatively-valenced film, participants had significantly more activation in orbitofrontal and parahippocampal areas when viewing attractive versus plain faces. This suggests the possibility of greater reward value when viewing attractive faces after viewing a film that increase arousal levels (even in a negative fashion).

## **Examining the Neural Representation of Verbs and Nouns through Meta-Analysis**

**Steven Kady**, Psychology - Senior

Mentor: Dr. Svetlana Shinkareva, Psychology

A number of neuroimaging studies have investigated the differences in noun-verb processing with inconsistencies across results. A quantitative meta-analysis was used to combine data from 241 participants across 16 functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) studies to identify the consistent differences in the neural processing of both nouns and verbs. Studies included in this meta-analysis were those that reported peak activations in healthy adults at a whole brain level using the contrasts Noun > Verb and Verb > Noun. Multi-level kernel density analysis was used to weigh these contrasts according to sample size and type of analysis. Meta-analysis results identified significant consistent results in the Verb > Noun contrast but failed to find consistent areas of cortical activation within the Noun > Verb contrast. Compared to

nouns, verb processing was found to elicit significant activation in the inferior frontal gyrus and the middle temporal gyrus, both of which play a major role within the verbal system.

### **Age-Related Changes in Task Performance and Parasympathetic Tone Regulation as a Function of Pre-Digestive Stress**

**Sara Newton**, Psychology - Freshman; USC Lancaster

Mentor: Dr. Kate Holland, Psychology; USC Lancaster

Diminished capacity of the left hemisphere has been associated with higher systolic blood pressure (SBP). Changes in left cerebral activation as a result of digestive stress exposure as a function of age have not been examined. The current experiment builds on existing knowledge by examining changes in verbal fluency and magnitude of left cerebral activation as a function of age and exposure to digestive stress. Eleven younger (ages 18-26) and 6 older (ages 55-85) women completed the Controlled Oral Word Association Task (COWAT) after fasting for a minimum of 4 hours, and 35 minutes after consuming a sandwich. To assess changes in parasympathetic tone, SBP measures were taken before and after each administration of the COWAT. A main effect for Age was found ( $F(1, 15)=19.94, p.005$ ), indicating that older women had a higher SBP than younger women across the first and second administrations of the COWAT. Moreover, an Age x Condition interaction was found ( $F(1, 15)=8.3, p=.01$ ), indicating an increase in SBP for older but not younger women after undergoing pre-digestive stress. For the number of rule violations made on the COWAT, an Age x Condition interaction was found ( $F(1, 15)=6.54, p.05$ ), indicating that older women showed an increase in rule violations on the COWAT after undergoing pre-digestive stress. Older adults demonstrated a diminished capacity to regulate sympathetic tone and pre-digestive stress concurrent with verbal fluency performance. These results support that left frontal lobe function changes in dual concurrent task conditions as a function of age.

### **Form and Motion Processing: What can dots tell us about development?**

**Sarah Ramsey**, Biological Sciences - Junior

Mentor: Dr. Melanie Palomares, Psychology

Human neuroimaging and animal electrophysiological studies show that motion processing is related to the dorsal visual pathway in the brain, while form processing with the ventral visual pathway. Using well-matched stimuli, we tested the Dorsal Stream Vulnerability Hypothesis (DSV) (Braddick, Atkinson, & Wattam-Bell, 2003): that the ability to recognize motion (maturation of dorsal visual functions) develops after the ability to recognize form (maturation of ventral visual functions). We presented dots that moved coherently in a circle (motion stimuli) or formed a circular texture (form stimuli) to adults, 5-6 year olds, and 8-9 year olds. We measured coherence threshold, the minimum percentage of dots that coherently moved along a circle or coherently formed a circular texture for participants to obtain an accuracy of 82%. We also varied inter-dot separation to evaluate how grouping principles might affect developmental curves. In adults, we found that thresholds were lower for motion than for form until the largest inter-dot separation. If the DSV Hypothesis is robust to the effects of separation, we expect detection of coherent form to be adult-like in young children, but not detection of motion coherence regardless of inter-dot separation. Our study has

two implications: (1) An accurate depiction of typical developmental trajectories would give us a comparison for atypical development, and (2) Careful evaluation of the DSV hypothesis using our task could help identify new measures for diagnosing disorders of visuospatial cognition.

### **Physiological Indicators of Autism Symptom Severity in Children with Fragile X Syndrome**

**Bailey Tackett**, Psychology - Junior

Mentor: Dr. Jane Roberts, Psychology

Autism is a pervasive neurodevelopmental disorder that currently affects 1 in 110 individuals and is characterized by impaired socialization, abnormal communication, and restricted repetitive behavior. The primary cause of this disorder is unknown; however, evidence suggests there is a strong genetic basis. Fragile X syndrome (FXS) is a genetic disorder that can be detected prenatally and is the leading known biological cause of autism. Because this high-risk population can be studied from birth, it is ideal to track their physiological development to identify potential early indicators of autism. The purpose of our study was to determine the relationship between heart activity and autism boys in children with FXS. We analyzed extant data from the Carolina Fragile X Project for 19 boys between the ages of 18-72 months. We investigated the relationship between heart activity, as measured by interbeat interval and vagal tone, during a standardized experimental press for social anxiety and their scores on the Childhood Autism Rating Scale (CARS), a standardized scale of autism symptom severity. The results of our study indicated that vagal tone and interbeat interval measurements during certain phases of the experimental press were significantly related to CARS scores. These results suggest that there is a specific relationship between autism symptom severity and heart activity in children with FXS. This research has important implications for informing the early identification and treatment of autism in FXS populations.

### **The Modulation of Murine Glucocorticoid Receptor Activity by Site-Specific Phosphorylation at Ser212 and Ser220**

**Michelle Trojanowsky**, Baccalaureus Artium et Scientiae - Senior

Mentor: Dr. Paul Housley, Pharmacology Physiology and Neuroscience

The glucocorticoid receptor (GR) is a cytoplasmic steroid hormone receptor that, upon ligand activation, migrates to the nucleus where it differentially modulates the transcription of target genes. The receptor has eight known phosphorylation sites. Studies have indicated that GR phosphorylation may play a role in functions as diverse as nuclear shuttling of the receptor protein and receptor protein half-life. However, few studies have yet sought to clarify the role that individual phosphorylation sites play in altering specific receptor functions. My research explores the effect of phosphorylation at Ser212 and Ser220 on the half-life and subcellular localization of the murine GR protein. I isolated and characterized stably-transfected clonal cell lines expressing either the wild-type GR, Ala212 GR, or A220 GR. Each cell type was tested for total GR protein content after varying times of hormone treatment. Cell protein extracts were separated using Western blotting and the relative total density of the resulting bands was quantified. Our results indicated that neither Ser212 nor Ser220 phosphorylation significantly affected the half-life of the GR protein. The Ser220 site was studied to determine

its effect on the subcellular localization of GR protein. COS-1 cells were transiently transfected with EGFP-tagged GR constructs containing either the wild-type or the mutant receptor. The subcellular localization was visualized using Ab57, the pSer220 antibody, and confocal laser scanning microscopy. The results indicated that Ser220 phosphorylation did not significantly alter the subcellular localization of the receptor protein. Experiments on the effect of Ser212 phosphorylation on subcellular localization are ongoing.

# Psychology & Social Sciences

## **Dance and Movement Therapy: The Healing Power of Dance**

**Hannah Bailey**, Dance - Sophomore

Dance and Movement Therapy is defined as the psychotherapeutic use of movement to promote emotional, cognitive, physical, and social integration of individuals according to the American Dance Therapy Association. The purpose of my study was first to better enlighten myself so that I could in turn enlighten as many people as I know about how amazing Dance and Movement Therapy truly is. The American Dance Therapy Association's website was a great resource that gave me background information as well as led me to many articles showing the healing power of dance. It also showed the options for receiving a masters in Dance and Movement Therapy. There are currently six schools in the United States that offer the masters program and they also allow students to take an alternate route by attending a different university but taking more classes after to obtain the registered Dance/Movement Therapist status. This study has had great impact on me because it has made me realize that after graduating from The University of South Carolina that I want to go to one of those six schools so that I can join the force and help others through dance and movement.

## **Comparative Creole Culture**

**Candra Chaisson**, Biological Sciences - Sophomore

Mentor: Dr. Kimberly Simmons, Anthropology

Is it a dialect? Or, wait is it a language? Isn't that a term used to refer to persons of mixed descent, or maybe it's the formation of two languages into one? These are all textbook definitions and what is more often not found when one Googles the term "Creole". And that is the purpose of my research. I am to find a more universal definition for the word Creole as it applies to the ethnicity I have identified with growing up in Southwest Louisiana. It is more than a term or loosely-defined word to me and I sought to explore origins and usage of the word by researching a variety of cultures who identify as "Creole" across the globe and looking at the similarities between the different cultures, and what about those similarities comes to unite us all as "Creole."

