



Undergraduate Symposium

2015



University of South Alabama Committee on Undergraduate Research

17th Annual Undergraduate Symposium

Thursday October 15th
12:30-4:00 PM
Student Center Ballroom

Welcome: Dr. John Shelley-Tremblay, Director of Undergraduate Research
Introduction of Dr. G. David Johnson, Provost and Vice President for Academic Affairs
Keynote Speaker: Dr. Julio Turrens “Undergraduate Research as a Transformative Practice”

Invited Student Presentations

Madison Tuttle	Chemistry
Jake Maynard/Alex Henderson	Computer Science
Brandi DePineuli	Mechanical Engineering
Luke Smith	Music
Michael Marfice	Biomedical Sciences
Zach Clark	Philosophy
Kali Thompson	Psychology

A special note of thanks to Katie Russ, UCUR Program Graduate Assistant, for program development and organization.

Thank you to Pamela Chastang-Howard, Honors Program; Debora Tittle, Pat Capps Covey College of Allied Health Professions; Bobbie Hancock, Academic Affairs; Deanna Cobb, Graduate School; Timothy Sherman, Department of Biology; Sally Steadman, Honors Program; Bevley Green, Career Services Center; Megan Guinn, Writing Center; Andrew Whelton, Department of Civil Engineering; Molly Miller, Department of Marine Sciences; Kelly Major, Department of Biology; Jana Rocker, Mitchell Cancer Institute; Kari Dugger, Department of Biomedical Services; and Sytske Kimball, Department of Earth Sciences for assistance with program management and symposium organization.

Best Paper/Portfolio Award

Madison Tuttle, Department of Chemistry
Mentor: Dr. Larry Yet, Department of Chemistry

Best Poster Award

Ravi Rajendra, Department of Biology, Mentor, Dr. Glen Borchert
Characterization of Extracellular RNA from Bronchoalveolar Lavage Fluid

Psi Chi Undergraduate Research Award

Kali Thompson, Department of Psychology, Mentor Dr. J. Langhinrichsen-Rohling

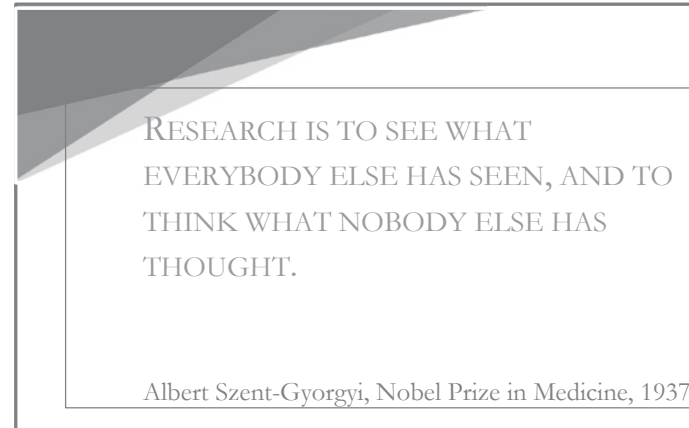
Poster Session – Student Center 2nd floor lobby

Sponsored by:

**Alabama Space Grant Consortium, University of South Alabama Academic Affairs,
University of South Alabama Graduate School, College of Arts and Sciences, School
of Computing, College of Education, College of Engineering, Pat Capps Covey
College of Allied Health Professions, College of Medicine**

Welcome

This marks the 17th year of the University of South Alabama's Summer Undergraduate Research Program. This is my first year as UCUR Director and I am so happy to share this journey of knowledge with our outstanding students and faculty!



Since its inception, the USA Committee for Undergraduate Research (UCUR) has sponsored over 600 students in the Summer Undergraduate Research Program, which is open to students from all disciplines. Our goal is to promote scholarly and creative activity at the undergraduate level, enhancing critical thinking, problem solving skills, and written communication. Through this program students are provided with hands-on training in their discipline, expanding their experience beyond that of the normal classroom.

The program is generously sponsored by the Alabama Space Grant Consortium, USA's Academic Affairs, and individual colleges and departments. Additional funding for students comes from individual faculty grants, and the support of the Mitchel Cancer Institute. Please read about the new initiatives and changes coming for the UCUR Program for next year below!

The committee thanks you for joining us in the culmination of the students' experience, our Undergraduate Symposium. We would like to take this opportunity to acknowledge not only the work of the students, but also the commitment of the faculty mentors to the training of these students.

John F. (Jack) Shelley-Tremblay
Director, USA Undergraduate Research Program



Dear Friends and Colleagues:

Welcome to the UCUR research symposium. Undergraduate Research has been identified as a "high impact" practice in American higher education. Research has shown that students who participate in research under the guidance of faculty benefit greatly from the experience. They are more likely to earn their undergraduate degree in a timely manner, they learn more advanced skills, and their career prospects are enhanced. We are very proud of the undergraduate research program at South Alabama and feel that it is one of key assets that make USA a great university. UCUR students get the opportunity to work with talented faculty, using state of the art research instrumentation, and contribute to the discovery of new knowledge. These students have excelled at their studies, have already accomplished much, and we expect great things from them in the future. Thank you for joining us today, and please enjoy the symposium.

G. David Johnson

Provost and Senior Vice President for Academic Affairs



Greetings

Welcome to the annual UCUR Symposium. Through the UCUR program undergraduate students have the opportunity to work with faculty and experience the process of accomplishing real research. The students learn to enjoy the creativity and accomplishment of problem solving, which can have a major impact on their lives.



Students realize many benefits including:

- Learn the relation of classroom knowledge to the real world
- Help identify career interests
- Develop skills to function more independently
- Build mentor relationships with faculty
- Learn to communicate better with a varied audience
- Learn to better think critically and logically
- Participate in the excitement of creative intellectual activity
- Increase self confidence
- Increase ability to overcome obstacles
- Increase likelihood of acceptance into graduate or professional school
- Learn research metrologies
- Learn about the ethics of research and scholarship
- Experience greater academic success in terms of GPA and retention

As the Graduate Dean, I think this program is especially worthwhile as students who participate in hands-on research are more likely to pursue advanced degrees. This perception is backed by a recent study of undergraduate research programs that found that a remarkable 83% of 1,135 research participants pursued postgraduate education.

Undergraduate research experiences can also result in some less obvious benefits, for example: helping to recruit outstanding freshmen, producing more successful alumni, and improving the university-learning environment.

So please enjoy the important accomplishments of the students and their mentoring faculty today as presented in this symposium.

Keith Harrison
USA Dean of Graduate Studies

University of South Alabama

Committee on Undergraduate Research

June Ayling, Ellen Buckner, Robert Coleman, Michael Chinkers, Jim Connors, Jason Coym, Michael Doran, Roma Hanks, Andrea Moore Kent, Zoya Khan, John Kovaleski, Silas Leavesley, Mihaela Marin, Rebecca Mindock, David A. Nelson, Thomas Rich, Elizabeth Rivenbark, James Swofford, Kelley Woodford and Julio Turrens

UNIVERSITY OF SOUTH ALABAMA
UNDERGRADUATE RESEARCH PROGRAM
UCUR

PROGRAM DIRECTOR:

Dr. Jack Shelley-Tremblay

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(DEPARTMENT OF PSYCHOLOGY)

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**University of South Alabama
Committee on Undergraduate Research**

**17th Annual Undergraduate Symposium
Fall 2015**

Best Paper/Portfolio Award

Madison Tuttle	Department of Chemistry
Mentor: Dr. Larry Yet	Department of Chemistry
Dean: Dr. Andrzej Wierzbicki	College of Arts and Sciences

Title:

Development of Small Molecule Chemical

Probes for Serine/Threonine Protein Phosphatase 5

Richard E. Honkanen (2), Edward A. Salter(1), Andrzej Wierzbicki(1)

(1) Department of Chemistry (2) Department of Biochemistry and Molecular Biology

Madison and her mentor will represent the University of South Alabama at the National Conference on Undergraduate Research at The University of North Carolina at Asheville in April 2016.

Psi Chi Undergraduate Research Award

Title:

Schemas as a Mediator for the Relationship between

Attachment and Suicidal Proneness and Ideation.

Kali Thompson, Department of Psychology,

Mentor Dr. J. Langhinrichsen-Rohling

Kali will receive a scholarship to assist with travel to the National Conference on Undergraduate Research in April, 2016.

**University of South Alabama
University Committee on Undergraduate Research**

**16th Annual Undergraduate Symposium
Fall 2014**

Invited Student Oral Presentations

Thursday October 15th, 12:45-2:00 PM, Student Center Ballroom

Oral Presentations

Madison Tuttle. *Development of Small Molecule Chemical Probes for Serine/Threonine Protein Phosphatase 5.* Department of Chemistry. Mentor: Dr. Larry Yet, Department of Chemistry, College of Arts and Sciences.

Jake Maynard/Alex Henderson. *Modeling a Warehouse System.* Department of Computer Science, School of Computing. Mentor: Dr. Michael Doran, Department of Computer Science, School of Computing.

Brandi DePineuli. *Using Collision as a Passive Control Method for a Micro-Airship Fleet.* Department of Mechanical Engineering, College of Engineering. Mentor: Dr. Carlos Montavlo, Department of Mechanical Engineering, College of Engineering.

Luke Smith. *Compositional Process: Analysis and Creation.* Department of Music, College of Arts and Sciences Mentor: Dr. David Durant, Department of Music, College of Arts and Sciences.

Michael Marfice. *Identification of Exosomes.* Department of Biomedical Sciences, Pat Capps Covey College of Allied Health Professions. Mentor: Natalie Bauer, Center for Lung Biology and Department of Pharmacology. University of South Alabama Health System, University of South Alabama College of Medicine.

Zach Clark. *A defense of the conceivability argument against physicalism.* Department of Philosophy, College of Arts and Sciences. Mentor: Ted Posten, Department of Philosophy, College of Arts and Sciences.

Kali Thompson. *Schemas as a Mediator for the Relationship between Attachment and Suicidal Proneness and Ideation.* Department of Psychology, College of Arts and Sciences. Mentor: Jennifer Langhinrichson-Rohling, Department of Psychology, College of Arts and Sciences.

UCUR NEWS

The UCUR Program is getting a

NAME CHANGE!

- What will the name be?
 - The Office of Undergraduate Research (OUR)
- Why?
 - The UCUR Committee is a *faculty* group that promotes UR at the University.
 - This faculty group will continue in its mission to advise the OUR
 - The new name emphasizes service to students and faculty and a permanent presence in the administrative structure of USA.
- Who?
 - The OUR will be headed up by the Director of Undergraduate Research, and one part time secretary
- Where?
 - The OUR is located on the web at www.southalabama.edu/UCUR
 - The OUR is located in University Commons, Suite 1000 in side the Department of Psychology
- When?
 - This change will happen slowly and will be implemented by Spring of 2016
- So now what?
 - You can expect greater services and more features!

NEW SOFTWARE
MAKES IT EASY

The UCUR (OUR) has purchased a contract with **InfoReady** Competition space. All UCUR applications for PAID and VOLUNTEER UCUR students will be submitted through this portal. Faculty may submit their recommendations electronically, and reviews will be fast and easy!

These features will be ready for the SU 2016 Paid summer competition.

Mentors and students can now find each other *easily* using Scholar Bridge!

<http://www.scholarbridge.com>

Students: Sign up to search for research opportunities and USA and 26 other member schools around the nation.

Faculty: Manage student workers, work study, paid and unpaid lab members and UCUR students effortlessly. Sign up and choose "Opt-In" to let scholar bridge build your free profile. All you do is to click and add your student opening information and you are all set!

Call Dr. Shelley-Tremblay with questions or for a demo today!

RESEARCH ABSTRACTS

Kellie Agaloff*Department of Mechanical Engineering***Mentor: Dr. Saami Yazdani***Biomedical Sciences***Preventing the degradation of Matrigel by crosslinking it with glutaraldehyde in order to grow smooth muscle cells into a 3-D structure**

Peripheral arterial disease (PAD), a circulatory problem in which narrowed arteries reduce blood flow to the limbs, affects approximately 8 million people in the United States alone. This is a chronic disease that is negatively impacted by damage due to unavoidable treatment, such as balloon angioplasty and atherectomy. The use of drugs combined with these treatments is becoming the gold standard of clinical treatment as they lengthen time between restenosis, or the accumulation of buildup (Figure 1). To date, no studies have been performed to create an in vitro model that can be used to assess the effects of damaging treatments on drug delivery and retention following clinical standard of care. Therefore, we propose to take the first steps in developing a benchtop 3-D structure in which cells can be grown to mimic an occluded artery. This model can then be used to allow for the visualization and quantification of drug adhesion and transport and provide a platform to quantify biological changes. This will allow for the best conditions for optimizing drug delivery to be determined. The goal of this study is to establish a protocol that can be used to prevent the degradation of Matrigel by crosslinking it with glutaraldehyde in order to grow smooth muscle cells into a 3-D structure, which can then be built upon with the addition of macrophages, collagen, fibrin, and calcification to form an in vitro model of an occluded artery.

Elizabeth Bemis*Department of Music*Mentor: Dr. Rebecca
Mindock*Music***Musical settings of four poems by French poet Paul Verlaine**

This paper uses musical settings of four poems by French poet Paul Verlaine to illustrate the differences and similarities between Claude Debussy's and Gabriel Fauré's *mélodie* and their settings of Symbolist text. This will include an analysis of the literary aspect of the pieces, focusing on the composers' choices in setting of the text of Verlaine's poems, and specifically, literary Symbolism in *mélodie*. It will also deal with the composers' individual styles of composition as demonstrated within the pieces, including the interaction between the piano and vocal lines, melody, harmony, and rhythm.

