1. Mission to Venus
Mai-Trinh Pham, Zachary Griggs, Chris Johnson, and Taj Ballinger, Department of Physics and Astronomy
The Mission To Venus (MTV) team proposes a planetary mission to: 1) search for evidence of current Venusian volcanic activity; 2) search for specifics about rocks and volcanic activity type at Iduun Mons; 3) identify specifics of Venusian surface structures; in an effort to better understand the contributors to Venus's greenhouse effect. Previous observations indicate that Venus' environment was forged by hostile greenhouse processes. When will Earth reach the tipping point where liquid water no longer exists and our current greenhouse effect will spiral out of control? What are the limits of the equilibrium on our planet to counter this devastating outcome? This mission proposes a year-long orbiter, 6 month-long balloon, and an hour-long lander mission to Venus, with science accomplished by magnetometers, an Alpha Particle X-ray Spectrometer (APXS), Gas Chromatography Mass Spectrometer (GCMS), thermal imager, descent imager, panoramic camera, drill camera, drill sampling system, and a radar system.

2. Ishtar Flagship Mission to Venus
Elliott Harrington, Angela Dapremont, and Winslow DiBona, Department of Geology and Environmental Geosciences
Can Venus provide clues to Earth’s early history? Venus has a wide range of geologic and atmospheric characteristics of interest for an exploration mission. Tectonic and volcanic activity over the course of the planet’s history can provide insights into planetary evolution, as can the study of surface and atmosphere interactions. We will implement an orbiter, two atmospheric balloons, and one lander to study Venusian characteristics. The primary landing site is located in Ishtar Plateau where balloons will permit the study of surface and atmosphere interactions and present day atmospheric conditions. Proposed instrumentation includes radar imaging (InSAR), spectroscopy (Vis-NIR, APXS, LIBS), atmospheric composition
(NGIMS, ASPERA-4), and seismology (Viking 1 Seismometers). This instrument package will allow for successful accomplishment of goals set by NASA, and will result in a greater understanding of the complexity and history of Venus and Earth.

3. EVOLVE: What can only Venus teach us?
Ryan Sullivan and Madysen Cheek, Department of Physics and Astronomy
The Exploring Venus’s Origin and EvoLution Via invEstigation (EVOLVE) mission is a multi-platform, scientific expedition that will conduct an energetic investigation of the planet Venus for four years. The transformation of energy from one form to another on the Venus may be characterized by studying its atmosphere and surface. Weather phenomena, such as the general circulation, will be explored in order to shed light on how momentum is transferred in the atmosphere. Measurements of the electromagnetic and mass spectra of the Venusian atmosphere will place constraints on its vertical and spatial chemical compositions. Surface and atmospheric temperatures will be monitored to parameterize the vertical and spatial distribution of heat on the planet, and to search for active volcanism. Visible and spectral imaging will be taken during descent by the aerial-surface element; this will produce unprecedented images of the Venusian landscape. The EVOLVE mission spacecraft is scheduled to launch in 2024.

Patricia Cooney, Erica Tracey, Melissa Hughes, and Chris Korey, Department of Biology
We are interested in developing the snapping shrimp, *Alpheus angulosus*, into a new laboratory model because of its brief embryonic development and relatively large embryos. As an adult, this species demonstrates lateralization of its two claws: one large snapping claw, and one smaller pincer claw. When threatened, the shrimp can switch claw lateralization by dropping its snapping claw and transforming the former pincer claw into a snapper. This process requires extensive rewiring of both motor and sensory neural components. Characterizing the neural development from embryo to adult will reveal how neural asymmetry in the claws develops and help us to understand the evolution of crustacean nervous systems. In this study, we observed embryonic nervous system development using antibody that highlights neural pathways. Thus far, we have examined embryos spanning Day 5 through Day 17 of development and will present initial characterization of the stages of neural development.
in *A. angulosus*.

5. **A Four Doublet Higgs Model**
   Timothy B. Hayward and Gardner Marshall, Department of Physics and Astronomy
   We present an extension of the Standard Model that includes four separate Higgs bosons. Models like this are motivated by the fact that the single Higgs boson in the Standard Model is only the simplest possible case and it is very likely that more complex scenarios exist. In this model the up-like quarks, down-like quarks and leptons all receive their mass through interactions with separate Higgs bosons. The masses, couplings and branching ratios of all particle content were investigated throughout parameter space. These predictions were checked against a number of experimental constraints and the model was found to be in agreement with all experimental restrictions.

6. **Architectural Damage to Public Buildings due to the Earthquake of 1886**
   Nicole Anderson and Steven Juame, Department of Geology and Environmental Geosciences
   The effect of the 1886 earthquake in Charleston on 7 public buildings were investigated and mapped in a Geographical Information System (GIS). Historical photographs were used to estimate the extent of the damage, and each building was given a ranking from 1-4 based on damage rankings in FEMA’s HAZUS natural hazard loss estimation software (1 being slight damage and 4 being complete damage). Out of 7 commercial buildings researched, 1 building was ranked 1 (slight damage), 3 buildings were ranked 3 (extensive damage), and 3 buildings were ranked 4 (complete damage). This data was added to a GIS map of damage to residential and commercial buildings previously created by K. Miner. For the buildings in this study, it was found that all were built on the same soil type, so variation in damage is largely due construction differences, and not the kind of soil they were built on.

7. **The Role of the Lateral Habenula in Behavioral Inhibition**
   Zana Elmaasarani, Peter Vento, and Thomas Jhou, Department of Biology
   An individual’s ability to withhold responses that lead to behavioral inhibition is impaired after extended exposure to drugs of abuse. Our group has recently found that lesions of the rostromedial tegmental nucleus (RMTg), a midbrain region implicated in aversive responses, causes
impaired behavioral inhibition in rats. It remains unknown what other brain regions contribute to the broader neural circuitry mediating this effect. The lateral habenula (LHb) sends dense excitatory projections to the RMTg, demonstrating similar responses to aversive stimuli. Accordingly, we hypothesized that the LHb plays a similar role in behavioral inhibition. Testing this, rats received electrolytic or sham lesions in the LHb and were tested for abilities to withhold lever-pressing responses for food reward while facing punishment via increasing footshock. Unlike RMTg lesions, we found no effect of LHb lesions on shock tolerance, suggesting that other regions are responsible for driving the RMTg role in behavioral inhibition.

8. Using shadowgraph method to investigate concentration-driven fluctuations in gold, silver, and silica colloidal suspensions
Danielle Masse and Ana Oprisan, Department of Physics and Astronomy
The direct visualization and analysis of concentration-driven fluctuations in nanocolloidal suspensions provide invaluable information about cooperative phenomena and the role played by fluctuations in a free diffusion process. Non-equilibrium concentration fluctuations in three nanocolloidal suspensions (silica, gold and silver) were recorded using a shadowgraph technique. A dynamic structure factor algorithm was used for image processing to compute the structure factor and the correlation time of the fluctuations. Based on the correlation time analysis we found the diffusion coefficients of each colloid. We compared the characteristic length and lifetime of these fluctuations using spatio-temporal sections of fluctuating images. Through this comparison, we found that the temporal fluctuation lasted longest in silver colloidal suspension and have the largest characteristic length in gold colloidal suspension. The analysis of these fluctuations allows us to gain more knowledge about the solubility, mobility, spatial and temporal evolution, therefore furthering the biomedical applications of these colloids.

9. A Preliminary Analysis of Complex Gamma-Ray Burst Pulses
Thomas Cannon and Jon Hakkila, Department of Physics and Astronomy
We present a preliminary analysis of previously unstudied gamma-ray burst pulses. Our sample consists of gamma-ray bursts observed between December 19, 1995 and February 2, 1997 by the Burst and Transient Source Experiment (BATSE) on NASA’s Compton Gamma-Ray Observatory. We found that the properties of these pulses are consistent with those of previously isolated pulses, despite the fact that the activity of Bursting Pulsar GROJ1744-28 caused BATSE’s trigger to be set higher than any
other time during its decade long mission. This activity created the unique sample set of gamma-ray bursts mentioned previously.

10. **Award of Merit - Sorption and Transport of Sildenafil in Natural Soils**
F. Garrett Boudinot and Vijay M Vulava, Department of Geology and Environmental Geosciences
Pharmaceutical Chemicals (PCs) mainly enter our ecosystems from discharged treated wastewater and have direct effects on the ecological health of that area. Sildenafil citrate (Viagra) is one such PC, whose presence has been reported in stream waters. Although one study has shown that sildenafil is not harmful to bacterial and fungal environments, there remains much unknown about its fate elsewhere in ecosystems. Given that sildenafil consumption (and concurrently disposal) is on the rise, it is essential that its behavior in the natural environment be better understood. The goal of this study was to quantify the sorption and transport of sildenafil in differing natural soils with varying compositions. Overall data indicate strong sorption of sildenafil to all soils, but stronger sorption to clay-rich soils. Strong soil sorption acts as a filter for water. These results suggest that little sildenafil will reside in groundwater once exposed to natural soils.

11. **The Explorer Project**
Robert Bryant, James Carroll, Evan Kosin, and Diana Luu, Department of Computer Science
Open Source software is a community based approach of software development that ensures free and open use to all people. One of the most rapidly expanding subsets of Open Source software is video games. Video games are often a reason that younger software consumers transition to software producers. This project is an opportunity to start and grow an Open Source project centred around a video game that allows participants in the community to access a modular code base that is easy to extend. The LÖVE 2D game engine was used as a well documented base for the game. Community standards for documentation and coding practices were created as well as a expandable base for community members that follow. A community wiki, GitHub repository and issue tracking system, IRC channel, and public Facebook page were created to allow for new community members to join the project.

