Kyle Adams
Mentor: Aaron Schrey, BIOL

Does variation in Toll-Like Receptor Genes Predict Invasion Status on House Sparrows

The purpose of this study is to determine if variation in toll-like receptor (TLR) genes can predict the invasion status of house sparrows (Passer domesticus). House sparrows are extremely successful introduced species; once introduced they undergo great range expansion, genetic diversity, and differentiation. When a species is introduced to a new environment they are subject to new pathogens and stresses, which they have not been exposed to before. This can make it difficult to proliferate in their new environment. Understanding the change in a TLR gene could shed light onto how the house sparrow is so successful as an introduced species because TLR genes are responsible for quick immune system response and general stress responses. I will perform phylogenetic analysis to compare the samples from locations across the globe that have been classified into three invasion categories: recent invasion, established invasion, and native. Sample locations include: Kenya, Arizona, Tampa, Panama, New Caledonia, British Columbia, Sweden, Turkey, Brazil, Kentucky, France, and South Africa. From this analysis, I will be able to determine whether the house sparrows have simply adapted to their new environment, which causes a change in their genotype, or if they have undergone phenotypic plasticity which causes a change in their phenotype in response to the environment, leaving their genotype unaltered.

Kyle Adams, Rachel Brown, Eric Celland, Cory Smalls, Robert Murray, and Christopher Edwards
Mentor: Jay Hodgson, BIOL

Descent with Modification Over Time in the Grey Wolf (Canis lupus)

The purpose of this study is to demonstrate the decent with modification of the grey wolf (Canis lupus). The fossil record shows developmental change in morphology within the family, Canidae, and helps to illustrate and track how over tens of millions of years, ecology, natural selection, and genetic drift led to the evolution of the grey wolf from its extinct ancestors, Leptocyon, Mesocyon, Eucyon davisi, Canis ferox, Canis lepaphagus, and others. Once an animal that spanned almost the whole Earth, the grey wolf’s habitat has changed, having been pushed into remote areas by the proliferation and expansion of the human population, which for a time made them an endangered species. The importance of the grey wolf, as a predator in its
niche, was made apparent due to overpopulation of other animals in its habitat and the realized trophic cascade upon the reintroduction of the grey wolf, leading to conservation practices that helped save it from extinction. There are also sufficient indications that show similar physical attributes between the grey wolf and German shepherd’s morphology along with that of a coyote; due to the environment it is possible to see the variety of the appearances of the wolves in their coat colors. This morphological diversity of closely-related species is an indispensable facet of evolution within the relation of natural selection, adaptations and mutations which all have had favorable outcomes in the survival of the grey wolf and its ability to develop new niches through thousands of years.

Robert Altman  
Mentor: Joshua Williams, Psychology  
Nancy McCarley, Psychology

Factors Affecting Student Involvement on Campus and in the Wider Community

Various factors affect the connection college students develop with their institution. Typically, the depth of a student's connection to their institution can be assessed through their engagement in various campus activities. In this study, we surveyed students at Armstrong Atlantic State University to assess the depth of their involvement in on-campus activities and their involvement in the off-campus community. A total of 134 students (91 female and 41 male) participated in the survey through Armstrong's Treasure Savannah Day of Service. The survey asked for information about students' basic demographics, religious affiliation, major, academic classification, living accommodations, and participation in both on and off-campus activities. We analyzed these data to identify any correlations between responses and to determine the total participation of different colleges, departments, and student organizations on campus.

**Kelsey Bailey  
Mentor: April Garrity, Communication Science & Disorders

The Benefits of Group intervention in Persons with Traumatic Brain Injury

Traumatic brain injury (TBI) is an acquired neurogenic disorder that occurs when an outside force causes brain dysfunction. Brain dysfunction and its manifestations vary greatly in persons with traumatic brain injury (PWTBI). However, communication impairment is a widespread and common effect of TBI. Several methods of intervention are used in response to communication impairments for PWTBI. The purpose of this literature review is to examine the effects of group intervention on the different aspects of communication following TBI. The author reviewed 6 studies that examined the effects of group intervention on communication in PWTBI. The information discerned from this review was synthesized to determine which parameters of communication were improved through the group intervention method. The studies that were examined indicate that PWTBI saw improved social and pragmatic language after receiving group intervention. It was concluded that group intervention is an appropriate and effective method of intervention to improve the social communication skills of PWTBI.

Christopher Bellflower, Austin Tyran, and Steven Gumann  
Mentor: Sarah Burroughs-Zingales, Chemistry and Physics

The Treatment of Antibiotic-Resistant Bacteria with Chalcones (1,3-diaryl-1-ones)

The rise of antibiotic-resistance bacterial strains calls for the need of new antimicrobial agents that can effectively treat related human disease. Chalcones (1,3-diaryl-1-ones) are
molecules that possess biological active antibacterial properties and possess the potential to treat such human disease. Through a chemical reaction known as aldol condensation we created chalcones analogs from variably substituted acetophenones and benzaldehydes molecules. Nuclear magnetic resonance was used to confirm the targeted structure of desired chalcones. Our partners in the College of Health Professions then tested those analogs for effectiveness against antibiotic-resistance bacterial strains. Results showed antimicrobial active chalcones analogs that were effective against Vancomycin-Resistant Enterococcus (VRE) and not effective against other bacterial strains. From these results, a structure-activity relationship has been developed allowing for the modification of chalcones analogs to become more selectively toxic against resistant bacteria. On-going chalcone analog synthesis is required for a more significant structure-activity relationship, allowing for a more effective treatment of antibiotic-resistant bacterial disease.

Sophia Blincoe  
Mentor: Rachel Green, AMT

*Up-cycling with technology: An Art Education lesson plan for High School students*

I will be creating two lesson plans on how to up-cycle outdated toys or stuffed animals using technology to create a new art. These lesson plans target high school students incorporating the Georgia Performance Standards. Students will see their old toys from childhood in a different light to discover new possibilities. My examples consist of a retro-fitted teddy bear and an interactive painting. The teddy bear will transform into a singing bear and the painting will use led lights that respond to sound. I will use my research of Flora, Maki Maki, Arduino, and other technology products.

Amber Blossomgame and Travis Shoop  
Mentor: Scott Mateer, Biology

*Altering the Catalytic Activity of ydl124w through mutagenesis*

The purpose of this experiment is to understand the catalytic activity of the alpha-keto amide reductase, YDL124w, and whether or not the site-specific mutation of a particular amino acid can alter its reaction rate. Through mutagenesis, we are attempting to mutate the residues, R-264 and R-277, by converting arginine to alanine and glutamic acid to aspartic acid, thus resulting in a potential increase in the catalytic activity of the enzyme. In completing this particular research, we believe the results may prove beneficial to pharmaceutical companies in the attempt to combat medical issues such as hemophilia, diabetes, and periodontitis while concurrently saving both time and expense. In previous experiments, these mutations proved to aid in the coagulation pathway by its activation of factor X. At the conclusion of this experiment, I am planning on presenting my findings at the 20th Annual Student Scholars Symposium held on April 30, 2014.

Violetta Bodycot  
Mentor: Aaron Schrey, Biology

*Phytogeography of the Southern Toad from Florida Scrub*

Not a lot of information is currently known about genetics of the Southern Toad (Anaxyrus terrestris). It is found at a scrubby flat-wood plant community named Florida Scrub. This environment is currently endangered and highly threatened due to various reasons, such as the ongoing construction and repopulation of people. The Southern Toad is relatively small in
size and its DNA is being studied in pursuance to learn more about this animal. We have developed a DNA sequence target, in order to screen a phylogeographic structure so that the origin and the distribution of the toad could be better understood. First, many different samples of the Southern Toad were collected from Highlands County, in Florida. Second, the DNA was extracted and the gene will be amplified. This target could either be a mitochondrial control region, mitochondrial cytochrome b gene, or recombination-activating gene one (RAG 1.). Once we have identified which region worked for the amplification, that gene will be amplified in many toads. After that, the gene will be sequenced in all of those toads. The last step will be used to compare the DNA sequence among the toads in order to observe how those toads are related to each other. We will compare the different places that the Southern Toads came from. This research is relevant because it could help conserve the habitat and provide further information about the ecology of this particular animal.

Joyce Bongang  
Mentor: Aaron Schrey, Biology  
*The effect of fire-based habitat disturbances on the genetic characteristics of Florida scrub herpetofauna.*

Fire-based habitat disturbance are inherently variable and can alter genetic characteristics of local populations. Because of the variability and potentially large effect on local areas caused by fire, species that occur on fire maintained habitats must adapt mechanisms to persist through the disturbance. The Florida scrub habitat offers a unique opportunity to study the effect of fire on populations of herpetofauna. Florida scrub is a fire maintained habitat, and Florida scrub is highly threatened and exists as fragmented patches. The Florida Sand Skink (Plestiodon reynoldsi), the Florida Scrub Lizard (Sceloporus woodi), Blue-tailed Mole Skink (Plestiodon egregius lividus), and the Six-lined Racerunner (Aspidoscelis sexlineata) occur in the threatened and fire-maintained Florida scrub habitat. Each has different habitat preferences and likely has different responses to local fire-based habitat disturbances. We compare patterns of change at multiple microsatellite loci among these species to identify the fire history characteristics that predict changes in genetic diversity and differentiation. We find that time-since-last fire coupled with dispersal capabilities of these species is a good predictor of genetic characteristics of local populations. Also, number of fires and fire interval are important factors that affect genetic diversity. Together, these species show preferences for different fire histories, but all appear to maintain genetic diversity when faced with a fire history similar to that naturally required to maintain the Florida scrub habitat.

Mark Boswell  
Mentor: Melanie Link-Perez, Biology  
*A New Plant to Learn About*

Today most children in middle and elementary school learn little about plants compared to animals. They are usually taught or given demonstrations about the same kind of bean plant year after year, which becomes repetitive. A new plant should be added to their learning about plants, something new and exciting to them. In this experiment five species were tested for possible use in the classroom: Baptisia australis(Blue Wild Indigo), Eucalyptus citrodora(Eucalyptus), A. marmelos(Bael), Cymbopogon flexuosus(Lemon Grass), and Ochroma pyramidale(Balsa Tree). These five were planted to determine their germination rates, average growth, and interesting features about them. B. australis had the best germination rates of these
five tested and also the greatest growth rate. These plants were also observed under a microscope in order to view their features. From this research I concluded that the best plant of these five to use in a classroom was E. citodora. This plant has a great germination rate and a fast rate of growth. The plants’ stem turns from a green to red in about a week, they grow hair like structures from the stems, and when the leaves on the plant are touched they release a citronella scent because the leaves are full of citronella oil. This plant is very interesting and can have many things tested on it. This plant is sure to get the attention of children more than the typical bean plant.

Jordan Bowker, Kayla Barnes, Eric Gigli, Reema Ahmed, Blake Lamb, and Jennifer Kist
Mentor: Jay Hodgson, Biology

The Evolutionary Significance of the Bowhead Whale

All whale species evolved from what were once terrestrial mammals that returned to the sea about 53.5 million years ago. Some whale species, like the Bowhead whale (Balaena mysticetus), still have internal vestigial hind limbs that serve no function. Bowhead whales are a critically endangered type of Baleen whale that inhabit Arctic Pacific waters. They fill an integral niche in the Arctic ecosystem but the intense commercial whaling in the late 19th and early 20th centuries has greatly reduced their numbers. By looking at the unique evolutionary history of whales, we hope to reveal the importance of insuring this species’ survival.

**Ansley Brooks and Kacey Civitella
Mentor: April Garrity, Communication Science & Disorders

Improving Expressive Aprosodia in Individuals with Right Hemisphere Brain Damage: A Comparison of Cognitive-Linguistic Therapy and Imitative Therapy

Right hemisphere brain damage (RHBD) can be the result of various neurological illnesses or injuries. People with RHBD can experience a variety of deficits impacting both linguistic and nonlinguistic skills. One common deficit seen in these individuals is expressive aprosodia, which is the inability of an individual to alter his or her voice in order to express emotion during speech production. Two therapy approaches aimed at improving expressive aprosodia in individuals with RHBD are cognitive-linguistic therapy and imitative therapy. Cognitive linguistic therapy relies on re-teaching skills necessary to understand and produce emotion in speech. Imitative therapy involves imitation of a modeled sentence targeting a specific emotion. We reviewed two studies that examined the effects of cognitive-linguistic therapy and imitative therapy on aprosodia in RHBD. Rosenbek, et al. (2006) and Leon, et. al (2005) published studies exploring the effects of cognitive-linguistic therapy and imitative therapy on expressive aprosodia in individuals with RHBD to determine whether one treatment is more effective than the other. The findings of these studies were that individuals receiving cognitive-linguistic therapy and imitative therapy in a randomized order showed improvement in their expressive prosody. These results suggest that both therapies were effective in improving expressive aprosodia. Due to the limited number of studies on aprosodia, further research is needed in order to determine the best possible treatment.

Derrick Brown, Manuel O’Canas, and Joshua Suttle
Mentors: Wayne Johnson, Engineering

Thomas Murphy, Engineering
Bryan Riemann, Health Sciences

Development of a Touch Sensitive Glove for Upper Extremity Rehabilitation Studies

Upper extremity plyometric exercises show potential for shoulder injury prevention and rehabilitation. Proper characterization of the efficacy of the exercise requires knowledge of ball contact events, specifically, the ball contact and release times. The purpose of this research was to develop a reliable means of collecting data in order to determine the time from the end of the eccentric phase (where rapid muscle lengthening movements occur) to the beginning of the concentric phase (where explosive muscle shortening movements occur), known as the amortization time, during plyometric exercises. A low cost touch sensitive glove that can be used to determine contact events during the amortization phase was designed, built, and tested. The touch sensitive glove consists of: six contact sensors positioned along fingers and palm, a 4.5V battery supply, interface circuitry, form fitting inner glove, and protective outer glove. The glove’s contact sensors consist of four primary components copper polyester fabric sheets, neoprene padding, stranded wire, and Velostat sheets. Upon completion of a fully functioning prototype, the glove was delivered to Armstrong Atlantic State University’s Sports Medicine Department where live-action testing commenced. Design revisions were made and the glove functionality proved to be sufficient while producing more reliable and accurate readings of the amortization time than previous studies. There are currently two sets of gloves in active research projects within the Sports Medicine Department.

Emily Brunner
Mentor: Aaron Schrey, Biology

How does genetic diversity change among Florida scrub lizards between two temporal samples?

The Florida scrub lizard (Sceloporus woodi) has been identified as a species of greatest conservation need in Florida by the Florida Fish and Wildlife Conservation Commission. Florida scrub lizards are small, relatively short lived (13 months) reptiles that have very low levels of dispersal. I will determine if genetic characteristics change over time to provide information to assist conservation and management of this species. I have access to 248 samples from 3 locations, 2 are on a large connected scrub patch and 1 is an isolated fragment of scrub. Individuals were collected from two time periods for each of the 3 sites. To complete this project, I must extract DNA from all individuals, amplify 6 microsatellite loci PCR, and analyze the resultant genotype data. I will use free genetic analysis software to determine if the genetic characteristics change between the temporal samples. I hypothesize that the genetic characteristics will have a greater change on the small fragmented scrub patch and this change will be different from that observed on the larger connected scrub. For this project, DNA extractions are completed and I have begun to perform PCR. I have verified that the microsatellite loci will resolve sufficient genetic diversity for this project.

Rebeka Bryan, Benjamin Floyd, Endee Brown, Miekela Smith, Darius Morales, and Devonte Davis
Mentor: Jay Hodgson, Biology

The Evolutionary History of the Domesticated Dog (Canis lupus familiaris)

The purpose of this research is aimed to discover the origin, history, and fossil record of the domesticated dog (Canis lupus familiaris.) The dog is a member of the family Canidae, which includes the domesticated wolf, fox, coyotes, and many other “dog-like” mammals. There is evidence that the dog, specifically, began with and is the subspecies of the Grey Wolf (Canis
Lupus), which was domesticated tens of thousands of years ago. Archaeologists have suggested that the first dogs were domesticated in southern East Asia. Using the information gathered from various peer-reviewed journals and scholar articles, along with other supplemental material, we will describe, in detail, the evolutionary history of the dog: where it originated from, the environment/habitat it lived in, the morphological and genetic differences it has acquired through time, and compare many key features (from the past until now) to show how the dog has evolved through time. We also aim to conclude the risks or advantages that the dog will face in the near future.