Donald Bethea*Department of Physics*

Mentor: Dr. Jacob Burress

Physics & Chemistry**Using a student built Sievert to measure gravimetric and volumetric data for nanoporous materials**

It is possible to reach similar levels of precision and accuracy using a student built Sievert to measure gravimetric and volumetric data for nanoporous materials, specifically Graphene Oxide Frameworks, as by more expensive automated systems that can be purchased.

Victoria Bishop*Department of Sociology*

Mentor: Dr. Roma Hanks

*Sociology*Dr. Nicole Carr , University of South Alabama
Executive Director, Student Academic Success**When Life Gives You Lemons...Commit Crime? An Assessment on Women's Pathways to Crime**

Traditionally, criminology (the study of crime) has predominantly focused on male crime. Women's and girls' experiences with crime, deviance, and victimization have challenged the overall traditional criminology. The feminist perspective has had roughly thirty to thirty-five years of advancement in the field of criminology (Barkan, 2015). The feminist perspective of criminology addresses four areas: the victimization of women, gender discrepancies, explanations of women's criminality, and women's experiences with gender discrimination. The purpose of this research is to acquire a better understanding of the relationship between women's pathways to crime and their life histories, particularly their life course transitions. We conducted this analysis by examining interviews of twenty-one women's life histories while using the grounded theory approach formulated by renowned sociologists, Barney Glasser and Anselm Strauss. Four key themes—family history, social dependency, male influence, and environment—emerged in our study. The interaction and relationships of these four categories illustrate dimensions within the framework of the life course theory by influencing their life transitions, and therefore, contributing to their pathways to crime.

Craig Browning*Department of Chemical Engineering*

Mentor: Dr. Silas Leavesley

Chemical Engineering**Endoscopic light source modifications implementing LED array for spectral imaging**

Colorectal cancer is the 3rd leading cause of cancer deaths in the United States.[1] Standard screening technique is colonoscopy using white light endoscopy (WLE). Several newer methods have been implemented to improve performance of WLE, including narrow band imaging and autofluorescence imaging.[2] However, these methods have demonstrated negligible increases in specificity and sensitivity in large-scale studies. The goal for this project is implementing a real time spectral imaging endoscope using 16 narrow wavelength LEDs that increases detection sensitivity and specificity. An Olympus CLK-4 light source was modified to accommodate a novel spectral LED array and circuitry. Custom electronics were designed to allow high-speed wavelength switching and independent wavelength dimming. Computer control was provided via National Instruments hardware and Nikon Elements software. The retrofit design was successfully fitted with the spectral array and circuitry. LED testing resulted in effective wavelength switching and dimming. Optical output was scaled linearly with LED current, in turn was linearly controlled as a function of the reference voltage to the current driver. The linear correlation created a table allowing all LEDs to be set to an equal power output. The spectral light source was successfully coupled to the endoscope. The equal LED output power allows camera coupling, with a flat spectral excitation profile, for imaging. Future work will include testing the system imaging performance, acquiring spectral image data from ex vivo pairs of normal, precancerous and cancerous tissues, and comparing this data to assess spectral differences for early signs of colorectal cancer. [1] R. Siegel, C. Desantis, and A. Jemal, "Colorectal cancer statistics, 2014.," CA. Cancer J. Clin., vol. 64, no. 2, pp. 104–117, 2014. [2] R. Singh, S. Mei, and S. Sethi, "Advanced endoscopic imaging in Barrett's oesophagus: a review on current practice.," World J. Gastroenterol. WJG, vol. 17, no. 38, pp. 4271–4276, 2011.

Austin Clark*Department of Department of Earth Sciences*

Mentor: Dr. Systke Kimball, Dr. Chad Shafer

Earth Sciences

Dr. Wesley Terwey, Dr. Alex Beebe

Department of Earth Sciences**Association of Gulf Coast Watershed Historic Discharge Events to Precipitation Rate and Accumulation**

Multiple flash flood events occurred in Alabama and the Florida Panhandle in the spring of 2014, with considerable societal and environmental impacts. These events have prompted investigation into the sensitivity of discharges from multiple watersheds in the region to high-accumulation precipitation events. Identification of historic discharges (i.e., discharges at least an order of magnitude larger than the 20-year daily average value) from 1995 to the present will be conducted for watersheds along the Gulf Coast from Mississippi to the western Florida Panhandle. These events then will be used to identify the meteorological environments present 0-48 hours prior to the historic discharges. Previous subjective analysis indicates that three distinct meteorological environments exist prior to high-discharge events, with varying degrees of predictability: (1) landfalling tropical cyclones (highly predictable), (2) zonally-oriented mesoscale convective systems in association with a favorably positioned warm front along the Gulf Coast in the cool season (highly unpredictable), and (3) northeast-southwest oriented squall lines in association with slow-moving cold fronts in the cool season (moderately predictable). Sea-breeze convection in the warm season notably was not associated with the largest discharge events in the region.

William Clark*Department of Geology*

Mentor: Dr. Murlene Clark

Earth Sciences

Clark, M.W. , Earth Sciences, University of South Alabama, 5871 USA North Drive, LSCB 136, Mobile, AL 36688-0002, wclark38@gmail.com.

**Neogene Biostratigraphy and Sedimentation Rate Analysis of Deep Oil Well Samples, Block 555**

The nannofossil biostratigraphy was determined for a deep oil well in the northeastern Gulf of Mexico, Block 555 Mississippi Canyon. Biostratigraphic analysis of the Late Miocene through Early Pleistocene section allowed sedimentation rates to be calculated using absolute ages assigned to last appearance datums of marker species, and their respective depths in the well. Sedimentation rates in the present study compare favorably with changes in deposition proposed by others for this area of the Gulf, during the Neogene. The study area received lower rates of sediment supply between 7.53 and 6.32 Ma, than during later time periods. The main depocenter of the Mississippi River was probably to the west, and high sea level stand at the close of this interval, resulted in open basin conditions. Between 6.32 and 5.71 Ma, sedimentation rates rose to 1967 ft/my, a trend which peaked at rates of 14,750 ft/my between 5.71 and 5.59 Ma. This increase in sediment delivery is correlative with a worldwide decline in sea level which culminated in the latter part of the Messinian. Sedimentation rates of 449 ft/my, between 5.59 to 3.92 Ma, suggest a rise in sea level which trapped sediment shoreward. Rising sedimentation rates between 3.92 and 3.7 Ma may be related to sediment influx from northeastern Gulf slope retreat and the migration of turbidity currents into the area. Unconformities in the data set provide evidence for the migration of mass transport systems which eroded the base sequences between 3.54 and 1.93 Ma and 1.6 and 1.26 Ma.

Zach Clark*Department of Philosophy*

Mentor: Dr. Ted Poston

*Philosophy*Ted Poston , University of South Alabama
Department of Philosophy**A defense of the conceivability argument against physicalism**

In this paper I defend the conceivability argument against physicalism. Physicalism, broadly conceived, is the view that only physical states exist. When physicalism is applied to mental states, physicalists say that mental states just are physical states. The conceivability argument presents a case in which mental states and physical states are distinct. In pursuit of my goal, I examine different forms of physicalism, selecting plausible forms of physicalism to argue against. I then focus on conceivability by explaining different senses in which statements can be conceivable. Next I consider different principles that link the gap between conceivability and possibility. I then discuss the possibility of zombies; zombies lack consciousness and yet are physical replicas of people in all physical ways. In overview I argue thusly: Physicalism is a thesis that the link between mental states and physical states are necessary. If zombies are conceivable, then zombies are possible. If zombies are possible, then the link between mental states and physical states is not necessary. Zombies are conceivable. Therefore, physicalism is false. Finally I discuss objections to the conceivability argument.

Bethany Cobb*Department of Geology*

Mentor: Dr. Murlene Clark

Geology**Biostratigraphy of a Northwest Gulf of Mexico Deep Well**

A deep well in the northwest Gulf of Mexico has been biostratigraphically zoned for Late Miocene through Pleistocene nannofossils. The well is located in Block 627, slightly west of Alaminos Canyon. Species abundance has been estimated and related to depositional and sea level changes. The portion of the well covering the Late Miocene through the Earliest Pleistocene is a condensed section, largely the result of slow deposition, a factor of being associated with a deep ocean basin-type environment. Reworked Cretaceous species were observed in the nannoflora assemblage beginning around the extinction depth of *Discoaster tamalis* in the Middle Pliocene, and continued to be present upward throughout the shallowest depth studied in the Pleistocene. Reworked Cenozoic species were also found circa the extinction of *D. tamalis*, and spanned upward for 90 feet.

Jessica Comeaux*Department of Pre-Physical Therapy*

Mentor: Dr. Ben Hill

PsychologyAnneliese C. Boettcher, & Benjamin D. Hill ,
Department of Psychology, Mobile, AL 36688**Cognitive Constructs of Pain**

With chronic pain being such a prevalent issue in the United States, the emotional effects of pain are a major focus in neuropsychological research today. Chronic pain is a phenomenon that encompasses the fields of both Biology and Psychology. The focus of this study was the association between self-reported pain and emotional functioning. Data from chronic pain patients who have completed the Minnesota Multiphasic Personality Inventory-2 Restructured Form (MMPI-2RF) was utilized in this study. This study made use of specific scales related to validity, somatic/cognitive complaints, and internalizing, along with the restructured clinical scales and higher order scales. This study explored the idea that the perception of pain is moderated by personality and emotional variables.

Jackson Corely*Department of Civil Engineering*

Mentor: Dr. John Cleary

Civil Engineering**Optimization of the ASCE Steel Bridge**

The American Society of Civil Engineers (ASCE) is one of the most active student organizations on the University of South Alabama's campus. ASCE engages students in numerous activities to introduce them to engineering concepts outside of the classroom. The Student Chapter of ASCE at USA competes in various competitions with schools from across the southeast at an annual student conference each year. One of the premier competitions at the student conference is the steel bridge competition. Students design and build a small scale (20 to 30 foot long) steel bridge, then assemble and load it at the competition. There are several categories for judging the bridges, which include deflection (displacement) under load and construction time at the competition. Although the students at USA compete at the conference each year, there is typically no time to conduct full scale structural testing. A structural model will be used to optimize the design of the bridge. These results can then be used to develop more competitive bridges for future competitions. The overall weight of the previous year's bridge was reduced by nearly 20 pounds and the deflections only changed by 2%. The newly designed bridge weighs 30 pounds less than the previous year's bridge and will deflect nearly 4% less than the previous year's bridge.

Laura Crawford*Department of
Philosophy/English*Mentor: Dr. Allan
Hillman*Philosophy/English***Why Lewisian Possibilism about Fiction Just Isn't Possible**

While David Lewis provides an interesting account of possibilism concerning fiction in his work "Truth in Fiction" and the following "Postscripts," he does not provide much of an explanation (if any) concerning what would seem to be an essential component of a theory concerning fiction: authorship. In this paper, I provide an account of Lewis's theory, followed by speculation concerning what authorship could amount to in relation to modal realism. I then give my own defense of the traditional notion of authorship in contrast to Lewis's theory, focusing on such issues as: the two contrasting occupations Lewis ascribes to the author as well as the death of fiction that ensues. Ultimately, it appears that while Lewis's version of possibilism holds up well against problems of language and reference, it leaves much to be desired concerning the notion of authorship—and even the notion of creativity in general.

Scott Darling*Department of Geology*

Mentor: Dr. Murlene Clark

Earth Sciences**Gold and other heavy metals in the Alabama Piedmont region**

Gold and other heavy metals exist in the Alabama Piedmont region, the question is are there ore bodies with sizes and concentrations large enough to be commercially viable. Sampling areas known to have been gold producing in the past can be difficult; access to property can be difficult to obtain and samples from publicly accessible sites may not be representative of the area due to contamination. Because of budget constraints fire assaying was not an option, so old fashioned panning was a part of each of two analysis methods used. Results were less than hopeful with respect to gold content in the samples collected. The lessons learned and contacts made at Alabama Graphite Mining Company during the research project will make the planned future research on Weogufka Creek far easier and much more productive.

David Denton*Department of Mechanical Engineering*

Mentor: Dr. Kuang-Ting Hsiao

Mechanical Engineering**The Harvest of Geothermal Energy from the Earth's Oceans**

While the use and depletion of non-renewable resources continues to be an enduring concern, the necessity for developing sustainable clean energy sources is gaining importance. The increase in recognition that geothermal energy resources are vast and located throughout the world has led to the promising potential of its use as a renewable clean energy source. Geothermal energy is referred to as all possible forms of heat that may be produced from the earth. Our proposal is that geothermal energy can be extracted from Earth's oceans by applying the principles of the Second Law of Thermodynamics. These principles imply that the flow of thermal energy from a hot reservoir to a cold reservoir produces power and energy to perform work. This concept is applied to the Earth's oceans, where there is a natural temperature difference between the surface water and deep ocean water. This temperature difference causes natural convection and heat transfer to occur, creating a natural power cycle. ANSYS Fluent is used to perform a mechanical analysis to determine the feasibility of extracting geothermal energy from the Earth's oceans by these principles of the Second Law of Thermodynamics. Our results show that as the temperature of our system changed along the boundary conditions, the density of the working fluid, ethanol, fluctuated as well. Through this change in density, the pressure was observed as fluctuating throughout the system. Due to the pressure variation, and the body forces acting on the working fluid, velocity flow vectors were also analyzed. These results suggest that extracting geothermal energy from the natural power cycle existing in Earth's oceans is a feasible and potential alternative to being a renewable clean energy source.