12. **Mapping Eruption Facies from Cinder Cones and Associated Flows Using LiDAR, SW Utah**
Basaltic volcanoes are among the most common continental volcanic landforms. Due to their complex eruptive histories and processes, morphologies range from small pyroclastic mounds to extensive shield volcanoes. For this study, nine basaltic cinder cones in southwestern Utah were mapped using LIDAR data, existing geologic maps, and age data from the Utah Geologic Survey. Relationships between age, morphology, and composition were examined.

Our results suggest that relative age dating based on cone slope is unreliable. Vegetation cover and cone age were also found to correlate poorly. Slope and vegetation appear to be controlled by micro-climate and degradation. Flow compositions revealed a pattern of increasing silica content and alkalinity moving northward; northern magmas could be derived from sources with greater continental crust input, which is consistent with the greater abundance of quartz xenocrysts observed. Finally, flow length was correlated with calculated effusion rate rather than slope or variation in basaltic silica content.

13. Shoreline Change and Sediment Dynamics after Renourishment of Folly Beach, South Carolina
Robin Banner, Department of Geology and Environmental Geosciences
Folly Beach County Park, SC has a long history of chronic erosion. The park was renourished in 2013 and a terminal groin was built to prevent longshore transport of sediment. Bimonthly elevation surveys and photography were utilized to determine post-renourishment sediment dynamics. Our results revealed that immediately following the renourishment, lateral deflation lessened the beach slope. Afterwards, longshore transport to the southwest caused sand to accumulate updrift of the groin. The groin appears to be most successful at retaining sediment up to 350 meters updrift. Sand also migrated around the groin and was deposited on the upper beachface. However, as available updrift sand decreases, erosion south of the groin increases. The groin’s overall effect on downdrift beaches has yet to be determined. Dunes are also important in regards to maintaining a recreational beach. The dunes’ seaward extent has decreased dramatically and dune elevation has remained constant throughout the project period.

14. Neuroprotective effects of rasagiline in a double lesion model of Parkinson’s disease
Kelsey Cantwell, Heather Boger, Claudia Umphlet, Aurélie Ledreux, and
Ann-Charlotte Granholm, Department of Psychology and Program in Neuroscience, Department of Neurosciences and the Center on Aging, MUSC

Most published work with the monoamine oxidase (MAO) inhibitor rasagiline and disease modification in Parkinson’s disease (PD) has focused on the classical models of PD, including motor deficits associated with unilateral 6-OHDA (dopamine neurotoxin) lesions in rats. However, these models do not take into account the cognitive dysfunction seen with Parkinson’s disease (PD). We have utilized a model for progressive loss of both locus coeruleus noradrenergic neurons (LC-NE) and substantia nigra dopaminergic neurons (SN-DA) in rats, mimicking the cognitive and motor function impairments observed in PD. We hypothesize that rasagiline, and its metabolite, aminoindan, will have neuroprotective effects on cognitive and motor symptoms. Fischer 344 male rats were administered DSP-4 (a norepinephrine toxin), followed by bilateral intrastriatal 6-OHDA injections. Three weeks following, either rasagiline, aminoindan (3 mg/kg/day) or saline were delivered subcutaneously. Rats were tested in cognitive and motor function tasks three weeks into the drug treatment. Double lesioned rats treated with rasagiline and aminoindan exhibited increased motor velocity in a spontaneous locomotion task and enhanced performance in a novel object task. We conclude that rasagiline and aminoindan enhance spontaneous activity, exploratory behavior, and cognitive function. Supported by a grant from TEVA Neuroscience.

15. Modeling the Response of Neurons to Unconventional Stimuli

Davy C. Vanderweyen, Derek R. Tuck and Sorinel A. Oprisan, Department of Physics and Astronomy

Neurons are excitable cells that act as information processors by responding to changes in their electrochemical surroundings. These alterations set into motion a series of events that ultimately leads to a change in the voltage of the neurons. Thus affecting the likelihood that the neuron will produce action potentials, which are small propagating electrical impulses produced to relay information. We used a Hodgkin-Huxley model to investigate the effects that different types of stimuli characteristics have on the response of the neuron.

Our results suggest that the neuron modulates its frequency proportionally to changes in stimulus amplitude, but there is no linear relationship with changes in stimulus duration. We also observed that injecting the same amount of charge into the neuron yields different results based on the pulse’s geometrical shape. Our results also infer that information is encoded by
modulating the duration of the depolarization and repolarization of the action potential.

16. Sorption and Transport of Diphenhydramine in Natural Soils
Casey J. Rutherford and Vijay M Vulava, Department of Geology and Environmental Geosciences
Diphenhydramine- an antihistamine - is a pharmaceutical chemical that has been detected in streams and groundwater as a result of sewage overflows, runoff, or sewage treatment facilities unequipped to remove trace levels of pharmaceuticals. The objective of this study is to measure chemical binding and transport behavior of diphenhydramine in natural soils and determine its reactivity to soil components. Studies were conducted in the laboratory using natural soil collected from the Francis Marion National Forest. Equilibrium chemical binding patterns and reaction kinetic rates were measured using batch reactors, while transport behavior was measured using chromatographic column experiments. Kinetic experiments showed that diphenhydramine bound strongly to the clay-rich soils and reached equilibrium after seven days, compared to kinetic reaction rates of ten days in organic-rich soils. The results have implications for how diphenhydramine move in different soil environments, and eventually affect larger ecosystems.

17. Patient Specific Induced Pluripotent Stem-cells for Geotrophic Atrophy
Jacquelyn Joseph¹, Linda Jones¹ and Mark Fields²
¹Department of Physics, College of Charleston
²Storm Eye Institute, Medical University of South Carolina
Age-related macular degeneration (AMD) is the leading cause of blindness in the Western World. This vision loss stems from retinal photoreceptor cell death in the macular region of the retina. Mark Fields and his team are conducting research aimed to restore retinal function in those patients with advanced AMD. Rather then use embryonic stem cells for cell replacement therapy, they are using induced pluripotent stem cells. The idea behind iPSCs is that they are not controversial, as embryonic stem cells are, and they are not foreign to the patient’s body, avoiding the problem of implant rejection. They have been able to get confirmed stem-cell-like cells formed from skin-punch biopsies and are now looking working on their next objective: successful implantation of these iPSCs and restoration of the macula.
18. Using Hyperspectral Remote Sensing Data to Determine Phytoplankton Density in the Coastal Waters of Long Bay, SC
Elliott Harrington and Adem Ali, Department of Geology and Environmental Geosciences
The southeast coastal region is one of the fastest growing regions in the United States and the increasing utilization of open water bodies has led to the deterioration of the aquatic ecology, placing the future of these resources at risk. In coastal zones, a key index that can be used to assess the stress on the environment is the water quality. This is heavily influenced by optically active constituents (OACs) such as phytoplankton, total suspended matter, and colored dissolved organic matter. To support the sustainability and to better manage the resources, water resource managers need enhanced capabilities to monitor and understand the state of the conditions of water quality. Satellite remote sensing of the marine environment has become instrumental for environmental monitoring and impact assessment. In this study, a suite of ocean color algorithms are applied to high resolution sensor data to predict OACs in the coastal waters of SC.

19. Quantitative analysis of ECM proteins in vascular cell aggregates for application to scaffold-free tissue engineering
Cassandra Awgulewitsch¹, Agnes Nagy-Mehesz², Zoltan Hajdu², and Richard Visconti²
¹Biology Department and the Honors College
²Department of Regenerative Medicine, MUSC
Some medical conditions involve blood vessel damage; conventional treatments and even cutting-edge engineering methods face major drawbacks. Scaffold-free tissue engineering is an alternative engineering method in which the patient’s own cells are used to form blood vessels. These vessels must be both strong and elastic enough to withstand blood pressure. A functional extracellular matrix (ECM), composed of proteins, provides this strength. The goal of this project was to assess how different cell types in aggregates influence production of ECM proteins. We fabricated four groups of aggregates: (1) smooth muscle cells (SMCs), (2) SMCs with serotonin, (3) SMCs with endothelial cells, and (4) SMCs, endothelial cells, and fibroblasts. We evaluated ECM protein production using the western blot procedure. Mixed aggregates in Groups 3 and 4 showed increases in ECM protein production compared to Group 1 aggregates. These results provide insight into the best cell type combinations to achieve optimal ECM production.
20. **Award of Merit** - General Relativistic Radiation Hydrodynamic Numerical Simulations of Multidimensional Accretion onto a Black Hole
Ally Olejar and P. Chris Fragile, Department of Physics and Astronomy
We use the state-of-the-art, astrophysics numerical code Cosmos++ to gain insight into black holes and black hole accretion disks. We investigated black hole accretion disk systems which exceeded the Eddington Limit, the maximum luminosity an astronomical object can have while maintaining hydrostatic equilibrium. Astronomers have observed objects (particularly black hole systems) that exceed this luminosity, which suggests that the proposed Eddington Limit may not restrict nature at all. We look for inhomogeneities in these accretion flows that may facilitate energy and mass loss, enabling the system to maintain equilibrium while exceeding the Eddington Limit. Throughout all simulations we note how much matter reaches the black hole compared to how much matter is caught in the outflows.