Robbie Carl
Mentor: Melanie Link-Perez, Biology

Lamination of Leaves to Teach Leaf Structure and Function with Associated Biological Systems

The specific problem addressed in this research is the development of a cost effective method to teach leaf structure and function in a classroom setting. Teaching critical observational and thinking skills is most effective if taught through hands on projects, but they can be costly. This research identifies easy to grow plants and tests their effectiveness for an alternative method of making microscope slides. In order to identify appropriate plants a variety of plants and plant cuttings were grown in competitive environments. An alternative to wet mount slides is to put the leaf between 2 pieces of clear packing tape and create a seal. Although the main objective is to identify plants with leaves most suited to the tape laminating, observations identified which leaves give an opportunity for further biological study. Analysis of the results suggest good candidates for this method of microscopic slide preparation is the ZZ plant (good initial study and later bacteria could be squeezed out for further study), the inch plant (good stomata images on the underside of the leaf), and desert plants (observe how slowly plants leaves degrade). The laminating slide process is safe, cheap, effective, and made the sample more stable. In conclusion, plants and laminating can be used to teach biology in a classroom setting in an interesting and cost effective manner.

Adela Casas and Jonathan Groover
Mentor: Brent Feske, Chemistry and Physics

Using Novel Amine Dehydrogenase Enzymes in the Asymmetric Synthesis of Amines

Chiral amines are ubiquitous in biological systems and pharmaceutical products, but are difficult to prepare in high yield in the laboratory without use of hazardous heavy metals or biocatalysts with poor atom efficiency, such as transaminases. It has been reported that a newly-developed enzyme family derived from engineered dehydrogenases is capable of the asymmetric conversion of a ketone moiety to the corresponding amine using free ammonia Using these amine dehydrogenases, we are investigating their promiscuity towards a variety of categories of potential substrates with the hope of fully characterizing the products and gaining insight into the function of the enzymes Investigation thus far has been largely the reproduction of published results with the intent of optimizing reaction conditions and yields, which can then be applied to the study of the enzymes’ potential interaction with future substrates. This will involve the determination of an enzyme’s activity toward a substrate, a scaled-up reaction yielding product sufficient for full characterization, and the determination of stereoselectivity of the enzyme toward the substrate and absolute stereochemistry of the product using nuclear magnetic resonance spectroscopy. If successful, we hope to show that the amine dehydrogenase family of
enzymes is promiscuous and reactive enough to be applied to the preparation of a variety of chiral amines in a green and efficient manner.

**Autumn Chapman**
Mentor: Patricia Norris-Parsons: EDE

*What are the effects on student writing when using a daily journal to script thoughts on open-ended topics?*

In kindergarten, the importance of writing is monumental. Children are introduced to a form of communication that is new and exciting to them, as they begin to transform their thoughts to words in a written format. The thought process involved in creating an original piece employs various brain functions simultaneously. From the initial idea for the illustrations and planning to the phonetic spelling of the specific words a child wishes to include in his/her piece, the young writer is involved in a growing process.

In my kindergarten classroom, I had several budding authors, as my students often enthusiastically shared their imaginative ideas and conceptions through writing. There were some areas, however, that needed improvement, such as spelling and grammar, handwriting, and details in illustrations. I hoped to find a way to help my students with these basic weaknesses in their writing. Because of this, I focused this research project on finding the effects on student writing when using a daily journal to script thoughts on open-ended topics. After allowing the students to write in their journals daily for six weeks, I compared a final writing piece with a initial writing from the beginning of the research period by using a rubric I created. The rubric included the areas in which I wanted to see the most growth. Much to my delight, all of the students observed for my research showed overall improvement. By completing this research, I found that daily journal writing does promote growth in kindergarten students’ writing.

Michael Choromanski, April Graves, and Kimberly Wyse
Mentor: Mirari Elcoro, Psychology

*Resurgence in a Peak-Interval Procedure*

Resurgence is the recurrence of previously reinforced behavior during extinction of another, more recently reinforced behavior. Resurgence provides a framework for deciphering the origin of operant responses, study effects of historical variables, and also understanding various socially relevant behaviors such as creativity and clinical relapse. In the present study, four experimentally naïve Long Evans rats were trained using a concurrent variable-interval (VI) 30-s, fixed-interval (FI) 30-s schedule, each programmed on a different lever. After responding stabilized, responding under the VI 30-s schedule was extinguished for 15 sessions. A peak-interval procedure (PIP) then was employed to examine resurgence of the previously VI responding. The PIP consisted of FI 30-s trials (30% of trials) alternating randomly with 300-s peak trials (70% of trials), each separated by 20-s blackouts. Overall response rates revealed resurgence of VI responding during the peak trials. Additional analyses include proportions of lever presses during the resurgence test relative to responses during extinction and analyses focused on responding during peak trials. These findings are compared with similar studies of resurgence and with findings from the literature on behavioral contrast. The present study extended the use of a procedure typically utilized to examine temporal control to the analysis of resurgence.

Lauren Cobb
Mentor: Joshua Williams, Psychology  
*Perception & Goal-Directed Reaching in Infants*

During infancy, goal-directed reaching for objects is one of the first actions that requires synchronization of perception and action. The development of intentional reaching and exploration of the environment opens the door for further development, especially that of coordination, cognition, and sociality. Because intentional reaching is so foundational for virtually every domain of development, researchers have proposed many theories attempting to explain the processes behind it. In this literature review, we examine two historically prevalent theories and then compare them to current perspectives. These past theories were too simple and did not account for the complexity of development, unlike contemporary theories, which do incorporate explanations such as dynamic systems theory, functional values, neuronal group selection, and approximate optimal control. What these contemporary theories have in common is their emphasis on the role of repetition in the pairing of perception and action for goal-directed reaching. Two key empirical studies from our lab will be discussed to support the contemporary theoretical perspectives.

**Janna Coker, Jenna Hinkle, and Rebecca Pruitt**

Mentor: April Garrity, Communication Science & Disorders  
*The Benefits of Group Therapy for Adults with Dementia*

**Clinical Question:**
Dementia is a progressive disease with a decline in multiple areas of function displaying psychosocial and emotional difficulties. Due to the mandate of evidence-based practice in our discipline, we asked: In patients with dementia, which type of therapy is more beneficial for overall emotional well-being, cognitive stimulation group therapy (CST) or music group therapy (MGT).

**Methods/Procedures:**
Due to a collective interest in the topic of dementia, we reviewed three studies about these two types of treatment among patients with dementia. Gardner et al. (2011) and Tuppen (2012) used qualitative methods while Sung et al. (2011) and Fischer-Terworth et al. (2011) used an experimental design.

**Outcomes:**
From Gardner et al., (2011), two themes developed from the CST: ‘Positive experiences of being in the group’ and ‘Changes experienced in everyday life’. Tuppen (2012) found members showed a positive response in interest, communication, enjoyment, and mood at the end of the CST group. Fischer-Terworth (2011) found that MGT decreased symptoms related to negative well-being, but increased with the control group; with increased communication abilities for both. Sung et. al. (2011) determined the experimental group had a significant decrease in anxiety after MGT was greater than the control group. The research also determined the experimental and control group both decreased in agitation but the experimental group’s decreased agitation could not be directly contributed to MGT.

**Conclusions:**
These studies suggest both group therapy types are emotionally beneficial for patients with dementia. Speech-language pathologists working with patients with dementia may find this information useful for intervention.

Zachary Copeland
Mentor: Cameron Coates, Engineering

**Modeling the Dynamic Elastic Modulus of a Bio-absorbable Composite Internal Fixation Plate**

In this work, a mathematical model is developed that predicts the rate of reduction of the elastic modulus for a composite internal fixation plate. The plate geometry used is consistent with typical fixation plates used for the repair of long bone mid-shaft fractures. The hybrid internal fixation device design is comprised of Poly-L-lactide and Hydroxyapatite (HA/PLLA) and Titanium. The model, based on composite theory, employs the Finite Element Method (FEM) in order to establish relationships between geometrical constraints (material interfaces) and a theoretical elastic modulus determined using the Reuss model. The elastic modulus of the hybrid device is shown to decrease as the fracture heals. The stiffness decrease allows the application of increased stimuli needed for optimal post traumatic osteogenesis. The dynamic aspects of the device’s elastic modulus demonstrates that the composite fixation plate has a strong potential for improved fracture healing through the reduction of stress shielding while the fracture heals and the elimination of stress shielding after fracture healing.

Megan Crawford and Brianna Raegan
Mentor: Scott Mateer, Biology

**Mutagenesis of H122 and S259 in YDL124w**

Research is being conducted in order to understand how mutagenesis can affect the catalytic activity of a targeted protein in YDL124w. This inquiry will be carried out through the process of mutation of the targeted site specifically chosen in a certain sequence. For our purposes, residue H122 will be changed into a Cysteine and S259 into a Threonine. These specific residues were chosen because they are located in active sites of the enzyme. We are choosing to replace Histidine with Cysteine due to the fact that they both have a pKa value close in proximity to the physiological pH of seven. Threonine was chosen to replace Serine because they are similar in structure and are the only two proteins that have hydroxyl R-group. We are trying to understand how mutation of a specific protein could affect the efficiency, such as substrate binding in the Biocatalysis process, and overall activity. Increasing the efficiency of the catalytic activity may aid in making pharmaceuticals, as well as making the entire process more cost effective.

Joy Creighton, Catherine Jones, Mary Logue, Esther Medrano
Mentor: Austin Francis: Biology

**Using 3D Printing To Understand Vertebrate Form and Function**

New technology, like 3D printers, has opened up new avenues for education and research. It is now possible to create replicas of vertebrate skulls previously not available to students in order to study the dimensions, kinetics, and unique synapomorphies of different vertebrate taxa. Students participating in Vertebrate Zoology (BIOL 3020) at Armstrong Atlantic State University obtained computed tomography (CT) scans for five different vertebrate skulls from an online archive of digital animal morphology (Digimorph). Scans were exported from the original medical format, converted to a standard 3D format, and then edited to separate the mandible from the skull. The resulting 3D renders were then imported into 3D printer software, oriented and scaled for an optimal print size, and saved as print instructions. These skull models were subsequently printed using the additive manufacturing technique by laying down 0.25 mm layers of PLA plastic preserving the impressive detail of the original vertebrate skull. The
resulting 3D skulls provided a tangible method of study contributing to student understanding of comparative vertebrate morphology.

**Abigail DeLuca, Amanda Laconianni, and Rochelle Withem  
Mentor: April Garrity, Communication Science & Disorders  
Does treatment utilizing group reminiscence therapy techniques increase functional communication skills in individuals with dementia in comparison to individuals that do not receive reminiscence therapy?**

Dementia is a degenerative syndrome characterized by multiple cognitive deficits, which interfere with activities of daily living. Prevalence of dementia is expected to rise with the “baby boomer” population, and therefore effective speech-language intervention techniques are essential for maintaining communication skills and quality of life for these individuals (Kim et al. 2006). One example of these techniques is group reminiscence therapy. This type of therapy encourages discussion in groups of individuals, about past life events, hobbies, and experiences. Often, items such as photo albums, books, and music are used to enhance/aid these sessions. Research suggests that strong efficacy is expected in multiple modalities, ultimately leading towards improved overall functional communication skills for those treated with reminiscence therapy techniques, compared to individuals who do not receive this type of therapy. (Woods et al., 2005).

The research presented is an analysis of three data-based and review studies, that focused on effects of group reminiscence therapy on individuals with dementia given measures of functional communication. Data for these studies have been collected using both quantitative and subjective measures, including questionnaires, surveys, and standardized test results given to the participants and caregivers. Overall, data collection was obtained across verbal and nonverbal modalities in order to compare a control group not receiving reminiscence therapy. Our review of research findings suggest that reminiscence therapy increases verbal and nonverbal communication, cognition, and well-being for individuals with dementia and their caregivers, compared to individuals who did not receive this form of therapy. (Okumura, et al., 2008).

**Bridget Devlin and Manuel O’Canas  
Mentor: Priya Goeser, Engineering  
Critical Evaluation of a U.S. Coastal Site for Electricity Generation using the Undulating Motion of Waves**

The world’s oceans are a renewable source of power. Recent technological advancements have resulted in the invention of the Pelamis device, which makes the large scale generation of electrical power using the undulating motion of waves through tethered buoy systems a reality. This project involves choosing a site in U.S. coastal waters, evaluating the average wave power potential over a two year time period for the chosen site, and exploring the implementation of an offshore wave farm at the site using Pelamis devices. Through the use of thermodynamic analysis and evaluation techniques, the project evaluates the potential for power generation at the site, and how cost effective a Pelamis wave farm would be. The project also evaluates the potential environmental impacts on the site, along with the infrastructure needed to bring the power generated to the existing electrical grid. This analysis lays the foundation for future work involving the evaluation of the electrical power generated within a Pelamis power generation module, improvements that can be implemented in the overall design of such modules to increase efficiency, and the evaluation of future sites for power generation.
Alejandro Diaz  
Mentor: Scott Mateer, Biology  

Creating 3D molecule models with 3D printer  

Biocatalyst uses microbes or their enzymes to do the chemistry needed to make the organic molecules building blocks important in drug manufacturing. In order to understand the relationship between a molecule’s structure and its function are creating 3D models of yeast reeducates important to Biocatalysis. These models will help students understand molecule structure, reaction site properties, and surface structure. We began this process the process of building 3D models by fetching virtual molecule models of 4IJR (YBR149w) from the Chimera Protein Data Bank and use the modeling software, Chimera to convert the PDB files into the STL files needed for the 3D printer. To fix holes in the molecular model, the STL files were processed by the Netfabb website. The resulting corrected STL file was, then fine-tuned and converted to a 3D print file using the CubeX Software. Models can take four to twelve hours to print with 2x2x2 inch dimensions. Several prototypes models have been created using this process. We plan to use this methodology in the future to develop multicolor models.

**Laina Dinneen and Amber Manning  
Mentor: April Garrity, Communication Science & Disorders  
Effects of TANDEM Caregiver Training Strategy Compared to RECAPS/MESSAGE Training Strategy for Caregivers of Populations with Dementia  

Individuals with dementia suffer from cognitive-linguistic disorders, which inhibit their ability to communicate. Research has shown that caregiver-training programs may be beneficial in enhancing the quality of life (QoL) of the individual with dementia and reducing the caregiver’s burden. Two such programs are RECAPS/MESSAGE and TANDEM. RECAPS/MESSAGE provides caregivers with compensatory or facilitative strategies to aid both the receiver’s communication as well as their own; while TANDEM focuses on training caregivers in communication strategies to improve the care receiver’s communication through focusing on strengths and bypassing weaknesses. The purpose of this research experiment is to determine if the RECAPS/MESSAGE training strategy facilitates better communication than the TANDEM caregiver strategies in populations with dementia. A literature review was conducted comparing TANDEM to RECAPS/MESSAGE strategies for caregivers of individuals with dementia. We found four experimental studies; two researching TANDEM and two researching RECAPS/MESSAGE. Both programs trained caregivers in a series of strategies and measured Pre and Post caregiver knowledge, use of strategies, and receiver QoL, along with utilizing a caregiver survey to determine caregiver QoL. The RECAPS/MESSAGE training program is more beneficial to individuals with dementia and caregivers based upon evidence that caregiver wellbeing is strongly correlated with increased mood and self-concept in persons with dementia. RECAPS/MESSAGE better facilitates caregiver learning of communication strategies in a program that is:  
1.) Compact, easy and comprised of a DVD, manual, and display/lanyard cards.  
2.) Cost effective.  
3.) Increases caregiver knowledge of dementia and support strategies.  
4.) High satisfactory ratings.  
5.) Applicable to everyday situations.
The Art of Assessing a Reader and Writer: A Case Study of a Third-Grade Student

The summative results from an Informal Reading Inventory (Roe & Burns, 2011) administered to a third-grade student yield insights into literacy development based upon oral, silent, and listening reading comprehension data and student writing samples. After determining the appropriate level for passage administration based on the student’s reading of leveled word lists, the student was asked to read a selected passage, generate predictions, re-tell the main ideas presented in the text, and respond to a range of comprehension questions. Progressively more difficult passages were administered based on the student’s ability to read and accurately respond to comprehension questions to discern the student’s relative grade-level placement. Following the reading portion of the inventory, writing samples were collected from the student. An examination of the student’s reading preferences, strategies, and habits; the reader’s fluency patterns and comprehension scores; and an analysis of writing samples yields a more authentic perspective of the student’s strengths and weaknesses as a reader and writer. This data was utilized to generate curricular suggestions that improve build upon the student’s strengths and address areas where the student could benefit from additional literacy instruction.