Brandi DePineuli*Department of Mechanical Engineering*

Mentor: Dr. Carlos Montavlo

Mechanical Engineering**Using Collision as a Passive Control Method for a Micro-Airship Fleet**

The project presented here examines the feasibility of coordinated flight of blimps. Studying blimps in formation flight can be a useful platform to study multi-body missions, collision avoidance, and even allow collisions, given their soft structure and slow flight speed. The information gained in blimp research can potentially be used as an addition to research involving more complex aircraft, such as fixed wing aircraft or spacecraft. On a larger scale, this research could be used to further delve into the aerospace field of swarming, which involves coordinated flight of hundreds or even thousands of vehicles. Coordinated control of multiple aerospace vehicles is the future of unmanned aerial flight. This research will attempt to scratch the surface on an otherwise untouched platform.

Cameron Englebert*Department of Biology*

Mentor: Dr. Smoot Major

Biology**Biodiversity of The Mobile-Tensaw Delta (MTD)**

The Mobile-Tensaw Delta (MTD) is a unique ecological area and of tremendous value to the northern Gulf economy. Although historically understudied, recent research efforts have been focused on biodiversity and how the ever-changing delta influences distributional patterns, community structure, and long-term evolutionary change. The MTD is not only large (>260,000 acres or >1,000 km²), but is also characterized by a wide range of habitat types. Through site analysis and the sampling of beetles, we have begun to look for relationships between ground-dwelling insect diversity and geospatial environmental differences. Preliminary research indicates that subtle changes in species composition exist among sites. Interestingly, largest differences in beetle assemblages appear to be between sites located along the edges of the MTD relative to those on the interior. Thus, initial results of this work indicate that the MTD might act as a physical barrier, relegating particular beetle species to exterior edge habitats.

John (Drew) Faulk*Department of Mechanical Engineering/Mathematics*

Mentor: Dr. Audi Bryne/ Saami Yazadani

*Mathematics**Department of Mechanical Engineering***A Mathematical Model and Computer Simulation Approach to Reendothelialization: Post-Drug Eluting Stent**

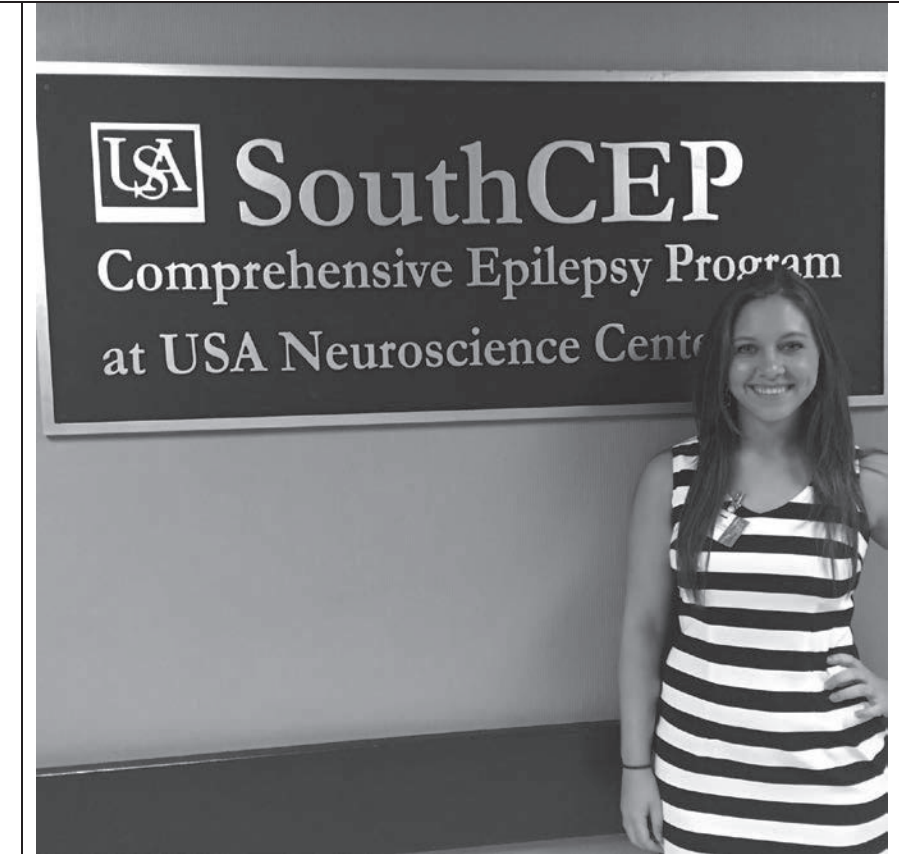
Implantation of the drug-eluting stent, following a myocardial infarction, can be a very invasive surgery. Mechanical injury to the coronary artery causes partial and full denudation of the endothelial cell monolayer.¹ Antimitogenic drugs released from the stent inhibit the regrowth of endothelial cells, possibly resulting in stent thrombosis.² Our goal was to create a model and simulation with simplified mathematics and simulations to provide insight into endothelial cell regrowth around a drug-eluting stent in efforts to reduce or possibly prevent stent thrombosis. A mathematical model was implemented to constitute the arterial drug concentration over time and establish a clear gradient of drug concentration ratios surrounding the stent due to fluid flow. Computer simulations with varying parameters were instituted to provide visual confirmation of endothelial cell interaction with the antimitogenic drug gradients and concentrations.

Chelsea Fisher*Department of Geology*

Mentor: Dr. Doug Haywick

*Earth Sciences*Brian Axsmith, Department of Biology Mobile,
AL 36688**Resolving the Grain Size variation and Foraminifera Content of a Portion of the Oligocene Bucatunna Member in Southwestern Alabama**

The Bucatunna Clay is a relatively thin member of the Byram Formation (Oligocene, c. 34-25 million years BP) that is exposed along creeks in portions of southeastern Mississippi and southwestern Alabama. It thickens toward the south and east into Florida where it represents an important subsurface aquiclude. This project targeted specific intervals of Bucatunna Clay exposed near Monroeville AL in an outcrop exposed along Randons Creek. In places, exposure is excellent allowing for detailed sedimentological and paleontological analysis. The Bucatunna Clay Member is predominantly composed of dark clay/silty clay. Thin alternations with silt and well sorted quartz sand are interpreted to reflect rapid, short duration fluctuations in depositional energy, specifically water velocity. These intervals are also enriched in comminuted plant material and display evidence of soft sediment deformation, both of which are consistent with flooding events in quiet probably fluvial environments (e.g., oxbow lake, swamps). Other intervals at the study site contain in addition to dark clay, thin beds of well-sorted, laminated and cross-bedded quartz arenite sand, foraminifera-rich intervals and mollusc-dominated shell beds. Comminuted carbonaceous detritus is still present in these shelly beds, but less abundant, suggesting a transition to brackish water conditions. Foraminifera analysis is ongoing, but preliminary data suggests a limited biota consistent with marginal marine deposition. One explanation is that sea level rise flooded what had previously be a primarily non-marine embayment. With more comprehensive analysis (beyond the scope of this project), it may be possible to better resolve the Oligocene history of sea level change during deposition of the Bucatunna Clay. The research produced in this study provides important geological information by which to better understand this interval of Cenozoic sedimentation in southern Alabama and will be pivotal for associating the plant fossils currently being studied by Brian Axsmith to the depositional and climate conditions during the Oligocene when they lived.

Jordan Harrison*Department of
Biomedical Sciences*Mentor: Dr. John Shelley-
Tremblay*Psychology*Juan Ochoa, Department
of Neurology, University
of South Alabama,
Mobile, AL**Electrocorticographic Study of Semantic Processing in Patients with Temporal Lobe Epilepsy**

Individuals with Temporal Lobe Epilepsy (TLE) show numerous language deficits including semantic paraphasias, anomia, and difficulty with pragmatic language and inference. The current study examines a patient with severe, intractable TLE in the left hemisphere to determine whether normal semantic priming can occur behaviorally and in the cortical network recorded using EEG during a paired word priming task. The patient was shown 104 words that were either semantically, associatively, and semantically related or control words that were unassociated. The EEG was time locked to the onset of the second word, and Event-related Potentials were formed. ERP's were processed in EEGLab using the SIFT Toolbox and resulting network transfer functions were created. 3-D information flow models indicate that word processing is occurring in the participant. Further research is needed to better define the language network impairment.

Cortney Hays*Department of Pre-Physical Therapy*

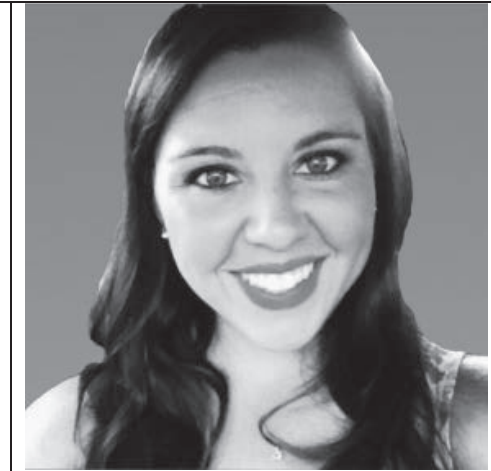
Mentor: Dr. Coral Gubler

*Physical Therapy*Pat Capps Covey College of Allied Health
Professions**Assessment of In-Season Changes in Risk Factors for Non-Contact ACL Injuries in Women Collegiate Basketball Players**

Anterior cruciate ligament (ACL) injuries are a very common in elite and recreational level sports. Approximately 70-80% of all ACL injuries are non-contact. Non-contact ACL injuries are more common in sports where sudden deceleration or acceleration along with movements such as cutting, pivoting or jump landing occur. Basketball, soccer, and volleyball have a lot of these types of movements and are considered sports with high-risk of ACL injury. Female athletes in high-risk sports have the greatest risk incidence of ACL injury with rates at 4 to 6 times greater than their male counterparts. Studies have shown that female athletes tend to perform certain tasks such as landing from a jump or quickly changing direction differently from male athletes. Generally, women land with greater knee extension, knee abduction, hip adduction and hip internal rotation than men which are all causes of non-contact ACL injury. During drop landings, female athletes use increased quadriceps force without an increase of hamstring force which increases risk for injury. The lack of matched increase activation between the hamstring and the quadriceps can be tested during angular velocities with isokinetic testing and then expressed in a hamstring/quadriceps ratio (H/Q). This low H/Q ratio can be the cause of two predominant ways of ACL injury: as a result of knee valgus collapse and by anterior tibia shear force. The purpose of this study is to evaluate how pre-season training and in-season training affects predictors of non-contact ACL injury risk. A double leg and single leg drop box jump tasks were recorded and analyzed to obtain hip flexion and knee flexion measurements. Also, a hand held dynamometer was used to assess the participants' hip external rotation, hip extension and hip abduction strengths. The participants' H/Q ratios were determined using knee flexion and extension strengths from isokinetic testing and assisted in analyzing their strengths pre-season and post-season.

Morgan Dare Hicks*Department of Speech And Hearing Sciences*

Mentor: Dr. Brenda Beverly

*Speech And Hearing Sciences*Adam Powell, Hanes Swingle, & Amy Mitchell ,
College of Medicine and the USA Autism
Diagnostic Clinic**Child and Parent Communication: A Comparison of Electronic and Non-electronic Toys for Children with Autism Spectrum Disorder and Their Neurotypical Peers**

Parent and child communication was analyzed for two groups of 14 children in three toy conditions. Group 1 consisted of 7 children (ages 2-4 years) with autism spectrum disorders (ASD). Group 2 children were neurotypical and matched to Group 1 participants for age and sex. All were video-recorded playing with their parents with a familiar book, their favorite non-electronic toy, and a handheld electronic device. Each condition was observed for 5 minutes, and speech and gesture samples were transcribed. Spoken language was analyzed to determine the number of different words, the number of total words, mean length of utterances, and an indicator of reciprocal exchange in conversation determined by the ratio of parent to child speaking turns. Children who were neurotypical had statistically greater quality and quantity of verbalizations compared to children with ASD ($p < .02$). Between-group differences for children's spoken language and for parents' spoken language were nonsignificant ($p > .05$). However, both groups of children gestured more, parents talked more, and the reciprocal exchange was higher (favoring parent talking) during book reading ($p < .05$). Overall hypotheses regarding spoken language differences in various toy conditions were not supported with this small sample. When assessing ASD, book interactions could be most effective to elicit gesture use, an early communication form built on joint attention. If handheld electronic devices are motivating and do not interfere with language and social communication, then future research could assess their use in treatment activities.

Steven Hinson*Department of Physics And Computer Science*

Mentor: Dr. Romulus Godang

Physics**A study of the branching fraction of the rare decay of B meson to Tau and its Neutrino**

We present a study of the branching fraction of the rare decay of B meson to Tau and its Neutrino. The purely leptonic decay is of particular interest to test the prediction of the Standard Model and to probe new physics effects. The study is based on a simulated data sample of B meson pairs collected at the Upsilon(4S) resonance with the Belle II detector. The Belle II detector is located at the Super-KEKB asymmetric-energy of electrons and positrons collider in Tsukuba, Japan.

Benjamin Jackson*Department of Biomedical Sciences*

Mentor: Dr. Alexandra Stenson

Chemistry

Bradley D. Harris, Taylor Brown, Jimmie McGehee, Brandon Buchel, Dominika Houserova, Logan C. Krajewski, Andrew J. Whelton, Department of Chemical Engineering, Department of Chemistry, University of South Alabama, Mobile, Alabama 36688, Department of Chemistry and Biochemistry, Florida State University, Tallahassee, Florida, 32306, United States. Division of Environmental and E

**Strength, Weaknesses, and High Resolution Mass Spectrometry for the Characterization of Disinfection Byproducts from NOM Components**

Chlorination is one the most popular methods for disinfecting drinking water. Reactions between chlorinating agents and natural organic matter (NOM) create potentially harmful disinfection by-products (DBPs)¹ and exposure to these DPBs has been linked to increased likelihood of developing bladder cancer². As NOM concentrations increase in surface waters,³ removal of NOM is increasingly necessary. Due to the high cost of removal of NOM in the treatment of drinking water, components of NOM most reactive with chlorine need to be identified. Suwanee River Fulvic Acid (SRFA) and Humic Acid (SRHA), subsets of NOM, were selected for analysis and treated with NaClO to determine reactivity with chlorine. SRHA was found to have the highest chlorine consumption at all concentrations, when compared with SRFA. Of the SRFA fractions, %NaClO consumption was highest in the middle eluting fractions. This data would indicate SRHA is the more reactive to chlorine and therefore a potential culprit in the production of harmful DPBs.