21. **Characterization and Quantification of black carbon in wetland soils in Big Cypress National Preserve in Southwest Florida**
Kyle Bostick and Vijay Vulava, Department of Geology and Environmental Geosciences
Black carbon (BC), partially combusted organic matter, is resilient to chemical, thermal, and biotic degradation. BC participates in environmental processes such as chemical sorption and long term carbon storage. BC quantity and characteristics was analyzed for the Big Cypress National Preserve (BCNP). 12-inch cores were extracted at ecologic boundaries along Turner River in BCNP. Ten grams of sample from each core were processed with a chemo-thermal-oxidation method, where BC was quantified. BC was imaged via SEM and characterized as charcoal or soot. Charcoal particles are large (400-900 µm) and retain cellular structure. Soot particles tend to be small (5-10 µm) and are semi-spherical particles. Soot was abundant in the sawgrass soils, ~13 wt. % BC. Pineland soils, were mostly enriched with charcoal particles, ~7 wt. % BC. It is possible to use BC as a proxy for the history of wildfires and climate change.

22. **The Batwing: The Catalyst Gotham Deserves**
Carson W. Reed, Travis P. Varner, Richard A. Himes, and Justin K. Wyatt, Department of Chemistry and Biochemistry
During the synthesis and development of new carbon-carbon bonds in molecules (such as polymers and pharmaceutical drugs), it is vital at times to
utilize a catalyst that will exhibit control over the reaction and the stereochemistry of the desired product. More specifically, organometallic complexes of this nature are currently being used to catalyze the formation of polysterenes. A novel bis-indenyl “batwing” ligand metal complex is being designed and synthesized to increase the control on stereochemistry when synthesizing such polymers. Further modification of the batwing ligand with chiral moieties may also lead to enhanced enantioselectivity.

23. Spatial and temporal expression of karyopherins IPO5 and IPO13 in the sea urchin *Lytechinus variegatus*
Ross Baker and Melanie Overcash, Department of Biology
The karyopherin-beta family of transport proteins binds to other proteins and transports cargo into the nucleus through the nuclear pore complex, making them essential for basic cell functions. This study focuses on characterizing the temporal and spatial expression of karyopherin-beta proteins importin 5 and importin 13 in the sea urchin *Lytechinus variegatus*, through the process of reverse transcriptase PCR (RT-PCR) and in situ hybridization. In other organisms, we know that importin 5 is necessary for the transport of histones that package DNA into nucleosomes and that importin 13 facilitates transport of translation initiation factor 1A. Hopefully, through these studies, we will be able to determine when and where these genes are expressed in the developing embryo of *Lytechinus variegatus* and form preliminary hypotheses about their roles in developmental processes. This information may also expose new and previously unknown roles of these transport proteins pertinent to the development of other organisms.

24. The Effect of Noise on Timing Network Response
Derek Novo¹, Sorinel A. Oprisan¹, and Catalin V. Buhusi²
¹Department of Physics and Astronomy
²Department of Psychology, Utah State University
Timing in the seconds-to-minutes range (interval timing) is crucial for rate estimation, decision-making and foraging and has been demonstrated in many species, from invertebrates to vertebrates. Deficits in interval timing have been reported in a series of neurological disorders, including Parkinson’s, Huntington’s, and schizophrenia. We implemented a computational model of interval timing that mirrors the thalamo-cortico-striatal loops involved in interval timing. Our striatal beat frequency (SBF) model correctly reproduces peak interval (PI) experimental results. We showed that, in the presence of noise, the output is (i) Gaussian, (ii) accurate, and (iii) has a width proportional to the criterion time $T$. 
25. **Energy-Efficient Lighting in Theatre: Are Smart Reflectors an Answer?**
Benjamin Fetterolf and Linda R. Jones, Department of Physics and Astronomy
The halogen incandescent lamp is the industry standard in theatre spotlights because of excellent color rendering, throw, and natural color shifts while dimming. Unfortunately, a good deal of their energy is wasted as heat. Consequently, replacement bulbs such as light-emitting diodes and compact-fluorescent lights are being developed for theatre lighting. However under the dynamic conditions of theatre, there are still problems to be overcome. In this research, possible enhancers of LED light—a simulated diffraction grating (compact discs), a prism, and colored reflectors—were tested. It was found that the colored reflectors make the most pronounced and selective difference in the output. Therefore it is proposed that future research focus on the design of tunable colored reflectors to selectively alter regions of the LED output spectrum to create more natural-appearing light and more natural shifts in light during dimming.

26. **The Influence of Carbon Nanotubes on Solvent-Driven Polymer Assembly**
Philip Philiphose and David Boucher, Department of Chemistry and Biochemistry
Composites of poly(3-hexylthiophene) (P3HT) and carbon nanotubes (CNTs) are promising candidates for next-generation, polymer-based photovoltaic and thermoelectric devices. The structural order (crystallinity) of P3HT/CNT assemblies formed in solution is significant in determining the morphology and photophysics of the photoactive solid-state materials. To control the structural order within P3HT/CNT systems, we exploited the properties of binary solvent mixtures to drive the assembly of poly-(3-hexylthiophene) (P3HT) into nanofibrillar structures that may incorporate CNTs as a nanoscale scaffold. We used absorbance spectroscopic techniques to investigate the differences between the crystallinity and the kinetics of formation of P3HT assemblies and P3HT/MWNT nanohybrid structures in several binary solvent mixtures.

27. **Exploring Adaptive Gain Theory through Economic Demand**
J. I. Osborne¹, B.S. Bentzley², Z.A. Cope², E. Vazey², B.L. Roth³ and G.S. Aston-Jones²
Adaptive gain theory suggests that explorative-exploitive behavior observed in response to changes in task demand and utility is correlated with tonic firing of the locus coeruleus. We employed a within-session behavioral-economic procedure to assess changes in demand for cocaine as a function of price. The maximum price that maintains increases in response rate is Pmax. We hypothesized that increased tonic discharge of locus coeruleus-noradrenergic neurons would initiate task disengagement at a lower Pmax. Locus coeruleus-noradrenergic neurons were tonically activated using an excitatory DREADD (Designer Receptors Exclusively Activated by Designer Drugs). After self-administration training, animals were randomized to receive one of three doses of the selective DREADD agonist, clozapine-N-oxide before testing. A decrease in Pmax in response to CNO would provide evidence for a causal role of the locus coeruleus in modifying behavior in response to changing task demands and utility. A trend toward CNO decreasing Pmax was observed (n=5, p<0.10).

28. Post Mortem Muscle Softness in the Spotted Seatrout *Cynoscion nebulosus*: Effect of the Myxozoan parasite *Kudoa inornata*
Candice Alge, Eric McElroy, and Isaure de Buron, Department of Biology
*Kudoa inornata* is a myxozoan that infects the skeletal muscles of the spotted seatrout, *Cynoscion nebulosus*. A previous study in our laboratory indicated that infected wild fish displayed increased post mortem flesh softness when compared to non-infected fish (mariculture raised). We hypothesized that infection by *K. inornata* was at the origin of the difference in flesh softness observed. Plasmodium density, plasmodium area, and spore density were determined from biopsies of seatrout previously tested for muscle softness (3 biopsies per fish, N=33). Results indicated that spore density was positively correlated with plasmodium density and area. Although muscle softness was not correlated with spore and plasmodia densities, data suggest that the larger the plasmodia, the softer the muscle is. Hence, the older the infection in a fish, the higher the post mortem muscle softness may be. Since old infection may occur in larger (older) fish, this may be of concern to anglers.

29. Award of Merit - A Musical Introduction to Functional Programming: Teaching the Nyquist Programming Language within
Audacity
Joseph Black, Matthew Lannan, Justin Wooton, and John Youngblood,
Department of Computer Science
Computers and technology have become ubiquitous in society; this fact has
forged the belief that the study of computer science must become an
essential aspect of basic education. Unfortunately, fundamental computer
science instruction is rarely offered prior to the later stages of education; and
even so, purportedly entry-level textbooks and materials are still tailored to
computer science academia and not necessarily easily digestible by non-
academics. To help encourage computer science education among those who
may not have necessarily had the opportunity to learn the basics, an
alternative type of introductory textbook for functional programming was
devised. This online textbook uses music as a means to an end; that end
being fundamental computer science education. Using Nyquist - a sound
synthesis functional language - with Audacity - an open-source digital audio
workstation - this textbook compels the interested musician to become the
future computer scientist.

30. Acute toxicity of naproxen and its degradants on southern toad
tadpoles
Sarah Turner¹, Jonathan Brown¹, Allison Welch¹, Jessica Ramirez² and
Wendy Cory²
  ¹Department of Biology
  ²Department of Chemistry and Biochemistry
Pharmaceutical pollution is an emerging environmental issue. Many
pharmaceuticals that pass through the body are not completely removed
during wastewater treatment, and are ultimately released into the
environment. Naproxen, a widely used pain reliever, has been detected in
natural waterways around the world. When exposed to sunlight, naproxen is
converted into two compounds, known as photodegradants, which are
predicted to be more toxic than naproxen itself. We tested the toxicity of
these three compounds on southern toad tadpoles during acute (96 hours)
and chronic exposures (until metamorphosis). Acute toxicity of the second
photodegradant proved to be six times more toxic than both naproxen and
the first photodegradant. During chronic exposures at lower concentrations,
both photodegradants reduced tadpole survival and growth to
metamorphosis, while all three compounds reduced tadpole survival through
the metamorphic phase. These results suggest that the degradation of
naproxen in the environment may increase risk to freshwater organisms.
31. The Effect of Temperature Change on Oxygen Binding to Hemoglobin
Allison Sullivan and Linda Jones, Department of Physics and Astronomy

Low level light therapy is a medical treatment that utilizes near-infrared light for the relief of chronic pain and inflammation as well as the stimulation of wound healing. The purpose of this study was to determine whether changes in temperature caused by illumination could be the major factor in the effectiveness of near-infrared light therapy. In this project, isolated hemoglobin was placed in an air-tight container where it was then treated with heat. Temperature, dissolved oxygen, and bound oxygen were monitored simultaneously with the use of a temperature probe, a fiber optic dissolved-oxygen probe, and a fiber optic reflectance spectroscopy system. The data concluded that increased temperature resulted in a decrease of bound oxygen and an increase of dissolved oxygen from the hemoglobin. In order to confirm the role of temperature, the results of a preliminary experiment of oxyhemoglobin treated with illumination will also be presented.