Historical Perceptions of George Whitefield

The Reverend George Whitefield was a significant individual in the shaping of the Great Awakening. As a noted historical figure, scholars have continuously assessed George Whitefield and his defining role in American religious history. This project investigates the different interpretations of Whitefield, his characteristic role in the Great Awakening, and the ways in which he set a precedent for evangelical revivalism. Then, contextualizing that within the establishment of his orphanage at Bethesda, it explores the relationship of Bethesda’s formation to that of the colony of Georgia and the city of Savannah. An exploration of George Whitefield largely acts as a case study for the significant elements of culture and society in that broader narrative of church-state relations in early American history.

Application of 3D Printing to Microbiology and Human Anatomy

We have been exploring the use of 3D printing within the biological sciences in a two-part project. For the first portion, we have been studying diatoms, which are microscopic algae characterized by silica cell walls. Their ornate structure was ideal for 3D modeling. We drew three species of diatom (Triceratium favus, Rhaphoneis amphiceros, and Luticola mutica) in a computer drafting program and rendered them on 3D printers. For the second part, we used the 3D printing technology to study aspects of human anatomy. We successfully printed a replica of a knee joint in one solid piece that included the femur, fibula, tibia and the patella fused together. Our results suggest that 3D printing technology is a feasible method for hands-on teaching and research.
Mentor: Sarah Burroughs, Chemistry and Physics

Synthesis of Chalcones for Anti-bacterial and Anti-cancer Properties

The growing need for anti-cancer and drug-resistant bacterial treatments in the medical field calls for the development of new pharmaceuticals. Extensive scientific experimentation and work suggests that Chalcones, a family of small molecules found in edible plants, many of which are used in traditional Chinese medicine, possess biological activities such as anticancer, antibacterial, and anti-inflammatory properties. With the help of our collaborators in Georgia Southern University and Emory University, we will synthesize analogs of chalcones and then they will test them for their potential as anticancer and antibacterial agents. First, known chalcones will be synthesized and tested for novel action against the HIF pathway and then we will synthesize novel compounds based off of our chalcone backbone. The teams’ current work includes the addition of various substituents on both the benzaldehyde and the acetophenone sides of the molecule in order to create a diverse library of chalcone analogues. Once the library of compounds is completed, a structure-activity relationship model will be developed, which will identify key structural motifs and help to direct the project toward new, potentially more potent compounds.

Ashlynn Dykes and Todd Hizer
Mentor: Brent Feske, Chemistry and Physics

Exploring the Chlorination of Diethyl cyanomethylphosphonate

An efficient method for chlorinating Diethyl cyanomethylphosphonate is important because this reagent can be used via the Horner-Emmons reaction to afford a variety of chlorinated enenitriles. Diethyl cyanomethylphosphonate was reacted with N-Chlorosuccinimide as a chlorinating reagent. Analysis using GCMS indicates that both mono- and dichloro substitutions have occurred and further optimization needs to be achieved to result in a higher yielding and higher selective reaction.

Shane Farrar and Gunpreet Kaur
Mentor: Felix Hamza-Lup, Computer Sci. and Info Tech.

Grasping Electrons Haptics Enabled Simulation of Electromagnetic Forces

Abstract thinking is a special level of thinking about our world that is removed from the facts. Abstract thinkers are able to reflect about attributes, relationships and events separate from the objects that have those attributes or share those relationships. Physics is one of the subjects in which abstractions and theoretical models are abundant. The frustrations learners experience is linked with abstract concept understanding. [REF] (http://blogs.discovermagazine.com/crux/2012/07/11/is-autism-an-epidemic-or-are-we-just-noticing-more-people-who-have-it/)

Cognitive studies have shown that learners would be more apt to learn if the method of exposure engaged them. Younger generations (Millennials [REF]) are accustomed to multimedia technology, and can more easily understand abstract/difficult concepts if they better relate new information to what they already understand. Without the engagement of learner in the learning process we will face more failing grades, higher expulsion rates, increased dropouts, and a lower number of undergraduate degree completions, especially in the various STEM disciplines. Several abstract concepts from Physics can be pulled in the concrete arena by incorporating visual and haptic sensory modalities in the classroom. We have developed a virtual reality simulation to assist students in learning the Lorentz forces. It is an apparent deflection on an
electron in motion when electric and magnetic fields act on the charged particle. This force is described as being perceived because the observer’s rotating frame of reference creates the illusion of a force acting upon the object.

**Anna Ferraro and Ashlee Wilcox**
Mentor: April Garrity, Communication Science & Disorders

*The potential successes of neuroplasticity in the rehabilitation of patients with chronic aphasia*

Aphasia is an acquired communication disorder caused by some type of damage to the brain, oftentimes stroke-related, and characterized by language deficits including: speaking, listening, reading, and writing. Our research focuses on the most beneficial treatments for aphasia patients beyond the initial recovery stages to determine the best treatment for continued improvement of their communication skills. Our research seeks to answer the question, “Among individuals with aphasia, which right hemisphere brain function treatment methods lead to greater improvements in language skills beyond the acute stages of recovery -- formulaic therapy or utilization of the undamaged motor cortex? A comprehensive literature review revealed four articles that examined the effectiveness of various treatment options for patients with chronic nonfluent aphasia due to left-hemisphere damage. These studies examined therapeutic methods utilizing the undamaged right-hemisphere brain function. Two articles, Stahl et al. (2013) and Zipse et al. (2012), discuss the improved performance of individual’s speech with formulaic therapy (melodic intonation therapy/rhythm training). The others, Meister et al. (2006) and Crosson et al. (2005), provide support for techniques that activate the motor cortex of the unaffected hemisphere to improve speech. Each method provides promising evidence for effective treatments beyond traditional speech-language therapy. The findings of this research suggest that stimulating the individual’s intact right-hemisphere and activating functional connectivity in the brain may be a more effective treatment for people with aphasia beyond the acute recovery stage.

Katharine Field
Mentor Mirari Elcoro, PSYC

*Learning in the Painted Lady Butterfly*

The goal of this study is to examine the behavior of painted lady butterflies (Vanessa cardui). Previous research by Weiss (1997) has shown that pipevine swallowtail butterflies can learn to associate colors with a nectar reward within 10 flower visits which shows rapid learning capabilities. Furthermore, this research has shown that this species will switch their color preference to obtain nectar. We seek to extend these findings by using the methods from Weiss’s research with painted lady butterflies. Thirty live caterpillars were kept in the laboratory until butterflies emerged. Artificial flowers assembled from red, purple, and yellow construction paper were arranged in a chamber. A sugar solution was available in the center of some of the flowers. A fixed-ratio schedule of reinforcement was implemented to get the butterflies to visit some of the flowers. Once the training and sessions were completed, removal of the sugar reward (i.e., extinction) was implemented. Previous research has shown that butterflies learn to visit a flower based on the contingency of available nectar, but little is known about how their behavior changes under conditions of extinction. The following behaviors were examined and recorded in 15-min sessions with individual butterflies: an encounter (only landing) and a visit (unrolling proboscis to feed). Additionally, the latency to land on a flower and the amount of time spent on different flowers will also be studied. Inter-observer agreement methods will be used to examine
reliability. These results could potentially contribute to the generality of learning to other species.

Alexis Fields and Morgan Connor
Mentors: Catherine MacGowan, Chemistry and Physics
Todd Hizer, Chemistry and Physics

Heavy Metal Remediation using Hydrogels
The objective of the project was two-fold: 1) to investigate the interaction of the hydrogels with multi-valent metal cations (e.g. Cu^{2+}, Ni^{2+}, Fe^{3+}) and 2) determine their efficiency of the metal remediation. Hydrogel beads were measured for their mass and diameter prior to being placed in a solution containing metal cations at various concentrations. After a 24-hour adsorption period, the hydrogels were analyzed for size, mass. Metal ions remaining solution were determined using atomic absorption spectroscopy. The hydrogels were dried and reconstituted in the distilled water to determine ion leakage. Preliminary results indicate that the beads were very effective for divalent metal remediation; the efficiency of metal ion removal was concentration dependent and binding of the metal ion to the hydrogel irreversible.

Bridget Frederick
Mentor: Aaron Schre, BIOL

Population Genetics of the Six-lined Racerunner
The six-lined racerunner (*Aspidoscelis sexlineata*) is a small, broadly-distributed lizard that is a very active disperser. The six-lined racerunner is found on Florida scrub habitat in central Florida. Florida scrub is one of the world’s most threatened habitats. Florida scrub is a fire dependent habitat, which means there must be high-intensity fires within 5-100 years in order for Florida scrub to persist. I used microsatellites to investigate population genetics of this species from multiple locations in Florida. Previous studies failed to detect population structure within a large scrub patch in Florida. Therefore, I looked at more individuals, more locations, and a greater spread in fire history. My object was to determine if fire history changed the genetic characteristics of this species. Samples (n = 154) were collected throughout Highland County Florida in 2002-2004 by Dr. Kyle Ashton. I performed DNA extractions, PCR, and agarose Gel Electrophoresis. Final products were genotyped at the Georgia Genomics Facility. I then analyzed the genetic data to compare diversity and differentiation among locations. My results identified a negative correlation between time-since-fire and observed heterozygosity (r = -0.65, P = 0.02), a trend of increasing inbreeding coefficient with time-since-fire, and a trend of greater variance with increasing time-since-fire for expected heterozygosity, allelic richness, and private allelic richness. There also was a low magnitude genetic differentiation among all sites (F_{ST} = 0.007, P = 0.001). Together, these results show that habitat disturbance by fire affects the local populations of six-lined racerunner.

**Jessica Free, Rebecca Greenslade, and Kelsey Knight
Mentor: April Garrity, Communication Science & Disorders

Pediatric Traumatic Brain Injury: Family-Centered Intervention versus Clinician-Directed Intervention

Clinical Question: Children with traumatic brain injuries (TBIs) present with a wide range of behavioral, emotional, cognitive, and physical difficulties for an indefinite amount of time post-injury. Traditional intervention for these children consists of treatments implemented by a
clinician (i.e., speech-language pathologist). However, intervention that focuses on the child’s family may also produce positive results.

**Methods:** Four studies reviewed two different types of intervention for children with TBI. Three studies were randomized controlled trials comparing family-centered intervention to clinician-directed intervention. The fourth study was a review of common challenges experienced by parents of children with TBIs.

**Outcomes:** Braga et al. (2005) found that children receiving family-centered intervention showed significant cognitive improvements as compared with children who received clinician-directed intervention. Wade et al. (2006b) discovered families assigned to the family-centered intervention reported significant improvements in behavioral problems, such as depression and anxiety. Wade et al. (2006a) found family-centered intervention was more beneficial than clinician-directed intervention. Conoley & Sheridan (1996) described the importance of involving families in the intervention process because they will be the most instrumental in advocacy and the most active participants in their child’s recovery.

**Conclusion:** These studies suggest that family-centered intervention resulted in more successful clinical outcomes and was also more beneficial for both the child and their family. Speech-language pathologists working with children with TBIs should incorporate these findings into their intervention.

**Tamara Fry**  
**Mentor:** Patricia Norris-Parsons, EDE

*Gender Gap in Reading Achievement*

This research study was developed in order to study the ever-growing concern for the gender gap in reading achievement, which can be found in classrooms across the world. After observing my students, I realized that in addition to lower levels of achievement, my male students also showed lower levels of enthusiasm for reading. In order to discover if there was a link between the two, I conducted an interest inventory, to determine the interests of my male students, and an interest interview, to discover their feelings about reading. After implementing the inventory and survey, I began to introduce reading material into classroom instruction and free reading time that reflected the students’ interests; I also provided the students with time to collaborate and discuss their books. After a five week period of time, I interviewed the students again to determine whether or not their interest in reading had increased. In an effort to quantify their growth, I compared the amount of time taken to complete a Dr. Cupp reader after the research plan, to the amount of time taken before the research plan. The students’ responses to the interview showed an increase in their enthusiasm, and the amount of time taken to complete a reader showed a decrease. By combining these results I determined that by increasing their enthusiasm for reading, I was able to increase their reading growth as well.

**Abigail Futch**  
**Mentor:** Anne Katz, EDE

*Portrait of a First Grade Reader: An Analysis of an Informal Reading Inventory*

A critical role of a lower elementary school teacher is to guide students on their journey as a reader and writer. Both the teacher and student work together towards the ultimate goal—reading for understanding. The purpose of this case study research was to work one-on-one with a first grader in a suburban school to assess her reading level and establish literacy instructional goals. We worked together to blend individual phonemes and discover specific strategies to help
uncover the meaning of text. To aid in assessing the first grader’s reading level, I used the Informal Reading Inventory (Roe & Burns, 2011). The student decoded words from leveled word lists, read leveled passages, completed a re-telling of main events, and answered comprehension questions. By administering this assessment, I was able to place the student at a pre-primer/primer reading level. Her results showed that she is able to identify specific phonemes, but could benefit from further instruction on blending when she encounters new words that she does not know in the text. To help the student decode new words and gain meaning from the passage, we generated specific strategies that she can use when reading silently on her own.

Andrew Goetz  
Mentor: Sarah Burroughs-Zingales, Chemistry and Physics

The ability to create more effective anti-cancer medications is crucial to our being able to aid the millions afflicted with the disease. We hope to create a more effective means to combat cancer by creating a compound that can better inhibit the HIF pathway, which is essential for the function of tumor cells. We used the naturally occurring molecule called chalcone as a starting point. Chalcones have long been used in traditional Chinese medicine. Their medicinal qualities have inspired several researchers to investigate chalcone’s ability to combat inflammation, bacteria, and cancer. We plan to create an effective anti-cancer agent by synthetically creating molecules that are analogs of these chalcones. We created these analogs by reacting various acetophenone molecules with different substituents with various benzaldehyde molecules with different substituents. The resulting compounds were analogs of chalcone. These were purified and fully characterized before being sent to our collaborators who will analyze their anti-cancer and anti-bacterial abilities. We will examine the effectiveness of each analog in combating cancer and bacteria. Then we will compare the structure to activity relationship.

**Ryan Goetz  
Mentor: Sandy Streater, Health Sciences

Assessment of the Effectiveness of the Cancer Assessment Tool (CAT) in Generating Mammogram Referral and Screening Completion in a Medical Clinic for Underserved Populations

The Good Samaritan Clinic (Clinic) provides medical care to over 700 uninsured, underserved, predominately minority patients annually and is staffed by volunteer health providers (Providers). Acute client care for co-morbidities is often the focus of the office visit, with routine cancer screening often being overlooked. The Clinic and the Nancy N. and J.C Lewis Cancer & Research Pavilion utilized evidence-based guidelines to develop a Cancer Assessment Tool (CAT) with age and sex appropriate cancer screenings. The CAT was implemented in March 2013. During clinic visits Providers used the CAT to review recommended screenings and refer patients for appropriate screening. To evaluate CAT effectiveness in prompting Provider referrals for and client completion of mammograms, data was collected from April 1-September 30, 2013. Measurements included the number of patients eligible for age-appropriate screening seen at the clinic from April-Sept 2013 (n = 201), number assessed with CAT (n=123), number referred by CAT for mammograms (n=32), number of patients who completed mammograms from CAT referral (n=21), and number of women with mammograms BI-RADS IV or V (n=0). While 32 women completed screening mammograms as a result of CAT referral, an additional 44 women without CAT referrals
completed mammograms. The larger number of mammograms completed from non-CAT referrals indicate that the CAT may not be effective in prompting mammogram referrals. Currently other methods for increasing mammogram completion rates are being implemented, such as reminders on electronic medical records.