## **Context Effects on Political Perceptions and Preferences**

**Addison Fay**, Psychology - Junior

Mentor: Dr. Doug Wedell, Psychology

This research asks how attitudes toward political positions may depend on contextual exposure to extreme positions. We are interested in the political positions of people and how these change when participants are presented several conditions under which there is a context change of political candidacy. For example, will one's position on gun control be influenced by exposure to extreme liberal or conservative positions on the topic? Furthermore, do liberals perceive political positions differently than conservatives when describing how liberal to conservative a position is? Before being able to determine these effects of context, we first had to develop stimulus materials that 1) assessed respondents' own tendencies to endorse conservative or liberal positions and 2) norm statements for various political issues on a liberal to conservative dimension. We created a survey that has 60 participants rate their own political position, and then they

were asked to rate six statements on a six point scale through fifteen conditions. Lastly, they were asked to rate the same statements on a six point scale from strongly agree through strongly disagree. These sections will determine how accurate the participants perceive these statements and how they relate to their own interpretation of their political position.

### **The Link Between Self-identification and Status for Biracial Persons**

**Katherine Granger**, Sociology - Senior

Mentor: Dr. Shelley Smith, Sociology

We live in an increasingly diverse society. The United States population is growing not only racially and ethnically, but there are an increasing number of people who consider themselves biracial. It is important to explore the relationships between differing classes and races in order to increase the cohesiveness in our society. Outside sources are generally held responsible for racial inequality, but this study hopes to increase the understanding of how the internalization of race impacts one's status. How is a biracial person's socioeconomic status influenced by their self-identification with a principle race? Does their socioeconomic status vary depending on which principle race they identify with? I have three objectives concerning racial self-identification among biracial people. The first objective is to determine the relationship between racial self-identification and educational attainment. The second objective is to determine the relationship between racial self-identification and occupational prestige/status. The final objective is to determine the relationship between racial self-identification and earned income. I conducted regression analyses using data from the 2000 Census (downloaded from the IPUMS website). The sample is employed individuals. For the purpose of this project, I narrowed the sample to those who said they belong to two race groups, and listed either black or white as their principle race. The two biracial groups were then compared to monoracial black and white groups in terms of educational attainment, occupational prestige, and earned income.

### **The Importance of Distal Social Support for Individuals with Serious Mental Illness**

**Henry Miller**, Psychology - Senior

Mentors: Dr. Bret Kloos, Psychology

Mr. Greg Townley, Psychology

Social support is a vital component of community integration for individuals with serious mental illness (SMI) (i.e., active community involvement and inclusion). Although research has investigated more typical types of support (e.g., friends, family, mental health staff), less is known about casual relationships with people living and working in the community ("distal supports"). This study utilizes data from the NIDRR-funded USC HOME Study, which aims to understand individual and environmental factors impacting community integration. Data were collected on participants' experiences at grocery stores, pharmacies, restaurants, and places of worship. Participants were asked about feelings of being welcomed, recognized, knowing people by name, and receiving help. In order to understand the impact of distal supports, bivariate correlations were examined between distal supports and participant demographics; and between distal supports and indices of psychological well-being and community integration. It was expected that participants who reported more distal supports would report more well-being and

community integration. It was found that female participants and older participants reported more distal social support. Greater number of distal supports correlated with less loneliness, higher life satisfaction, stronger perceptions of recovery, more participation in activities, and stronger feelings of community belonging. A hierarchical regression was conducted to assess whether distal supports impacted well-being over and above the influence of typical types of support. It was found that distal supports contributed positively to well-being after controlling for other support. Results of this study suggest distal supports are an important factor in community integration and well-being for individuals with SMI.

### **Don't Call us, We'll Call You: The effects of Visibility on the Decision to Hire Disabled Individuals**

**Rashad Morgan**, Psychology, Experimental - Senior; USC Upstate

Mentor: Dr. Ann Hoover, Psychology; USC Upstate

The purpose of this study is to examine the effects of visibility on hiring decisions. Specifically, this study attempts to unveil whether or not visibility of a person's disability combined with visibility of a job position influences hiring decisions. This study compares participants' hiring decisions for applicants whose disabilities are high (i.e., wheelchair user) versus low (i.e., back injury) in visibility applying for positions that are high (i.e., salesperson) or low (i.e., telephone customer service representative) in visibility.

### **The effects of recent musical context on emotional ratings of musical stimuli**

**Tanya Nichols**, Psychology - Senior

Mentor: Dr. Douglas Wedell, Psychology

Previous studies have considered many of the different aspects of music - tempo, mode, dissonance and melody - to evaluate emotional responses. Of these, dissonance in music has been considered the least. The current study will answer several questions. First, Ernst Krenek has a method of classifying the dissonance of chords by the intervals they contain. How valid is this classification? Second, as participants give emotional ratings of dissonant musical stimuli, will they have consistent emotional ratings? And finally, can the emotional rating of a chord be shifted by the context in which it is heard? Sixty-two university students have completed the rating of musical stimuli in varying contexts. Upon initial analysis, we are seeing some exciting results. Chords are rated with a good amount of reliability. And we are seeing a significant shift in emotional ratings of musical stimuli as a result of context effects. Upon completion of the analysis, we expect to see significant contrast effects between chords that are at the extremes, but assimilation between chords that are closer in their level of dissonance.

### **The Effect of Gender Roles and Gender Identity on Perceptions of Sexual Behavior**

**Melissa Peters**, Psychology - Senior; USC Aiken

Mentor: Dr. Jane Stafford, Psychology; USC Aiken

West and Zimmerman (1987) emphasize the issue of "doing gender," highlighting the role society plays in the construction of gender roles and the acceptance of gender-normative behaviors. Further, Simon and Gagnon (1986) connect the issues of gender and sexuality, identifying particular "sexual scripts" that guide

individuals' behavior and are largely influenced by concepts of gender norms and identity. Building on these ideas, the purpose of this research project is to explore how prescribed gender roles and gender identity influence individuals' perceptions of sexual behavior. The project utilized computer-based surveys that presented participants with 4 different sexual scenarios dealing with the topics of initiation of sex and various aspects of contraceptive use. The scenarios were manipulated as to whether they portrayed a female or male sexual aggressor, which will help determine the impact that notions of gender roles have on perceptions of sexual behavior. Additionally, participants completed the Bem Sex-Role Inventory to discern the influence of gender identity on views of sexuality. By investigating the links between gender and sexuality, the goal of this project is to identify gender-related variables that shape sexual beliefs, attitudes, and behaviors. As a college student and Peer Educator at my university, I am highly aware and interested in understanding the multitude of factors, including gender, that impact sexual activity. Consequently, this project holds potential implications for a range of both social and health-related issues such as the sexual objectification of women, male sexual aggression, safe-sex practices, sexually transmitted diseases, and unplanned pregnancies.

**Try Not to Bore Him: A Cross-Cultural Examination of Battered Women's Shelters in Seville, Spain and Columbia, SC and the Feminine Societal Role as Dictated by Each City's Response to Domestic Violence**

*Allison Reid*, Anthropology - Senior

Mentor: Dr. Jennifer Reynolds, Anthropology

While the emotional and physical repercussions of domestic violence are the most heard of, it is true that domestic violence is on a larger scale, an overarching commentary on the society in which the abuse exists. Until my college experience I took for granted the positive empowerment of my parents' healthy relationship devoid of any abuse. In my classes I began to read about domestic violence and the plight of the women involved. Over the past thirty years, the discrepancy between men and women's rights has drastically leveled out on a global scale, yet resources available for women in need are still underdeveloped. For my project, I compared battered women's shelters in Seville, Spain (during a study abroad semester) and in Columbia, SC (where I attend school). My goal was to cross-culturally examine support groups in an attempt to find out what worked best for each group so that I could relate my findings back to each shelter in an endeavor to further help domestic violence victims. Ultimately, in examining the different infrastructures, I gained insight to the options that women have and, moreover, women's roles today in their respective societies. Through academic research, photography, interviews, and participant observation I obtained the data for this project. For me personally, my research was very fulfilling knowing I may have helped change even one woman's life. It is incredibly important that these institutions maintain support. The more domestic violence is exposed, the easier it becomes for women to escape abusive relationships.

## **How We Got Here and What It Means: The Socioeconomic Journey of African-Americans**

**Ebony Sumpter**, Political Science - Senior

Mentor: Dr. Bobby Donaldson, History

African-Americans have an extensive history of lacking income, low education levels, and poor health. Since Emancipation and the failed promises of '40 acres and a mule', the socioeconomic status of African-Americans has yet to equal that of European Americans despite the numerous achievements and contributions to society. In this project, I argue that opportunities for African-Americans to increase their socioeconomic status has constantly been restrained beginning with Reconstruction and the Jim Crow System. I examine the generational effects of these historical and governmental failures and present possible solutions. My study includes that of past and current trends in South Carolina in comparison to the United States of America.

## **The Relationship Between Volunteerism and Self-Esteem**

**Bobbi Jo Wilson**, Psychology - Senior; USC Upstate

Mentor: Dr. Stefanie Keen, Psychology; USC Upstate

Volunteering is positively associated with health and happiness (Borgonovi, 2008). Previous research has shown that volunteerism results in positive emotions, thus lending to a possible explanation as to why those who volunteer lead a healthier and longer lasting life than those who do not volunteer (Dillard, Schiavone, & Brown, 2008). However, research has shown that most volunteers are psychologically healthy prior to their involvement in service work, so the extent to which volunteering can increase one's psychological well-being may be limited. The present study took place over the course of a semester at the University of South Carolina Upstate. Participants were pooled from four University 101 classes and from a service-oriented student organization (i.e., IMPACT). Participants completed a variety of self-report measures, at the beginning and end of the semester. The goal was to compare the self-esteem and overall well-being of those students who were obligated to volunteer based on a class requirement and those who volunteered by choice. Results demonstrated initial lower, though non-significant, depression rates and significant higher self-esteem scores for the IMPACT students. Also, depression scores were significantly lower from the first to the second wave of data collection for the University 101 students. Although the students who volunteered of their own accord were psychologically healthier at the start of the study, those who were required to volunteer reported a decrease in depression scores over the course of the semester. These findings suggest that volunteering, whether by choice or by obligation, may positively impact psychological well-being.