Brannon Kerrigan*Department of Electrical Engineering*

Mentor: Dr. Edmund Spencer

Electrical And Computer Engineering

Samuel Russ ,

**A Time Domain Impedance Probe for Sounding Rocket**

The Time Domain Impedance Probe (TDIP) is an experimental Plasma Impedance Probe (PIP) design that uses a concise pulse containing a wide bandwidth of frequencies to take ultra-fast impedance measurements. The prototype design is able to measure the impedance of plasmas up to 2.5 MHz at an extremely high spatial resolution never before achieved by any other PIP design. This allows the instrument to measure the electron density and neutral collision frequency more accurately since these properties remain constant during the window of measurement. The operation and design of the TDIP prototype for sounding rockets is discussed and analyzed.

Michelle Labelle*Department of Geology*

Mentor: Dr. Jim Connors

Geology**Data Collection: Recording Metamorphism and Lithology at the Grenville Front along the Georgian Bay**

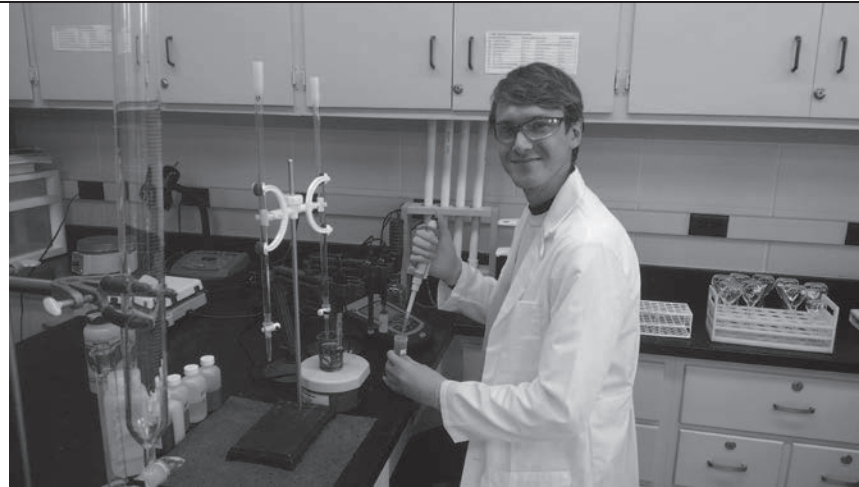
During the Mesoproterozoic, the first supercontinent, Rodinia, was formed. The result was a major mountain-building event that occurred due to the collision of the Laurentian and South American plate. That long lived event was the Grenville Orogeny. A field study was organized to collect and catalog data pertaining to the country rock and metamorphic composition as well as the tectonic environment that shaped the study area within the Grenville Front Zone. Lithology and deformation of crust within the Grenville tectonic zone from the area of Parry Sound tracing the Georgian Bay to Killarney was recorded using a cluster analysis based on access. Limited tectonic activity in the area allowed for a more accurate study of the Grenville metamorphism. The most recent glacial recession had exposed the existing bedrock of the orogeny in the study area. The study of this area provided a base compilation of data for future studies. Initial analysis has found granitic samples with a low percentage of potassium feldspar in a localized area (Grundy Lake). This suggests hydrothermal processes in the area. Several Sturgeon Bay site samples showed boudinage characteristics that may indicate post orogenic deformation. The literary research gathered herein is to provide a basic knowledge regarding this study, and a basis in which to compare this study's findings.

Dane Leach*Department of Geology*

Mentor: Dr. Alex Beebe

Earth Sciences

Alex Beebe ,

**Characterizing Submarine Groundwater Discharge into Mobile Bay, AL.**

Human activities including municipal waste disposal, agriculture, and industrial development all release contaminants into coastal waters. Typically, these contaminants are monitored in the numerous rivers and streams that discharge into the coastal environment. However, submarine groundwater discharge has recently been recognized as a significant avenue for transporting contaminants into coastal environments. Submarine groundwater discharge is characterized as any fluid that flows from the ground into a coastal marine water body. Past submarine groundwater discharge studies have shown that this phenomenon can rival river and stream input of freshwater and contaminants into coastal environments. Regional studies of submarine groundwater are sparse and limited, for example not one study has been conducted to determine the extent of submarine groundwater discharge into Mobile bay. Therefore, the purpose of this study is to characterize submarine discharge at a field site located on Mobile Bay. In order to determine rates of submarine groundwater discharge, water levels will be measured in a set of wells located directly on the coast of Mobile Bay. Darcy's Law will be used along with water level data and hydraulic conductivity measurements to determine the flux of groundwater discharge at the field site. In addition, the submarine groundwater seepage face will be mapped using specific conductivity and temperature measurements collected using a multi-parameter water quality sonde. The flux rates will be multiplied by the seepage face area to determine the volumetric rate of submarine groundwater discharge along the shoreline. Samples of groundwater collected from seepage meters will be analyzed for nutrients to determine the flux of harmful nutrient contaminants to the coastal environment. We anticipate that this research will improve our understanding of the links between land use and the near-shore coastal environment.

Anesha Lee*Department of Nursing*

Mentor: Dr. Ellen Buckner

Nursing**Self-Efficacy and Self-Management in Children with Type 1 Diabetes**

Children diagnosed with type 1 diabetes are required to become responsible for their health at young ages. In order to maintain adequate management of the illness, the family involvement is extremely important. The family can either serve as a support system and health care management team for the child and his or her adaptation to diabetes, or they can become detrimental to the child's well-being due to social and environmental distress. The ability to assess the effectiveness of care is measured through both the child's daily blood glucose monitoring and the child's Hemoglobin A1C (HbA1C or A1C). A1C measures the child's blood glucose percentage over a period of two to three months. The Roy Adaptation Model (RAM) served as the framework for this study and findings were evaluated based on the RAM Middle Range Theory of Adaptation to Chronic Illness. Following diagnosis as an inpatient, patients and families attend 6 follow-up clinic visits that are integral to their self-management. However often these clinic visit are missed resulting in poorer self-management and lower adaptation. The purpose of this IRB-approved study was to assist healthcare team be better equipped to support patients and families to adapt to a new diagnosis of Type 1 diabetes.

Children who were newly diagnosed in 2014 in a Southeastern pediatric specialty clinic were assessed for their adaptation both physiological and psychosocial through retrospective chart audit. Primary variables measured were attendance at follow-up clinic visits since diagnosis, and HbA1C. Compliance and competency ratings given by the health care team, and recommendations were noted for each visit. Age categories of preschool, elementary, middle school, and high school were computed. Compliance categories, low, medium, and high, were computed. The highest number of diagnoses occurred in the elementary age group. Their HbA1C was the highest at diagnosis with 13.5%. Although 57% were rated as low compliance by the health care team, their best HbA1C averaged 7.8%. 70% attended at least three out of four visits in the first six months. Further analysis is in progress. Implications for practice and future research will be generated.

Beverly Lowery*Department of Geology*

Mentor: Dr. Alex Beebe

Earth Sciences**Application and Effectiveness of Biochar as a Fertilizer and as a Substrate for Removing Harmful Nitrates from the Environment**

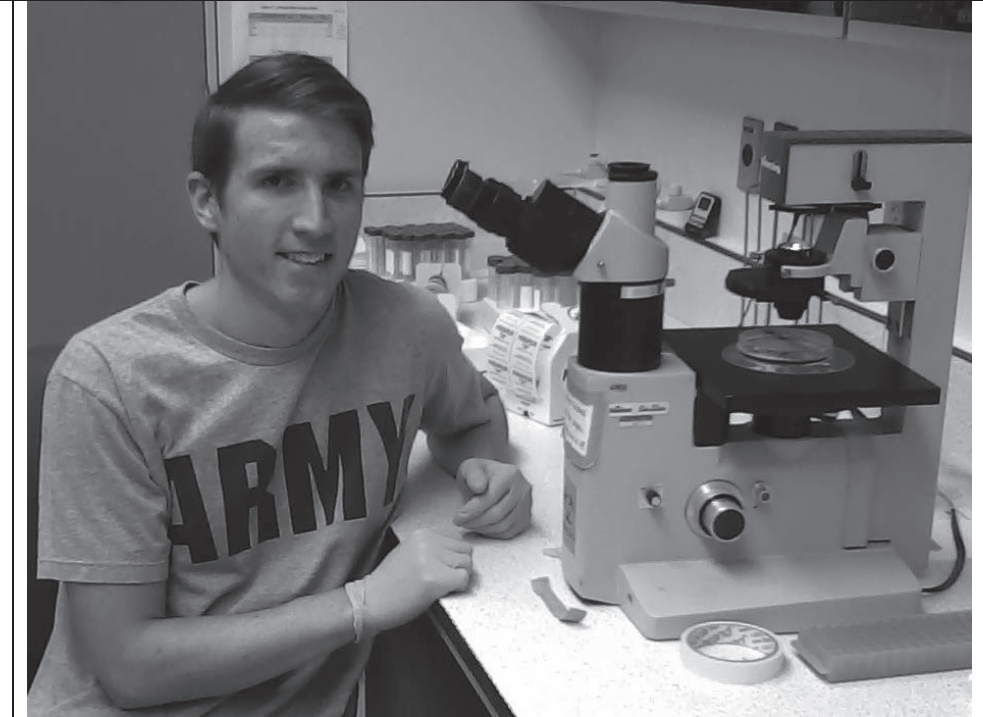
The presence of excess nitrate in the environment leads to eutrophic conditions that make it difficult for marine animals to survive. The Gulf of Mexico “Dead Zone” is a region of hypoxic water attributed to nitrate from land application of chemical fertilizer along the Mississippi River basin. Biochar, a carbon-rich solid produced from pyrolysis of biomass for biofuel production, has proven effective in improving soil conditions for agriculture and sequestering harmful nutrients when added to soil. In addition, biochar can be used to sequester carbon in order to mitigate the effects of global climate change. Biochar was produced from food waste collected from several households in the Mobile area. Food waste is a growing problem in the United States. Americans throw out the equivalent of \$165 billion of uneaten food each year, most of which ends up in landfills. This rotting organic matter increases waste disposal costs and leads to emission of greenhouse gases including methane. By converting waste products into biochar that can be applied to soil, the effects of nitrate leaching in the environment and greenhouse gas emissions can be reduced. Therefore, the object of this study was to assess whether biochar made from waste products can act as a fertilizer and as a carbon-fixing substrate for preventing nitrate leaching. Biochar made from food waste and biosolids was added to the soil of pots containing radish seeds to determine if the biochar enhances plant growth compared to a control. Due to the poor quality of the ultisols used, no significant difference was observed in plants containing biochar versus the control plants. However, plants containing food waste biochar did show a greater germination rate of 28%. Additional experiments were conducted to determine if the biochar is able to absorb chemical fertilizer added to the crops. After watering half the plants with nutrient rich water, food waste biochar proved to be the most effective in absorbing nitrates from fertilizer while the biosolids biochar actually leached nitrate back into the system. While there was an observable difference in mean effluent concentrations of nitrate, the differences were not significant ($\alpha = 0.05$).

Michael Marfice*Department of Biomedical Sciences*

Mentor: Dr. Natalie Bauer

Pharmacology

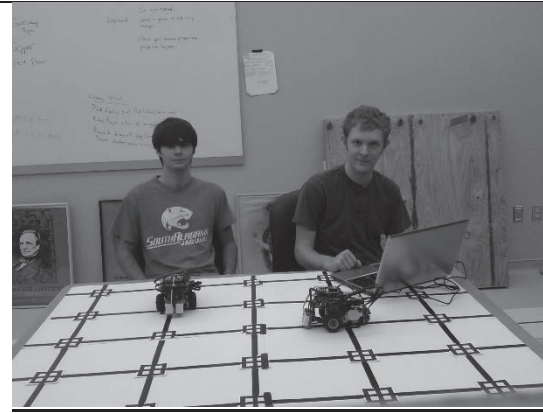
Center for Lung Biology and Department of Pharmacology

**Identification of Exosomes**

The studies of exosomes and other extracellular vesicles, namely micro-particles, offer a promising new field due to their diversity in function and potential usefulness in clinical application. The objective of this study was to observe the population of isolated extracellular vesicles from cell culture media and from circulation of healthy and diseased rats to determine what percentage were exosomes. Extracellular vesicles were isolated from various forms of media (e.g. stimulated vs. non-stimulated, physiological vs. pathophysiological). They were analyzed for Alix and CD63, two common exosome markers, to determine the presence of exosomes within the total vesicle population. Our results suggest neither Alix nor CD63 were altered by treatments of cells or disease status of the animal. Regardless of origin of sample, our preparation isolates of extracellular vesicles contained 30-40% exosomes within the population, with the remainder of the population containing micro-particles. Altogether, groups should recognize the presence of both sub-populations and thus focus exclusively on one extracellular vesicle type by inhibiting the other.