April Graves  
Mentor: Mirari Elcoro, Psychology

*An Animal Model of Behavioral Reinstatement*

Reinstatement, the recurrence of previously reinforced behavior during the presentation of a reinforcer following extinction, has been acknowledged as a key element to consider in treating addiction. In the present study, four experimentally naïve Long Evans rats were trained to press a lever using a variable-interval (VI) 30-s schedule. After more than 30 sessions and after stability criteria were met, responding under the VI 30-s schedule was extinguished for 10 sessions. In the next 10 sessions a cup of food was placed in each operant chamber and responding was measured. Following the reinstatement model, responding during the reinstatement condition was expected to increase relative to the extinction condition. Additionally, the pattern of responding in each session during the reinstatement condition was expected to resemble the pattern of responding during baseline. The present study differed from previous studies in that the reinforcers were presented at the beginning of and available throughout each session during the reinstatement condition instead of being presented on a fixed-time schedule. The presence and pattern of reinstatement in the present study would have implications for the timing of the response-independent delivery of the reinforcer needed to produce the response during reinstatement.

Amy Gutting  
Mentor: Jennifer Zettler, Biology

*Mealybugs: An Old Threat Poses a New Risk to Native Epiphytic Orchids in South Florida*

About one fourth of orchids in North America are found within three counties in south Florida, all in or near the Florida Panther National Wildlife Refuge (FPNWR). During a survey in 2010, scales were found infesting native epiphytic orchids at the FPNWR. On a return visit in 2012, a novel discovery was made—the presence of the orchid mealybug Pseudococcus microcirculus in the nearby Fakahatchee Swamp. In California, this mealybug has been known to be a problematic pest of orchids in greenhouses. Until now, no published records have documented P. microcirculus on orchids in natural habitats, much less those in Florida. In 2013, the FPNWR was surveyed to identify the extent of the infestation. P. microcirculus was found on five endangered epiphytic orchid taxa, including the Florida clamshell orchid, Prosthechea cochleata var. triandra—which is endemic to south Florida. In addition, 3.3% (4 of 118 plants) of these infested clamshell orchids harbored yet another common greenhouse pest, Boisduval scale, Diaspis boisduvalii. In cultivation, feeding damage by scales and mealybugs weakens plants and can even cause death. It is unknown how the presence of these insects in the FPNWR will affect the long-term health of Florida’s endemic orchid populations.

**Sarah Hackney**  
Mentor: Anne Katz, EDE

*Case Study of a Reader and Writer: An Analysis of a Third Grade Student’s Literacy Skills and Needs*
The purpose of my case study report was to collect both qualitative and quantitative data in order to present a portrait of a third grade student as a reader and writer. I studied data collected to assess the reading level of the student and determine her specific skills and needs as a literacy learner. As a future teacher, it is important for me to be adept at determining a student's literacy level so that I may provide targeted instruction. In order to learn more about the student as a reader and writer, I administered questionnaires regarding the student's attitude toward reading and writing, leveled word lists, oral reading passages, silent reading passages, listening comprehension passages, a range of comprehension questions, a Directed-Reading Thinking Activity, and writing prompts. Once the data was collected, I was able to analyze the results to discover the student's strengths and needs. The student's results indicated that she was slightly ahead of grade level in reading and on grade level in writing. She possesses a vivid imagination, strong comprehension skills, and a firm grasp of punctuation. She would benefit from instruction in contractions, reading aloud in order to improve fluency skills, and written expression. To conclude my report, I was able to recommend several literacy instructional strategies and methods to help her continue to grow as a reader and writer.

John Haddock
Mentor: Brandon Quillian, Chemistry and Physics

Preparation and Deprotonation of Bis(pyrazolyl)acetate (BPA) and Bis(methimazolyl)acetate (BMA) Ligands

The development of new ligands to support metal ions is an important aspect of organometallic chemistry, as they can control the electronic, steric and the ultimate reaction chemistry of the metal. These properties are often controlled by the identity and location of two-electron donating moieties on the ligands. Carboxylate, amines, phosph-ines/-ites and thiols are commonly utilized. Carboxylic acids often display facile dissociation from the metal and must be deprotonated by strong base to form the anionic carboxylate to lessen this event. Herein, we describe the synthesis and characterization of bis(pyrazolyl)acetate and sodium bis(pyrazolyl)acetate and our efforts to prepare and characterize bis(methimazolyl)acetate (BMA) as well as its intermediate 2-Chloro-2-methimazolylacetate (CMA).

Britton Hammel-Cobb and Harold Morgan
Mentor: Scott Mateer, Biology

Using mutagenesis on G23 and Y64 in the yeast gene YDL124w to understand the catalytic activity of this aldo-keto reductase.

YDL124w is an aldo-keto reductase used in many pharmaceutical companies for its sterioselectivity in the making of drugs. Through inserting a point mutation on YDL124w, we can better understand the catalytic action of the cofactor. This study could lead to more efficient biocatalytic processes in the future. We are mutating Glycine 23 to an Alanine and Tyrosine 64 to a Phenylalanine. These points that are being mutated were chosen because they are active sites conserved throughout many AKRs (Aldo-keto reductase family). These points are found close to where the cofactor binds and are possibly actual binding sites for the cofactor. We will be using mutagenesis to complete this process. With these mutations we hope to see an increase in the catalytic activity of our gene and possibly lead to faster synthesis of drugs made by pharmaceutical companies.

**Rhonda Harris
Mentor: Sara Plaspohl, Health Sciences

Evaluating the new law change for no prescription for the emergency contraceptive pill: An analysis among MPH college students

In the United States, the Federal Drug Administration (FDA) in 2009 approved the over-the-counter purchase of the Plan B pill for adolescents without physician prescription or parental consent. Plan B also known as emergency contraception pill reduces the probability of pregnancy, if taken 72 hours of unprotected sex. The main purpose of this study was to explore perceptions regarding the new law change on the Plan B pill. One issue pertaining to new law change on the Plan B is the perception that it can alter adolescents’ beliefs that unprotected sex is acceptable. This qualitative research study was fielded with convenience sample of twenty-three students from the Master of Public Health (MPH) program at AASU in Savannah, GA. The data was collected from a single open-ended question to explain thoughts, opinions, or beliefs regarding the new law change for adolescents to purchase the Plan B pill without parental consent or prescription from physician. The results from the open-ended question revealed that majority of the MPH students expressed support for the new legislative law change. In conclusion, scientists are still conducting research on the Plan B pill and its effects on adolescents.

Jeremy Haynes
Mentor: Joshua Williams and Nancy McCarley, Psychology

An Analysis of Notes Taken During and After a Lecture Presentation

In this correlational analysis, we reviewed notes from a previous study by Williams et. al (2013), which tested the effect of the timing of note-taking on the retention of lecture material. Williams and colleagues hypothesized that taking notes after a lecture could serve both an encoding and review function. There were three conditions in the study: no-notes, notes-during, and notes-after. Participants took a retention quiz immediately after a brief reflection period and one month following the lecture. Scores showed that students who took notes during and after the lecture outperformed students with no notes, however there was no difference between the notes-during and notes-after groups. We analyzed the notes from the notes-during and notes-after groups in order to examine trends in note-taking based on total word counts, relevant and irrelevant word counts. Results will be presented in the context of the dependent measures as they relate to quiz performance.

Jeremy Haynes, Samantha Cain, Jenna Birch, and Amanda Laurelli
Mentors: Joshua Williams, Psychology

Study Methods for Learning from Textbooks

Note taking is the most common method for college students to prepare for taking tests. Question writing, the technique of creating questions and answers reflecting learned, or to-be-learned, material, is another potential method to help college students prepare for tests. In this study we analyzed the impact of note taking, question writing, and basic reflection on short term comprehension of textbook chapter information. Participants read a 10 page textbook and then engaged in one of the three study methods. All participants took the same retention quiz after engaging in their assigned study method. Preliminary results indicate that all methods may be effective at keeping information active over the short term.
Cecilia Hernandez and Alexander Merrit
Mentor: Scott Mateer, Biology

*Effects on enzyme activity through investigation of amino acid residues 207Y and 268A in yeast enzyme YDL124w*

The purpose behind this research is to understand the catalytic activity and substrate binding of the yeast enzyme YDL 124w. More specifically, the active site amino acid residues 207Y and 268A were examined through mutagenesis of the DNA responsible for these residues’ production. Polymerase chain reaction (PCR) was used to amplify the section of the YDL 124w gene responsible for encoding residues 207Y and 268A. YDL 124w shows great significance due to its stereoselectivity and its ability to produce chiral molecules. It has also shown great worth within the synthesis of intermediates required for the production of pharmaceutical agents. The mutated products of 207Y and 268A were 207F and 268N, respectively. These specific residues were chosen as a result of their apparent functions within YDL 124w with regards to its interaction with the NADPH cofactor. 207Y seemed to have a major role in the hydride transfer from NADPH to the substrate, while 268A appeared to act as an anchor for NADPH within the enzyme’s active site, supporting our decision to investigate these residues. The catalytic activities and substrate binding were analyzed after successful DNA transformation and expression to determine the significance of these point mutations.

Brandon Hillis
Mentor: Nancy McCarley, Psychology

*Psychology and the Military: An Ethical Dilemma*

Psychology and the Military: An Ethical Dilemma

After World War II, America experienced a great increase in interest in all fields of science, psychology included. The American military and government helped expand clinical psychology with an increase in funding. The money was used to establish the first APA-certified internships, giving psychologist opportunities for groundbreaking research in key new areas, opened more university counseling centers, and new job opportunities for psychologists. As the years went by, the military began to push the boundaries of psychology in positive ways, such as counseling-vocational centers at universities, as well as in ethically questionable ways, such as research in sensory deprivation and the introduction of psychologically focused interrogation techniques. This poster will delineate the impact of the military on the history of psychology and how psychology is being used today within the military and government.

Adam Holloway, Christopher Stephens, Joshua Suttle, and David Twibell
Mentor: Priya Goeser, Engineering

*Analysis of an Assisted Dip/Chin-up Machine*

An assisted chin-up machine uses a system of variable weights and pulleys to create an upward force which aids the user during dips and pull-ups. The purpose of analysis was to find the force exerted by the machine as a function of the weight increment selected and the angle of the lever arm which supports the user. This function was derived using a force balance and moment balance analysis formulated from free body diagrams of the machine. MATLAB, a technical computing software, was then employed to calculate the range of forces for all possible positions of the lever arm between its rest position and the horizontal for each weight increment. Specific results vary, but the force exerted by the machine was calculated to be approximately 46% of the nominal weight. This analysis enabled increased knowledge of the force exerted on
the user at any point during the exercise and for any weight selected. Such an analysis could find uses in the field of rehabilitation sciences. When combined with data about the user’s body type, this information could be used to maximize the machine’s benefits for each unique patient. This analysis can also be used to implement and determine the effects of improvements to the machine, such as changing the pulley positions to increase the assistance the user receives.

Mathew Holmes and Sarah Shafer
Mentor: Sarah Gray, Chemistry and Physics

The purpose of this research is to design and build autonomous aquatic sensors to measure the flux of carbon dioxide (CO2), in coastal environments. Levels of CO2 in the atmosphere have significantly increased due to anthropogenic activities including transportation and electricity production since the Industrial revolution. The oceans are absorbing a significant amount of anthropogenic CO2, contributing to ocean acidification, which can be harmful to organisms such as shellfish and corals. In order to accurately monitor short-term changes in CO2, hourly measurements (unfeasible without sensors) are essential. The design for these new aquatic sensors will be based on CO2 devices similar to carbon monoxide detectors currently available for industrial indoor uses. These industrial devices need to be adapted before they can be used in aquatic environments. Challenges include modifying the device for use underwater and making it more durable to handle abrasive weather and the corrosive nature of seawater. After the devices have been modified, they will be tested in the lab using known CO2 standards to ensure that they remain both accurate and precise over substantial periods of time (up to 2 months). Once laboratory testing is complete, we will begin field trials with the sensors. Field sites will be local to Savannah, providing access to both seawater and freshwater locations. Our long-term goal is to establish a network of autonomous sensors across the southeast coastal Atlantic area. This data will be compared to data from other coastal locations to compare regional trends and impacts of shifting CO2 levels.

Ben Hortman, Charnice McDonald, and Michael Lerque
Mentor: Donna Mullenax, Chemistry and Physics

Analyzing Headgear Safety: Focusing on Concussions

In many contact sports, like soccer, there are many chances for injuries. Our research focuses on the most impactful injury, concussions. Headgear has been developed to supposedly minimize the amount of impact coming in contact with the players. All three of the manufacturers, we purchased the headgear from, state their headgear lowers the amount of impact force coming in contact with the players. We measured the amount of force of the soccer ball to the headgear using multiple trials collecting copious amounts of data. From the data, we can prove or disprove the claims made by multiple companies that created the three types of headgear.

Victoria Howard
Mentor: Peter Mellen, AMT

The South Eastern Theatre Conference

The South Eastern Theatre Conference, otherwise known as SETC, is a competition for actors and actresses in the southeastern area to compete for a position with a theatre company in the summer. The conference was held on March 5th through the 9th of 2014 in Mobile, Alabama. The actor or actress must come prepared for their audition by having just a monologue
or a monologue and song ready to be performed. As the thespian auditions, he or she will be auditioning in front of Theatre companies looking to hire. The conference cost 140 dollars for those who were passed on from the Georgia Theatre Conference and are students, and 220 for those who were passed but are not students. This research opportunity would be presented by documentation (pictures) and journal reviews that shows progress. My attitude is such that it would be utilized to execute a clean and professional audition; to carry the name of Armstrong with professionalism and seriousness.

**Kevin Huet**
Mentor: Andy Bosak, Health Sciences

*Effects of Standing vs. Seated Position on HR Palpation Accuracy Following a 3-min Step Test*

Prior studies have evaluated the accuracy of subjects palpating their carotid heart rate (HR) post-submaximal exercise. But, few studies have evaluated the accuracy of palpating post-exercise recovery heart rate (HR) when in different recovery positions. Post-exercise recovery HR has an important and symbiotic relationship with step tests and accurate palpation of post-exercise recovery HR is extremely important for more precise exercise prescription. **PURPOSE:** to evaluate subjects’ ability to accurately palpate their step test post-exercise recovery HR (RHR) when resting in different recovery positions. **METHODS:** Thirty-eight above averagely fit subjects (males = 20, females = 18) were connected to an Electrocardiogram (EKG) and completed two 3-min step tests at a cadence of 24 or 22 steps/min, separated by 48-72 hours, in a counterbalanced order. Upon completion of stepping activity, subjects palpated their carotid site HR, while in a standing or seated recovery position, within 5 secs and then counted their post-exercise RHR for the next 15 secs. **RESULTS:** The post-exercise recovery EKG seated (SEekg) and standing (STekg) HR were compared with their respective post-exercise recovery palpated seated (SEpal) and standing (STpal) HR using MANOVA with significant differences considered at p < 0.05. Differences between SEekg vs SEpal and STekg vs STpal were not significant. **CONCLUSIONS:** The results suggest that subjects palpated their SEpal (2.00 + bts off) slightly more accurately than STpal (2.18 + bts off), but it appears that both recovery positions produce similar palpation results despite the fact that subjects were not 100% accurate at palpating their post-exercise RHR.