32. Statistical Analysis of Raindrop Arrival Times
Cassidy Jenks and Michael L. Larsen, Department of Physics and Astronomy

Commercial raindrop disdrometers are readily available but expensive. Consequently, a low-cost alternative capable of resolving individual raindrop arrival times and sizes is desired. An audio recording was taken from beneath a metal pan in the rainfall. This recording was used to create a time series of arrival times. Then, a statistical analysis of raindrop arrival time was completed. Results from rainstorm data taken in early 2014 are consistent with current rain theory, however more precise data with a smaller dead time is desired.

33. Developing for an Open Source Software Suite
Hannah Lyhne, Jeremy Jones, Tomoko Goddard, Joshua Bruce, and Steven Pilkenton, Department of Computer Science

Libreoffice is an open source free office suite that is very open to outside help. The software is obtained by anyone that wants to develop through github which is a repository that makes it easy to keep up with different versions of software. Our team started with summarizing comments on the development wiki to ease bug fixing for developers. Soon after we started to look at bugs to fix ourselves after the most recent update. Our bug fix focus has been on an error with the right to left nature of other languages in their
writing software.

34. Implementing the Galerkin Method in Cosmos++
Thomas Briggs and Chris Fragile, Physics and Astronomy
The Nodal Discontinuous Galerkin Method (NDG) is a finite element method by which systems of partial differential equations can be solved with a higher degree of accuracy compared to the finite difference and finite volume methods currently used in Cosmos++, Dr. Fragile's astrophysical code. Currently, an extensive C++ library is under construction with the capabilities to solve one-dimensional systems of partial differential equations utilizing the NDG method. The ultimate goal is to provide an option within Cosmos++ to select either a finite difference or NDG method by which to solve the desired equations.

35. KiwiIRC
Paul Shahid, Sydney Aiken, Chris Taylor and Randy Jiminez, Department of Computer Science
KiwiIRC is a lightweight and versatile open source web based IRC client. It allows users to open a browser window and begin chatting, without the need for downloading files or installation of software. Many online communities use IRC, and the feature rich and free KiwiIRC is a great solution. Contributors are able to improve features or correct bugs through GitHub by submitting pull requests. Pull requests are then reviewed and discussed by the creators for possible integration. Several bugs were addressed for KiwiIRC, with some being accepted into the code base. The example bug, #381, would show the server page, instead of the previous tab, whenever a tab was closed. The experience gained by contributing to this open source community has given the group exposure in addition to expanded code and software knowledge.

36. Efficacy of Oxidative Stress Treatments on Human Squamous Cell Carcinomas
Alexander Cattran¹, Linda Jones² and Anna-Liisa Nieminen³
¹Department of Biology
²Department of Physics and Astronomy
³MUSC College of Pharmacy and Biomedical Sciences
I have tested the efficacy of different types of oxidative stress treatments on human head and neck cancer cell (HNSCC) lines both in vitro and in vivo. A large portion of the experiments were run using photodynamic therapy (PDT). PDT is a treatment in which a photosensitizer is used to
make tissues and cells susceptible to certain wavelengths of light so that a laser can then be used to target only the cancerous tissues. The main photosensitizer used was phthalocyanine, or Pc4. One challenge of photosensitizers is that they are not specific to any particular tissue; they will diffuse into their surroundings and be taken up by the entire body. One way to overcome this is to use a targeted drug which utilizes nanoparticles to aid in transport into the cancerous cells. The targeted drug was shown to be much more effective in killing the cells.

37. Microplastic Particles in Marine Food Web of Charleston Harbor
Jessica Barber and Philip Dustan, Department of Biology
We examined the abundance of microplastic in the bodies of zooplankton in Charleston Harbor. Plankton net samples were collected at the City Marina, near the mouth of the Ashley River, on an incoming tide. Zooplankton were isolated using size fractionation, digested with strong acid-base chemistry, and examined with Epifluorescent microscopy. Our results indicate that zooplankton consume microplastic regularly and that there is a high prevalence of microplastic in Charleston harbor implying that it is becoming incorporated into the grazing marine food chain that is the basis of life in the sea.

38. Photodegradation Mechanisms of Vardenafil and Sildenafil
Logan Herbert and Wendy Cory, Department of Chemistry and Biochemistry
An understanding of the solar photodegradation of pharmaceuticals is an important part of assessing the overall environmental fate of these emerging contaminants. Investigations into how they degrade and what new compounds are formed are important in order to assess any potential toxicity to human or aquatic life. In this work we have studied the solar photodegradation of vardenafil and sildenafil, the active ingredients in Levitra and Viagra. Aqueous samples were exposed to simulated solar light then analyzed by HPLC and ESI-LC-MS to determine both the rates of photodegradation and the products of the reaction. Proposed mechanisms for the photodegradation of both compounds were developed from the MS data.

39. Oscillation of circadian genes in response to a simulated tide in the starlet sea anemone, Nematostella vectensis
Carissa James and Elizabeth Meyer-Bernstein, Department of Biology and Program in Neuroscience
Animals display endogenous rhythms in physiology and behavior that are
governed by a self-sustaining biological clock. The most widely studied of these biological clock outputs, circadian rhythms, have an approximately 24 hour period and are synchronized to the environmental photoperiod. In intertidal marine organisms, non-photic environmental cues such as tidal oscillations can also generate rhythmic behavior. We have observed circatidal behavior in the starlet sea anemone, *Nematostella vectensis*, when exposed to a simulated tide in the laboratory. To determine whether known genes of the circadian clockwork also underlie this circatidal behavior, we have analyzed patterns of gene expression in *N. vectensis*. Presence of a simulated tide concurrent with a photoperiod altered rhythms in gene expression significantly, suggesting a role for known circadian genes in the generation of multiple frequency biological rhythms.

40. **Award of Merit** - Experimental infection of a potential cyclopoid vector of *Anguillicoloides crassus*, an invasive parasite of the American eel

Ian M. Hubbard, Jennifer L. Hein, David Knott and Isaure de Buron, Department of Biology

The development of *Anguillicoloides crassus*, an invasive nematode parasite of the American eel, was studied via the experimental infection of a cyclopoid copepod. The life cycle of this worm has never before been studied in North America, where no vectors were heretofore known. *L₂* larvae from *A. crassus* were obtained from swimbladders of infected eels captured locally. Copepods were collected from Goose Creek and exposed in groups of 10 to larvae at either 21°C (N=4) or 26°C (N=3). After 24 hours, infected copepods were separated and maintained at their respective exposure temperatures to monitor larval development from *L₂* to *L₃* stages. Infection prevalence of copepods kept at 21°C and 26°C was 85.6% and 88.9% respectively. Copepod mortality was highest in 72 hours post exposure (50-80% for both temperatures). Larvae grew faster at 26°C and molted into the *L₃* stage in 6-10 days in contrast to 11 days at 21°C.

41. **Preliminary analysis of a hydrothermal vent chimney, El Guapo**

M. Montgomery Taylor, Robert L. Nusbaum and Leslie R. Sautter, Department of Geology and Environmental Geosciences

An inactive 1-m tall hydrothermal vent chimney was collected at the base of a massive 17-m chimney, El Guapo, using the robotic vehicle ROPOS from aboard the research vessel Thompson. This small chimney, nicknamed El Lindo, was located on Axial Seamount, an active deep-sea volcano 300 miles off the Newport, Oregon coast. The chimney was collected during the
University of Washington’s VISIONS ’13 Expedition, part of the NSF-funded Ocean Observatories Initiative (OOI). Working on a longitudinal ½ slice of the chimney, elemental analysis was performed on fragments of its rind and inner mass using a SEM TM-1000. The chimney’s growth patterns were evaluated and its mineralogy was analyzed, revealing a number of different sulfide and clay minerals formed by hydrothermal alteration of mafic rock present at the volcanic region. Secondary mineralization was also present in the form of vugged-structures on an oxidized rind.

42. Beyond the Habitable Zone
Carter Rhea and Cassandra Runyon, Department of Geology and Environmental Geosciences
The search for extraterrestrial life depends on a deep understanding of geologic processes which create conditions necessary for life. Magnetic fields, plate tectonics, and volcanoes are the most important processes because together they influence the climate of a planet. Planetary climate governs the ability of life to develop on a celestial object. Mars and Europa are prime examples of planets which indicate past or present life that previously or still exhibit a strong magnetic field, volcanoes, and plate tectonics in one form or another. The search for extraterrestrial life should not be restricted to planets within the habitable zone, but rather encompass planets exhibiting the necessary geologic prerequisites for life.

43. Cortisol Levels in Response to Physiological Stressors as a result of Chronic Neuropathic Pain
Shannon Lyons¹,², Chantelle Ferland², Arthur Riegel²
¹ Department of Biology and Program in Neurosciences and Honors College
² Department of Neuroscience Medical University of South Carolina
The interaction between chronic pain and severe stress is of particular importance considering the increased population experiencing neuropathic pain. We studied the impact of acute and chronic stress on corticosterone levels in rats. Animals underwent spared nerve injury (SNI) surgery or served as sham or naïve controls. The SNI procedure induces physiological stress that can be measured 1 day (acute) or 28 days (chronic) post-surgery. Each animal’s plasma was tested using radioimmunoassay to determine corticosterone levels. While SNI surgery resulted in an increase in corticosterone in both groups as compared to controls, chronic pain rats had a significant reduction as compared to the acute pain rats. The corticosterone reduction in chronic stress rats may be explained by prolonged activation of
the hypothalamic pituitary adrenal axis negative feedback loop. This experiment provides insight into the effect of prolonged stress which may lead to future treatment therapies for neuropathic pain.