Jake Maynard & Alex Henderson*Department of Computer Science*

Mentor: Dr. Michael Doran

Computer Science**Modeling a Warehouse System**

The following project was designed to model and simulate the functions of a warehouse system equipped with state-of-the-art Automatic Guided Vehicle (AGV) technology. The centerpiece of the project was the to-scale mockup of the warehouse environment integrated with RFID technology to enable landmark recognition. Multiple Lego NXT robots complete with RFID reception antennas and XBEE radio modules represented the AGVs. Communication across the system was moderated by a central control unit according to a hierarchical network structure, which enabled global vision for the system, prevented collisions, contention, and deadlock, and stored large amounts of system data for diagnostic and statistical purposes. Test results were compared to industry standards and applied to a real-world warehouse with no AGV system to determine that equal efficiency and throughput was possible with automation.

Megan McDowell*Department of English**College of Arts and Sciences*

Mentor: Dr. Harrison Miller

Department of History**Japanese History and Culture Late Yamato Period-Present**

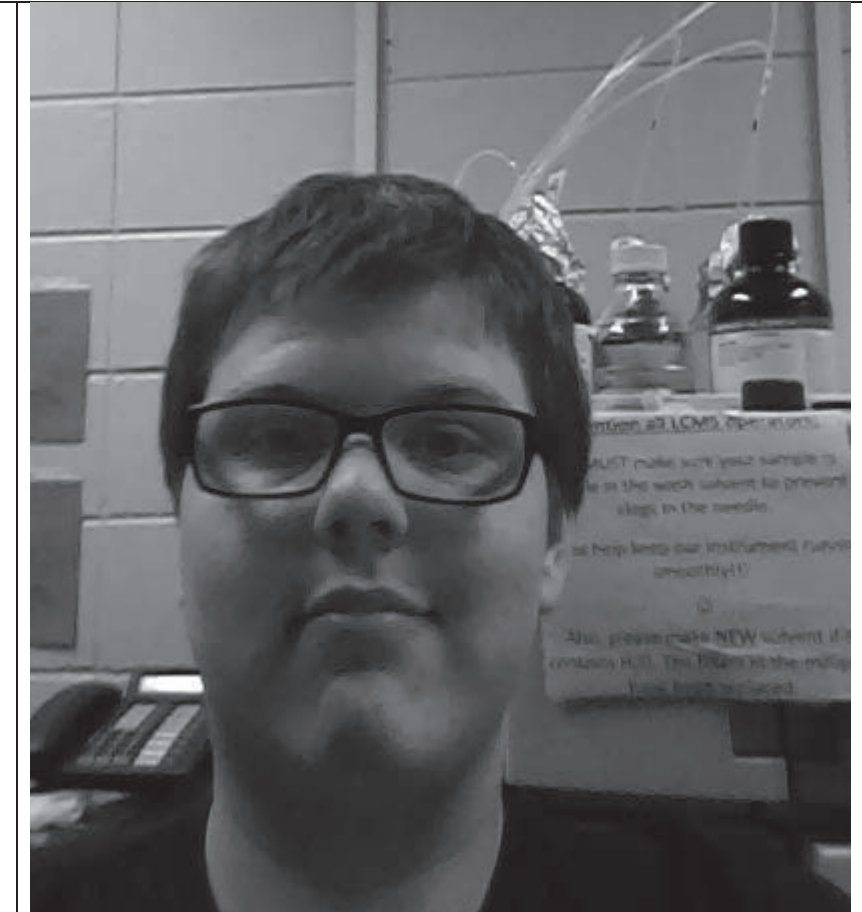
Japan is a diverse and complex nation. Throughout history its role a major or minor country in the world sphere has shifted and change to fit the demands of time. The cultural norms and history of Japan can be hard to grasp for people of the western world and thus require an open mind and dedication to understanding. Despite efforts towards westernization, the country still holds on to values and beliefs far different from those of Europe or the United States. Through intense study and exploration, Megan McDowell, an English undergraduate student at the University of South Alabama, under the guidance of Dr. Harrison Miller of the History Department at the University of South Alabama, was able to make observations and research facts about Japan's history and culture over the course of one month's stay in Hakodate, Hokkaido, Japan. Her findings include information, historical facts, and personal observations made on Japanese history, culture, and geography as a biracial Japanese American looking at the country from an outside perspective. The information presented provides historical context starting in the Late Yamato period through to modern day Japan as well as personal statements by Megan McDowell.

Angela McGaugh*Department of Biomedical Sciences*Mentors: Dr. John Wood;
Dr. Aimee Tucker*Department of Microbiology and Immunology, University of South Alabama, Mobile, AL 36688***Identifying Putative Secretion Effectors in *Rickettsia prowazekii***

The obligate intracellular, gram-negative bacterium *Rickettsia prowazekii*, the louse-borne, causative agent of epidemic typhus, is a historically significant pathogen that has caused millions of deaths during periods of war and famine. It is also identified as a potential bioterrorism weapon. Because *R. prowazekii* only grows within the cytosol of host cells, it has evolved mechanisms that aid its infection, intracellular growth, and ability to evade host cell defense. The rickettsial genome contains several secretion systems that may support the delivery of secreted effectors that would interact with its host. To identify putative effectors, a shuttle vector was constructed containing an expression cassette that incorporates a tandem FLAG and glycogen synthase kinase (GSK) tag that can be fused to a protein of interest. The FLAG-GSK tag allows the proteins to be identified within the eukaryotic cytosol, confirming protein secretion from the pathogen and supporting its role as an effector molecule. Finally, incorporation of an RpCherry-Arr2 fusion protein into the plasmid allows for fluorescence detection and selection of the desired transformants using the antibiotic rifampin. This system permits the screening of hypothesized secreted effectors in *Escherichia coli*, a surrogate host. Targets secreted can then be identified prior to validating the secretion of the effectors in BSL-3 agent *R. prowazekii*. The identification of potential secreted effectors that allow rickettsiae to enter, manipulate, and exit its host will reveal crucial information regarding rickettsial obligate intracellular growth and ability to cause human disease.

Jimmie McGhee*Department of Chemical Engineering*

Mentor: Dr. Alexandra Stenson

Chemistry**Chlorine as a disinfectant to dissolve Natural Organic Matter in Suwannee River fulvic acid**

Humic substances are a form of natural organic matter (NOM) found in soil and water. When chlorine is used to disinfect water it reacts with dissolved NOM to form potentially harmful disinfection byproducts (DBPs). Because NOM is so varied, the types of reactions that form DBPs are poorly understood. To better understand the reactions Suwannee River fulvic acid (SRFA), a portion of NOM, was separated by polarity into 100 fractions using high performance liquid chromatography (HPLC). Select fractions were then analyzed using liquid chromatography mass spectrometry (LCMS) before and after chlorination to observe changes in polarity and mass distribution. Fourteen acid standards with similar elution times to the fractions were also analyzed to compare the results. The analysis showed that early eluting high polarity fractions and acid standards appeared to undergo destructive reactions, breaking into smaller fragments and losing material to volatile DBPs, while late eluting material seemed to react constructively by absorbing chlorine into the non-volatile NOM. Signal strength was boosted by chlorination, indicating increased ionization potential. The evidence for different reactions according to fraction agrees with previous literature that NOM follows multiple reaction pathways simultaneously.

Shawn Morris*Department of Civil Engineering*

Mentor: Dr. John Cleary

Civil Engineering**Time Dependent Material Degradation and the Structural Implications**

A structural material's durability gives insight to a structure's sustainability and resiliency. Knowledge of a structure's durability reduces the public safety hazard of premature failure due to material degradation. This study focuses on the time dependent material degradation characteristics of reinforced concrete and the structural implications. Determining the lifespan of a reinforced concrete structure in the field is subjective; however, by examining the strength of degraded concrete, the ability to better determine the capacity of a concrete structure increases. Statistics show that nearly 30 percent of bridges in America are considered obsolete (Saad and Fu, 2013). This is alarming since the majority of the structures remain in operation. This study helps better understand the behavior, and assists the ability to approximate when reinforced concrete structures may need repair and maintenance. This paper utilizes concrete compression testing using concrete cylinder specimens as well as structural modeling using commercially available software called STAAD.Pro. Structural models were developed and degradation was simulated by modifying the material properties and cross-sectional area of the members. The degradation effect on the structure will be evaluated at each increment. The level of material degradation was determined based on the reduction in structural integrity. Concrete compression results yielded that degradation reduces the strength of the concrete.

Corey Nguyen*Department of Chemical Engineering*

Mentor: Dr. Kevin West

Chemical And Biochemical Engineering**Synthesis and Application of an Amino Acid-Based Metal Organic Framework**

Porous materials are an important component in many adsorbents and catalysts in the chemical industry. Recently, a new class of materials, metal-organic frameworks, or MOFs, have shown promise as high surface area materials with interesting chemical properties. MOFs are comprised of metal cations connected by organic linker molecules; it is the geometry between metal and the linker which creates the structure and the porosity. In this work, a linker molecule is synthesized to create a novel MOF. The amino acid-based linker was successfully synthesized using inexpensive materials and the structure was characterized by NMR (H and C13). A copper-based MOF has been synthesized with this linker through solvothermal techniques. The synthesized material show signs of a porosity with surface areas of $\sim 50 \text{ m}^2/\text{g}$. Although a porous structure was formed, experiments to maximize its porosity are still needed to accurately characterize the compound as a MOF. Through various observations, oxidation during the activation process is believed to have occurred since the MOF turned brown after the activation when the initial color was blue/green. Future work using x-ray diffraction will verify the structure of the crystallized material and determine which MOF synthesis conditions are appropriate. Once the synthesis conditions have been optimized, the adsorption capability of the new material will be characterized. Based on its chemical structure, we anticipate that CO₂ adsorption will be exceptionally high, which has applications for CO₂ capture in energy production and recirculated air for spacecraft and submarines.

Ravi Rajendra***Department of Biology***

Mentor: Dr. Glen Borchert

BiologyMark N. Gillespie , Department of Pharmacology,
University of South Alabama, Mobile, AL**Characterization of Extracellular RNA from Bronchoalveolar Lavage Fluid**

Until recently, all types of ribonucleic acid (RNA) were thought to exist only within the cell. Excitingly, evidence now indicates that RNA can at times be secreted outside of the cell within extracellular vesicles (EVs). This RNA called extracellular RNA (exRNA) has been shown to play a role in aiding intercellular communication and regulating cellular processes. In a clinical setting, exRNA has the potential to either serve as a biomarker indicating the presence of a disease or as a targeted tool used to treat a disease. Our project marks the first time that exRNA has been isolated at the University of South Alabama. Our study aims to characterize the exRNA composition found in bronchoalveolar lavage fluid (BALF) from the lungs of rats and how the exRNA composition found in BALF varies based on stressors. BALF from three experimental groups was used: 1) control 2) the effect of a high pressure environment and 3) the effect of Pseudomonasbacteria. In our study, exRNA was successfully isolated from all three samples of BALF with the addition of buffers and series centrifugation. In the future, we will receive results from commercial next generation sequencing of these exRNAs. In anticipation of the reads from commercial next generation sequencing, we successfully analyzed a publicly available exRNA dataset using the NCBI's Basic Local Alignment Search Tool (BLAST) algorithm. Surprisingly, the composition of RNA in the publicly available exRNA dataset resembled that of a regular cell. Based on these results, we theorize that host cells produce exosomes containing RNA, which could then function as "decoy cells" that reduce the pathogenicity of viruses. Once we receive results from sequencing, the same method of using BLAST to characterize exRNA composition will be used on the exRNA we isolated in this study. Through this analysis, we can determine what types of RNAs are released by cells in the lungs, how exRNAs released might vary with stressors, and if exRNAs play a role in immune response.

Alicia Ratcliffe***Department of Mechanical Engineering***

Mentor: Dr. Carlos Montavlo

Mechanical Engineering**Orbital Mechanic Simulation of a 1U CubeSat**

The overall goal of this program is to investigate sending multiple CubeSats discretely into orbit and connecting them to form a monolithic system. Composite satellites have greater abilities in areas such as data collection, mission, and surveillance capabilities. The work investigated here will be a start for a much larger program to build the tools necessary to perform research in this area. Initial work will be done on analyzing the orbit of a single satellite with the potential to expand the simulation to multiple CubeSats.

Janice Smith*Department of Biomedical Sciences*

Mentor: Dr. Seema Singh

Biomedical Sciences

Dr. Nikhil Tyagi , University of South Alabama Mitchell Cancer Institute

**Mint3 in Prostate Cancer**

Prostate cancer (PC) is the most commonly diagnosed non-cutaneous malignancy and second leading cause of cancer-related deaths in males in the United States¹². Despite early diagnosis and treatments, many patients exhibit relapse of PC in castration-resistant (CR) form¹³. It is hypothesized that overexpression and localization of Mint3 will be seen in metastatic PC cells due to an overexpression of Mint3 being associated with growth and metastatic progression of PC cells. This hypothesis will be tested using IHC assay on prostate tumors and adjacent normal tissue samples to examine the expression and localization of Mint3 to assess its correlation with tumor stage. By understanding how Mint3 promotes prostate cancer progression and metastasis, we may be able to develop effective treatments for PC and in distinguishing lethal from benign PC.