Erica Janocha, Ellen Hiers, Like Kawasha, Andrew Neidlinger, Matthew Hall, Violetta Bodycott
Mentor: Jay Hodgson, Biology

*Evolution of Crocodylus porosus; the Saltwater Crocodile*

Crocodylus porosus, commonly known as the saltwater crocodile, is the world’s largest extant terrestrial reptile. The fossil record indicates that this genus first appeared in the Paleocene epoch, approximately 66 to 56 mya. Fossils discovered in Australia, dating back 98 mya when Australia was part of the supercontinent Gondwana, are speculated to be of direct lineage to Crocodylus porosus. The earliest fossil evidence for the saltwater crocodile dates to 4-4.5 mya. This carnivorous ambush predator has a wide range of distribution along southeastern Asia and Australia due to its tolerance to saltwater. Although it has adapted a tolerance to salinity, the saltwater crocodile is typically a native to brackish riparian habitats; such as mangrove swamps, lagoons, deltas, and estuaries. Due to its large size and wide distribution, Crocodylus porosus has remained at the pinnacle of the food chain, posing a threat to humans throughout its evolution into an apex predator.
Megan Jerome  
Mentor: Lara Wessel, CJSPS  
*The Correlation between Corruption and Government Efficiency: Case Study India*

My hypothesis for this study is that government efficiency decreases when higher levels of corruption are present. For the purpose of this study, I chose to do a case study of corruption in India. My hypothesis supports the old theory that corruption negatively impacts government’s efficiency. However, I think that this research is important, because it focuses on corruption in a nation quite different from America and many Western European nations. India has higher poverty levels and an immensely larger population than these aforementioned nations. This research paper seeks to study corruption in nations with larger populations and seeks to prove that corruption does not have to exist within this nation in order to function and that corruption is, indeed, inhibiting efficiency and growth in the welfare of its people. If the anti-thesis were to be true, than that conclusion would be an interesting discovery that would take on a new meaning for dealing with corruption and nations. In order to conduct my research, I will analyze data in order to determine if any patterns the emerge suggesting that government efficiency is decreased by corruption. Corruption will be measure through using the data collected via the Transparency International India surveys. Government efficiency will be measured by the Educational Development Index.

Andrew Jones  
Mentor: Nalanda Roy, CJSPS  
*The Relevance of Neutrality in International Relations*

Neutrality was once an acceptable status in international relations, but due to the modernization of the world neutrality is irrelevant. Neutrality cannot thrive in world politics because of its connection to the theory of neutral liberalism where the theory fails at the state level. If neutrality fails at the state level, then it cannot be a relevant status for any state and their relationships. Also, globalization is a major factor for why neutrality cannot be relevant. With the growth of communication and transportation between states and the popularity of global political organizations, neutrality cannot succeed. Another major factor is the issue of collective security. Collective security threatens the isolationism neutral states cling to, and it forces them to be a part of a security organization for the best of the world. With examples of Switzerland’s neutrality, the religious dilemma in India, and the China-Japan conflict, neutrality’s popularity and influence is slowly fading away into a nonexistent position.

Lia Kerkes  
Mentor: Robert Gregerson, Biology  
*Fungus in Spanish Moss*

To obtain DNA from endophytic fungi associated with Spanish moss, two techniques were used. First, Spanish moss tissue was surface sterilized, and placed onto Petri dishes containing LB-agar. After incubation at room temperature, fungi growing out of the plant tissue were collected and pure cultures were established. DNA was then isolated from pure fungal cultures. Alternatively, DNA was isolated directly from surface-sterilized Spanish moss tissue (“bulk DNA”). This sample would contain plant DNA and DNA from any endophytic organisms. PCR amplification of the fungal ITS sequence was conducted from DNA of the pure fungal cultures or “bulk DNA.” Resulting bands were purified, cloned into the pTOPO vector.
and submitted for sequencing. DNA sequence analysis indicates that several different species of fungi are found within the tissues of Spanish moss.

Jennifer Kist and Chelsea Knight  
Mentor: Scott Mateer, Biology  

Mutagenesis of N158D and P209H in YDL124w

We are trying to understand the catalytic activity and substrate binding of the yeast enzyme YDL124w. We are performing site-directed mutagenesis where we will mutate certain residues in order to see if this will increase catalytic activity and/or increase substrate binding. We are trying to understand this because this enzyme is stereoselective, important in pharmaceutical companies, and could help aid in the process of synthesizing drugs. The process by which we will perform this site-directed mutagenesis is through PCR, which stands for Polymerase Chain Reaction. One of the residues that will be mutated is asparagine 158 to aspartic acid. Asparagine is a neutral amino acid and aspartic acid is an acid, so if we lower the pH, the aspartic acid will most likely increase catalytic activity of YDL124w. Since aspartic acid works better in an acidic environment, lowering the pH should have a positive effect on YDL124w. The other mutation in our group is proline 209 to histidine. Based on previous literature, when this change was performed on other enzymes, there was an increase for the affinity of substrate-enzyme binding. We are hoping that both mutations will have a positive effect and increase substrate binding and catalytic activity of YDL124w. We will be presenting our research and results at the Armstrong Symposium.

**Margaret Loftus, Sarah Hawkinson, and Laura McIntyre  
Mentor: April Garrity, Communication Science & Disorders  

The Benefits of Gesture Therapy in Persons with Aphasia

Purpose: Aphasia is a disorder that results from damage to the language centers of the brain, most often caused by strokes. It can impair any or all modalities of language: reading, writing, speaking, or listening. There are many intervention strategies for persons with aphasia (PWA) in order to improve their communication. Gesture therapy is a strategy that involves the act of using hand motions to take place of or help facilitate spoken language. The authors are specifically interested in the outcome of functional communication using various gesture therapies associated with intervention in different types of aphasia.

Methods: We reviewed seven articles that examined the efficacy of gesture therapy among PWA. All studies were experimental in nature correlating data through group comparisons.

Results: All studies confirmed that gesture therapy is beneficial in therapy settings in PWA. More specifically, certain types of gesture therapy have shown positive outcomes within specific aphasia types. Findings in two of the studies showed improvements in persons with Broca’s aphasia following pantomime gesture therapy. One study found that iconic gesture therapy was most beneficial for those with Wernicke’s aphasia, whereas nonsymbolic gesture therapy facilitated improvements in persons with nonfluent aphasia.

Conclusion: These results suggest that utilization of gestures within therapy can significantly improve functional communication skills in PWA. Targeting intervention with a specific gesture therapy can be useful in treating an individual aphasia subtype (i.e. Broca’s, Wernicke’s, global, etc.).

Ryan Logan, Talia Williams, Katrina Goff, and Jacob Blair
Mentor: Denene Lofland, Medical Technology  
Suzanne Carpenter, Chemistry and Physics  
Richard Wallace, Chemistry and Physics

*The Antimicrobial Activity of Spanish Moss*

Experiments to evaluate the antimicrobial properties of Spanish Moss (Tillandsia usneoides) were performed. Using extracts of Spanish Moss, produced by organic chemistry students, the minimal inhibitory concentration (MIC) was measured, by medical laboratory science students, using the following bacteria: Staphylococcus aureus, methicillin resistant Staphylococcus aureus, Klebsiella pneumoniae, vancomycin resistant Enterococcus faecalis, and Pseudomonas aeruginosa. All organisms are pathogenic and some are resistant to antibiotics that are currently used in the treatment of disease. All extracts were tested using a microtitration assay in 96 well microtiter plates. Each well contained a volume of 100 microliters of a combination of extract, microorganism, and Mueller Hinton Broth. Antimicrobial agents with known MICs against each organism were used as controls. The extracts showed no effect on inhibiting the growth at the concentrations tested in the lab (>512 micrograms/mL).

Kyron Longwood  
Mentor: William Baird, Chemistry and Physics

*Buoyancy's Effect on Electronic Scale Measurements*

Buoyancy is an upward force exerted by a fluid (liquid or gas) that opposes the weight of an object. Mass measurements displayed from an electronic scale show the compensating (normal) force necessary to support the object. Buoyancy also opposes gravity, so the electronic scale supplies the difference between the forces of buoyancy and gravity. The force of gravity is constant, but buoyancy is dependent on the density of the fluid; in this instance, the local pressure, humidity, and temperature affect that density. Any slight change affects the mass measurement reading displayed by the scale. Utilizing an Arduino® microcontroller board and low-density material, measurements were recorded to document any slight changes in mass reported by the scale as temperature, pressure, and humidity change over a period of time.

**Lauren Lovett**  
Mentor: Anne Katz, EDE

*Snapshot of a Reader: A Case Study Approach*

The purpose of this presentation is to assess a fourth grade student’s attitude and self-perceptions towards reading, as well as to collect data on decoding skills, fluency levels, and reading comprehension ability. The data collected through oral reading, silent reading, and listening reading passages was analyzed to gain insight into the student as a literacy learner and address weaknesses with specific instructional strategies. The passages were presented to the subject followed by a series of comprehension questions. The data collected from the passages and comprehension questions revealed the subject to have strong decoding skills, but to have deficits in comprehension skills. As a result, it was determined the subject would benefit from instructional strategies aimed at improving comprehension, specifically in the areas of detail and main idea, sequencing, and generating inferences. It would also be beneficial to the subject to receive explicit instruction in strategies for learning new vocabulary terms.

Thomas Ludwig and Desiree Adams
Mentor: Melanie Link-Perez

**Distinguishing Adiantopsis alata from A. radiata through isolation and amplification of genomic DNA**

Adiantopsis Fée is a small genus (30-40 species) of ferns in the cheilanthoid clade of the Pteridaceae. One species in this genus is known as Adiantopsis alata. It was described in the late 1880’s by Karl Anton Eugen Prantl but has generally been subsumed into A. radiata since many workers regarded the two species as identical. Adiantopsis radiata is the most widespread member of the genus and has many morphological similarities to A. alata. An in-depth morphological study conducted by the Link-Pérez lab suggests that A. alata is actually a distinct species. The objective of this project was to collect molecular data to clarify the taxonomic identity and phylogenetic placement of A. alata. Total genomic DNA was isolated from six samples of A. alata and the plastid genes rbcL and atpA were amplified. The DNA sequences were compared to those of the rest of the clade to determine A. alata’s relationship to A. radiata and the other species within the genus. Phylogenetic analysis has confirmed that A. alata is molecularly distinct from A. radiata. Furthermore, A. alata is less closely related to A. radiata than some other members of the genus.

Linda Madala
Mentor: Patricia Norris-Parsons, EDE

**Research Findings Implementing Higher Order Thinking Skills**

I completed my gifted endorsement five years ago because I like the challenge accompanied when teaching gifted students. Since that time, I have had many gifted students placed in my first grade classroom and have taught gifted collaboration and resource segments. Their passion for learning is a perfect fit for the rigorous instruction I implement in my classroom. However, throughout my many years of teaching, I have become aware of the overwhelming frustration these students feel when addressing mathematical word problems that must be thought through and analyzed in various ways. This gave me a foundational starting point for my research.

I was curious as to whether my students would be able to transfer learned strategies to solve like problems as the wording and thought processes became more complex. I noted specific strengths and weaknesses in students providing me with the insight necessary to assist them. I watched as their frustration level grew less and less as the weeks progressed. They were learning how to think instead of impulsively trying to come up with a correct answer. They gained the confidence needed to accept a challenge.

I was amazed to see the results. Working with other students, sharing different thought processes, and realizing that the process is as important as the answer were all excellent motivational tools in the achievement attained by my students. The students learned to take risk when solving open-ended math problems which require critical thinking and reasoning skills in order to solve real-world problems.

Gladys Magana and Rebekah Sapp
Mentor: Michael Toma, Economics

**Savannah, Georgia’s HOPE VI Reconstruction: Was It Effective in Increasing the Employment Rate?**

By the end of 1980s, public housing was considered one of the biggest failures of American social welfare policy. More public housing projects were extremely segregated and
usually located in isolated, distressed, and poor neighborhoods. In response to ongoing emerging problems, the HOPE (Housing Opportunities for People Everywhere) VI grant, also known as the Urban Revitalization Demonstration, was created in 1992 by the US Congress and the Department of Housing and Urban Development (HUD). HOPE VI was meant to address the problems associated with severely distressed public housing by demolition, rehabilitation, reconfiguration and creation of new mixed-income communities. The goal of HOPE VI was to replace the acting projects with sustainable neighborhoods that will avoid or at least decrease the concentration of very-low income families. Another major objective of the program was to improve the surrounding neighborhood and to improve the living environment for residents. This study is a least-squares regression that tests for improvements to the employment rate due to a HOPE VI grant given to Savannah, Georgia in 2006 to reconstruct the Benjamin van Clark neighborhood.

Carina Izabela Marinho  
Mentor: Austin Francis, Biology  
*Contrasting Hydrodynamics of a Conical Head-Shaped Shark with Hammerhead Sharks*  
Sharks exhibit a diversity of head morphologies from cone, or conical, shaped to the hammerhead shaped cephalofoil. This study compared the hydrodynamics of a conical head-shaped shark, the black nose shark Carcharhinus acronotus, with that of different species of hammerhead sharks, Eusphera blochii, Sphyrna mokarran, and Sphyrna tudes. In order to evaluate the hydrodynamics of these distinct variations in head shape, computed tomography scan data (provided by DigiMorph) were used to print three dimensional models (using a Cubify CubeX Trio printer) for testing purposes. Models of the black nose shark and hammerhead sharks were placed in a tank where the movement of water passing over a head was examined using digital particle image velocity (DPIV).

Emily Mathis  
Mentor: Kathryn Craven, Biology  
*Who’s Your Daddy?: The Frequency of Multiple Paternity in Carolina Diamondback Terrapins*  
The Northern Diamondback terrapin subspecies (Malaclemys terrapin terrapin) has been observed by Dr. Barbara Brennessel to participate in mating aggregations at Wellfleet Harbor, MA. This reproductive behavior suggests that multiple paternity may be present in clutches of eggs which means that more than one male is the father of a single clutch. Dr. Brennessel tested this hypothesis using microsatellite markers and saw high levels of multiple paternity in the Northern Diamondback terrapins. Unfortunately, the Carolina subspecies (M. t. centrata) has not been observed in mating aggregations in Savannah even though they are common in local salt marshes. However, multiple paternity can still be tested in the Carolina subspecies without knowing if they form aggregations. The results would shed light on the mating system, and indicate that aggregations may just be hard to locate. Our hypothesis is that the Carolina subspecies exhibits similar mating behavior as the Northern subspecies by forming these aggregations. If we reject our hypothesis, it indicates a 1F:1M operational sex ratio, and conservation efforts should focus on both sexes equally. If our hypothesis is supported, it indicates an operational sex ratio skewed toward males by high levels of multiple paternity.

Robyn May, Colleen JoCaro, Charnice McDonald, Benjamin Hortman, Carina Izabela Marinho, Whitney Mullins, and Apekchaya Pokharel
Evolution of Birds

Dating back to the Jurassic period, the Dromaeosauridea velociraptor is one of the earliest common ancestors of today’s birds. Our research will focus on the development and diversity of avian wings and their niches for modern environments. More specifically we will use the example of Darwin’s finches to establish a better understanding of decent with modification and the ecological pressures that shaped them.

Jeff McAuliffe, David Dukes, Marcos Gonzalez, Abbey Bernal, and Elizabeth Beagle

Evolutionary History of Snakes and the Effect of Anthropogenic Acuity on their Future Survival

The purpose of this research project is to demonstrate the evolution of limblessness in snakes through transitional fossils, showing why limbed transitional forms of snakes have gone extinct, and elucidating whether modern anthropogenic impact threatens the future of this organism. To establish the evolution of the snake, transitional fossils of both land based and marine limbed snakes will be examined as well as molecular evolution. Although similar in appearance, the difference between snakes and limbless lizards through the evolutionary process will also be addressed.

Christina Miller

Epigenetic Variation Among Bluegill Sunfish in Power-cooled Lakes

Epigenetics is the change in gene expression without changes in DNA sequences. There are several epigenetic mechanisms, but DNA methylation is the best studied so far. DNA methylation may allow organisms to fine-tune their gene expression in response to changes in the environment. Bluegill Sunfish provide an interesting model in which to study how DNA methylation changes in response to the environment. Bluegill Sunfish are popular sportfish that have been stocked into numerous lakes. In Illinois, some lakes are used to collect excess heat generated by power plants. Thus, some lakes have artificially higher temperatures and the Bluegill Sunfish must respond to this change in environment. The purpose of our research was to determine if epigenetic variation existed among Bluegill Sunfish populations from lakes with different temperatures. Samples were collected from two locations in one power-cooled lake and one non-power-cooled lake. We used metAFLP to screen variation in DNA methylation among 48 individuals. We compared epigenetic diversity and differentiation among individuals, sites, and lakes. If we see different patterns of epigenetic variation between the two lakes, it is possible that the fish are using DNA methylation to fine-tune their gene expression in response to local environmental conditions.