# Psychology, General

## **Effects of monthly dental care coaching on improving dental health in elementary students compared to usual care**

**Sukhi Guram**, Biological Sciences - Junior

Mentor: Dr. Brad Smith, Psychology

The surgeon general's report on oral health showed that dental carries is the most common childhood disease. Most carries can be prevented by improving daily dental care. A previous study found that coaching a student in brushing, flossing, and using mouthwash was more effective in improving daily care than a standard dental care demonstration, but no measures of dental health were collected. The primary goal of this research is to examine the effects of repeated dental care coaching on improving dental health as measured by professional dental screenings. At baseline, 100 elementary school students will be assessed for dental care by trained coaches and dental health by trained hygienists. Students will be randomly assigned to a standard dental care demonstration (control) or the demonstration plus three coaching sessions. During coaching sessions, students will be given toothbrush, toothpaste, dental floss, and mouthwash and observed performing their dental care routine by their coach. Each aspect of care (brushing, flossing, and rinsing) will be rated and discussed with the students with instruction about how to improve their dental care score. This coaching will be repeated three times about one month apart. Six months later, the dental care and dental health of all students will be re-assessed. Results will be assessed using repeated measures Analysis of Variance looking for a group by time interaction. This research project focuses on a preventative chronic disease that can be lessened with effective education provided by university service-learning students or other paraprofessionals.

## **Examining factors related to substance abuse among individuals with SMI**

**Boris Klaric**, Psychology - Senior

Mentors: Dr. Bret Kloos, Psychology

Mr. Greg Townley, Psychology

As is the case with members of the general population, substance abuse is an issue that affects individuals with serious mental illness (SMI). Substance abuse may exacerbate symptoms and affect individuals' abilities to function in the community. There has been little research regarding specific factors that may be related to substance abuse for individuals with SMI. This study utilized data from the NIDRR-funded USC HOME study to examine factors related to self-reported substance use among people with SMI living independently. Specifically, the study examines relationship between sociodemographic characteristics and reported substance abuse, as well as the relationship between substance abuse and indices of psychological well-being and functioning (e.g. loneliness, stressful life events, community integration). It was expected that there would be a strong correlation between substance abuse and sociodemographic characteristics, including age, gender, and race. Furthermore, it was expected that there would be a positive correlation between stress-related variables and reported substance use. It was found that participants' gender, age, and income were strongly correlated with reported substance use; however, there was not a significant correlation between reported substance abuse and race, education level, or relationship status.

Significant positive correlations were found between substance abuse and stressful life events, while negative correlations were found between substance abuse and life satisfaction, illness management, and community integration. These findings suggest certain factors that may be related to substance abuse in individuals with SMI and point to the need to design interventions that address substance abuse issues for members of this population.

### **At a glance: comparing the perception of scenes in children and adults**

**Liana Krajnak**, Psychology - Junior

Mentor: Dr. Melanie Palomares, Psychology

With even a quick glance at a scene, the average adult can almost always tell what the scene is about, but needs more time to remember details about the scene. However, it is unknown whether children perceive scenes in the same way, and little is known about the process of this phenomenon's development. In a pilot study, 20 participants, 12 children and 9 young adults, were chosen. The children ranged in age from 5-12 years. Each participant was presented with 20 randomly ordered images for 100 ms followed by a visual mask. For each image, participants were asked to identify whether it was indoors or outdoors, and whether there were people in the image. The former tested whether they had perceived the gist of the image, and the latter tested whether they picked up on detail. We found two significant results. First, adults were significantly better at perceiving both gist and detail than were children under 10. Second, both children and adults were better at perceiving gist than detail. In an ongoing study, we have expanded the number of test images and varied presentation time from 100-500ms. We are also including children as young as 2 years of age in order to explore the possibility that gist perception is innate.

### **Differences in social support for healthy behaviors in adolescents with low and high body image dissatisfaction**

**Maria Lopez**, Journalism and Mass Communications - Senior

Mentors: Dr. Dawn Wilson, Psychology

Mrs. Sara Mijares St. George, Psychology

This study used a bioecological framework to examine whether underserved (low-income, ethnic minority) adolescents with low versus high body image (BI) dissatisfaction would have different levels of social support for healthy behaviors (physical activity and healthy eating) from parents and peers. It was hypothesized that adolescents with high BI dissatisfaction would perceive less social support from parents and peers for physical activity and diet compared to adolescents with low body image dissatisfaction. Forty-five African American Adolescents (23 girls, 22 boys; mean age= 12.64, 29% obese) from two high crime communities in South Carolina completed psychosocial surveys that assessed BI dissatisfaction and social support for physical activity and diet from family and peers. Adolescents were divided into two groups based on their BI dissatisfaction score, with those below the mean classified as having low BI dissatisfaction and those above the mean classified as having high BI dissatisfaction. Independent sample t-tests were conducted in order to analyze the differences in social support from parents and peers for physical activity and diet between adolescent with low and high BI dissatisfaction. Although no significant differences between groups was found, there was a trend for low BI dissatisfaction to show a higher mean ( $M= 3.06$ ,  $SD$

=1.02) than high BI dissatisfaction ( $M=2.64$ ,  $SD = 0.92$ ) in social support for physical activity from peers with  $t(43) = 1.43$ ,  $p(0.15) = .05$ . Further analysis are forthcoming and will examine the relationship between social support (PA and diet) from family and peers and BI dissatisfaction predicting adolescent weight status.

### **Recognition of Affective Faces Using Six Basic Emotions**

**Sara Mallon**, Psychology - Sophomore

**Arjamand Sami**, Psychology - Sophomore

Mentors: Dr. Svetlana Shinkareva, Psycholog

Dr. Douglas Wedell, Psychology

Mr. Jongwan Kim, Psychology

Ms. Jing Wang, Psychology

Multidimensional scaling was used on a behavioral study designed to examine how people process emotional faces. The objective was to replicate the results from the Circumplex model (Russel, 1980) on two dimensions of arousal and valence using the six basic emotions of happy, sad, anger, fear, disgust and neutral. The latency and accuracy in identifying six emotional expressions of males and females with varying ages of young, middle and old was measured. The total of 324 trials was conducted with 12 trials having the same expression and 15 having different expressions. The stimuli had same gender and age but varied emotions.

Participants were given a discrimination task of identifying whether the facial expressions presented were the same or different. The data seems to fit the Circumplex model of affect (Russell, 1980) which used multidimensional scaling on two dimensions. Happy was the most accurately identified emotion with the shortest reaction time, whereas sad had slower accuracy and the longest reaction time. When graphed, happy and neutral were set farthest apart for valence and arousal when compared to other emotions. Fear, anger, sadness, and disgust were more or less similar in accuracy and reaction time. Disgust and anger had a 50% accuracy and reaction time according to MDS. The data collected from this experiment will help to design further neuroimaging studies for affective faces.

Personal Statement By: Arjamand Sami The experience of working in Dr.

Shinkareva's lab has helped me to realize that my goals of working in neuroscience projects are possible. I hope others are able to appreciate the human brain and how it judges emotions. Sharing my data on affective faces might better the understanding on how we perceive emotional facial expressions. It is interesting to see that each of us distinguish emotional expression differently. Many dream to work with the fascinating complexity of the human brain; as for me I get to see it as a reality.

### **PATH: An Ecological Framework of Public Health that Increases Physical Activity in Underdeserved Communities**

**Arienne Muhammad**, Nursing - Sophomore

Mentors: Dr. Dawn Wilson, Psychology

Mrs. Sandra Coulon, Psychology

Mrs. Shamika Robinson, Psychology

Mrs. Sara St. George, Columbia

Mrs. Neve Trumpeter, Psychology

Background: Minority and lower SES (socioeconomic) adults have some of the highest obesity rates and lowest levels of physical activity (PA). Using an ecological framework to increase social and environmental supports for PA, such as creating safe and convenient places for PA, is an emerging public health strategy. The Positive Action for Today's Health (PATH) trial is a randomized trial evaluating an environmental intervention to improve access and safety for walking in underserved (low income, high crime) communities. Design and Setting: Three communities were randomly selected to receive one out of three programs: a police patrolled-walking program plus social marketing intervention, a police-patrolled walking only intervention, or a no walking intervention (general health education only). Measures included PA (7-day accelerometer estimates, 4-week PA history), body composition, blood pressure, psychosocial measures, and perceptions of environmental supports for safety and access for PA at baseline, 6-, 12-, 18-, and 24-months. Intervention: The 24-month intervention focused on increasing safety (training leaders in the community to serve as walking leaders, hiring off-duty police officers to patrol the walking program, and controlling the amount of stray dogs), increasing access for PA (creating a walking trail), and developing a tailored social marketing campaign for increasing PA (in the full intervention community). Main Hypotheses/Intervention Data: It is hypothesized that the police-patrolled full intervention will result in greater increases in PA as compared to the police-patrolled walking only or the general health interventions after 12 months, and that the effect would be maintained at 18- and 24-months. PATH intervention data was collected systematically and then processed and interpreted on a weekly basis by myself and others. Conclusions: Implications of this innovative community-based trial are discussed.