Luke Smith*Department of Music*

Mentor: Dr. David Durant

Music**Compositional Process: Analysis and Creation**

This paper serves to expose the process behind the composition of a musical work for solo vocalist and small chamber ensemble, a genre nicknamed “Pierrot ensemble” after Arnold Schoenberg’s radical setting of poetry by Albert Giraud, “Pierrot Lunaire,” Op. 21. The text chosen for this work is a selection of poems from Gertrude Stein’s *Tender Buttons*. The paper begins with an artistic interpretation of the text given by the composer. Then the paper describes ways in which this interpretation forms the creative intention behind the piece, supplemented with examples of this occurring in other works from this genre given in accounts by those works’ composers. Finally, the paper provides details about the composing of the original work. Throughout the paper, several musical instances have been extracted from the completed score for the sake of exploring their intellectual origins and the significance of their placement in the work. For the purpose of analyzing musical instances in relation to each other and the overall work, all the elements of the composition have been categorized as follows: structure defined as the segmentation of time and musical parts, form as the range and quality of changes in intensity and atmosphere that the music undergoes, method as the procedure for placement of notes and larger units of musical events, and material as all the musical matter apparent in the work, especially timbre, pitch, and rhythm. These four generalizations are given by John Cage in his article “Composition as Process”¹ and the definitions of them given here are informed by further research into writings by Cage and other composers. In treating the text of *Tender Buttons* it is the composer’s intention to unite the poetry and the music in similar function and aesthetic, so that the artistic vision inspired in the composer by the poetry informs the development of the abstract concept behind the piece. This abstract concept then instructs every macroscopic and microscopic decision made in creating the work.

¹ John Cage and Kyle Gann, *Silence: Lectures and Writings, 50th Anniversary Edition*, 2nd edition (Middletown, Conn: Wesleyan, 2011): 18-34.

Noelle Smolcic*Department of Biomedical Sciences*

Mentor: Dr. Eugene Cioffi

Pharmacology/Biomedical Sciences

Donna L. Cioffi ,

**Role of 3-Fluorosialic Acid in Endothelial Cell Growth and Barrier Integrity**

Sialic acids comprise a family of nine-carbon keto acidic sugars, including N-acetylneuraminic acid (Neu5Ac), and are found on the ends of carbohydrate chains. Neu5Ac, a commonly occurring sialic acid found in mammalian systems, has an effect on the overall negative charge of glyconjugates and cell adhesion (1). In previous studies, sialic acids have been observed to play a major role in cell-to-cell adhesion and have been largely accepted as the receptor for neurotransmitters in the nervous system (2). Sialic acids are traced from the biosynthetic antecedent molecule N-acetyl-D-mannosamine (ManNAc). Similar structures of this molecule can be transformed into artificial sialic acids that can be incorporated into the glycocalyx of endothelial cells. Research has shown ManNAc hinders the growth of capillaries; likewise these artificial sialic acids may alter the formation of blood vessels in endothelial cells (3). In this project, we synthesize fluorinated sialic acids to be incorporated into the glycocalyx of pulmonary endothelial cells. We then determined the effects of fluorosialic acids on endothelial cell growth and barrier integrity.

William Spikes*Department of Chemical Engineering*

Mentor: Dr. Kevin N. West

Chemical And Biomolecular Engineering**Chemically stable solid adsorbents to selectively adsorb ethylene**

The production of ethylene, a chemical precursor for a broad variety of materials, is approximately 165 million tons per year, placing it third among the top chemicals produced worldwide. As such, improvements to processes related to its production can have significant financial, energy usage and environmental impacts. Specifically, the separation of ethylene from ethane during production consumes ~1-2% of the total energy required by the chemical industry. Our group is developing chemically stable solid adsorbents to selectively adsorb ethylene. First a copper salt (known to reversibly bind ethylene) is deposited on a high-surface area support, then the support is coated with an ionic liquid, chosen for its very low H₂ solubility, to create a protective barrier preventing H₂ present in the mixture from reacting with the copper, rendering it inert. To achieve a high dispersion of the copper, we are using supercritical fluid deposition. Supercritical fluids are excellent deposition solvents because they have liquid-like solvent strength, and gas-like diffusivities, allowing for rapid transport of solutes through the solvent. The salt has a low solubility in the supercritical fluid (CO₂), which is advantageous as it allows for deposition of individual species from the solution, eliminating cluster formation and maximizing dispersion. However, the effectiveness of the adsorbent depends on the deposition conditions (temperature, pressure, time, etc.). In this initial study, we examine the effect of the deposition conditions on the amount of copper deposited, the change in the surface area of the support material and the selective ethylene/ethane separation.

Kali Thompson*Department of Psychology*

Mentor: Dr. Jennifer Langhinrichson-Rohling

Psychology**Schemas as a Mediator for the Relationship between Attachment and Suicidal Proneness and Ideation**

Suicide can be conceptualized as being on a continuum. On one end, suicidal thoughts take place. These can then progress to making a plan to commit suicide, making threats, and then finally attempting or completing suicide. Since suicidal behavior progresses, early intervention is critical. Relatively recently, Lewinsohn and colleagues have expanded the suicidal continuum to include life-diminishing behaviors than can proceed overt suicidal ideation; this construct was named suicide proneness. By understanding the variables that relate to suicide proneness as well as suicidal ideation, prevention of suicide may be enhanced. Thus, the goal of the current study was to determine if negative self-related cognitive schemas mediate the relationship between poor parental attachment and suicide proneness as well as suicidal ideation in college-aged adults. Participants included 619 students from a southern university. The Baron and Kenny method of regression was utilized to determine the relationships among the variables of interest. Three components of parental attachment were considered: trust, communication, and alienation. Five different schemas were assessed: most were from the disconnection and rejection domain. The analyses were conducted twice, first with suicide proneness and then with suicide ideation, as variables being predicted. Results demonstrated that all study variables were significantly correlated (correlations ranged from $-.30$ to $.39$) with poor parental attachment and schemas reflecting self-rejection relating to both suicide proneness and ideation. Additionally, as predicted, schemas were partial mediators of the relationship between poor parental attachment and suicide proneness and suicidal ideation. However, different schemas were significant mediators. Specifically, when attachment and schemas were regressed onto suicide proneness, the defectiveness and abandonment schemas were significant predictors. When regressing onto ideation, defectiveness and emotional deprivation emerged as the significant mediators. For college age students, the most detrimental suicide-related combination was to feel both alienated from one's parents and personally defective and deprived.

Morgan Tooles*Department of Physical Therapy*

Mentor: Dr. Barry Dale

Department of Physical Therapy**Upper extremity biomechanics associated with the modern golf swing**

Purpose: The purpose of this research is to show the importance of understanding the injuries linked to golfing as well as the biomechanics displayed in the upper extremity. Background: Many individuals believe golf is a low impact sport with no needed safety requirements. However, any golf-related injury can happen when it is least expected. Professional or amateur, a golfer will realize how physically exhausting the game is and how much it targets upper extremities. Subjects: Thirteen healthy subjects participated in the study. Subjects ranged from 19 to 66 years of age (38 ± 15 yr), and did not currently have low back or shoulder pain. Methods: Data were collected in motion analysis laboratory using Vicon MX Cameras (Denver, CO) capturing data at 240Hz and AMTI force plates sampling at 1000Hz. Subjects utilized their own 7-iron for all swings. Subjects reported to the lab on two occasions to perform five full and five shortened swings in a counterbalanced order. During this procedure, the subjects were covered head to toe with body markers. This full body marker set was used consisting of 39 on the body and 4 on the golf club. The full marker set was utilized to capture each movement of the subject while performing full or half swings. The data was processed manually, exported to Microsoft Excel and then to SPSS for further analysis. Results: For the shoulders, the highest magnitude peak force was found in the left shoulder at 3.41 ± 1.1 . With the elbows, the highest force was found at 2.49 ± 0.6 in the left elbow. Finally for the wrists, the right wrist contained the highest force with 8.69 ± 7.0 . Conclusions: During our research, we looked at forces and injuries of the upper extremity. After analyzing our findings, we came to the conclusion of a successful project.

Leomie Tuberville*Department of Anthropology*

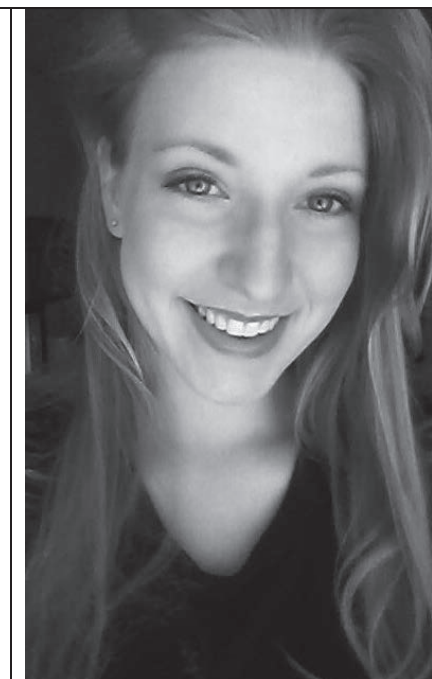
Mentor: Dr. Phillip Carr

Physical Therapy**Visitation habits and public opinion of museums and community-based exhibits**

Museums perform a unique function in our society. Regardless of economic conditions, museums have continued to achieve their purpose: the preservation of the shared past of their communities and the enhancement of knowledge for the populace. Exhibit type is one factor that effects museum attendance. This project will investigate the attendance of small museums and public opinion of community-based exhibits. Community-based exhibits are projects that engage the population in a form of partnership. Small rural museums located in South Alabama will be contacted to gather attendance data and exhibit parameters in an effort to reveal patterns and relationships. Target museums include the Monroe County Heritage Museum, the Clarke County Museum and the Baldwin County Museum. In relation to museums, community may be defined as a common interest rather than geographical area. The Mobile Medical Museum, the Kathryn Tucker Windham Museum, the Hank Williams Museum, the MOWA Choctaw Museum and the University of South Alabama Archaeology Museum are examples of common interest museums. A selection of the general population in the area of each location will be randomly chosen to participate in a poll. The findings will used to determine visitation habits and public opinion of museums and community-based exhibits. The anticipated results are a direct increase in attendance for museums that participate in community-based exhibits.

Madison Tuttle*Department of Chemistry*

Mentor: Dr. Larry Yet

Chemistry**Development of Small Molecule Chemical Probes for Serine/Threonine Protein Phosphatase 5**

Protein phosphatase 5 (PP5) is an evolutionarily conserved serine/threonine phosphatase whose dephosphorylation activity modulates many cellular factors including enzyme activity, receptor-ligand binding affinity, protein stability, and protein interaction. Recent studies have shown that overexpression of PP5 is associated with aggressive development of human breast carcinoma, cancer cell proliferation and survival, and apoptosis resistance. However, characterization of the biological and pathological roles of PP5 in the antitumor activity of breast cancer is difficult because of the lack of selective inhibitors that may serve as chemical probes. To solve this problem, our team developed a homogeneous fluorescence intensity-based biochemical assay and conducted an ultra-high-throughput screen of over 315,000 compounds to detect inhibitors of PP5. More than 30 compounds were confirmed as PP5-selective inhibitors. The strongest inhibitors contained a common (7-oxabicyclo[2.2.1]heptane) core, which quantum mechanical modeling suggests could be decorated at carbons 5/6 to improve PP5 selectivity. This work details the experimental procedure developed for the construction of the (7-oxabicyclo[2.2.1]heptane) scaffold, as well as past unsuccessful methods, current synthetic progress, and future analog routes.

Morgan Watkins*Department of Social Work*

Mentor: Dr. Joseph Currier

Psychology**The relationship between the veterans' spirituality and their risk for interpersonal violence**

Over the last fifty years, interpersonal violence (IPV) has emerged as a serious national health concern and researchers have increasingly evaluated the various factors that could influence an individual's risk for IPV. However, there is very little clinical data evaluating the potential link between spirituality and IPV, especially among combat veterans with PTSD. For that reason, this project analyzes the relationship between the veterans' spirituality and their risk for IPV by utilizing clinical information from 471 veterans residing in a therapeutic setting and participating in numerous psychological interventional efforts (e.g., anger management, stress reduction, interpersonal process groups, etc.). Admission to this residential treatment program was based on clinician referrals to veterans with severe PTSD who had not improved sufficiently through less intensive options. This sample consisted of predominately men (95%) with an average age of 50.86 years (SD = 10.68). Spiritual functioning was assessed via six subscales from the Brief Multidimensional Measure of Religion and Spirituality (BMMRS; Fetzer Institute & National Institute on Aging Working Group 1999). Aspects of adaptive spirituality included Daily Spiritual Experiences (6 items), Forgiveness (3 items), Private Religious Practice (5 items), Positive Religious Coping (3 items), and Organizational Religiousness (2 items). Maladaptive spirituality was assessed using the Negative Religious Coping subscale (3 items). Additionally, interpersonal violence was assessed by an 8 item Conflict With Others scale developed at the PTSD residential treatment program. With a yes/no format, this scale noted whether the veterans had engaged in aggressive acts over the past four months. Examples of conflict included destruction of property, physical violence, threats, aggressive weapon usage, verbal aggression, and withdrawal as a result of conflict. This project sought to focus on the overall sum of this scale. It was hypothesized that adaptive dimensions of spirituality (daily spiritual experiences, forgiveness, private religious practice, positive religious coping, and organizational religiousness) would be associated with less risk for IPV; in contrast, it was expected that negative religious coping would be associated with a higher risk for IPV. Bivariate correlations revealed that veterans with daily spiritual experiences, private religious practice, positive religious coping, organizational religiousness, and experience with forgiveness had lower risk for engaging in violent events. Alternatively, negative religious coping was associated with greater risk for interpersonal violence in this sample of veterans with PTSD.