Jason Miller

A Path Into the World of Job Shadowing

This project set out to try to aid Armstrong students in participation of job shadowing. With this project, various paperwork and contact information was received and will be kept on campus. This paperwork will be available to the student body for years to come. The importance of job shadowing is ever growing in the process of applying to graduate schools of various types. This project expanded across many fields and specialties giving students the opportunity to
explore the vastness of the medical field. Six surgical groups and Memorial Hospital are all involved in this cooperative and includes 67 doctors from the Savannah area. This gives students the opportunity to follow multiple doctors from different fields of medicine and fine their niche. This project has the potential to help many students here at Armstrong for a long time.

Hwee Min Loh
Mentor: Floyd Josephat, Medical Technology


With currently no cure for human immunodeficiency virus (HIV), it is vital to control the disease outspread by prevention and management. The availability of an effective assay is pivotal for identifying the virus that can allow early medical management and treatment intervention. The traditional use of HIV serodiagnosis has relied on a two-test algorithm: an initial screening of anti-HIV antibodies, followed by a confirmatory assay when subject sample is tested reactive. With the advances of HIV testing, the feasibility of a “one-size-fits-all” algorithm has decreased with increasing number of available assays. This also leads to development of several other new algorithms that are further adjusted based on factors such as population size and accessibility. In addition, the performance and accuracy of testing are further enhanced with the introduction of combination serologic testing, and nucleic acid amplification test (NAAT). In this paper, we will evaluate the development of HIV testing based on testing time frame, immunological response, assay limits: sensitivity and specificity, and cost. We have also assessed the possibility of the fourth-generation combination assay as a more feasible alternative for screening of blood donations than NAAT.

**Temberly Mitchell**
Mentor: Leigh Rich, Health Sciences

*The Ethics of Notifiable Diseases*

Mandatory disease reporting is essential for epidemiological surveillance, health promotion, and public health planning. Some diseases, however, are more stigmatized than others; thus, the advantages of reporting must be weighed against the potential risks of discouraging individuals from seeking testing and care. One area of concern in public health is the prevention of sexually transmitted infections (STIs), including HIV as well as STIs that are developing resistance to current treatments. Unfortunately, despite an increase in the number and ease of STI testing methods, it is unclear whether individuals understand the importance as well as implications of being tested. Moreover, members of the public may not fully comprehend the differences between “anonymous” and “confidential” testing. This presentation explores the ethics of disease reporting with regard to STIs: How has STI testing changed over the past three decades, particularly since the recognition of HIV in the 1980s? Is truly anonymous testing more available now and, if so, for whom? And what are current barriers to the successful promotion of STI testing?

Learn Objectives:
- Discuss changes in STI testing methods and access since the 1980s.
- Identify the public’s knowledge of the importance of STI testing as well as differences between anonymous versus confidential testing.
- Evaluate the appropriateness and ethics of mandatory disease reporting (with regard to stigmatized diseases).
Wais Mojadedi, Tobias Friedrich-Moe, and Anna Tran
Mentor: Mitch Weiland, Chemistry and Physics

Preliminary Results for the Expression of a Soluble FAM5C Truncate

Proteins containing the membrane attack complex/perforin (MACPF) domain can be found in nearly all forms of life from eukaryotes to bacteria. MACPF domains are identified by a signature motif consisting of Y/W-G-T/SH-F/Y-X6-GG, where X6 is any intervening amino acid sequence. Known functions of MACPF-containing proteins include mediators of immune defense, venoms, eukaryotic pathogenesis factors, and roles in developmental and neurobiology. FAM5C is a relatively uncharacterized, mammalian mitochondrial MACPF protein that has been implicated in periodontitis and decreased expression levels are seen in tongue squamous cell carcinoma. The N-terminal region of FAM5C contains a putative MACPF and a coiled-coil (CC) domain. CC domains have been shown to be highly versatile with functions ranging from protein-protein interactions to transcriptional control. After analyzing the sequence of FAM5C, boundaries were created to include both the MACPF and CC domains. Based on previous literature reports, the MACPF has been shown to be a soluble, independently folded domain. With the aim of identifying binding partners for human FAM5C, a recombinant FAM5C truncate with a cleavable C-terminal 6x His tag, encompassing the MACPF and CC domains, has been created and transformed into competent cells. Current efforts focus on optimizing expression and purification of the FAM5C truncate. Preliminary results show that the FAM5C-truncate is a soluble protein with the potential of being crystallized.

Harold Morgan
Mentor: Jay Hodgson, Biology

Georgia’s Giant Swamp Spider

The world’s largest fishing spider, Dolomedes okefinokensis, thrives within the swamplands of southern Georgia. Transitional fossils detail the evolutionary descent from ground-dwelling Paleozoic spiders to the aquatic predators known today. Simplistic silk assemblies and other predatory tools specialized over millions of years to become incredibly complex.

Amanda Murrell
Mentor: Brandon Quillian, Chemistry and Physics

Functionalization of Tetraethylene Glycol (TEG) for Specific Binding of Gold Nanoparticles

Gold nanoparticle photothermal therapy—ultraviolet irradiation of gold nanoparticles to generate sufficient localized heat to kill cancer cells—offers a non-invasive method to treat cancers. Coating the gold nanoparticles with drugs, antibodies, and proteins that specifically bind to cancer cells provides a means for targeted therapy. This presentation describes our early efforts to functionalized tetraethylene glycol (TEG) with moieties to bind gold-nanoparticles on one terminus and a therapeutic agent on the opposing end. Herein, we discuss the preparation and characterization of two functionalized TEG intermediates en route to our ultimate synthesis of a gold nanoparticle conjugate.

Leticia Nascimento, Richard Evans, and Michelle Zhang
Mentor: Aaron Schrey, Biology

Conservation Genetics of the Florida Scrub Lizard
Florida Scrub Lizard (Sceloporus woodi) is listed as species of greatest conservation need in Florida. They only occur on Florida scrub habitat, which is one of the world’s most threatened habitats. This habitat currently exists as small fragmented patches, which are isolated from each other. We used six microsatellite DNA markers to investigate conservation genetics of this species. We were particularly interested in determining how fire-based habitat disturbances affect the genetic characteristics of this species. Previous research has found genetic diversity of the Florida Scrub Lizard is affected by fire. We screened 413 Florida Scrub Lizards from 17 locations in Highlands County Florida. Our results show the Florida Scrub Lizard prefers more recently burned habitats and that long unburned patches has higher private allelic richness, indicating they are more isolated. Also, Florida Scrub Lizards were genetically differentiated among habitat patches, which indicates that they do not migrate among the currently isolated patches. Our results show that effective conservation of this species would require active fire management of Florida scrub habitat.

**Nyssa Owen
Mentor: Sara Plasphol, Health Sciences

*Impact of the Spanish Influenza Pandemic of 1918 on Savannah*

The Spanish Influenza is a pandemic that struck the United States in waves from September 1917 through March of 1918. This study investigates the impact of the Spanish Influenza on the Savannah and Chatham County area of Georgia. Primary death records from the Chatham County Health Department were examined and analyzed for the years of 1917, 1918, and 1919. Through this study we are able to compare historical disease rates in the Savannah area to those of other parts of the United States and world. Many large cities such as New York, London, and Madrid have publicly accessible data concerning the impact of the 1918 influenza pandemic on their population. These data will allow for Savannah officials to understand the historic trends of communicable disease morbidity and mortality in relation to other parts of the world. The will also serve as a reference when channeling future resources into epidemic prevention in Chatham County.

Zachary Owens and Jeremy Smith
Mentor: Scott Mateer, Biology

*Site Directed Mutagenesis of YDL124w*

The purpose of this research project is to better understand the catalytic activity of the Saccharomyces cerevisiae enzyme YDL124w. This enzyme is an NADPH-dependent oxidoreductase that is a member of the alpha-keto reductase (AKR) superfamily of proteins. We will be using site-directed mutagenesis to alter the codon sequence of the gene that encodes for this YDL124w to see how this mutation affects its catalytic activity. AKRs are involved in a wide range of physiological functions in nearly all eukaryotes, including humans, are important enzymes used in the pharmaceutical industry, and play key roles in several human diseases such as diabetes, depression, and some inflammatory diseases. A greater understanding of YDL124w’s catalytic activity will provide insight into how proteins of the greater AKR superfamily function and could prove to be beneficial for any of the aforementioned reasons. In our project, we generated two different YDL124w mutants. In the first mutant, we changed the arginine at position 264 to glutamine (R264Q). This change has the possibility of increasing the rate of catalysis by speeding up the rate limiting step of the reaction. In the second mutant, we changed the glutamine at position 179 to a tyrosine (Q179Y). This change could lead to altered
orientation of the cofactor in its binding pocket and possibly displace it to a degree that alters the rate of catalysis of the reaction. Regardless of the outcome, the results provide insight into the catalytic activity of a superfamily of proteins that is an important focus of future research.

Matt Park
Mentor: Priya Goeser, Engineering

*Traversing through the Logic of Programming using MATLAB: Learning Tools for the Beginner to Advanced Programmer*

MATLAB Marina is a Virtual Learning Environment (VLE) dedicated to the improvement of student learning of programming concepts using MATLAB, a technical computing language. It consists of several learning modules organized under the following areas: Fundamental Programming Concepts, Advanced Programming Concepts and Applications. This work represents recent updates to MATLAB Marina: focused on creating tutorials for the freshman programming course - Computing for Engineers (ENGR 1371) addressing topics including functions, while loops, and sound processing.

The multimedia tutorials use a combination of captions, video, and audio to explain a concept quickly and efficiently. In an effort to keep within the normal attention span of students, these tutorials are limited to 3-5 minutes each in length. Multiple software is used in the development of the tutorials: MS Power Point and MATLAB are used to develop the initial visual aids; Audacity is used to record and edit the audio; Camtasia Studio is used for compiling and producing the final product; and the videos are posted in YouTube with links from the corresponding website.

Currently there are a total of 98 tutorials, with a total of 149,026 views as of 02/19/2014. This shows an extensive use of the tutorials alone. Other assessment statistics show that MATLAB Marina as a VLE is being used extensively by students at Armstrong and globally and has significantly improved student learning of programming concepts. Overall, MATLAB Marina has and will continue to be a benefit to students and engineering professionals.

James Parker, Kaitlyn Patterson, and Robert Altman
Mentors: Joshua Williams, Psychology
Nancy McCarley, Psychology

*History and Systems as a Capstone Course*

Williams, McCarley, and Kraft (2013) proposed that the capstone course for a psychology major, History and Systems of Psychology, allows students of psychology to reactivate information the learned in previously-taken core curriculum courses. Psychology majors enrolled in History and Systems of Psychology completed “interdisciplinary essays” in which they had to make connections between current course information and core courses of their choice. We examined 47 student essays for relevance and relationships to core curriculum areas (communication and quantitative skills, ethical and cultural perspectives, humanities and arts, physical and life science, and social sciences) to determine the effectiveness of History and systems of Psychology as an interdisciplinary capstone course. We categorized the core area to which students related, calculated the percent of essays corresponding to specific core areas, and recorded the number of key people, concepts and theories to which students connected across disciplinary areas.

Kaitlyn Patterson

34
Mentor: Wendy Wolfe, Psychology

**Testing Mediation in the Relationship between Body Dissatisfaction and Disordered Eating**

The role of body dissatisfaction as a risk factor in the development of eating disorder behaviors is established; a recent study illustrated that an additional role is played by depressive symptoms. Stice, Marti, and Durant (2011) followed a group of almost 500 middle school-aged females for eight years. They found that adolescent girls with higher levels of body dissatisfaction were four times more likely to develop eating disorders than those with lower levels, and that within the high body dissatisfaction group, those with higher depressive symptoms were almost three times more likely to develop eating disorders than those with high body dissatisfaction and low levels of depression. We believe that a variable that may further account for the pathway from body dissatisfaction to depression and disordered eating behaviors is dispositional self-focus. Dispositional self-focus has been found to be associated with depressed mood (Watkins & Teasdale, 2004) and considered a risk factor for depression (Ingram, 1990). Degree of self-focus has also been found to differentiate between dieters and non-dieters (Heatherton, 1993). Restrained eating among those dissatisfied with their body size may result from a heightened degree of self-focus and concern about how one appears to others (Heatherton, 1993). It also has been proposed that other disordered eating behaviors, may be used during times of stress in order to escape from an aversive state of heightened self-focus (Heatherton & Baumeister, 1991). In our study, we examine body dissatisfaction, depressive symptoms, dispositional self-focus, and disordered eating behaviors in females using an online survey.

Kaitlyn Patterson
Mentor: Wendy Wolfe, Psychology

**Cognitive and Gratitude-Based Interventions for Reducing Body Dissatisfaction**

Gratitude interventions have been used effectively in the treatment of depression, PTSD, and for improving psychological wellness (Nelson, 2009). Recently, researchers have investigated the efficacy of gratitude interventions for decreasing body dissatisfaction among a sample of self-selected male and female adults from the United Kingdom (Geraghty, Wood, & Hyland, 2010). Results demonstrated that the gratitude intervention (Grat) worked equally well to decrease body dissatisfaction as a cognitive restructuring intervention (CR) and that both performed significantly better than no intervention. Moreover, fewer participants dropped out of the Grat condition, indicating that such an intervention may be associated with greater adherence than the more established CR interventions used for improving body satisfaction. We have extended this investigation by comparing Grat, CR, and control conditions on both body dissatisfaction and eating behaviors in a college female population. Through this investigation, we hope to replicate the findings of Geraghty et al. (2010) in a non-self-selection sample. We are also including measures of eating behaviors to determine if change in body dissatisfaction is associated with change in eating behaviors. Finally, we are comparing the efficacy of the interventions in participants with low versus high levels of body dissatisfaction.

Candace Poole
Mentor: Scott Mateer, Biology

**Characterizing substrate-specificity in the aldo-keto reductases, YHR104w and YOR120w**

Alcohols are very desired in pharmaceuticals because they are the building blocks to some of our most modern medicines; however, the synthesis of these alcohols can be hazardous,
difficult, and costly. One potential strategy to safe, easy, and cost-effective synthesis of these alcohols is the reduction of keto-esters by aldo-keto reductases (AKRs). However, it is often laborious and time consuming identifying which enzyme can reduce an alcohol to its desired orientation. Our work seeks to explore the stereoselectivity of YHR104w and YOR120w by identifying amino acid residues that are important for substrate binding and orientation. For our analysis we have targeted amino acid residues located in the reductases’ Substrate Specificity Loop A (Loop A region). The AKR YOR120w produces one specific orientation of a product when reducing the ester to an alcohol, while the AKR YHR104w produces the opposite orientation of the product. Mutagenesis of the amino acid residues of Loop A on YOR120w and YHR104w was conducted because we predict that the residues of the Loop A region of these aldo-keto reductases dictates the specific orientation of the enzymes. The Loop A region of YHR104w was substituted for the Loop A region in YOR120w, and vice versa to determine if opposite stereoselectivity is observed in the reduced products of the substrates used. The wildtype and mutant proteins will be expressed in bacteria, and the resulting crude lysates will be used to characterize the reduction of several keto-ester substrates.

Lisa Powell
Mentor: Amy Potter, History

Savannah and Haiti: Uncovering Longstanding Cultural Connections

Haiti and Savannah have longstanding connections, whether through art, food, architecture, religion, migration, or historical battle. My project explored this long-standing relationship between the city of Savannah and the island of Haiti that was not only cultural, but also manifested itself on the landscape in the form of built memorials. For this project, I took a multi-method research approach: utilizing archival information from books, newspapers and other historic documents, as well as conducting semi-structured interviews. I also utilized past experiences in Haiti, which allowed me to make informed observations in terms of the evidence of Voodoo in both Bonaventure and Greenwich Cemeteries. I was able to document these long standing connections through photographs, interviews, numerous reference materials, local markers, and monuments. Haitians risked their lives in the Siege of Savannah, and there are still descendants of Haitian migrants in the city that keep alive a religion closely related to, but adapted from Voodoo. Voodoo is a religion that has long been black listed, shunned and whispered about in hushed voices amid this mainly puritanical society. As a port city, Savannah welcomed most Haitian diversity amidst its cobblestone streets and Spanish moss laden oak trees. Even now our city boasts a Haitian restaurant and a famous Haitian artist. In conclusion my project proves that there are both past and present connections between Savannah and Haiti, which link our cultures through religion, food, art and architecture.