### **Parental Limit Setting of Sedentary Behaviors and Fast Food Intake in Overweight African American Adolescents**

**Ann Newsom**, Biological Sciences - Junior

Mentors: Dr. Dawn Wilson, Psychology

Ms. Hannah Lawman, Psychology

Metabolic syndrome is present in approximately 4-10% of adolescents in the United States and is strongly associated with coronary heart disease, type 2 diabetes, and all-cause mortality. Minority adolescents are at increased risk for developing metabolic syndrome due in part to high rates of obesity. This project examines how parenting styles may relate to their child's risk factors for metabolic syndrome in African Americans. Metabolic syndrome was assessed with height, weight, and waist circumference measurements, along with a fasting-glucose blood test. Both anthropometrics and a self-reported survey were taken from 50 pairs of overweight minority adolescents and their parents. Parents self-reported their ability to set limits upon their child's sedentary behaviors as well as fast food intake. In addition, parents reported having a meal with the family 3 times a week and eating at fast food places 1-2 times a week.

Although it appears that the parents self-report limiting their child's sedentary behaviors and fast food intake, the prevalence of overweight and obesity is quite high in this sample of youth. Flaws in self-report could indicate that there might be some miscommunication or it could be that the parents have not developed the behavioral skills for properly limiting their child. Further studies should examine family dynamics in communication and behavioral skills for limit setting. Although

this cross sectional survey displays parenting styles, further data is forth coming on how these measures directly relate to 24 hour dietary recalls obtained in the youth.

### **Identifying Faces: Which Features Matter?**

**Matthew Shannon**, Psychology - Junior

Mentor: Dr. Melanie Palomares, Psychology

The ability to properly recognize and respond to emotions in facial expressions is important in communication. We evaluated which features are important for identifying emotive faces, and whether these features would benefit from a holistic context. Participants matched a target face with one of two choices (happy vs. surprised or angry vs. disgusted). The faces were broken down into the two main face features (eyes or mouth), which were presented on two backgrounds (blank screen or neutral face). We measured threshold contrast, the faintest intensity at which facial expressions can be identified at 75% correct, in typical children and typical adults. We found three notable results: (1) Participants were better at identifying faces when the mouth was shown, rather than the eyes. This is inconsistent with the popular notion that “the eyes are the windows to the soul.” Instead, the results are consistent with the idea that muscle movement in the mouth area provides better cues to facial expression than in the eye area (Ekman & Friesen, 1975). (2) Participants were better at distinguishing a happy vs. surprised face than distinguishing an angry vs. disgusted face, suggesting that people might be better at differentiating subtle differences in facial expression with positive affect over negative affect. (3) Participants were no better at identifying faces when the background was a neutral face, rather than a blank background, suggesting that when features are highlighted in attention, a holistic strategy is unnecessary. Preliminary results suggest children discriminate facial affect differently than adults.

# Social Sciences & Business

## **Taiwan and Tourism: How They Connect**

**Will Boggs**, International Business - Sophomore

Mentor: Dr. Dwight Kelehear, Educational Leadership and Policies

On this trip I was able to study how tourism affected Taiwan's economy and furthermore how the tourist affected the economy depending on their length of stay, habits, etc. Tourism is an industry that dominates the economies of many smaller countries especially in large popular cities such as Taiwan. Through this international inquiry trip I learned how specific tourist attractions become popular and attract millions of people to visit them each year and why people pay to see them. Furthermore I was able to complete a lot of observations about how certain tourist type activities can be free, but how these can also benefit the surrounding economy. Many studies estimate food, lodging, and tourist attraction admission costs into the tourism industry field. I observed all three of these things as well as observed the tourist attractions themselves. While at these attractions I was able to speak with other tourists and this helped me get an idea for where the majority of Taiwan's tourists come from. Furthermore many of them were on trips with larger groups through travel organizations and I was able to see how these travel organizations can influence the tourism industry. Finally I was able to observe some of the less obscure tourist attractions away from the main city and learned how the impact of these tourist attractions are similar and different from tourist attractions in the main city. The tourism industry impacts much more than the admission into tourist attractions thus making tourism a dominant market.

## **ProPowerLINKS**

**Alan Brylawski**, Management - Senior

We created the idea of a professionalism resource based on the problems we saw with our generation. We wanted to create a resource for students and young professionals which had not been thought of before and is needed in order to be successful. ProPowerLINKS.com was first started to teach professionalism through an online resource for Alpha Kappa Psi Business Fraternity here at USC. While creating the resource, we received a large demand for the resource from other organizations, schools, and students themselves. The design of the website revolved around the image of a "one stop shop for all professional needs." The website is divided into four distinct categories; Content, Services, Seminars, and Tools. Content: the website breaks professionalism down into "LINKS" such as Business Attire, Interviewing, Negotiating, etc. Each link consists of videos, articles, and comments explaining the Link topic in detail. It also has a Blog and Q&A section for users to add their own experiences. Services: ProPowerLINKS provides several personal services to our members to help them achieve the level of success they desire in their careers. Seminars: These are for organizations to take advantage of in-depth seminars on various professional topics. Tools: Each tool we provide is free to all members to use to help with subjects from a homework helper to personal financial planner. Students come to college to get an education but do not know how to be professional, until now.

## **Analyzing the viability of premium seating as a major revenue source for professional and collegiate sport organizations**

**Dylan Burton**, Sport and Entertainment Management - Senior

Mentor: Dr. Tom Regan, Sport and Entertainment Management

Luxury suites and other types of premium seating have been the primary revenue source for professional and collegiate sport organizations since the mid-1990s (Lawrence, Kahler & Contorno, 2008). However, the recent recession in the U.S. has negatively impacted sales throughout the sports industry, including premium seating. My research focused on how the economy has impacted sales of premium seating inventory and the specific ways the industry has adapted to changes in demand. The purpose of my research was to determine the best practices for selling premium suites in a recession and how these practices can be applied to new and existing facilities in the future. Various online databases were utilized and several phone interviews were conducted with top executives in the industry to gather information on effective sales strategies for premium seating. The industry has become much more customer service-oriented since the economic downturn, with an increased focus on adding value to luxury suites. Most teams have had to be more flexible on the length of contracts in order to maintain a strong level of sales and keep prices flat, especially those in smaller markets or that have older facilities. Premium seating clients are also expecting teams to show an increased return on investment by helping them to improve business-to-business interactions in their suites. It will be important for sport organizations to continue to improve their relationships with premium seating clients and adjust appropriately to changing economic conditions in the future.

## **Process of internationalization in Mexican multinational corporations**

**Cameron Cegala**, International Business - Senior

Mentor: Dr. Alvaro Cuervo-Cazurra, International Business

My research project was aimed to understand the multinationalization process of companies from Latin America, specifically Mexico. Multinationalization is the establishment of value added activities outside the country of origin. Because Latin American multinational firms have received very little attention in the academic literature, we do not understand well how these companies have become multinationals. In order to gain such detailed understanding of the steps taken by firms from Latin American in their multinationalization process, I am conducting in-depth analyses of case studies on two Mexican multinational corporations, America Movil and Telmex. I have selected firms from Mexico to control for country-of-origin effects and to facilitate the interview and data gathering process. In addition, I chose the two firms from the same industry to control for industry variables. I will be conducting interviews with these two firms as well as with the Chamber of Commerce in Mexico and a regulatory body for the telecommunications industry over Spring Break. After conducting the interviews and gathering as much information as possible, I will return home to draw conclusions and finish my thesis.

## **Market Valuation of Booked Assets under the use of IFRS and GAAP**

**Michael Depp**, Accounting - Senior; USC Upstate

Mentor: Dr. Elizabeth Cole, Accounting; USC Upstate

Since the 1980's there has been a growing trend towards developing a single set of

accounting standards that can be used by all countries. It is generally assumed that a single set of accounting standards will enhance transparency of reported accounting numbers and increase global market efficiencies. Throughout the last two decades, over 100 countries have adopted IFRS. In 2002 the U.S. Financial Accounting Standards Board and the International Accounting Standards Board signed the Norwalk Agreement, pledging to converge U.S. Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS). Since 2007, the Securities Exchange Commission has allowed foreign firms to register in the U.S. using IFRS. Benefits of adoption include greater liquidity, decreased cost of capital, better allocation of capital as well as decreased costs of standard setting. However the benefits may not exceed the costs of transition and costs associated with certain provisions in IFRS that could result in lower quality of financial statements in certain circumstances. One of the greatest differences between GAAP and IFRS is the treatment of fixed assets. International Accounting Standard 16 allows companies to either report fixed assets at cost less accumulated depreciation or revalue to market value. Under U.S. GAAP fixed asset's carrying value is always cost less accumulated depreciation, unless there is an impairment of the asset value. This research extends earlier research by looking at the valuation and the quality of reported asset figures rather than the more aggregated income figure.