Mikalya Wheeler*Department of Chemical Engineering*

Mentor: Dr. Christy West

Engineering**Catalysts containing platinum and ceria on alumina support**

Catalysts containing platinum and ceria on alumina support are very important in environmental and energy applications, as they are very efficient at converting CO, hydrocarbons, and nitrogen oxides (NO_x) to less harmful CO₂, H₂O, and N₂. An important characteristic of the catalytic surface is platinum dispersion, which evaluates the number of platinum atoms that are exposed on the supported nanoparticle surfaces as catalytic sites. For most catalysts, the common way to determine platinum dispersion is to perform pulse chemisorption of CO. However, this type of measurement is convoluted by the presence of ceria due to a phenomenon known as spillover. When spillover occurs, CO molecules that are activated by adsorption on platinum form bonds to ceria as well, vacating Pt sites for further adsorption. This leads to an inflated dispersion measurement. Dispersion can be measured by pre-saturating ceria with other adsorbates, but this method is rather complex and it is difficult to verify saturation. Spillover has been avoided by running the reaction at -78°C, but how low of a temperature is really necessary to obtain accurate measurements? We carried out pulse chemisorption measurements from -80 °C to 40°C, and found that at -40°C the dispersion seems to level off. It remains to be seen if the same result is obtained for catalysts of other precious metals or of Pt/ceria/alumina catalysts prepared by other methods. Our results confirm that CO spillover is suppressed by operating at lower temperatures, and the efficiency of the method is improved by the opportunity to perform measurements at -40°C instead of -78°C.

VOLUNTEER RESEARCH

ABSTRACTS

Kaia White

Department of Microbiology

Mentor: Dr. Systke Kimball

Earth Sciences

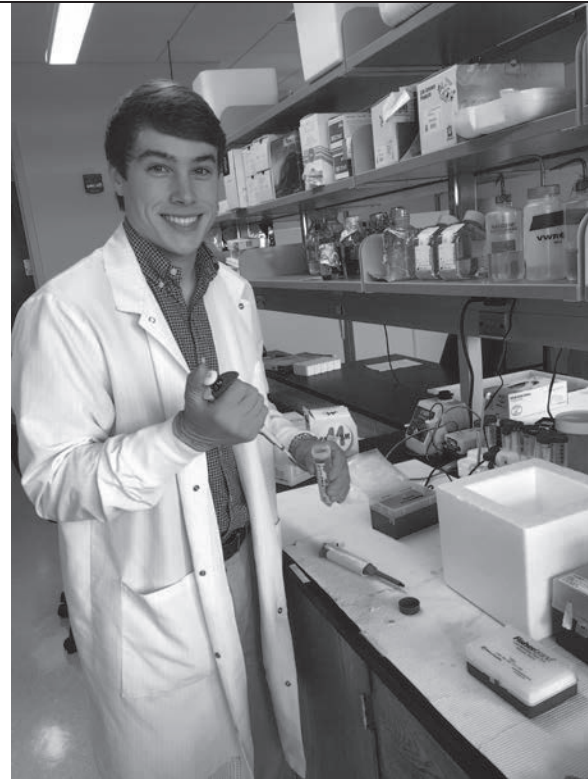


Warm fronts imbedded within landfalling tropical systems

The purpose of this research is to explore U.S. landfalling hurricanes and tropical cyclones since 2005 to see if these warm fronts imbedded within landfalling tropical systems is more common than previously thought. By exploring this hypothesis, a better understanding of whether or not a warm front enhances the overall impacts of a tropical cyclone or hurricane can be achieved. It is not common for fronts to be observed within hurricanes and when such an event occurs, it is noteworthy because the fronts can cause heavy rainfall and strong wind gusts to occur at the surface. The first step was to determine which storms made landfall in the contiguous United States from 2005 to 2014. Next, was used to record date, time, coordinates and intensity of landfall as well as which state the landfall occurred in. Given the landfall coordinates for each tropical cyclone every Automated Surface Observing System (ASOS) station within 100 km of the landfall location was identified. This 1-minute ASOS data contains wind speed and direction, precipitation, pressure, temperature, and dew point temperature. The next step involved putting the data through a FORTRAN program to extract the 24 hours before landfall and 24 hours after landfall. The final step consisted of running the FORTRAN results through a Python program to create time series plots. Analysis was performed for storms for the years 2005 to 2014. Of these storms, none of them showed a front occurring as the storm made landfall. Next steps in this research will include identifying other data sources besides ASOS stations and using radar imagery to identify fronts in landfalling hurricanes.

Gerald Garriga*Department of Biomedical Sciences**College of Allied Health*

Mentor: Dr. Padmamalini Thulasiraman

*Department of Biomedical Sciences***Co-author: Andrea Butts****Regulation of Mucin 1 by Honokiol in Mammary Carcinoma Cells**

One of the diagnostic markers of metastatic progression is the overexpression of a transmembrane protein called Mucin 1 (MUC1). High levels of MUC1 have been found in tumor tissues, including breast cancer, and have been implicated in reduced survival rate. After translation of the protein, carbohydrate groups are attached to MUC1, a process called glycosylation. The resulting glycocalyx, which serves as a protective layer on epithelial surfaces, is involved in cell-cell interactions, signaling and metastasis. Not only do breast tumors have simpler and fewer carbohydrate chains than MUC1 from normal breast epithelial tissue, they also have increased levels of the carbohydrate derivative, sialic acid. Altered addition of sialic acid (sialylation) has been associated with cancer transformation and metastatic progression of the disease. The enzyme, α -2,3 sialyltransferase which adds the α -2,3-linked sialic acids to MUC1 is increased in breast tumors and has been correlated with poor prognosis. Shortening of the carbohydrates units on MUC1 in breast tumors unmasks the peptides that would otherwise be covered by the carbohydrates in normal MUC1. Preliminary studies have shown that plant derived natural product, honokiol suppresses protein expression of MUC1 in mammary carcinoma MCF-7 and MDA-MB-231 cells. However, it is unknown whether honokiol alters the sialylation patterns of MUC1. Among the three ST-3 isoforms, ST3Gal1 is elevated in breast carcinoma cells. Treatment of MCF-7 and MDA-MB-231 cells with 10 and 20 μ M of honokiol demonstrated down regulation of ST3Gal1 protein expression in both mammary carcinoma cell lines.

Eric Smith*Department of Psychology**College of Arts and Sciences*Mentor: Dr. Jennifer
Langhinrichsen-Rolhing*Department of Psychology***Thematic Analysis of 30 Families Study Post-Disaster**

Abstract: On December 25, 2012 a tornado hit the midtown area of Mobile, Alabama causing major damage to one of the area's high schools containing several thousand students. Following this disaster, system-level changes occurred to accommodate students, including relocation to the back lot of school serving middle schoolers. School mobility can have both positive and negative effects on student achievement (Heinlin & Shinn, 2000). The purpose of this study was to assess how students and their families were affected by the tornado and the family processes that promoted resiliency. Thirty families, with an impacted student, consented to partake in a two-part study: completing a survey set as well as a family interview about their experiences. Upon listening to these interviews, thematic coding ensued. Several themes emerged. After the move, over two-thirds of the parents and students disliked the mandated transportation system, which disrupted daily schedules, extending school hours on both ends. This transportation system also posed issues for early dismissals, as parents had problems accessing their children readily. There was an overwhelmingly unwelcoming feeling for the incoming high school students. Several described the new location as a "prison," with an emphasis on the physical barriers that were erected to contain them. The students suffered academically due to changes in their academic obligations. Results from the thematic analysis will be presented as well as a description of the coding currently occurring. Findings have implications for school systems and families post-disaster.

Austin Ray*Department of Biology**College of Arts and Sciences*

Mentor: Dr. Ylenia Chiari

*Department of Biology***Austin Ray¹, Scott Glaberman¹, Pierre Moisson², Miguel A Carretero³, Ylenia Chiari¹****1 – Dept. of Biology, University of South Alabama, Mobile, AL.****2 - A Cupulatta, Véro, 20133 Ucciani Km21, Corsica, France****3 - CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos da Universidade do Porto****Campus Agrário de Vairão 4485-661 Vairão, Portugal****Estimates of relative preferred temperatures (Tp) in two species of turtles**

It has been found that global climate change negatively affects biological systems. The effect of global climate change varies across ecosystems and species. However, ectothermic organisms are thought to be more sensitive to any climate change as their own homeostatic processes depend on environmental conditions. Ectotherm species have various strategies, such as moving between areas in sunlight and areas covered in shade, to regulate their body temperature. Because of the importance that environmental temperature has on the biology of ectothermic organisms, uncovering the preferred temperature for ectothermic species and how different temperatures are selected by the organisms is of vital importance to understand how climate change may affect them. In this work, we studied the preferred temperature(s) and thermoregulatory behavior – as seeking the sun or the shade – in two different species of turtles studied in a semi-controlled environment – outdoor enclosures with shelters available for the animals. Temperatures were continuously measured every twenty minutes for 114 days by attaching a data-logger on the carapace. Dataloggers were also placed in the same enclosure with each species in areas with sunlight or shade throughout the day. This was used to record maximum and minimum temperatures occurring for each sampling day in each enclosure. Data were analyzed as median individual variation from the recorded environmental temperatures. The gathered data can be used to determine which species are more sensitive to temperature variation and what temperatures species prefer.

Marzieh Atigh*Department of Mechanical Engineering**College of Engineering*

Mentor: Dr. Saami Yazdani

Department of Mechanical Engineering**In Vitro Stent Endothelialization**

Peripheral Artery Disease (PAD) is one of the major causes of morbidity that affects approximately 10 million people in the US. PAD is caused by atherosclerosis, which causes hardening and narrowing of the artery. It is hypothesized that, PAD reduces the Endothelial Cells (EC) ability to function optimally, and eventually leading to disease initiation and clinical complications. The preferred method of treatment of PAD is stent placement which is minimally invasive procedures. Bare Metal Stent can lessen the rate of restenosis by preventing elastic recoil and cell growth. However, in-stent restenosis remains one of the major drawbacks of this procedure. Drug-Eluting Stents (DES) has proven to be effective in reducing the risk of late restenosis, and also to reduce the growth of endothelial cells. Therefore, the objective of this study was to develop a benchtop model to study the impact of stents on EC growth and confluency. Briefly, silicone tubes with arterial geometry and similar mechanical compliance were created and was prepared for cell seeding. A stent was deployed inside the scaffold, the balloon was inflated to the appropriate pressure. The inner surface of the tubes was then seeded with rat aortic ECs. The bioreactor was then placed inside an incubator for a period of 48 hours. The result demonstrated that ECs successfully attached to the inner surface of the scaffold and around stent. This system can be potentially used to examine EC growth and consequently their responses to DES.

Nickolas Moreno*Department of Biology**College of Arts and Sciences*

Mentor: Dr. Ylenia Chiari

*Department of Biology**Nickolas Moreno¹, Will Allen²,
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of South Alabama, Mobile, AL.****2 – School of Biological,
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Hull, UK.****3 - Department of Biological
Sciences, Marquette
University, Milwaukee, WI.****Evolution of spotted color pattern in geckos**

Coloration in animals, especially vertebrates, have different purposes ranging from camouflage, signaling, mimicry, and temperature regulation. In vertebrates, coloration has been widely studied in some groups (fish, mammals, birds), but data for reptiles is still limited to a few examples. Among reptiles, geckos show a wide range of variation in color patterns. The function of color pattern in gecko is still largely unknown. In this work, we present our results focusing on understanding the influence of phylogeny, time of activity (diurnal vs nocturnal), and habitat use on spotted color pattern variation in geckos. We focused on spotted color pattern, as this character in geckos varies for number of spots, shape of the spots, distribution and density. We created a database of around 240 pictures of gecko species. Species selection was based on the most recent gecko phylogeny. Dorsal views of the geckos were selected to obtain the best view of the color pattern. The photos collected in the database were only of adults, and for species with sexual color dimorphism, only males were used. The presence or absence of adhesive toe pads was used as a proxy for habitat use. Our hypotheses are that phylogeny will have a strong influence on geckos' patterns, as well as time of activity and habitat. We expect more disorganized patterns to be associated with nocturnal species and complex habitats for cryptic functions.

George Moore II*Department of Mechanical Engineering**College of Engineering*

Mentor: Dr. Chinedum Okwudire

Department of Mechanical Engineering**An Optimization Model Designed to Increase MakaPad Production While Maintaining Sustainability and Customer Preference Expectations**

The Base of the Pyramid (BoP) -- the poorest 4 billion of the world, more or less -- is responsible for approximately 2.5% of the world's consumption while the richest 10% of the world is responsible for 65%. Efforts to level this imbalance include providing the BoP with an infrastructure that encourages independent value creation and sustainable development. Hence, this study focuses on improving the manufacturing of MakaPads -- low-cost and biodegradable sanitary towels developed in Uganda that can alleviate the educational hindrance placed upon girls during menstruation cycles. The manufacturing of MakaPads involves methods of production that are sustainable and accepted by locals. To improve production of MakaPads, an optimization model that factors customer preference, sustainability, and profitability in a mathematical model has been designed in this project. This model includes the price of MakaPads, investment in pro-environmental preference and behavior (PEP and PEB), and percentage of recycled paper pulp (RPP) as input variables. The outputs include PEP activation, performance, profit, and demand. Absorbency, tear strength, and softness of the MakaPad material will be evaluated at variable percentages of RPP. These traits will be used to determine performance and will ultimately contribute to the resulting demand for MakaPads. We anticipate that results will indicate an optimal price, investment in PEP and PEB, and percentage of RPP that produces a desirable balance of profit and demand. Other than benefiting MakaPad production, this project provides insight on the accuracy of quantifying customer preference and demand of a product in lesser developed countries.

Key Terms: Base of the Pyramid, Sustainability, MakaPads, Pro-environmental Preferences, Pro-environmental Behavior, Recycled Paper Pulp

Jeffrey Hendrich

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Kang Rui Xiang, Frankie D. White, Jared D. Taylor



Investigating Auophilic Interactions: Synthesis, Structural, and Photoluminescent Properties of Lanthanide Cyanometallates Containing 1,10-Phenanthroline.