Alexandria Ragsdale
Mentor: Aaron Schrey, Biology

Using MS-AFLP to Investigate Ecological Epigenetics of Bluegill Sunfish

Ecological epigenetics studies the changes in gene expression that are not caused by changes in DNA sequences that have relevance to ecologically relevant traits. Bluegill Sunfish (Lepomis macrochirus) is a common sportfish. In Illinois, there are several power-cooled lakes with artificially raised temperature acting to vent excess energy from power plants. These cause the water to be artificially higher than non-power-cooled lakes. The different water temperature is known to affect fish’s phenotypes. Our objective is to determine if epigenetic mechanisms be
responsible for the change in phenotypes. We collected 48 fish, 12 from two sites in a non-
-power-cooled lake and 12 from two sites in a power-cooled lake. We extracted DNA and used
MS-AFLP to screen variation in DNA methylation from sites throughout the genome. DNA
methylation was different between the two lakes, which may indicate epigenetic mechanisms
may be responsible for the change in phenotype. In future experiments we will use additional
epigenetic techniques to get a better understanding of the genes that may be differentially
methylated.

Amanda Raun
Mentor: Melanie Link-Perez, Biology

The Most Poisonous Plant in the World

The biology of plants is an overlooked subject for school-aged children and teens. Many
elementary classes focus on the basics of plants, using similar experiments year after year. High
school level science courses primarily focus on molecules, cells, and animals, with little
emphasis on plants. This research investigated the Castor Bean plant, Ricinus communis, to see
if it would prove to be an adequate plant to introduce into classrooms for experimentation.
Students tend to be more interested in subjects they can easily associate with or subjects that
pose serious health risks, such as toxins. Ricinus communis seeds contain high amounts of ricin,
a toxin known to cause severe gastrointestinal problems or mortality. This toxin is also present
in lower concentrations throughout the plant. In 2007, Ricinus communis was named “Guinness
World Record’s most poisonous plant in the world.” In this research project, Ricinus seeds were
planted, grown, and observed in a controlled environment for several months. Specimens were
used for various microscopy experiments, which included toluidine blue, Gram’s iodine, and
neutral red staining. During observations, a symbiotic relationship between the plant and certain
arthropods was noted. By including Ricinus communis into classroom experimentation, students
will be able to identify parts of the plant as it matures, easily view parts of the plant using
microscopy, and will observe important symbiotic relationships amongst the plant and other
organisms.

Anthony Ravita and Rachel Thompson
Mentor: Sara Gremillion, Biology

Who is Important in the COG Complex of Fungi?

In order to maintain proper Golgi function, this organelle must continually recycle
membrane and enzymes lost by departing vesicles. The Conserved Oligomeric Golgi (COG)
complex is a tethering complex involved in the retrograde transport, or recycling, of vesicles
within the Golgi. Studies in animal and yeast cells revealed that the COG is an eight-protein
complex with the essential subunits of COGs1-4. In the filamentous fungus Aspergillus
nidulans, very little is known of the COG complex. Fusion PCR and cell transformations were
used to create new strains of A. nidulans to determine which subunits are important for the
function of this complex.

Melina Raymundo and Nathan Peek
Mentor: Will Lynch, Chemistry and Physics

Clifford Padgett, Chemistry and Physics

Transition Metal Isoquinoline N-oxide Complexes, a Novel Class of N-Oxide Structures.
N-oxides represent a class of compounds which have undergone extensive research for use as hypoxia-selective agents, with one particular example, tirapazamine, having undergone phase II and phase III clinical trials.(1) The mechanism is reported to include a one-electron reduction of the N-oxide followed by release of hydroxyl radical.(2) The radical then proceeds to oxidize DNA strands. The interactions of metal complexes that are capable of binding N-oxide, stabilizing the N-oxide bond, as well as facilitating redox reactions are of interest to help understand the chemistry of these N-oxide compounds. Our initial studies presented in this talk center around the formation of redox stable compounds of zinc(II), silver(I) and gold(III). The compounds are all redox stable and the synthesis and structural analysis of the compounds has been achieved using isoquinoline N-oxide. Zinc(II) chloride forms a 1:2 square planar complex with the title ligand. Silver forms a unique coordination polymer with the isoquinoline N-oxide whereas the gold(III) complex, derived from chloroaauricacid, forms a AuCl4- tetrahedral complex ion with two N-oxide species hydrogen-bonded in the crystal lattice.

**Allyson Riley**
Mentor: Bryan Riemann, Health Sciences

*Velocity Spectrum Torque Testing of Shoulder Internal Rotators*

Muscle power is one of the most important components of sports and physical activity performance. Limited quantification of shoulder internal rotator (IR) isolated power across a wide range velocities exist.

**PURPOSE:** To perform torque testing of the shoulder IR using isokinetic velocity spectrum testing.

**METHODS:** Thirty recreationally active and healthy males between the ages of 18-30yrs (1.87±.06m, 80.0±13.6kg) completed shoulder IR isokinetic testing at nine velocities (beginning at 60°/s, increasing by 30°/s, ending at 300°/s). Participants were tested using an isokinetic dynamometer with the arm positioned in 80° shoulder abduction and 90° elbow flexion. Subjects were instructed to perform four maximal effort bouts of IR and external rotation at the nine velocities in a random order through the entire range of motion.

**RESULTS:** Averaged across all speeds, the dominant shoulder demonstrated significantly greater average peak torque compared to the nondominant shoulder (P<.001, 95% CI_diff: 2.5 to 6.4 Nm). Average peak torque significantly decreased (range: 1.7 to 5.1Nm) at each incremental velocity increase until 210°/s. There were no significant average peak torque differences between velocities of 240°/s, 270°/s and 300°/s.

**DISCUSSION:** Specificity of training is important in developing shoulder power for upper extremity athletes. Using isolated training of each link is an important part of injury prevention and performance enhancement. Based on these results, we recommend training at 300°/s to replicate sports performance speeds because the same amount of torque was produced at 300°/s compared to 240°/s and 270°/s.

**Laura Ringler**
Mentor: April Garrity, Communication Science & Disorders

*Gesture or Melodic Intonation Therapy for Aphasia?*

Procedures: Aphasia is a communication disorder frequently seen in individuals who have suffered a stroke. Those with aphasia can have difficulty with parts of language including reading, writing, speech, and auditory comprehension. Gesture and melodic intonation therapy (MIT) are two forms of therapy used with aphasia patients. While gestural therapy focuses on
alternative communication, MIT uses relatively spared “musical” skills to facilitate verbal communication. The purpose of this research is to determine whether gesture or MIT is a more effective treatment for gaining communication skills in persons with aphasia after initial recovery. Five articles were selected for review relative to the research question. Four were experimental, and one was comparative. One of the gesture therapy articles trained participants with random circular motions, and the other trained a different gesture for each word being assessed. Both experimental MIT articles had the participant listen to a presentation first, then one had the participant repeat what they heard, and the other vocalized with the clinician before repeating. The last comparative article analyzed different therapy techniques (MIT was our only style of concern) and the outcomes presented in those articles.

Outcomes: The results from all articles indicated that communication skills of those with aphasia improved with both MIT and gesture therapy. The articles all found a raise in number from baseline scores.

Conclusions: Though positive results for all articles means both types of therapy are, according to Marshall et al. (2012) different techniques appear to be more effective for some clients than for others.

Esmeralda Rivas-Torres
Mentor: Scott Mateer, Biology

*Enzyme Stereoselectivity and Substrate Specificity of Yeast Reductase YDL124w*

I am currently a research student working on an approach to understand enzyme stereoselectivity and substrate specificity of the model yeast reductase, YDL124w. YDL124w is a well characterized enzyme that requires NADPH-dependent to reduce carbonyl moieties into chiral alcohols. These chiral alcohols are important building blocks in drug manufacturing; therefore, our efforts have the potential to improve the synthesis of medicine by developing more enzymes that make medications more efficient. In order to understand how YDL124w works we must generate a series of mutants near its active site. We are generating site-directed mutants using circular mutagenesis. Once the mutant is created through PCR, it is transformed into bacteria and the mutant DNA is allowed to replicate. Next we harvest the DNA and screen for mutants using PST I/Pvu I digest. Finally we will verify each mutant by DNA sequencing. Once we confirm that we have made our desired mutants we will then start characterizing the mutants by looking at their ability to reduce various alpha and beta keto-esters.

Rebekah Robinson and Mario Johnson
Mentor: Traci Ness, Biology

*Construction of a Single Nucleotide Polymorphism in the Human TLR4 gene*

Pattern recognition receptors (PRRs) are responsible for recognizing pathogens and initiating appropriate immune responses in many cell types. Toll-like receptor four (TLR4), a well-studied PRR, is the receptor for lipopolysaccharide (LPS) found in the outer membrane of Gram-negative bacteria. However, it has been demonstrated that the fungal polysaccharide mannan is also capable of binding and signaling through TLR4, but the details of this interaction are poorly understood. TLR4-D299G is a naturally-occurring polymorphism which has been shown to alter the response to LPS. Individuals with this polymorphism are highly susceptible to Gram-negative bacterial infections. Our lab is interested in determining if this polymorphism will also eliminate mannan binding and signaling through TLR4 in human cells. The goal of this project was to construct the TLR4-D299G polymorphism in the plasmid pUNO-hTLR04a using
circular mutagenesis. A single nucleotide change (adenineàguanine) was introduced which changed the amino acid at site 299 from an aspartic acid (D) to a glycine (G) residue. The success of our mutagenesis strategy has been verified by antibiotic resistance of bacterial transformants, Pst I digestion of the isolated plasmids, and direct sequencing. The mutated and original plasmids were each transiently transfected into a human cell line lacking TLR4 expression (HEK-NULL2) and cultured under drug selection. Receptor activation was assessed using an alkaline-phosphatase expression assay. Despite drug resistance, neither cell line responded to LPS stimulation.

Haley Roennebeck and Apekchaya Pokharel
Mentor: Scott Mateer, Biology

Site-Specific Mutagenesis of YDL124W to Gain a Better understanding of its Catalytic Activity

The point of our experiment is to better understand the catalytic activity of the S. cerevisiae gene YDL124W by using site-specific mutagenesis. YDL124W codes for an aldo reductase that makes chiral molecules. This is interesting because it is stereoselective in its preference to make one enantiomer over the other and it is also stereospecific, in that it prefers to make the S-enantiomer 98% of the time. Pharmaceutical companies are very interested in using such enzymes to make their chiral drugs. Many times only one of the enantiomers of a drug is biologically active and in some cases the other enantiomer is toxic; therefore, drug companies could potentially cut costs by having more active product produced. Our amino acids of interest are Y-64 and K-89. Y-64 is considered to be the most plausible candidate for the proton donor of the carbonyl group of the substrate during catalysis and K-89 is believed to lower the pKa of Y-64 to allow for this protonation to occur. Studies suggest that the hydroxyl group of Y-64 is needed to bind the substrate correctly so that the carbonyl group is oriented for the proton donation. We want to mutate Y-64 to S-64 and K-89 to R-89. S-64 has a potential to speed up catalysis because it lacks a bulky phenyl ring and this may also allow for larger substrate binding. For R-89, we want to determine whether or not having three amine groups on the R will lower the pKa of the Y-64 faster than K-89.

Jennifer Savary
Mentor: Lara Wessel, CJSPS

Analyze on the Changes of the Concept of Security after 9/11 in the United States.

On September 11, 2001 a terrorist attack victimized the United States. After the attack on the World Trade Center in New York, the Pentagon, and an attempted attack on the White House by Al-Qaida, President George W. Bush took actions to ensure the security of the nation. The protection of the United States consisted in passing air transport legislation such as the Aviation and Transportation Security Act and Transportation Security Administration. These acts entail regulations of the objects that can be transported on a plane, used as a bomb or for other terroristic plots. The personnel is regulated as well. U.S. Border Control policies were put in place to increase efficiency as well as immigration laws and touristic visas requirements such as the Enhanced Border Security and Visa Entry Reform Act was passed. After September 11th, it became harder to obtain a visa to visit the U.S., especially for Muslim or with Middle Eastern origins as well as International students. The Patriot Act, a domestic security legislation, protects the county internally avoid any domestic attacks from within nation’s borders. Deportations help the protection of the country. Since the attack, the number of deportations has significantly increased. Deportations are related to a harsher visa process which makes it harder to stay legally
on U.S. soil. The United States declared war on Afghanistan due to the possession of weapons by President Saddam Hussein who was suspected to supply the terrorists of the group Al-Qaida.

Brett Searing, Amber Blossomgame, Joe Zehler, Matthew Holmes, Derrick Sharp, and Rebecca Kramer
Mentor: Jay Hodgson, Biology

The Evolutionary History of the Wild Turkey

The Wild Turkey (Meleagris gallopavo) is the heaviest member of the Galliformes family weighing on average 5-11 kg. Preferred habitat includes interspersed forests in 49 states excluding Alaska as well as portions of Canada and Mexico. This research will clearly define the Wild Turkey’s evolutionary history including its line of descent. We will characterize its current habitats, how it acquires energy and how these have changed throughout its evolution through time. Because of its popularity as table fare, it has a better known fossil record than most other birds. The Wild Turkey has some specimens dating from over 5 million years ago. Fossils recovered include Meleagris sp. from both the early and late Pliocene, Meleagris Californica and Meleagris Crassipes from the late Pleistocene, and will be used to demonstrate these changes and the conditions that led to their evolution and extinction. Due to their value to humans as a food item and a game bird, extensive efforts have been made concerning population recovery and habitat restoration. Special consideration will be given to climate change, pollution and their effect on its habitat, as well as the Turkey’s role in current ecological systems. Using this supporting evidence conclusions will be drawn concerning the outlook for the Wild Turkey.

Travis Shoop
Mentor: Scott Mateer, Biology

Altering the Catalytic Activity of YDL124W Through Mutagenesis

The purpose of this experiment is to understand the catalytic activity of the alpha-keto amide reductase, YDL124w, and whether or not the site-specific mutation of a particular amino acid can alter its reaction rate. Through circular mutagenesis, we are attempting to mutate the residues, R-264 and R-277, by converting arginine to alanine and glutamic acid to aspartic acid, thus resulting in a potential increase in the catalytic activity of the enzyme. In completing this particular research, we believe the results may prove beneficial to pharmaceutical companies in the attempt to combat medical issues such as hemophilia, diabetes, and periodontitis while concurrently saving both time and expense. In previous experiments, these mutations proved to aid in the coagulation pathway by its activation of factor X. At the conclusion of this experiment, we are planning on presenting our findings at the 20th Annual Student Scholars Symposium held on April 30, 2014.

Delia Singleton
Mentor: Brent Feske, Chemistry and Physics

Difluorination of (2-Nitroethyl) benzene for Enzymatic Purposes

Fluoronitro derivatives have shown to have important biological activity and are key building blocks in organic synthesis. However, the number of methods to produce fluoronitro derivatives is very minimal. The purpose of this experiment was to difluorinate (2-Nitroethyl) benzene. The fluorination was done by deprotonating the beta carbon with potassium hydroxide followed with the process of difluorination using a fluorinating reagent (Selectfluor®). From the experiment it was concluded that the difluorination of (2-Nitroethyl) benzene was successful.
Now that this compound has been synthesized we can probe its ability to be a substrate with enzymes from the nitroreductase or ene-reductase family.

Caroline Smead  
Mentor: Austin Francis, Biology  
*Head Hydrodynamics of Hammerhead Sharks*  
Different species of hammerhead sharks have unique head shapes (called a cephalofoil) compared to other cartilaginous fishes. Hammerhead cephalofoil shapes range from a shovel-like appearance to thin, wing-like projections, and everything in between. These unique head shapes correlate with the shark’s environment: open water (pelagic) sharks have a more wing-like shape while bottom dwelling (benthic) sharks have a more shovel-like shape. To evaluate the head hydrodynamics of these different species, three-dimensional imaging, scanning, and printing technology were used to compare and contrast head shape. To accomplish this, computed tomography (CT) scans of hammerhead cephalofoils were used to produce physical models with a 3D printer (Cubify CubeX Trio). These models were submerged in a flow tank where the movement of water over the cephalofoil was measured using digital particle image velocity (DPIV). The results of DPIV were used to identify functional differences in head hydrodynamics for three species (Euphysa blochii, Sphyrna mokarran, and Sphyrna tudes) with contrasting head shape.