### **Supply Chain for Starbucks Corporation**

**Saidah Grimes**, International Business - Senior

Mentor: Dr. Jayanth Jayaram, Management Science

Starbucks is an international coffee chain established in Seattle and is the largest coffee house company in the world. Starbucks went abroad in 1996 with the first store outside of North America opening in Tokyo. Starbucks recently expanded into Brazil for two reasons. Their fair trade line of coffee has been very successful in the United Kingdom, with Brazil being a key supplier. Fair trade coffee is a social movement to help developing countries promote sustainability by paying higher prices for the promotion of higher social and environmental standards. Additionally, Brazil is the second largest coffee consumer market in the world. Starbucks opened its first store in Brazil in 2006 and is currently pursuing rapid expansion. Culturally, Starbucks has had trouble adapting to the tastes of its Brazilian consumers. Customers are looking for the bold flavor provided by Brazilian coffee in addition to the sophisticated atmosphere that only Starbucks can deliver. With the first store opening in Sao Paulo, Starbucks has chosen to target global cities for massive expansion. The largest challenge for Starbucks remains their ability to provide a high quality, local through international distribution channels. Their key competitive advantage has been using local suppliers to provide customized Brazilian snacks and coffee in Brazilian Starbucks stores.

### **Benefits/Liabilities of Four Summer Olympic Stadiums after the Olympics 1996-2008**

**Mark Johnson**, Sport and Entertainment Management - Junior

Mentor: Dr. John Grady, Sport and Entertainment Management

The purpose of this study was to examine Summer Olympic stadiums from 1996 to 2008 to determine what benefits or liabilities the use of these stadiums created for

the host cities after the Olympics. A qualitative method was used to conduct the study which involved examining secondary press data. The researcher coded the information from the literature to determine benefits and/or liabilities. The research study revealed the host cities in this study faced challenges in sustaining the usage of the Olympic stadiums after the Olympics. The research study gave an understanding to the issues of both benefits and liabilities after the Olympics as they related to: location, cost, pre-construction plan for post-Olympic usage, construction, renovation, post-Olympic usage, and ownership. Understanding the post-Olympic role of Olympic stadiums in their communities could help define the role of the stadium early enough that liabilities could be limited and benefits could be extended. An emphasis and knowledge base by stakeholders could further enhance the efforts of the link between Olympic stadiums and Olympic legacy.

### **Turkish Perspectives on European Union Accession**

**Hannah Miller**, Economics - Sophomore

Mentor: Dr. Amy Mills, Geography

Turkey's bid for the EU has been plagued with obstacles cultural, political, and economic. Though EURO Barometer polls taken yearly assess public opinion on a variety of political issues, coverage of Turkish opinion is limited and largely inaccessible. Such polls generally focus on EU citizens. I travelled to Istanbul last summer to interview Turkish college students, academics and researchers on their perspectives regarding the accession negotiations, after gleaning a historical background from various reading material. I sought out interview subjects and the pool grew through a snowball effect. As I worked at Turkish Policy Quarterly as an editorial assistant, I gained access to leading opinions on the subject from experts in the field and I absorbed the editing process of scholarly articles, valuable insight for my subsequent research drafting. Current perceptions of Turkey evolve around the notion that Turkey is moving away from the West. Polls, such as a recent study by The Economist, show enthusiasm for European integration as waning, declining from 70% to 42% over four years. However, the cultural elite I contacted is supportive of the project and hopeful regarding substantive results in the near future. By speaking in an intimate setting with my research subjects, I followed up with targeted questions and detected emotions attached to responses. During the research process, I took courses on Turkish language and the history of the Turkish Republic at Bogazici University that gave me a deeper look into the culture of my subjects and better ability to communicate with them.

### **Microcredit in South Carolina: An effective way to improve per capita GDP?**

**Patrick Morris**, Business Economics - Senior

Mentor: Dr. Janice Breuer, Economics

For decades, microcredit has helped the impoverished in the developing world escape the clutches of poverty, by giving entrepreneurs small loans to be used as capital to help foster their very local and small scale businesses. My project attempts to quantify the impact a microcredit program would have if it were implemented in South Carolina, by forecasting the success of past programs in other states and countries to South Carolina. The research was done by examining; publically available data sets on poverty, GDP, and employment; research by other studies; as well as media articles that examined microcredit in the US and abroad.

The purpose of this project was to see whether or not Microcredit would be a useful program to lift South Carolina's citizens out of poverty and create jobs to help move the economy forward. I learned that there can be many pitfalls of microcredit – but on the whole it can be a very beneficial tool to help those with an entrepreneurial spirit escape the clutches of poverty. My hope is that one day my research will be used as a part of a broader effort to bring microcredit to South Carolina.

### **Evaluating the Impact of Child Support Grants in Lesotho**

**Will Payne**, Political Science - Junior

Mentor: Dr. Edward Carr, Geography

In the summer of 2010, I spent six weeks in the mountainous country of Lesotho in southern Africa to observe the Lesotho Child Support Grants pilot program.

Developed by UNICEF and administered by the Lesotho Department of Social Welfare (DSW), it provides unconditional cash grants for orphans and vulnerable children and their caregivers. In studying a welfare program in a small, developing country I was able to consider both the challenges and the outcomes of administering such a program and its relation to poverty reduction and development. It was apparent from my fieldwork that the Child Support Grant is a vital lifeline for these caregivers, assisting them in procuring basic necessities and allowing the children the essentials to get an education (by assisting with the additional costs of schooling). However, the program suffered from inadequate resources, hasty implementation, and a number of organizational challenges that hindered the government's ability to effectively monitor and manage the pilot project. This project allowed me a different lens through which to view challenges in public policy and emphasized the importance of the local, individual, and cultural relevance of policy decisions.

### **The Effects of Transnational Integration Regimes on Domestic Capital Market Regulation in Developing Countries**

**Anna Sekulich**, International Business - Senior

Mentor: Dr. Gerald McDermott, International Business

The recent global economic crisis has brought to light the importance of sound financial regulation; this is especially true for countries that are undergoing the integration process. Through the examination of several existing indices and past research that aim to assess the link between public and private regulation and quality of capital markets, this project compares the development of capital markets in Latin American and Eastern European Countries. This analysis is done through the collection of relevant data on the size and strength of regulatory bodies, regulations, and capital markets. The project also attempts to build an index that demonstrates the divergent paths of capital market development in Latin American and Eastern European countries.

### **Sustainability and Sourcing: Designing Scorecards for the French Perfume Industry**

**Emily Sutton**, Management Science - Senior

Mentor: Dr. Jayanth Jayaram, Management Science

My objective was to study sustainability and ethical sourcing issues in the French perfume industry. We hoped to develop a tool in the form of a scorecard that could



be used to help firms access the sustainability practices of their entire supply chain. Firms could then develop strategies to address their suppliers and improve the corporate responsibility of the whole industry. I was able to obtain funding through the study abroad office, Office of Undergraduate Research, and the Honors College that allowed me to spend a semester studying near the heart of the French perfume industry. Using the resources of the French Institute where I was studying and face-to-face interviews with local industry executives, I was able to gather information directly from the industry's core. In order to supplement this information I also contacted industry representatives in the United States when I returned. I found corporate attitudes towards sustainability that ran the gamut from defensive indifference, to wait and see, to committed leadership. While most firms recognize the importance of sustainable strategies, they have yet to standardize a way to ensure their suppliers are aligned with their sustainability efforts. I feel that a supplier scorecard will provide real utility to the industry by promoting green practices, reducing waste, and controlling risk in their supply chain.

# Social Sciences & Education

## **Gender Differences in Academic Self-Efficacy in Grades 3 to 8**

**Daryn Barker**, Psychology - Junior

Mentor: Dr. Bradley Smith, Psychology

My research is on academic self-efficacy and looks at the differences between genders in self-efficacy from third to eighth grade. Academic self-efficacy is an important attitude toward learning that is defined as the perceived ability to be successful on academic tasks. Compared to skill alone, academic self-efficacy makes unique contributions to predicting performance. This means that improving self-efficacy should also improve achievement, interest, and motivation. I chose to study this topic to create awareness for academic self-efficacy, especially its gender differences. The study population is from the after-school Challenging Horizons Programs. Most of these students have been referred to the after-school program because they are struggling in math or reading. Each week in the program students take a math test. Students must earn a score of 90 or higher to pass to the next level of difficulty. Prior to taking the weekly tests, students use a 10-point scale to rate their confidence that they will pass the test (10 = 100% confident, 1 = not at all confident). Data on these self-efficacy scores, test performances, and gender will be coded and analyzed. I expect to find significant differences in self-efficacy between the genders, as well as age effects, upon completion of the project in April, 2011. I feel that this can have a large impact on the community because more knowledge on academic self-efficacy could be a key part of getting youth up to speed academically and producing successful adults.

## **Orff-Schulwerk Applications of Penatonic and Diatonic Tonal Systems for Elementary-Aged Students**

**Megan Graham**, Music Education - Senior

Mentor: Dr. Wendy Valerio, Music Education History and Theory

Orff-Schulwerk is an approach to teaching music through imitation, exploration, and improvisation. The children in an Orff-Schulwerk elementary classroom are instructed to create music by using speech, singing, body percussion, unpitched instruments, and pitched instruments. As they engage in music instruction, students gain skills using tonality. The purpose of my research was to investigate experts' views of using songs in the pentatonic tonal system or diatonic tonalities with elementary-aged students. The specific research questions were: 1) What are the benefits and drawbacks of using the pentatonic tonal system or diatonic tonalities when teaching music to elementary-aged students, and 2) what are optimum sequences for transferring sung tonal skills to Orff instrument performance? I recorded individual, open-ended interviews with three expert Orff-Schulwerk pedagogues at the 2010 Orff-Schulwerk National Conference in Spokane, WA. My initial question to each interviewee was, "How do you use tonality with elementary students?" I transcribed each 30-minute interview, and analyzed the data by determining common themes, as well as differences. The commonality was that each pedagogue uses the diatonic tonalities with elementary-aged students. Each pedagogue reported different reasons for their choice of tonal instruction, a different definition of tonality, and different ideas regarding how to incorporate the different diatonic tonalities into the music classroom.