44. Photodegradation of Loratadine in Simulated Natural Water Samples
Adam Jenkins and Wendy Cory, Department of Chemistry and Biochemistry
The increasing use of prescription drugs and over-the-counter medicines has resulted in the detection of these compounds in our water supplies at trace levels. This has led to concerns about the effects of exposure to the aquatic ecosystem and on public health. In this research, we investigated the environmental fate of a widely used antihistamine, loratadine (LRD.) Studies included the photodegradation of LRD in aqueous solution with humic acid (HA) to simulate natural water systems. In order to quantitatively and qualitatively study this photodegradation, we measured the solar photodegradation rate of LRD and identified the products of this photodegradation using high performance liquid chromatography (HPLC) and liquid chromatography-mass spectrometry (LC-MS).

45. Sexual dimorphism and size differences between mated and unmated males in the pycnogonid Tanystylum orbiculare
Justin Skinner and Robert Podolsky, Department of Biology
In many species, the male’s role in reproduction is limited to fertilizing eggs. Because females have fewer gametes, males often compete for access to females, and females are often choosier. Darwin recognized that either form of sexual selection can result in sexual dimorphism. Pycnogonids (sea spiders) are unusual because males carry and care for eggs they collect from females. To understand whether this reversal in parental care influences sexual dimorphism in Tanystylum orbiculare, we compared size measurements between males and females and between males with and without eggs. Males were smaller than females in leg but not body size measures. Mated males, however, were larger than unmated males in most body and leg measures. Among mated males, larger males carried greater volumes of eggs. Thus, although larger males appear to be favored by females, this does not appear to have resulted in sexual size dimorphism as predicted by Darwin.

46. Stimulus velocity encoding by primary afferents in the wind-sensitive cercal systems of three cockroach species and the house cricket
Anne C. K. Olsen and Jeffrey D. Triblehorn, Department of Biology and
Program in Neuroscience
Extracting information from the environment is an important function of sensory systems. Three species of cockroaches (*Periplaneta americana*, *Gromphadorhina portentosa*, and *Blaberus craniifer*) possess almost identical neuroanatomical makeups, but exhibit different escape responses to wind generated by a predator. These behavioral differences may result in different sensory processing of wind in these species. Previously, our lab discovered that wind evoked more activity in the wind-sensitive interneurons (WSIs) of *P. americana* and *B. craniifer* than of *G. portentosa*. To determine whether these differences in WSI activity related to afferent input, we performed extracellular recordings on the wind-sensitive afferents of the roaches. We also tested the house cricket, *Acheta domesticus*, to examine the relationship between afferent responses and number of wind-sensitive hairs and further our comparative analysis. Stimulus-Response curves were generated for all species and showed that afferent input contributes to the differences in WSI responses.

47. **Phosphorite Analysis and Provenance using SEM, Reflectance Spectroscopy, and Petrography, Charleston, SC**
Kyle S. Schultz, and Robert Nusbaum, Department of Geology and Environmental Geosciences
Charleston area phosphorites themselves are largely uncharacterized. The phosphorites in this area range in color from brown/tan to grey/black, referred to as Type 1 and Type 2. This study focuses on the character of eight phosphorites collected from Pleistocene fluvial sand locations. Type 1 samples displayed a higher content of clay minerals, collophane cement, and larger quartz clasts. Type 2 samples were higher in higher carbonate matrix/cement along with collophane and angular quartz clasts. Accessory mineral constituents proved useful for provenance analysis, zircon, allanite, and monazite suggest a granitic source rock. Abundant clay minerals identified using reflectance spectroscopy includes kaosmectite mixtures. The samples collected indicate reworking of originally marine phosphorite (Paleogene) with terrestrial input. The mineralogy is consistent with a Piedmont provenance, followed by episodes of Ca-phosphate cementation. It appears that clasts in Type 1 and 2 phosphorites have slightly different histories, with greater terrestrial input for Type 1.

Kyle S. Schultz, Department of Geology and Environmental Geosciences
Bathymetric surveys were conducted by the University of New Hampshire in to visualize the seafloor of the Arctic Basin. The purpose of analyzing these data is to characterize the bathymetry to facilitate an accurate resolution for the UN Convention of the Law of the Sea (UNCLOS). Bathymetry can be used to reveal sections of ridge systems and other features on the seafloor to determine the continental margin to which sections of the basin belong. These decisions are crucial to identify the extent of Economic Exclusive Zones. The depth of the seafloor in this study area ranges from 1800 to 4000 meters. The shallower portion lies on the border of where a number of previous surveys have been conducted. This shallow region gradually deepens into a broad relatively flat area that contains a channel-like feature with a relief of 20 to 50 meters, and is the primary area of interest.

49. Sorption and Transport of Triclosan in Natural Soils
Jennifer Brennan and Vijay Vulava, Department of Geology and Environmental Geosciences
Triclosan (5-Chloro-2-[2,4-dichlorophenoxy]phenol) is a complex organic compound that is used as an antibacterial agent in many common personal care products such as toothpaste and soap. Its presence in the environment is entirely a result of human activity, but little is known about the behavior of this chemical in the environment. The main objective of this study was to determine sorption and transport of triclosan in natural soils using column experiments. Experiments showed that triclosan sorbed strongly to soils with the highest organic content, and less strong in soils with low organic content. Therefore, triclosan can be relatively contained as a pollutant when exposed to organic soils.

50. Photodegradation of Diphenhydramine in Simulated Natural Water Samples
Aliya Dumas and Wendy Cory, Department of Chemistry and Biochemistry
Consumers are increasingly concerned about the presence of pharmaceutical agents in the public water supply and their potential effects on both aquatic and human life as well as the environment. Active compounds in surface waters are exposed to UV light, which can lead to degradation and the formation of structurally related compounds. Diphenhydramine, a first-generation antihistamine with sedative properties, is found in many commercial allergy and sleep aid products. In this work, the photodegradation of diphenhydramine using simulated sunlight in the presence of humic acid was investigated. Rates of degradation were
determined after analysis of samples using HPLC.

51. Synthesis of a Novel Triazole Antibiotic
Ryan Murphy and Amanda Wimbish, Department of Chemistry
We tested multiple different synthetic schemes in order to design a new triazole antibiotic to be used as a topical agent. 3,4-dimethoxybenzoic acid was first converted into a phthalide through electrophilic aromatic substitution and Fischer esterification. The phthalide was treated with various strong bases but formation of a stable carbanion was not observed. A second synthesis with p-anisic acid involved conversion of the carboxylic acid to an amide, followed by subsequent carbon activation and addition of an aldehyde. Addition of the aldehyde to the aromatic ring was not observed in yields over 30%. A third scheme included a Michael addition to the aromatic ring of p-anisic acid through ethyl acrylate, which resulted in poor yields.

52. Blind Date Biology: Does it have to be a perfect match?
Joseph Karam¹, Jomel Jacinto¹, Garrett Mitchener², Gilbert Ariani³, and Renaud Geslain¹
¹Department of Biology
²Department of Mathematics
³Architecture et Réactivité de l'ARN, Université de Strasbourg, Institut de Biologie Moléculaire et Cellulaire, Strasbourg, France
Genetic translation is the universal mechanism that allows the biosynthesis of cellular proteins. The main components of this machinery are the ribosome, the messenger RNA, the transfer RNA (tRNA) and the aminoacyl-tRNA synthetases (aaRS). aaRS are responsible for the transfer of 21 different amino acids onto their respective tRNA. tRNA have virtually identical 3D structures which makes tRNA discrimination by aaRS a true molecular conundrum. By textbook standards, we are taught that aaRS and tRNA must perfectly match; however, a growing body of evidences suggests that aaRS - tRNA mismatches happen at a significant rate. This study aims at identifying the subset of *Saccharomyces cerevisiae* tRNA able to interact with *S. cerevisiae* Arginyl-tRNA synthetase (ArgRS). Our approach combines aaRS - tRNA binding assays and screening via tRNA microarrays. This is the first time a genomic approach (as opposed to one tRNA at a time) is designed to study aaRS - tRNA interactions.

53. An Interpretation on Spectra of Various Tephra Samples: A comparison Between Rhyolite and Dacite Compositions
Reflectance spectra, particle size, and geochemistry were analyzed to identify differences in absorption features between rhyolite and dacite tephra composition. Samples analyzed include tephra from the 1912 Novarupta eruption in Alaska, the 1980 Mount St. Helens eruption, and 760 ka Bishop Tuff (CA). Results indicate that sample grain size directly affects the spectra, yet even when samples of a similar grain size were analyzed, a difference still existed between rhyolite and dacite compositions. Spectral absorption feature depths provided the most diagnostic differences. Possible causes for these differences were further studied using thin sections, published chemical data, and results from particle size analysis. Preliminary interpretation suggests that spectral absorption feature depth is probably a function of water content in the tephra glass. The samples have recently been sent to Washington State University for XRF analysis, which will more accurately determine tephra composition and water content of tephra.

54. Subpixellation and the Hubble DICE Survey
Benjamin Wilson and Joe Carson, Department of Physics and Astronomy
We present a status report on computational improvements made on a sample of stars observed with the Hubble Space Telescope. Our data set is a collection of 11 stars that contain circumstellar debris disks. In particular, we utilize a customized version of a subpixellation protocol known as Drizzle which provides measurable improvements to the quality of our data. This increase in data quality highly correlates to the improved probability of identifying fine disk structures that may indicate the presence of planet formation. These results will directly inform upon the posited planet formation mechanisms that occur after the ~ 10 My epoch of gas depletion, a time in our solar system when giant planets were migrating and terrestrial planets were forming, and directly test theoretical models of these processes.