The preparations of lanthanide cyanometallates incorporating the organic ligand 1,10-phenanthroline (phen) are presented. Isostructural compounds with a general structural formula of $[\text{Ln}(\text{Au}(\text{CN})_2)_3(\text{H}_2\text{O})_2(\text{phen})]$ ($\text{Ln} = \text{Eu}, \text{Gd}, \text{Tb}$) are determined using single crystal X-ray diffraction. These structures contain auophilic interactions of six continuous gold atoms ranging in distances of 3.196 Å to 3.305 Å, along with pi stacking of phen groups between the gold hexamers. Temperature-dependent photoluminescence properties of each product are also examined and can be attributed to long-range auophilic interactions between moieties, as well as intramolecular energy transfer in select compounds from the cyanometallate and/or phen ligands to the lanthanides. Due to Gd^{3+} ions having no visible emissive properties, the Gadolinium sample is used as a control to observe energy transfer exclusively facilitated by the coordinated ligands to and from Eu^{3+} and Tb^{3+} ions.

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Center for Lung Biology

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Alpha-pix expression in pulmonary endothelium

Pulmonary Arterial Hypertension (PAH) is a devastating disease in which mean survival from diagnosis is only 2.8 years and for which, despite efforts, there is currently no effective treatment. Although the mechanism of PAH is largely unknown, inflammation appears to play a role in the vascular remodeling that is typical of this disease. Recent findings indicate that microparticles isolated from the blood of PAH rat models induce increased intracellular adhesion molecule (ICAM-1) expression in pulmonary endothelial cells when compared to treatment with microparticles from control animals. It has also been found that the protein alpha-pix, a guanine exchange factor responsible for downstream ICAM-1 expression, is found in the microparticles of PAH patients at concentrations seven times that of microparticles isolated from control patients- causing speculation that this protein may be the source of increased ICAM-1 expression in the PAH microparticle-treated endothelial cells. Before it can be determined whether the microparticles are delivering or stimulating increased alpha-pix expression, we first had to determine the constitutive expression of alpha-pix in pulmonary endothelial cells. We used several methods to confirm protein expression in both pulmonary microvascular endothelial cells (PMVECs) and pulmonary artery endothelial cells (PAECs) including western blotting, immunocytochemistry, and flow cytometry. These methods proved that there was alpha-pix expression in both PMVECs and PAECs, but that expression was considerably higher in PAECs (25% vs 2%) and that localization of the protein was perinuclear. These results suggest that alpha-pix is expressed in both endothelial cell types but more abundantly and with clear nuclear localization in the pulmonary artery endothelial cells. These findings may contribute to our knowledge of the function of alpha-pix in PAH and help us determine the endothelial response to circulating microparticles in the setting of pulmonary arterial hypertension.

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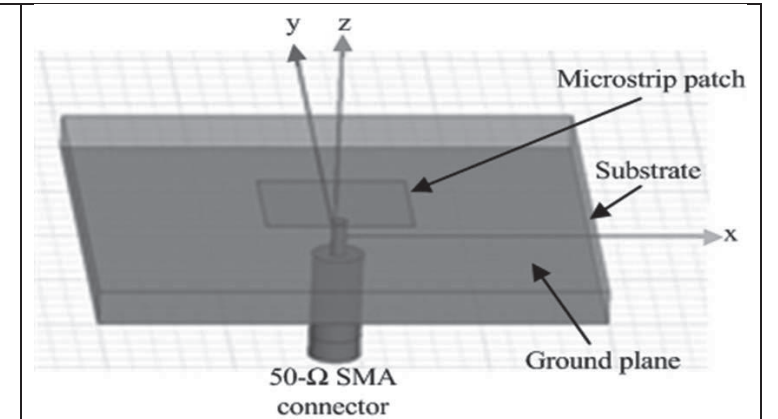
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**Simulation and Modeling of a millimeter-Wave Microstrip Antenna for Biomedical Application**

A millimeter Wave (mmWave) antenna is presented that operates at a frequency of 35 GHz and radiates 30 dBm power and can be used for biomedical applications. The microstrip patch antenna has a planar configuration and suitable for medical devices such as blood flow monitoring systems. Ansys HFSS, version 16.0, is used to model and simulate the designed antenna. The antenna performance was evaluated based on the return loss, gain patterns, and radiated power. A skin phantom is added above the patch antenna and the return loss and near- and far-field gains are analyzed to study its effect.

Thermal Analysis & Phase Behaviors of N-methyl-N-alkylpyrrolidinium and N-methyl-N-alkylpiperidinium Iodide Salts

As the demand for alternative solvents increases, a better understanding of ionic liquids and the thermal behaviors of their ions is necessary. Ionic liquids have become increasingly popular due to their various potential applications, such as lubricants, electrolytes in batteries, catalysis, and separation media. This study focuses on the characterization of N-alkyl-N-methylpyrrolidinium [PYR1,RI] and N-alkyl-N-methylpiperidinium [PIP1,RI] iodide salts, where “R” denotes the alkyl group from R = 4 (butyl) to R = 10 (decyl). The thermodynamic properties, such as thermal phase transitions and thermal decomposition, of these salts are individually analyzed by Differential-Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA). Measurements of these behaviors provide insight upon the effects of differing alkyl chain lengths on their chemical properties. A significant odd-even trend is observed from the DSC melting transition temperatures for both series. This trend relates the impact of the cation symmetry with alkyl chain length. The enthalpies calculated from other phase transitions indicate a variation in chain motion at R = 7 (heptyl) and a potential change in the dominant intermolecular interactions that are broken upon melting. The longer chains have more ways of storing energy due to the increase of overall importance of van-der Waals interactions while decreasing the importance of Coulombic forces. The TGA data reveals a substantial trend: as the alkyl chain increases, the decomposition temperature decreases. A further investigation will entail analyzing the binary phase behaviors of PYR1,RI and PIP1,RI mixtures and collecting TGA-MS data to determine the decomposition mechanism..

Benjamin J. Burleson*Department of Chemical Engineering**College of Engineering*

Mentor: Dr. Kevin West

*Department of Chemical Engineering**College of Engineering***Properties of Lipidic Ionic Liquids**

Environmental pollution and safety hazards represent significant challenges in industrial chemical settings. The organic solvents currently used in industry exemplify these problems: they are both volatile and flammable. Additionally, many organic solvents pose significant health risks. To eliminate such undesirable effects of traditional solvents, less hazardous and more environmentally benign alternatives are needed. The emergence of ionic liquids (ILs) as a potential alternatives to more hazardous solvents represents a groundbreaking possibility, one that certainly warrants further research and investigation. ILs are chemical compounds which are ionic in nature, but liquids at or near room temperature. Although these compounds are ionic, they possess characteristics which make them optimal for solvent use—they have negligible vapor pressures and low flammability, and in many cases, exhibit low toxicity. As they are ionic (polar), traditional ILs cannot appreciably dissolve nonpolar substances, including many of the compounds of interest to the petroleum and specialty chemical industries. However, the introduction of long, nonpolar tails on the IL imbues them with “non-polar-like solvent” properties. By the addition of such nonpolar side chains to the IL, the compound thus inherits many nonpolar properties that resemble those of lipids in cell membranes, and the term lipidic ionic liquid is used to describe them. However, for lipidic ILs to become a viable alternative to traditional organic solvents, more information regarding their physical properties and phase behavior must be measured. In this work, we examine the liquid-liquid equilibrium and volumetric behavior of a representative lipidic ionic liquid with non-polar solutes.

Thanh Nguyen*School of Computing*

Mentor: Drs. Todd R. Andel, Brad Glisson

*School of Computing**Co-Author: J. Todd McDonald***Injection of Android Botnet into Snapchat APK**

Android smartphones have gained a huge market and popularity in the past years due to Android's open architecture and availability of its open sourced application programming interface (APIs). The vast popularity and monetary benefit of an android application have shown in influx of android malware. Increases in sophisticated stealth techniques such as code virtualization, encryption, and transformation have made it even harder to detect malware. A major concern is the possibility of code injection into trusted android application. Code injection is the term for an attack type consisting of injecting code that is then interpreted or executed by the application. Our research will demonstrate malware code injection into a trusted Android application called Snapchat. We design a malware in the form of a botnet that will use Android's services component in order to run hidden in the background gathering user sensitive data. The botnet listens for commands from a server in order to execute instructions such as sending real time GPS data and pictures. This data is sent silently to a remote server. The malicious bytecode gained from decompiling the botnet is injected into Snapchat. This process is done by decompiling Snapchat with apktool and reverse engineering the bytecode. Snapchat is then recompiled and signed. Further studies will be made on fortifying Android security and detecting this type of malware.

Joshua Shane Poling***School of Computing***

Mentor: Drs. Todd R. Andel,
Brad Glisson, J. Todd McDonald

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Co-Author: J. Todd McDonald


Recovering Source Code from Android Application Package through Reverse Engineering and Dynamic Analysis

An Android application package (APK) contains all the source code for an application that can be run on the Android operating system. An APK is essentially a zipped file with an apk extension. We recover most, and in some cases, all of the source code from these applications using common reverse engineering tools. In most cases the source code alone is not sufficient enough for analysis, due to the common practice of obfuscation. We propose to overcome this limitation by reverse engineering the original APK to contain debuggable capabilities, once the applications source code has been modified we create a new Android application with the same package name and start importing all the contents of the reversed application. By reconstructing the application in a form that is more comprehensible we plan to bypass obfuscation techniques and obtain the source codes structure. Having debug capabilities will lead to being able to dynamically analyze the original applications function calls and mapping out where strings are used. Once a map of the application is formed a malicious hacker can inject code where needed, modify code where needed, or obtain sensitive data.

Gerald Thomas***College of Nursing***

Mentor: Dr. Ellen Buckner

College of Nursing
Creating a Caring Atmosphere for Asthma Education: Nurses Knowledge and Perspective

Although asthma is a reversible lung condition that is controllable, according to the American Lung Association in 2010 asthma was the third leading cause of hospitalizations among children under age 15 years old. In 2012 the Centers of Disease Control and Prevention estimated that there were an estimated 124,321 children affected with asthma in Alabama. Additionally, in children under age 15 years old, the rate of asthma in Alabama exceeded the national average (Alabama Asthma Call-Back Survey, 2012).

Nurses are an integral part of the healthcare team that are responsible to educate patients on how to properly manage their symptoms. In some hospital settings nurses are the primary source of providing the education and training on the asthma home management plan of care (HMPC). The purpose of this performance enhancement project was to increase nurses' knowledge on the HMPC and how to communicate to the parents and/or patients. The principal investigator used Jean Watson's Caring Theory as the framework for the project. Focus was placed on the nurse-patient relationship and how effective teaching and learning is accomplished at the bedside. The project was conducted at a hospital in Southeastern section of the United States of American specializing in care of children. A mixed method approach was used in which participants were given a pre-test, then received training on the HMPC, and concluded with a post-test. Although the implementation of the HMPC remains with the primary provider, nurses have more contact with patients and parents to clarify any misunderstandings of the detailed instructions. Nurses equipped with a better understanding of the HMPC can facilitate an opportunity for interpersonal learning to occur enhancing the adherence to the HMPC. The implementation of an effective HMPC can result in decreased acute exacerbations and decreased emergency room visits.

Abigail Boyd, Amanda Peterson*Department of Chemistry**College of Arts and Sciences*

Mentor: Dr. David Forbes

Department of Chemistry**Methylene Transfers In Aqueous Media**


Reaction of aliphatic sulfonium carboxymethylbetaines using water as solvent in the presence of carbonyl derivatives afforded the desired oxirane in moderate yield. With the use of not aliphatic but aryl sulfonium salts, the desired product was not formed. Previous work documented the formation of micelles with these aliphatic salts and hypothesized was the formation of a micro-reactor enabling formation of the sulfur ylide generated by the thermally induced decarboxylation of carboxymethylsulfonium betaines. A lowering in percent conversion was observed as more organic solvent was tittered into the reaction mixture. Sulfonium methyldene epoxidations involving the decarboxylation of carboxymethylsulfonium betaine functionality compliments existing technologies with the advantages of the reaction protocol, levels of conversion and use of water as solvent.

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Mentor: Dr. Georgios Lazarou

Department of Electrical and Computer Engineering**Clean Slate Internet**

The structure of the current, ubiquitous Internet is limited, so the goal of a clean-slate Internet architecture design is to connect anyone anywhere. The objective is to deal with the future of the way people communicate with friends, family, or colleagues. A clean-slate design addresses the problems that arose from the outdated Internet protocols that have been the standard for over forty years. This proposal is a possible solution in trying to determine whether to maintain and evolve the current Internet or rebuild the architecture from the ground up. The problem addressed in this research is that the Internet has outgrown its initial five-layered protocols design in use and scope from the 1960s, and virtually affects almost every walk of life. Instead of adapting or continuously adding to the current structure riddled with security concerns and an inability to conform to new technology standards without time-consuming patches or extremely expensive equipment, the goal of a clean-slate design is to rebuild the architecture from the ground up to allow for current additions, as well as future changes. The proposal is to create a clean-slate Internet that must always be on to accommodate communications between machines and people as necessary, as well as whenever necessary as technology moves quickly towards an internet of things. The design will add a type of interlayer communication protocol with internal microprotocols and flags that via a cross-layering principle would essentially act as a feedback control system.

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The logo for the Undergraduate Research Program (UCUR) at the University of South Alabama. It features a red border. At the top right, there are three small square images: a microscope, a petri dish with a yellow substance, and a pipette. Below these images, the text 'University of South Alabama' is written in a small, black, sans-serif font. Underneath that, 'Undergraduate Research Program' is written in a larger, bold, black, sans-serif font. The letters 'UCUR' are prominently displayed in a large, light gray, sans-serif font, with a red square on the left side of the 'U' and a yellow horizontal bar extending from the right side of the 'R'. At the bottom of the logo, there is a solid red horizontal bar.