## **Ripples of Hope**

**Brittany Hayes**, Art Education - Senior

Mentor: Dr. Karen Heid, Art

Through the Magellan Scholarship program, I participated in a community project at A. C. Moore Elementary School where students created a mosaic garden at the school entrance based on the poetry each student wrote. This project gave the students an opportunity to express their literacy and ideas through art. As an Art Education Major with a background in Early Childhood Education I am interested in ways to incorporate art into more areas of the classroom rather than just the art room itself. This project not only allowed me to see how students made these connections but I was also able to see an entire community come together to make this possible for its students. Because the students were allowed to express themselves in new ways, they were highly enthusiastic about being a part of a long term project that took several months to complete. When I am given my own classroom one day, I will know how to incorporate this project and similar ideas into my lessons. I found that not only is it possible to incorporate art into other subjects, it is also possible to bring an entire community together to create something beautiful for the school to enjoy for years to come.

## **USC Students with Disabilities, Advocacy and Awareness**

**Christina Hoffecker**, Social Work - Senior

Mentors: Dr. Miriam Johnson, Social Work

Ms. Susan Parlier, Social Work

As a social work student I wanted to base my research project around the undeserved population of University of South Carolina students with disabilities. I started off my research project with a literature review. It was important to understand what projects had been done before and their outcomes. For my project, the majority of my efforts were spent conducting surveys and interviewing individuals. The project required that information was gathered from the students perspective on what they knew about students with disabilities, how we could help them and if they were even comfortable disclosing that information with others. I put a particular emphasis on the ages of these students and the correlation that it made with the knowledge known about disability resources. I also conducted a series of photo sessions with certain areas around campus that highlighted the more difficult areas of navigation. I then asked individuals to reflect on these areas and how they made them feel in relation to their disability. The project outcomes showed a strong correlation to the age of the student and their level of knowledge about disabilities. Students that didn't have disabilities were less likely to see the inaccessible building and paths around campus and many times, those individuals with disabilities did not feel comfortable sharing their needed accommodations with those around them. Overall, this information can be useful in modifying buildings across the USC campus and policies within the department of disabilities.

## **Evaluation of Transitional Mentoring Program Effects On Middle School Students**

**Alexandra Ingram**, Psychology, Experimental - Senior

Mentor: Dr. Amanda Fairchild, Psychology

Transitional mentoring shows high promise in targeting a key period in adolescent lives. However, due to the lack of research, the conditions under which these

programs provide maximum results are still unknown. We are examining how the changes in school connectedness as a result of transitional mentoring predict changes in a student's life satisfaction. Students from a sixth grade class at a middle school were randomly assigned to one of two conditions. Students assigned to the first condition received a transitional mentoring program in at the beginning of their first semester of sixth grade while those assigned to the second condition were our control group and did not receive mentoring. Those students who received mentoring were then paired and matched with an appropriate University Student Mentor on the basis of sex, race, and general interests. We distributed a survey to be completed by both mentors and mentees before the program began and once transitional mentoring had been completed. Specifically, we investigated changes on the measures of school connectedness and a measure of adolescent life satisfaction created by Scott Huebner. The data from said surveys are currently being electronically compiled and double checked for accuracy for its evaluation. We anticipate finding increases in students' levels of school connectedness as an outcome of school based youth mentoring. Additionally, these increases in school connectedness should statistically mediate increases in levels of life satisfaction. Anticipated effect sizes are between medium and small and preliminary power analyses suggest sufficient power to detect these effects.

### **Analyzing the effect an educational pharmacy camp has on high school students' perception and knowledge of the pharmacy profession**

**Cory Jenks**, Pharmacy - Senior

Mentor: Dr. Elizabeth Blake, Pharmacy

The pharmacy profession has been deemed one of the most trusted by the public. The viewpoint of the pharmacy profession by high school students deciding upon a career has yet to be established. The goal of this study was to determine the effect of a weeklong educational pharmacy camp on the perception and knowledge of the pharmacy profession by high school students. High school students attending a weeklong USC College of Pharmacy summer camp were exposed to a variety of pharmacy practice activities, simulated pharmacist duties, and taught about career paths available to pharmacists. A pre and post-camp study were administered to examine their desire to pursue pharmacy, as well as their perception and knowledge of the pharmacy profession. At the end of the camp, students expressed greater interest in applying to pharmacy school compared to the start of the camp. Student responses indicated increased awareness of a pharmacist's ability to prevent and potentially diagnose disease. Additionally, there was an increased awareness of the variety of settings in which a pharmacist could practice. Ironically, by the end of the week, students demonstrated a loss of trust in pharmacist's knowledge regarding health related questions. This educational pharmacy camp increased high school students' knowledge of pharmacy and the desire to pursue pharmacy school but did not increase their trust in the pharmacy profession. Additional review is needed to determine the loss of trust.

### **Can Charter School Mission Statements Predict Academic Success?**

**Peter Schaeffing**, Economics - Senior

Mentor: Dr. Orgul Ozturk, Economics

Today there are almost 5000 charter schools in the United States, an increase of over 65% over the past six years. Since schooling is a good whose quality is not

readily apparent it is important that parents evaluate various measures through which they may be able to make informed decisions about where to send their children to school. The charter school movement emphasizes the importance of the missions of its schools, and as such charter school mission statements may be indicators of the quality and orientation of individual schools. This study considered various characteristics of the mission statements of charter schools in five states to determine which characteristics, if any, correlate with better academic outcomes. Items considered were the focus of each mission statement, which ranged from character building to preparation for college, the length and succinctness of each mission statement, and for academically oriented mission statements, whether they focused on math and science or on the liberal arts. State laws affecting charter schools and teacher characteristics were among the variables controlled for. The findings of this study are important for all stakeholders in the charter school world, including lawmakers, who must decide which schools receive charters and which are rejected, charter school operators, who must decide how best to orient their schools for success, and parents and students, who must know which factors are truly indicative of success to make the vital decision of which school to trust.

### **Appropriation, Gender Play, and Technical Innovation in Children's Digital Video Production**

**Samantha Shoppell**, Art Education - Senior

Mentor: Dr. Olga Ivashkevich, Art

Currently, very few studies exist on children's new media use. One of the largest studies, a Project on Digital Arts and Learning, partly addressed how teenagers use technologies such as blogs, websites, text messaging, podcasting, and other new avenues of expression. However, there are virtually no studies of how new technologies are used by younger children and preadolescents. One of the challenges of contemporary art education in including new media production in the art curriculum is the difficulty educators face in teaching a generation of children who are often more familiar and comfortable with today's technology than their teachers. This study seeks to aid art educators in meeting the challenge of media integration by investigating how children use new technologies in their home environments. The study proceeded via a qualitative, ethnographic approach in which we acted as participant observers, working with an 11-year-old boy and 8-year-old girl in making videos over the period of one month for six hours weekly. This study investigated questions of how children learn to use new media tools and software, and what ideas, themes, and narratives they explored through their video production. Two particular themes which we saw emerge repeatedly, were those of gender play and of the influence and appropriation of popular culture texts. We hope that, by uncovering the child-centered issues that arise in the media production process, this study will aid art educators with designing engaging and relevant student-centered curricula involving new media.

### **Documenting the Story of Service Learning**

**Michael Youngblood**, Management Science - Sophomore

Mentor: Prof. Susan Houge, Art

During May of 2010, I traveled with twenty Capstone Scholars, Honors College, and Nursing students to Ecuador, documenting their journey and the impact of service

learning on students' lives. Through photography, I followed the students' daily activities in an attempt to understand how service learning works and how it differs from learning in a classroom environment. The students participated in many activities including helping keep facilities of a community center in Quito, "El Centro Del Muchacho Trabajador," in top shape, helping children at the center learn important academic skills, and even helping with the children's extracurricular activities. I also followed the students to a home site in a favela where they helped build a foundation for a new home, and to the Galapagos Islands and the cloud forest where they discovered the importance of biodiversity. I learned that by doing service work and seeing how normal people in a country experience life first hand, myself and the students grew their understanding of global and social issues. Students gained a much deeper understanding of what challenges countries like Ecuador face in trying to lift their population out of poverty and what an average college student can do to help solve these problems. These students were able to learn for themselves information that could never be understood in a classroom, and will be able to apply the lessons they learned to their future endeavors as college students and professionals.