55. The Gale Crater Mound in a Regional Geologic Setting: Comparison of Wind Erosion in Gale Crater and Within a 1000 km Radius
Angela Dapremont, Carlton Allen, and Cassandra Runyon, Department of Geology and Environmental Geosciences
The Curiosity rover is currently exploring Gale Crater on Mars. A variety of geologic features, including wind erosional features called yardangs, are present at Gale and in the Medusae Fossae Formation (MFF) units within a 1000 km of the crater. This study compares yardangs in two geologic units within Gale to those in the MFF. Yardangs in the lower mound of Gale are
consistently N-S in orientation, suggesting an eroding wind from the south during their formation. The upper mound of Gale exhibits more diverse orientations including N-S, NE-SW, and NW-SE. The most abundant yardang orientation in the MFF is NW-SE. MFF yardangs are most closely related to the upper mound of Gale, suggesting a potential correlation in their sediment erosion histories.

56. **The effects of the parasites *Kudoa inornata* and *Cardicola laruei*, on cold tolerance of the spotted seatrout, *Cynoscion nebulosus***

David Smiley, Katie Anweiler, and Isaure de Buron, Department of Biology

In the past decade, several large scale spotted seatrout kills occurred in South Carolina’s estuaries. These die-offs appear to be correlated with extremely cold winters. The spotted seatrout, *Cynoscion nebulosus*, is commonly infected with the parasites *Kudoa inornata* and *Cardicola laruei*. The aim of this study was to assess if parasite infection influences seatrout mortality during cold temperatures. Laboratory experiments at SCDNR indicated that seatrout raised in harbor water, and therefore likely to be infected with parasites, died at significantly lower temperature than seatrout raised in water free of parasites. To test if this difference was due to parasites, we quantified the parasite load of infected seatrout. After comparing parasite load at temperature of mortality by regression analysis, results indicated no significant relationship between *K. inornata* myxospore density or *C. laruei* granuloma number and cold tolerance. These findings suggest that parasites do not affect temperature tolerance of spotted seatrout.

57. **An Innovative Technique for 3D Imaging Technology***

Hannah Wilson and Joseph Carson, Department of Physics and Astronomy

We and collaborators have developed a novel imaging technique that enables 3D imaging from a single digital snapshot, for the purposes of low-cost clinical photography in resource limited settings, such as rural regions in southeast Africa. The technique takes advantage of the emerging technology of light-field photography, which captures the information of multiple focus depths in a single digital snapshot. Our novel software approach reconstructs 3D shapes by evaluating how different parts of the image sharpen or blur at different focal depths. We combine our computational approach with a commercially available light-field camera, Lytro, and a medical hardware adaptor custom-developed by collaborators to ensure controlled and repeatable measurements. Analyzing both calibration images as well as clinical images, taken with our hardware at Maputo Central Hospital in Mozambique, we have been working to evaluate
uncertainties on 3D shape and improve overall 3D rendering capabilities.

58. Phenotypic Effects of Glyphosate on Mutant and Natural Populations of Arabidopsis thaliana
Ka'Dedra Creech and Courtney Murren, Department of Biology
Glyphosate, a commonly used herbicide to kill weeds, has been reported to stimulate growth at very low doses. We examined the susceptibility of Arabidopsis thaliana that were derived from areas exposed to glyphosate. We obtained 11 accessions and grew them in the greenhouse. Where plants failed to germinate, we transplanted any additional seedlings. After a month, we administered glyphosate treatments of 0 g/ha, 5.8 g/ha, 11.5 g/ha, and 28.8 g/ha. The application of treatments continued at weekly intervals. We collected data on the days to bolt, rosette diameter and height. We found that seeds from a set of Iberian populations did not germinate. Of the remaining populations from Germany, Norway, Spain, Tajikistan, United Kingdom, United States and Russia we did not detect significant differences in the amount of glyphosate added for height, days to bolt or rosette diameter. Further studies on seed collected from geographic areas that vary in glyphosate exposure are warranted.

59. Temperature Effects on Peroxiredoxin Oscillation in Nematostella vectensis
Annemarie C. Galasso, Elizabeth Meyer-Bernstein, Department of Biology
An organism’s biological clock is known to underlie cycles in physiology and behavior. In our lab, we have been investigating the circadian, or 24-hour, clock of the sea anemone, Nematostella vectensis. Similar to other invertebrates, N. vectensis locomotor activity can be synchronized by temperature oscillations. In order to further establish temperature’s role in synchronizing the circadian clock of N. vectensis, we have assessed peroxiredoxin (PRX) protein expression in animals housed in a temperature cycle. Peroxiredoxins are anti-oxidant proteins that regulate intracellular peroxide levels and may serve as a universal marker for circadian rhythms. Temperature-entrained animals were collected at 8 time points across the day and protein levels of PRX were quantified. Results indicate that PRX rhythms are synchronized by temperature in N. vectensis with PRX more highly expressed during the lower temperature time points. Our data will provide a foundation for additional investigations into temperature regulation of circadian clocks.

60. Prediction and Annotation of Genomic Repeat Dynamics in the snail
Biomphalaria glabrata using Hidden Markov Models
Kelsey Yetsko¹, Andrew Shedlock¹, and Paul Anderson²
¹Department of Biology
²Department of Computer Science
Mobile elements cover an extensive amount of the genomes of both plants and animals. However, current homology, or similarity comparison, based search tools are optimized only for analyzing and annotating repeats in humans and well known experimental models. This skewed taxonomic distribution of reference data makes homology-based search tools less sensitive and less accurate, missing many targets in poorly examined genomically diverse lineages. With these limitations in mind, Hidden Markov Models (HMMs) were used for de novo, rather than homology based, repeat annotation in the gastropod mollusk species Biomphalaria glabrata. Here we compare the HMM profile repeat annotation output to other currently available methods in order to assess whether there is an advantage of using de novo model-driven repeat annotation methods over homology based tools. Finally, to experimentally verify our in silico methods, we used PCR to amplify eight selected independent repeat loci across five clonal individual B. glabrata specimens.

61. - Award of Merit - Mitochondrial Photobiomodulation of Cytochrome c oxidase (Cox) in Arabidopsis thaliana Knockouts
Taylor Hammock¹, Linda Jones², and Mark Lazzaro¹
¹Department of Biology
²Department of Physics and Astronomy
The cellular mechanism underlying wound healing and pain relief through low-level laser therapy is not well understood. Research suggests Cytochrome c oxidase (Cox), the terminal complex in the electron transport chain, reacts with near-infrared photons. We are investigating the role of Cox using Arabidopsis thaliana wildtype and eight knockout lines missing specific Cox subunits. We isolated mitochondria and used a fiber-optic system to record oxygen consumption following ADP stimulation with and without 630nm HeNe laser irradiation. Our results indicate laser energy increases respiration in wildtype and the subunit 6B knockout line but does not increase respiration in knockout lines for subunits 1, 3, 10, 11, 15, 17, or 19. This suggests these 7 subunits may be involved in how laser energy enhances respiration. We are examining this further with cytochrome C oxidase assays of knockout lines in the presence and absence of laser irradiation.
62. The effect of topiramate on drinking behavior and brain ethanol concentrations in a binge-like model of alcohol consumption
C. Barrett Hawkins¹, William C. Griffin III², Marcelo F. Lopez², Howard L. Haun², Christina E. May², Lauryn Luderman² and Howard C. Becker²,³,⁴
¹Department of Biology Program in Neuroscience
²Charleston Center for Drug and Alcohol Programs
³Department of Neurosciences, Medical University of South Carolina
⁴Ralph H. Johnson VA Medical Center
In this study, we investigate topiramate, or Topamax, as a possible method to curb abusive alcohol consumption. Aside from its role as an anticonvulsant, topiramate is known to reduce dopamine release in the mesolimbic pathway. Because of dopamine’s believed role in the rewarding effects of alcohol consumption, topiramate shows potential as a drug to reduce drinking. To measure ethanol intake, we employed a binge-like model of consumption where mice generally drink to a point of intoxication. We found that the administration of topiramate prior to a drinking session significantly reduced the consumption of ethanol compared to mice treated with saline (p<0.001). A neurochemical analysis of cerebrospinal fluid collected during microdialysis, also showed a decrease in the brain ethanol concentration of topiramate treated mice (p<0.001). Ultimately, topiramate may show promise as a pharmaceutical means of not only combating abusive behavior but also avoiding symptoms of withdrawal.

63. If Hugo Hit Today
Zak Bartholomew¹ and Caitlin Simmons²
¹Department of Anthropology and Sociology
²Department of Geology and Environmental Geosciences
This study investigates the physical and social impacts to South Carolina’s lowcountry Berkeley-Charleston-Dorchester region if a hurricane identical to Hugo were to make landfall today. In 1989, Hurricane Hugo Losses reached at least $5.9 billion in damages and there were thirty-five fatalities reported in South Carolina. This study employs Fema's HAZUS-2.1 (Hazards US) software package which uses ArcGIS 10.0 to model and calculate potential losses due to natural hazards. We investigated placing the historic HUGO storm onto today's infrastructure to better understand what a storm of its magnitude would do to the region today. Areas of focus included building and infrastructure damage, loss of emergency centers, and potential economic loss. If Hurricane Hugo struck today, damages are estimated to be upwards of 7.1 billion dollars. HAZUS helps us to calculate the most at-risk areas and offers insight into future preparations for hazard mitigation.
64. The Galaxy Project: Bug Fixing and Feature Addition
Clayton Turner, Jacob Dierksheide, Jacob Song, and Albert Nardonne,
Department of Computer Science
The Galaxy Project is an open-source, web-based platform for data-intensive bioinformatics analysis and research. Our team has contributed to this project and our contributions are available for public use. We handled the fixing of a bug that allowed metadata and comments in a tool that allowed for grouping to be performed on a dataset by a variable intrinsic within the same dataset. Additionally, we added a feature to Galaxy which allows tabular-delimited data to be transposed. Our implementation of the transposition takes advantage of the python garbage collector so datasets of any size can be used without having to worry about memory issues. These contributions can be utilized by anyone seeking to use Galaxy for their own projects and research, as well as anyone desiring to develop something novel to add to Galaxy.