Anthony Smith, Brittany Whitley, Adam Raines, Casey McManus, and Alicia Evans  
Mentor: Jay Hodgson, Biology  
*Evolution of the Przewalski’s horse (Equus ferus przewalskii)*  
The Przewalski’s horse is the only wild horse still in existence. All other horse species and subspecies are either domesticated or feral. In the mid 1900’s it went extinct in the wild but thanks to conservation efforts it now has a small growing population in Mongolia. We intend to trace back the evolution of this species to its earliest known Equidae ancestor. In doing so we will investigate the environments its ancestors it inhabited, its ranges, and its adaptations to those environments, noting its evolutionary progression until modern times. Finally, we will conclude by investigating the current factors threatening the horse and how its wild population can be increased through conservation efforts.

Lindsey Snopek  
Mentor: Ashraf Saad, Computer Science and Information Technology  
*Comparison of Ants for Use in Robotic Study.*  
The purpose of this study is to determine the best species of ants for use in behavioral replication in robotic models. The end-goal of this research is to replicate the food searching behavior and communication of ants in robotic models. Several species of ants that included wood ants, tropical leafcutter ants, desert ants and forest ants were compared based on their method of food scouting. It was determined that wood ants are the best species to replicate due to their use of visual landmarks, tendency to follow walls or lines in scientific studies, and use of size and placement of landmarks in nature. This information will be used in implementation of further studies.

Lindsey Snopek  
Mentor: David Lake, Physical Therapy
Use of Virtual Games in Treatment of Children with Cerebral Palsy.

PURPOSE: According to the CDC, cerebral palsy is the most common motor disability in children. Cerebral palsy is defined as a disorder of movement, muscle tone or posture. It is characterized by impaired movement with exaggerated reflexes, floppiness or rigidity of the limbs and trunk, abnormal posture, involuntary movements, unsteadiness while walking, or a combination of these symptoms. With the increased availability of virtual reality gaming, it is hypothesized that active gaming systems will improve balance and gross motor function in children with CP.

METHOD: The databases PubMed, Medline, Cinahl, and Pedro were searched using the keywords “virtual rehabilitation,” “virtual reality,” “Kinect,” “Playstation,” “Nintendo Wii,” “video game,” “motion capture,” “physical gaming,” “computer gaming,” and “active video game” presented with the words “cerebral palsy.”

RESULTS: One hundred and ninety five articles were found. Studies were limited to randomized controlled trials (RCTs). Non RCTs and duplicates were removed, leaving thirteen. Of these thirteen, four were removed due to age or not being focused on function. Three studies found an increase in sitting ability and knee muscle strength. Four studies concluded that there was no significant difference in balance or function.

CONCLUSION: While there is some research that suggests a possible use of virtual gaming in therapy, there are others still that find no significant increases in function for children with cerebral palsy. Further research needs to be conducted.

**Genna Speed
Mentor: Helen Taggart, Nursing

The Impact of a Delirium Educational Intervention with ICU Nurses

Delirium is a frequently encountered condition in critically ill patients that has significant clinical impacts. Associated costs for patients impacted by delirium are higher, including a 39% higher ICU cost and 31% higher hospital costs. Critically ill patients experiencing delirium have higher mortality rates, higher rates of complications, and greater likelihoods of being discharged to skilled facilities. Delirium goes unnoticed in up to 72% of cases. Intensive care unit (ICU) nurses are postured to lead in the identification of delirium due to their continuous bedside presence. If ICU nurses are not aware of risk factors and presentation of delirium, the condition may go unrecognized, allowing for development of negative sequelae. The purpose of this study was to examine delirium knowledge levels of ICU nurses at a single level-one trauma hospital both before and after a tailored educational intervention. A pre-intervention/post-intervention study design in conjunction with a tailored educational intervention was utilized. Pre-intervention/post-intervention delirium knowledge testing was completed through the use of the Nurses’ Knowledge of Delirium Questionnaire (NKDQ). The results of pre-intervention testing were used to develop content of the educational intervention. The results indicated a significant difference in pre-intervention scores (M = 74.65, SD = 8.68) and post-intervention scores (M = 84.95, SD = 5.73); t(23) = -5.256, p = .000. These results suggest that an educational intervention does have an impact on ICU nurses’ knowledge level of delirium. Increasing the knowledge level of ICU nurses may assist in identification of delirium and limit negative sequelae associated with delirium.

Leslie Stieber
Mentor: Barbara Bruno, Anthropology
Laura Seifert, Anthropology

Engaging the Public and Youth in Archaeology and Anthropology: The Archaeobus Experience

Our perceptions of the world are controlled by our experiences; we should not limit them to our own cultural perspective or history, but look at other’s experiences and perceptions throughout history to increase our understanding of how things work. This helps the growth of our future. The purpose of the Archaeobus event is to educate the public and engage the youth in archaeology and anthropology. The project has many facets, developed as a way to reach out to the community to acquire a larger audience to interest them in historic preservation and cultural education. The Archaeobus Experience is a coordinated effort between several entities with the same goals. There is Armstrong’s grant-funded Digging Savannah Project, the focus of which is in the education of forgotten and destroyed archaeology sites that are vital to historical preservation. The Archaeobus itself is a project of The Society for Georgia Archaeology, to help us unite all persons interested in the archaeology of Georgia, and to work actively to preserve, study, and interpret Georgia’s human past. The Archaeobus experience increased comprehension of archaeology and anthropology for all ages. Increased participation from the initial Archaeobus event demonstrated the communities desire to learn about these subjects which allow us to increase the availability for education. All of this is to reach the goal of educating the public and youth about other cultures and the past, to help the growth of the future.

Joshua Suttle
Mentor: Priya Goeser, Engineering

The Steady Rest: A New and Improved Lathe Support

The objective of this project is to use the engineering design process to improve the existing design of a Steady Rest. This product – the Steady Rest is used in a G8688 Variable Speed Metal Lathe where it supports the long and small diameter metal stocks during the operation of the lathe. It has been observed that the holders in the current design cause considerable wear to the metal stocks over a period of time and use. Hence, the design intent for the improved product includes the following: the product must lock onto the lathe’s track, the product must support metal stocks and hold the stocks in a stable position, and lastly the holders of the steady rest must cause minimum to no wear to the stock. The original product was first modeled and analyzed in detail using SolidWorks, a Computer-Aided Design software. The primary parts modeled were the base, prongs, clamping screw, adjusting bolt, and locking bolt. These were then bought together in an assembly and tested to see if the product works in a manner similar to the original design. The design changes were then implemented and the modified model was analyzed. A finite element analysis (FEA) was performed to predict the potential stresses that act on the product. Currently, the final design has been completed and analyzed using SolidWorks and found to be as cost-effective as the original design yet with lesser wear on the metal stocks used.

Gestine Tablada
Mentor: David Lake, Physical Therapy

Yoga for Chronic Low Back Pain

Background/Purpose: Exercise treatments for chronic low back pain (CLBP) are widely used and usually recommended because they are relatively safe, inexpensive and accessible. One form of this exercise treatment is yoga. Some argue that the benefits of yoga may be greater than other forms of treatment because it offers a combination of physical exercise, mental focus, and
relaxation. Chronic pain presents many aspects and may involve physical, psychological and social dimensions. The purpose of this systematic review is to describe the effectiveness of yoga on treating CLBP compared to a control or another form of treatment.

**Methods:** Databases including PEDro, Web of Science, ProQuest Research Library, PubMed, CINAHL, AltHealth Watch, and Medline were used to find published studies through March of 2014 that examined the effectiveness of yoga in treating chronic low back pain. Only studies that were randomized clinical trials were included. Also, only studies that include subjects with CLBP lasting 3 months or more were selected. There are a total of eleven randomized control studies in this review that focuses on the treatment of CLBP using yogic practices.

**Results:** Majority of the studies found a statistically significant improvement in pain intensity and/or back function for the yoga intervention groups.

**Conclusion:** According to the studies examined, yoga is effective in improving CLBP and/or back function. Although these studies contradict on what aspects of the yoga treatment caused the improvement, they show greater improvements than the control group.

Matthew Tipton and Joy Creighton
Mentor: Scott Mateer, Biology

*Study of Catalytic Activity of Mutated Aldose Reductase, YDL124w, Employing Steric and Electrostatic Hindrance Within the Active Site*

Aldose reductases have a unique ability to produce chiral enantiomers with high stereospecificity. These are often of great importance in pharmaceutical research; companies are interested in these types of enzymes in an effort to produce purer drugs containing only the active enantiomer. One such reductase is YDL124w, an enzyme located in Saccharomyces cerevisiae. We want to study the catalytic activity of this enzyme. We are attempting to increase the enzymatic activity of YDL124w through mutagenesis of amino acids within the active site, specifically point mutations at residue 23 and residue 59, to create two new mutants: G23E and D59N. The rate limiting step has been shown by previous research to be the release of NADP+ from the YDL124w active site. G23E mutant is expected to sterically hinder NADP+ binding due to its residue’s nearness to the cofactor binding site. D59N mutant is expected to reduce NADP+ affinity by repulsion between the residue’s partial positive charge and the positive charge of NADP+. To ensure that the mutation was successful, DNA extraction and PCR will be performed on the mutated region as a more cost efficient method of detection.

Anna Tran and Ryan Goetz
Mentor: Mitch Weiland, Chemistry and Physics

*Development of an Undergraduate Biochemistry Laboratory Experiment: Protein Purification*

Protein purification is an essential technique used in biochemistry research that exploits the intrinsic properties of different proteins in order to isolate a macromolecule of interest. Most undergraduate biochemistry courses introduce purification in lecture, but a more complete understanding occurs when students are able to apply the concepts in the laboratory. This project describes the development of a laboratory experiment that introduces students to the concepts of chromatography and electrophoresis. The experiment uses three proteins, hemoglobin (Hb), bovine serum albumin (BSA), and lysozyme, which were chosen based on their pI values, shape in solution, and molecular weight. Additionally, all three are readily available and relatively inexpensive. In theory, size-exclusion chromatography (SEC) will separate lysozyme from Hb and BSA based on their shape and molecular weight and subsequent ion-exchange
chromatography will separate Hb from BSA based on their differing pIs. Furthermore, SDS-PAGE analysis of the eluted fractions will reinforce the differences amongst the proteins under denaturing/ non-denaturing conditions in addition to reduced/non-reduced conditions. This poster will describe the strategy employed and the progress that has been made.

Duong Vo and Emma Makatura
Mentor: Scott Mateer, Biology

Molecular mutagenesis to understand the effects of catalytic activity

The goal of the cell molecular lab project/research is to understand the effects of mutations on catalytic activity of the specific protein YDL124w. YDL124w is a yeast enzyme that is part of the superfamily of proteins known as Aldo-Keto Reductases. We are using the method known as mutagenesis in order to introduce the mutation in YDL124w. The method requires two rounds of PCR reactions that will make the mutation actually identifiable through the use of specific restriction endonucleases. This methodology is longer than some others such as DNA sequencing, but in the long run it saves quite an exuberant amount of money, and this is always a plus. The PCR process will change a single nucleotide in a DNA sequence, and this will change the amino acid residue at the specific site. This amino acid residue could possibly change protein YDL124w interaction with itself and its cofactor NADH. The research will change amino acid residue through two specific site, and these sites were highly conserved which means they hold some type of importance in protein structure. Protein conformation dictates its functionality, and so changes at these highly conserved sites means more than likely there will be an observable effect. These effects will be analyzed based upon the protein catalytic activity. The reason we want to understand the effects of mutation on catalytic activity is because this could potentially unlock many revenues in areas such as medicine, pharmaceuticals, and even industrial application.

**Shaileen Wallani and Britta Sterling
Mentor: April Garrity, Communication Science & Disorders

Evaluation of Clinical Measures Used to Treat Patients with Left Neglect Due to Damage in the Right Cerebral Hemisphere

Left neglect is defined as a lack of awareness of stimuli in the left side of a person's visual field, typically as a result of right hemisphere brain damage. The purpose of this research is to determine the efficacy of different left neglect treatments in order to support evidence-based clinical practice. A variety of treatment methods have been clinically evaluated for effectiveness and reliability. We reviewed 5 articles that focused on methods including: limb activation treatment, prism exposure, and scanning therapy. Limb activation, a method of left limb stimulation used in conjunction with visual cueing, produced improvements, especially when combined with contralesional limb vibration therapy (Pitteri, Arcara, Passarini, Meneghello & Priftis, 2013). Prism exposure via prismatic glasses, which are used to displace the visual field laterally, has the potential to result in long term improvements in neglect; it was also deemed beneficial when used during visuomotor activities used in daily living (Parton, Malhotra & Husain, 2004). Scanning therapy, where patients were asked to strategically view a task from left to right, displayed little generalization in decreasing neglect outside of the training environment (Parton, Malhotra & Husain, 2004). After investigating these three treatments, we found that although each one has its own merits, some may be better suited to individual clients based on their needs and attributes, whereas others may be a better fit for others. This research
investigated the strengths and weaknesses of these treatments, as well as their usefulness on different populations.

Blair Weaver
Mentor: Brent Feske, Chemistry and Physics

*Synthesis of the Pharmaceutical Bepreve using biocatalysis as the key asymmetric step*

Bepreve is an asymmetric pharmaceutical that is used to relieve immune response irritation associated with allergies. Since this drug is sold as a single enantiomer the asymmetric synthesis can be challenging. This presentation describes the synthesis of Bepreve using biocatalysis as the key asymmetric step. Enzymes have been identified that can reduce 2-(4-chlorobenzoyl)pyridine to the chiral (4-chlorophenyl)(pyridin-2-yl)methanol in high enantioselectivity. (4-chlorophenyl)(pyridin-2-yl)methanol can then undergo two addition reactions to afford the asymmetric pharmaceutical target.

Allison Williams
Mentor: Scott Mateer, Biology

*Domain swapping of the N-terminus of YJR096w and YBR149w*

Biocatalysis is the use of bacteria cells or their enzymes to produce pharmaceuticals. We study yeast reductases that can be used to asymmetrically produce chiral alcohols from keto-esters. Chiral alcohols are important precursor molecules for several pharmaceutical compounds. To improve our understanding on how reductases make chiral alcohols I am studying two model reductases, YJR096w and YBR149w. These highly related yeast reductases react differently when presented with the same keto-ester. We plan to switch the active site loop regions between these two enzymes to help us identify regions that play key roles in substrate specificity. The strategy is based on previous research on domain swapping that has been published. There is still much to accomplish in my research. We must make our mutants, verify mutant construction, and then start the analysis of the mutant catalytic activity. Success of this research will bring a new way of producing pharmaceuticals is a more efficiently.

Jessica Young
Mentor: Sara Gremillion, Biology

*Purification of the Varicella-zoster Virus Terminase Subunits*

The members of the Alphaherpesvirinae, Betaherpesvirinae, and Gammaherpesvirinae share a core set of 41 orthologous proteins. These core proteins include those required for DNA processing and packaging (i.e. DNA encapsidation). Three of these proteins make up the viral terminase complex and have been the subject of much recent research. For VZV, these include the small (ORF45/42) and large (ORF30) terminase subunits and the UL33 (ORF25) gene family. They are responsible for binding DNA sequences, hydrolyzing ATP for the translocation of DNA into the procapsid, and nicking the DNA to produce unit-length genomes. The terminase subunits have also become potential targets for the development of new antivirals. Therefore, compounds that target proteins involved in viral DNA encapsidation are a viable option for chemotherapy of the Herpesviridae. Toward this goal, it is necessary to express and purify the terminase components to (i) better understand their function in DNA encapsidation and (ii) develop antiviral screening assays. This project involved the expression of epitope tagged terminase subunits via recombinant baculovirus (rb) infected insect cells or in vitro transcription / translation. Crude protein extracts containing the individual tagged subunits can
be purified via immobilized metal ion affinity chromatography and analyzed via western blotting. We provide an example of the utility of this strategy by isolating highly purified VZV pORF25 from rbORF25 infected insect cell extracts.