# Social Sciences & Public Health

## **E.S.C.A.P.E**

**Caitlin Dutton**, Exercise Science - Senior

Mentor: Dr. Kara Montgomery, Health Promotion Education and Behavior

A personal experience with stage 0 melanoma inspired my interest in the amount of knowledge that college students have in how to protect themselves. For my group project in HPEB 300 (Introduction to Health Promotion, Education, and Behavior), we designed a program proposal called ESCAPE (Encouraging Skin Cancer Awareness, Prevention, and Education) that targeted USC females and aimed to change their behavior and encourage more skin cancer awareness on our campus. This semester, I am attempting to take this one step further. By surveying female undergraduate students on our campus, I am better able to understand the knowledge base and to plan a program more specific to the needs of female students on our campus.

## **Sex, Drugs, & Rock 'n' Roll: An Artistic and Scientific Exploration of Addiction and Pleasure**

**Katherine Ensor**, Art History - Senior

Mentor: Dr. Neil Levens, Psychology

As an art history major extremely interested in human psychology, I decided to research the physiological and psychological bases of addiction. As I began to read more about the effects of genetics, personality, and upbringing on a young person's becoming an addict, I was struck by several things: There are many factors that can cause a person to become an addict. Not everyone with these risk factors becomes an addict. The underlying brain mechanisms behind all addictions are similar, if not the same. I have used books and current journal articles to gather the data I need to make a more informed statement about the reasons why some people fall prey to their addictions and others do not. As I learned, an individual's path to addiction does not have to follow an established pattern. Rather, there are many factors involved. As I researched the issue, I realized that what I learned could help resident advisors and other people who work with high school and college students deal more effectively with addicts and perhaps even help these counselors understand how addicts are "made." I also am interested in art, so a second component of my project involves photography. I am interested in the ways photographs can encourage and deter people to participate in certain activities; I have attempted to photograph the "ugly side" of addiction, and have also taken photographs of healthier activities that people could participate in instead.

## **A Cross-Cultural Comparison of Healthcare Volunteering in the United States and Peru**

**Jennifer Greene**, Exercise Science - Senior

Mentor: Dr. Erica Gibson, Anthropology

The healthcare systems in the US and Peru are very different. Through research and personal experience the difference between the two healthcare systems and the impact the differences have on the experience of healthcare volunteering are investigated. Specifically, the project investigates the similarities and differences between the level of volunteer interaction in the healthcare settings in the United

States and Peru by determining the impact of restrictions due to healthcare rules and regulations and language barriers. This is investigated through my personal volunteer experience, observation of other volunteers within the healthcare settings, and interviews with other volunteers to further understand the differences in volunteer interaction that I may not see directly. Finally the project investigates how the local culture impacts the rules and regulations placed on the American and Peruvian medical systems.

### **The Effect of Toning Shoes on Exercise Energy Expenditure and Walking Behavior**

**Kevin Huff**, Exercise Science - Senior; USC Aiken

Mentor: Dr. Brian Parr, Exercise and Sports Science; USC Aiken

Rounded-sole “toning” shoes are gaining in popularity as a method to lose weight and tone muscles. Toning shoes could lead to weight loss if they caused greater energy expenditure during walking or if wearing the shoes encouraged people to spend more time walking. However, there are no published studies that have researched the effects of wearing these shoes on weight loss. The purpose of this study is to determine the effect of toning shoes on energy expenditure during walking and/or changes in walking behavior which could potentially lead to weight loss. Subjects include adults who do not participate in a structured exercise program or currently use toning shoes, but do not have any medical conditions that would prevent them from exercising safely. Walking behavior will be assessed by monitoring daily walking using pedometers for one week while subjects wear their normal shoes, and one week while they wear toning shoes. The energy expenditure during exercise will be determined while subjects walk on a treadmill at a moderate intensity for 30 minutes (15 minutes wearing normal athletic shoes and 15 minutes wearing toning shoes). Expired air will be analyzed to determine oxygen uptake and calories expended. The significance of differences in steps per day and calories expended per minute during exercise between the toning shoes and traditional shoes will be used to determine the effectiveness of the toning shoes.

### **Through Aging Eyes: Environmental Gerontology through PhotoVoice**

**Angela Johnson**, Public Health - Senior

Mentor: Dr. Mindi Spencer, Health Promotion Education and Behavior

The purpose of this Magellan project was to examine environmental gerontology through the use of PhotoVoice. Environmental gerontology is a growing field that is dedicated to understanding the environmental factors that can affect older adults. The PhotoVoice methodology is often used by vulnerable and underserved populations as a way to have their voices heard through photographs; in other words, the photographs often capture what words are not completely capable of describing. Seven participants in Columbia over the age of 65 were given disposable cameras and asked to take pictures of aspects of their environment which might inhibit or facilitate activities of daily living. Cameras were collected after one week and once the film was processed, a final interview was scheduled with participants to discuss the photos they took. The results of my project have shown me that as we age, the environment becomes a very different place. Older adults are forced to adapt these changes, either by modifying their environment or by changing the way in which they interact with it. Bringing the environmental

issues of the aging population to light will help raise awareness about aging in the community and what the public can do to impact an older adult's life. It also demonstrated that in order to preserve independence in late life, older adults must have continued access to certain supplies provided by Medicare.

### **Increasing Eating Disorder Knowledge and Awareness among Students at the University of South Carolina (USC)**

**Lauren Muth**, Psychology - Junior

**Lauren Pendleton**, Psychology - Junior

Mentor: Dr. Kara Montgomery, Health Promotion Education and Behavior

We did this project to increase our knowledge about the statistics relevant to eating disorders on college campuses, explore the emotions attached to this topic, and raise awareness on our campus. We accomplished this by exploring multiple aspects of eating disorders through interviews, peer reviewed journals and analysis of the laws surrounding treatment. This all led up to our participation in assisting with the planning for Carolina Beautiful Week on campus. We are now in the process of planning two future campus events: a positive body image fashion show, and a 5K walk co-sponsored by the National Eating Disorder Association. We found that both at USC and on college campuses in general, neither eating disorders nor body image receive the attention that is necessary for prevention. For this reason, we feel it is important to make extra efforts to raise awareness on our campus. What we have participated in so far has drawn positive attention and we plan to continue raising awareness until we graduate in May 2012. We both intend to work with the eating disorder community after graduation and this project has been an extension of our passion for and knowledge of the topic.

### **Impact of Point of Selection Signage for "5 A-Day and 50k" Tailored to Eating Identity**

**Bernadette Riemer**, Management - Junior

Mentor: Dr. Christine Blake, Health Promotion Education and Behavior

Rural and impoverished communities have higher rates of diet and physical activity related morbidity and mortality than the national average. An innovative community-based intervention "5-A-Day-and-50k" was created to improve physical activity, food purchasing and dietary behaviors in one such community in South Carolina. The intervention provided culturally appropriate behaviorally-based nutrition education tailored to eating identity plus fruit and vegetable vouchers for use at a local market. Point-of-selection signage also tailored to eating identity was displayed at the market to reinforce nutrition education. Signage was developed to be appealing, interesting, understandable, and compelling. This study reports on the relationships between signage exposure and participants' fruit and vegetable related attitudes and behaviors using weekly surveys. Survey questions were developed based on constructs from the Elaboration Likelihood Model and included questions such as, "Did you notice the sign?" "Did you like the sign?" "Did you buy the featured fruit or vegetable?" and "Would you try it again?" A total of 50 participants completed surveys over five weeks. Data was analyzed by week and pooled across all weeks using chi-square tests. Differences in associations by eating identity group were also assessed. Overall, participants reported increased liking, intake, purchase, and intention to purchase for fruits and vegetables. Key differences were found between different

eating identity groups. This study demonstrates the utility of coupling nutrition education with point-of-selection messages to improve fruit and vegetable intake and suggests that tailoring messages to common eating identities may be an effective intervention strategy.

### **Promoting Positive Dietary Behaviors of Youth through Hands-On Cooking**

**Nicole Smith**, Biological Sciences - Senior

Mentor: Dr. Christine Blake, Health Promotion Education and Behavior

Rising rates of obesity and diabetes among children highlight the importance of promoting positive dietary behaviors from an early age. A main obstacle to healthy eating is lack of food preparation skills. Families that eat home-cooked meals together tend to have healthier diets. This goal of this study was to evaluate a program that involves hands-on cooking classes with an emphasis on home food preparation. We hypothesized that program participation would increase food preparation skills, cooking self-efficacy, and healthy diet behaviors. Sixty-five 3rd to 5th graders enrolled in a summer enrichment camp were recruited to participate. Twice a week for five weeks children attended classes that taught basic culinary skills with emphasis on whole grains, fruits, and vegetables and were assigned recipes to prepare at home to increase family mealtime involvement. Children and parents completed pre-post surveys to assess changes in skills, attitudes, and behavior. Data were analyzed using chi-square and t-tests. Significant increases in self-efficacy for cooking among children and in positive attitudes and health dietary behaviors of both children and parents were found. A subset of parents and children completed in-depth interviews to explore experiences not captured in surveys. Qualitative data were analyzed using a priori and emergent coding techniques. Findings suggest positive changes in parent and child attitudes about healthy cooking and ways to improve program implementation. This study demonstrates that culinary programs linking skills learned with parental involvement at home may be an effective means to fostering needed improvements in children's diets and warrants further investigation.