65. Coastal Change on San Salvador Island, Bahamas: 1988-Present
Christina Hefron and James Carew, Department of Geology and Environmental Geosciences
In 1988, Daryl Clark completed a Masters thesis outlining the characteristics of modern beach sediment for 18 beaches on San Salvador Island, Bahamas. This study provides an assessment of 16 of the 18 beaches 25 years after Clark’s study. Samples collected from the lower beachface, upper beachface, backbeach, and dune environments were processed to determine particle size, grain texture, sample sorting, sample skewness, and kurtosis. The results of this study, and a smaller study completed by a College of Charleston student in 2010, were compared to Clark’s results to determine coastal changes on the island during the last quarter century. Clark concluded the major determinant of sediment texture and sorting on the island was offshore and coastal geomorphology. However, extreme energy events such as hurricanes and tropical storms, many of which have affected San Salvador in the past 25 years, also contribute to coastal change.

66. Contributing to Bootstrap's Open Source Community
Brendan Keane, Andrew Armstrong, Crendall Kinard, and Will Franklin, Department of Computer Science
Bootstrap is an open source framework utilizing Java-script and CSS that aids in the development of web pages. Bootstrap has a large, active
community on Github, with nearly 500 contributors and over 8900 commits. With a community this engaged, it was difficult to keep up with such a proactive and rapidly evolving development corps. We chose Bootstrap because it exposed us to a fast paced mature software development community, and because we have all used bootstrap by some measure before. So far, we have made two significant bug fixes for Bootstrap. One is a code fix to streamline the automatic scrolling on a sidebar on Bootstrap's website, and the other is a documentation fix to document Bootstrap Expo, a page, Bootstrap uses for examples.

67. Synthesis and Biological Evaluation of Chemotherapeutic Phthalazinone Analogs on Prostate Cancer
Brett Hoover, Brenna Norton-Baker, and Francis James Claire, Department of Chemistry and Biochemistry
Modern cancer chemotherapeutic treatments are cytotoxic to cancerous cells and healthy cells, causing dangerous side effects that lead to more harm than the cancer itself, thus more selective anti-cancer agents are needed. In collaborations with MUSC, we designed three compounds for targeted synthesis by designing and utilizing an activity relationship modeling technique based on combretastatin A-4 (CA-4) and 104 of its known synthesized derivatives. CA-4 is a chemotherapeutic drug used in late-stage thyroid cancer. It causes tumor cells to die by binding to tubulin, a protein involved in microtubule formation. Three compounds were predicted as active and synthesized. Through collaborations with MUSC, the compounds have been tested on prostate cancer cells and glioma cells. The results so far indicate that the drugs are active in inducing cell death at a level comparable to CA-4, but one especially has a significantly reduced toxicity to normally dividing cells.

68. Fixing Fennec and Extension Development
Tan Nguyen, Patrick Brewer, Ian Feeley, and David Bruneau, Department of Computer Science
Our team fixed a bug in the open source Firefox for Android project known as Fennec. In addition we developed an extension to improve user experience with the OAKS system that users can utilize in Firefox for desktop or Firefox for Android.

69. Contributing to an Open Source Interactive Development Environment
Tyrieke Morton, Lisa Smith, Cameron Spell and Jason Wilson, Department
Light Table is a new interactive development environment from programming in languages such as JavaScript, ClojureScript, and Python. Our team’s mission was to contribute to the functionality and overall user experience of the Light Table Project. To do so, we gained an understanding of the software, brain stormed, and finally, turned our ideas into a reality. Our contributions made Light Table’s install process easier, its interface more user friendly and extended it to support 2 more programming languages. Our impact has had a positive impact on the software’s community and has made Light Table more popular among programmers across the globe.

70. Fractal Dimension as a Means to Characterize Statistical Systems
Timothy B. Hayward and Michael L. Larsen, Department of Physics and Astronomy
The statistical approaches used to characterize discrete stochastic physical systems often rely on the properties of statistical stationarity (for a time series) or homogeneity (for a spatial point process). Separate methods are necessary for investigating nonstationary or inhomogenous data sets and the use of stationary tools with a non-stationary dataset, or vice versa, may lead to unphysical conclusions. Motivated by the data analyst's need to determine what statistical tools are acceptable to use on non-stationary data sets, a number of fractal systems are investigated. A method is described for creating a colored noise signal and its fractal dimension as a function of sampling threshold is determined. The methods described for creating a data set with a predetermined fractal dimension can be used for investigating the statistical methods necessary for characterizing statistical systems.

71. Exoplanet and Circumstellar Disk Studies with the Hubble Space Telescope
Zachary Griggs and Brittany Yeager, Department of Physics and Astronomy
We present a status report on our efforts to develop computational tools to improve the effective sensitivity of Hubble Space Telescope (HST) imaging observations of circumstellar disks around nearby stars. Specifically, we are implementing and optimizing an algorithm, the Locally Optimized Combination of Images (LOCI), that enables one to combine tens or hundreds of digital images in a manner that strips away the overwhelming light from the parent star, while leaving intact the faint light from the surrounding disk. The computational tools are being applied to data collected as part of the Hubble DICE survey (Disk Imaging,
Characterization, and Exploration) of 11 nearby stars.

**72. Firefox an Open Source Experience**  
Ashley Dix, Krista Grooms, Nadia Rodriguez, and Alex Schroeder, Department of Computer Science  
Open source software development is quickly becoming one of the most preferred ways to develop software as it allows interested developers to contribute to the code base without them needing to be part of the original development team. Over the course of the past semester our team has been introducing ourselves into the Firefox open source development community. Contributing to the Firefox web browser has required us to join their development community by successfully submitting bug patches to their current release. As a team, we have learned the importance of communication not only among ourselves, but with other Firefox developers who have been able to guide and mentor us through our open source development experience. Through a team website we have cataloged many of our attempts both successful and unsuccessful to join the Firefox open source community which can be used as lessons learned when trying to join future projects.

**73. The Future of Cyber Security**  
Krista Grooms, Department of Computer Science  
President Obama has declared that the “cyber threat is one of the most serious economic and national security challenges we face as a nation”. Worldwide, cyber-attacks happen almost constantly. The targets of these attacks include not only individuals but larger organizations and even countries. I believe by understanding current risks, predicting future risks, and putting safeguards in place we may be able to diminish cyber security threats in the future. It is important that we not only teach these strategies to adults, but also to children as they are more accepting of technology which leaves them vulnerable to cyber-attacks. Furthermore, it is a necessity that we begin teaching these techniques to current computer science students who will be able to integrate what they have learned into their future computer programs; in turn leading to the replacement of risky code with programs that can battle cyber-attacks.

**74. Spring Emergence Study at Field Site**  
Jordan Townsley, Austin Fitzhenry and Ben Sagara, Department of Biology  
In decades to come, anthropogenic climate change will be a crucial selection pressure on the flora and fauna of the biomes. Our study records the
emergence of insect pollinators during the spring of 2014, using flight intercept traps to discover temporal and spatial activity. An unusually cold winter meant a later than expected commencement of activity. We captured no bees, as very few flowers bloomed at the study site. This and the bias of our sample toward female flies may point to the study site being a spring nesting area as opposed to a spring feeding area. Further, flies were found only in the trap on the highest ground, the area most suitable for nesting. The species found, as well as their abundance and date of emergence, create an informative historical registry in the face of changing times.

75. Developing an Automated Processing Pipeline for Proprietary Rain Measurement Equipment
Joshua B. Teves and Michael L. Larsen, Department of Physics and Astronomy
In a newly constructed rain measurement array, 21 instruments with proprietary data formats were used to collect rain drop size distributions. The data was transmitted on a minutely basis, with full reports consisting of approximately one week of transmitted data. In order to effectively use the data, an automated pipeline was developed to both process the reports for the instruments and to organize the data into a system more suitable for analysis, as well as to handle erroneous data transmission. These techniques, their development and implementation, and performance will be summarized.

76. - Award of Merit - Evaluation of Computationally Designed Enzymes by Comparison with Model Systems
Joshua Schmidt, Kate Diedrich, and Marcello Forconi, Department of Chemistry and Biochemistry
De-novo design by computation represents an exciting new avenue in enzymology, with potential to advance bioremediation of pollutants and synthesis of drugs. Current designed enzymes achieve rate acceleration with hydrophobic substrates three orders of magnitude less than natural enzymes. To provide a benchmark for the role of non-specific interactions, we have studied the retroalddol reaction of methodol in the presence of micelles and long-chain amines. We found that the combination of cetyltrimethylammonium chloride (CTAC) and dodecylamine enhances this second order rate constant by four orders of magnitude. The same rate enhancement was observed with bovine serum albumin and with cellular retinoic acid binding protein II. In addition, micelles of CTAC, in combination with a long-chain phosphate or carboxylate, accelerate the
Kemp elimination of 4-nitrobenzisoxazole by four orders of magnitude. For these two reactions, our findings suggest that the computational design did not capture common motifs of enzymatic catalysis.