### **Cultural and Linguistic Competency Practices: An Assessment of South Carolina Free Medical Clinics**

**Elizabeth Walker**, Latin American Studies - Senior

Mentors: Dr. Sara J. Corwin, Health Promotion Education and Behavior

Dr. DeAnne K. Hilfinger Messias, Nursing

The broad aim of this project is to conduct a systematic assessment of a sample of South Carolina Free Medical Clinics that offer services to Latino immigrants. Specific aims include: 1. Identify and assess cultural and linguistic competency practices in South Carolina Free Medical Clinics through site visits, telephone calls, and reviewing written guidelines; 2. Assess volunteer, staff and client perspectives of the cultural and linguistic competency practices in place; and 3. Make recommendations for further improvement and enhancement of cultural and linguistic competency practices. The assessment will provide an overview of the current status of cultural and linguistic competency practices among South Carolina Free Medical Clinics, suggest areas for improvement and serve as the basis for future research.



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Cory Bohon	Steven Kady	Dillon Smith
Christopher Boyd	Phillip Keck	Apoorva Srivastava
Justin Brady	Joshua King	Luis Suarez
Daniel Brown	Kevin Kinsey	Denise Sullivan
Marvin Brown	Ankur Kumar	Emily Sutton
Keith Browning	Briana Leaman	Bailey Tackett
Christian Buckson	James Lee	Tara Tae
Dustin Bunt	Keely Lewis	Jessica Taylor
Jessica Burch	Mihyun Lim	Christian Traylor
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Sukhi Guram	Eric Reichard	
Joanna Hardy	Allison Reid	
Nehal Hashem	Michele Repetto	
Rachel Herrin	Susan Riley	
Alexandra Hooks	Victoria Samples	

# Index of Presenters

Rahoul Ahuja .....	41	Michael Depp .....	106
Mikhail Alexeev .....	86	Ushma Desai.....	80
Sarah Ali.....	21	Richard Doe.....	65
Tyler Alion .....	55	Deon Doxie.....	56
Rachel Allen .....	2	Chase Dunn .....	28
Mohammed Alshareef .....	31	Caitlin Dutton .....	116
Luis Arzaluz.....	10	Leigh Eleazer .....	15
Angela Arthur.....	46	Katherine Ensor .....	116
Hannah Bailey .....	95	Tori Espensen-Sturges.....	91
Reginald Bain .....	12, 55	Addison Fay.....	95
Daryn Barker.....	111	Taylor Ferguson.....	3
Michael Barry .....	8	Joshua Ferring.....	50
Melissa Bennett.....	67	Matthew Fisher.....	31
Blake Bersinger .....	8	Michelle Forehand.....	46
Danielle Billings .....	15	Lauren Fowler.....	12
Will Boggs .....	105	Chris Frantel .....	77
Cory Bohon.....	60	Jonathan Freeman .....	71
Kristin Bourdua.....	33	Tyler French.....	36
Christopher Boyd .....	64	Taylor Gaines.....	50
Justin Brady .....	27	Christina Galardi .....	22
Natalie Brenders.....	21	Christine Gennosa .....	46
Daniel Brown.....	67	Kailen Gilde .....	71
Marvin Brown .....	27	James Gilmore .....	3
Keith Browning .....	28	Chelsea Goldstein .....	37
Alan Brylawski.....	105	Tierra Gooding.....	61
Christian Buckson .....	9	Megan Graham.....	111
Dustin Bunt .....	64	Katherine Granger.....	96
Jessica Burch.....	80	Lara Grantham .....	15
Molly Burnip.....	55	Laurie Graves.....	42
Christine Burke .....	76	Erik Grayson .....	18
Dylan Burton .....	106	Jennifer Greene .....	116
Parker Bush .....	60	Saidah Grimes.....	107
Nicolette Calhoun .....	76	Marc Guest.....	18
Jacqueline Cantwell.....	24	Sukhi Guram.....	100
Anna Capps.....	86	Taylor Hanayik .....	91
Breana Carter.....	87	Joanna Hardy .....	4
Amanda Casto .....	2	Kayla Hasbrouck.....	58
Lewis Cawthorne.....	60	Nehal Hashem .....	81
Cameron Cegala.....	106	Brittany Hayes .....	112
Candra Chaisson .....	95	Morgan Henley.....	77
Eeshwar Chandrasekar.....	41	Rachel Herrin.....	68
Anthony Ciambrone .....	77	Daniel Hinson .....	88
Caroline Clark.....	87	Christina Hoffecker.....	112
David Corso.....	12, 14	Alexandra Hooks.....	68
Jacob Damm .....	36	William Hoskins .....	14
Benjamin Davis.....	64	Kevin Huff.....	117
Sonya Davis-Kennedy.....	84	Alexandra Ingram.....	112

# Index of Presenters

Emily Ingram .....	77	Famatta Mensah .....	8
Jason Isenhower .....	61	Elizabeth Messman .....	82
Lesley Jacobs .....	84	Nicholas Metrakos .....	31
Sidney Jarido .....	47	Brett Michaud .....	62
Cory Jenks .....	113	Breland Miley .....	25
Angela Johnson .....	117	Hannah Miller .....	108
Ashley Johnson .....	4	Henry Miller .....	96
Chris Johnson .....	5	Brian Molesky .....	51
Mark Johnson .....	107	Jessica Moore .....	51
Samuel Johnson .....	12	Elisa Morgan .....	83
Monica Johnston .....	5	Rashad Morgan .....	97
Cierra Jones .....	81	Patrick Morris .....	108
Olivia Jones .....	84	Jonathan Motts .....	42
Samantha Jones .....	86	Arianne Muhammad .....	102
Lesley Joseph .....	29	Elizabeth Murray .....	19
Victoria Jumper .....	72	Caitlin Musgrave .....	83
Steven Kady .....	91	Sarah Mushtaq .....	43
Phillip Keck .....	57	Lauren Muth .....	118
Emma Kelley .....	72	Azka Nazir .....	69
Josh King .....	77	Ann Newsom .....	103
Joshua King .....	57	Sara Newton .....	92
Kevin Kinsey .....	16	Tanya Nichols .....	97
Boris Klaric .....	100	Andre North .....	6
Liana Krajnak .....	101	Amartha Ogburu-Ogbonnaya .....	33
Ankur Kumar .....	47	Candler Paige .....	89
Sarah-Nell Lader .....	89	Katharine Parham .....	20
Melissa Laitner .....	22	Payal Patel .....	52
Estela Landaverde Luna .....	10	Kennerly (Clint) Patrick .....	70
Sarah Langdon .....	5	Anne Payne .....	33
Bronwyn Lawrence .....	77	Will Payne .....	109
Briana Leaman .....	6	Lauren Pendleton .....	118
James Lee .....	50	Melissa Peters .....	97
Keely Lewis .....	19	Logan Phillips .....	16
Mihyun Lim .....	32	Lauren Pierce .....	37
Ji Y. Lim .....	82	Robert Player .....	62
Jennifer Link .....	24	Sarah Pulliam .....	48
Britt Logothetis .....	32	Miroslava Radieva .....	10
Maria Lopez .....	101	Ryan Rambo .....	78
Eliza Lotozo .....	78	Sarah Ramsey .....	92
Sara Mallon .....	102	Rohail Rashid Kazi .....	57
Jim Manning .....	9	Will Reade .....	25
Kyra Marsigliano .....	19, 72	Olivia Reburn .....	10, 38
Katherine McClellan .....	88	Allison Reid .....	98
Drew McElwee .....	77	Eric Reichard .....	52
Jack McFadden .....	65	Michele Repetto .....	73
Austin McNeilly .....	69	Bernadette Riemer .....	118
Katelyn Meade .....	73	Susan Riley .....	38

# Index of Presenters

Kari Rizzo .....	89	Elliot Turner .....	85
Eric Robinson .....	13	Elizabeth Walker .....	119
Kevin Romito .....	66	Patti Weed .....	23
Arjamand Sami .....	102	Daniel Weinberg .....	44
Victoria Samples .....	53	Justin Williams .....	66
Peter Schaeffing .....	113	Bobbi Jo Wilson .....	99
Charles Schumpert .....	74	Walid Yaghy .....	40
Mathew Sebastian .....	74	Michael Youngblood .....	114
Anna Sekulich .....	109	Matthew Zimmerman .....	25
Yasser Shalabi .....	25		
Matthew Shannon .....	104		
Cassidy Shaver .....	84		
Patrisha M. Shelley .....	58		
Samantha Shoppell .....	114		
Laura Simpson .....	14		
Tyrell Singletary .....	22		
Collin-Jamal Smith .....	14		
Dillon Smith .....	84		
Kaitlin Smith .....	38		
Kenneth Smith .....	8		
Leslie Smith .....	3		
Nicole Smith .....	119		
Sydney Spence .....	77		
Lisa Splawinski .....	10		
Apoorva Srivastava .....	43		
Madeline St. Julien .....	70		
Chavis Stackhouse .....	53		
Valerie Stiling .....	84		
Lauren Stitzlein .....	77		
Luis Suarez .....	58		
Denise Sullivan .....	48		
Dylan Summer .....	29		
Ebony Sumpter .....	99		
Emily Sutton .....	109		
Andrew Svenson .....	25		
Bailey Tackett .....	93		
Tara Tae .....	49		
Ronald (Jim) Talbert .....	12		
Lauren Talley .....	44		
Mark Taylor .....	39		
Jessica Taylor .....	54		
John Thompson .....	66		
Mary Tilden .....	7		
Molina Torres .....	77		
Christian Traylor .....	39		
Michelle Trojanowsky .....	93		
Brandon Truett .....	17, 69		