77. Modeling Subsidence of Olympus Mons Using Lava Flows as Palaeo-slope Indicators
Mariel Simpson, Ashleigh Reeves, John Chadwick and Patrick McGovern, Department of Geology and Environmental Geosciences
Olympus Mons is an enormous volcano on Mars (600 km wide and 22 km tall) that would be expected to subside into the crust, yet there is little indication of such subsidence on the surface. In this study, we mapped the orientations of lava flows on the plains to the southeast of Olympus Mons using imagery from the Thermal Emission Imaging System (THEMIS) on Mars Odyssey, and topography using Mars Orbiter Laser Altimeter (MOLA) data from Mars Global Surveyor. The results indicated that the lava flows deviate from modern slope vectors (i.e., downhill) in a counterclockwise direction by 21.4 ± 10.8 degrees (n = 65)—consistent with recently occurring subsidence centered on the volcano. Geophysical modeling estimates the lithospheric subsidence of about 1.2 km due to the magmatic addition of 3.8x10^5 km^3. Crater counts of the area constrained the date of the subsidence to the past 229 ± 26 my.

78. Fiber Optic Reflectance Oxygen Monitoring During Surgery
Elizabeth Works, Janet McKim and Linda Jones, Department of Biology
The pulse-oximeters at the Pet Helpers Greer Spay and Neuter Clinic frequently malfunction during surgery causing situations in which the animal’s safety is compromised. The research conducted was to determine if fiber optic reflectance would provide a non-invasive accurate method of determining an animal’s blood oxygen level during surgery. The results of the fiber optic reflectance method were initially compared to the readings of the pulse-oximeters to ensure the accuracy of the readings. It was determined that the fiber optic method accurately provided real-time visual indicators of oxygenation levels during surgery without the malfunctions associated with the current pulse-oximeters.

79. Mathematics in Ancient African and Middle Eastern Cultures
Alexx Niblock, Department of Mathematics
The importance of mathematics as a building block of society is irrefutable. Mathematics is a necessary component of business, architecture, technology and essentially everyday life. When it comes to ancient African and Middle
Eastern cultures, western education in the area of mathematics often neglects the important contributions of Ancient African and Middle Eastern Cultures. The lack of information circulating in regard to the roles of these civilizations in the development of mathematics as a discipline affects perception both educationally and socially.

80. **Groundwater Response to Evapotranspiration in a Forested Wetland: Congaree National Park, South Carolina**

Clay M. Dustin\(^1\), Austin E. Morrison\(^2\), Timothy J. Callahan\(^3\)

\(^1\)Dept of Mathematics  
\(^2\)Graduate Program in Environmental Studies  
\(^3\)Dept of Geology and Environmental Geoscience

We inspected groundwater level data to estimate gross evapotranspiration (ET) in a floodplain forest. Groundwater level data were collected hourly at ten different wells from 2009 to 2013. Wells were screened 4-7 m deep in the surficial aquifer and arrayed from the floodplain bluff along a 3-km, valley-perpendicular transect to Cedar Creek, a local tributary of the Congaree River. Time series analysis of diurnal ET signals in the groundwater level data was used to functionally group well locations with similar characteristics. Data on soils and forest community structure are currently being collected and analyzed to identify relationships between soil drainage, vegetation community, and groundwater dynamics. This project stemmed from hydrology class trips to Congaree National Park sponsored by the park’s education and outreach program. Students learned field methods and data collection, management, and analysis techniques to reinforce hydrology concepts and principles.

81. **Evidence of Anthropogenic Contamination in Shem Creek, SC**

Katie Kerns, Sonja Tyson, Kyle Schultz, Kelsey Murdaugh, Barbara Beckingham, and Vijay Vulava, Department of Geology and Environmental Geosciences

Shem creek is vital to the shrimp and tourist industries in Charleston, SC, making it highly susceptible to anthropogenic sources of contamination. Waterfront restaurants allow patrons to pull boats directly to their establishments. This combined with industrial shrimping traffic and boat storage are potential sources of polycyclic aromatic hydrocarbon (PAH) contamination in sediments and specific biota. The purpose of this investigation is to identify PAH contamination in the water column. PAH, pH, conductivity, total suspended solids, dissolved oxygen, and redox potential were measured to investigate contamination levels at three sites.
within Shem Creek. A Gas chromatography–mass spectrometry was used to analyze sixteen volatile varieties of PAH including: d-NAP, ACE, PHE, Chrys, and Pery. The results of the study are currently being processed.

82. Troponin T Isoforms and Flight performance in Honey Bees
Douglas Jansen and Agnes Southgate, Department of Biology
The troponin complex (Tn) is composed of TnC, Tn I, and TnT, and by binding calcium regulates muscle contractions. TnT binds tropomyosin and inhibits actin-myosin interactions. Isoforms of TnT are thought to affect calcium sensitivity of the troponin complex and may contribute to asynchronous contractions in insect indirect flight muscles (IFMs).

Quantitative differences between TnT isoforms in IFMs would support this hypothesis. Honey bees (Apis melifera) were collected as either foraging bees (high level of flight) or nurse bees, and RNA was extracted from dissected IFMs. RT-PCR was used to determine the presence, absence, and relative amount of alternative exons 10A and 10B, as well as the NH2 terminal exons 2-5. The 10A isoform is expected to be more prevalent than 10B in the IFMs, and to increase with the foraging behavior. Furthermore, differences in the N terminus of isoforms are expected to vary between nurses and foragers.

83. Diverging Ridge Features on the Juan de Fuca and Gorda Ridges
Mary Eaton, Monica Steele and Leslie Sautter, Department Geology and Environmental Geosciences
Geomorphological features of the Juan de Fuca and Gorda Ridges, and the Blanco and Mendocino Fracture Zones were observed, to relate them to the seismic activity associated with the diverging plate boundaries of the Northeast Pacific Ocean. These ridges and fracture zones comprise the divergent plate boundary of the eastern edge of the Pacific Plate and the western edges of the Juan de Fuca and Gorda Plates. Both of these eastern plates are being subducted beneath the western edge of the North American Plate. Fault and ridge orientations are used to compare the direction of seafloor spreading, and indicate that both the Juan de Fuca Plate and Gorda Plate are spreading in a southeastern direction. Younger ridges from the Gorda Ridge system mapped in the study run parallel to the boundary; however older ridges do not show the same orientation, indicating a change in spreading direction.

84. Effects of an Artificial Oyster Reef on the Surrounding Ecosystem near McClellanville, SC
Sonja Tyson and Scott Harris, Department of Geology and Environmental Geosciences
Artificial *Crassostrea virginica* reefs are installed to restore habitats, protect against erosion, and for economic reasons. This study quantifies change surrounding an artificial reef installation, including shoreline migration, sediment changes, and oyster growth near McClellanville, SC. Surveys collected sediment samples, digital photographs, and laser scans of the reef and surrounding area. Data from the laser scanner was post-processed using Cyclone 8.1 to generate 3-D point clouds. High-resolution images were combined in AGIsoft photo modeling software and sediment samples were analyzed using a Cilas particle size analyzer. The data shows a decrease in grain size on the landward side of the oyster reef. The increased deposition of sediment did not provide a discernible change to the shoreline. However, an increase in *Spartina alternifora* stalks in the marsh directly behind the reef indicate that lateral marsh growth is initiating. Oysters did not distribute evenly across the reef, but prospered in different areas.

**85. Susceptibility of Candida species to complement-derived antifungal peptides**
Mary Alice Cummings¹², Silvia Vaena de Avalos², David Schofield³ and Caroline Westwater²³

¹College of Charleston
²Department of Oral Health Sciences, Medical University of South Carolina
³Department of Microbiology and Immunology, Medical University of South Carolina

Candida species are the most common fungal pathogen of humans. Infections range from non-life threatening mucocutaneous disorders to life-threatening invasive disease that can involve any organ. Given the substantial mortality rates associated with invasive candidiasis, appropriate antifungal treatment is crucial. Candida infections are commonly treated with either azoles or non-azole antifungal agents; however, the emergence of resistance among Candida albicans isolates is limiting treatment options. Our laboratory has recently discovered that complement-derived peptides have potent antifungal activity against a range of Candida species. The goal of this study was to test the ability of complement-derived peptides to exert antifungal activity against a panel of C. albicans strains with resistant to one or more antifungal agent. Our preliminary data supports the further evaluation of complement-derived peptides as a therapeutic approach for the treatment of fungal infections.
86. Alternative Splicing & Z-Band Protein Isoforms in *Manduca sexta*
Diana Fulmer and Agnes Ayme-Southgate, Department of Biology
Alternate splicing offers the cell a convenient way to make multiple protein isoforms from a single gene. This in particular allows for the creation of slightly different myofibrillar proteins in different muscle types and different lifecycles. It is important to understand these different splicing patterns and the amino acids they encode in multiple species to better comprehend the conservation of functional domains in these proteins and how they have evolved through time. My project was focused on a better understanding of the proteins implicated in the sarcomere Z band from the Carolina sphinx moth *Manduca sexta*. I retrieved and annotated several splicing variants of the Z-band proteins α-actinin, ZASP52, as well as the splicing factor Muscleblind (Msb), which is involved in the alternate splicing of the previous two proteins. The data will be discussed in light of the differences in physiology between *Manduca sexta* and our reference system *Drosophila melanogaster*.

87. Mutational Position Effects of Allelic T-DNA insertions on Root Variation in *Arabidopsis Thaliana*
Amber Frazier and Courtney J. Murren, Department of Biology
Insertional mutagenesis is a method of disrupting gene function through the insertion of foreign DNA into a gene of interest. In the model plant *Arabidopsis thaliana*, insertional mutagenesis through transfer-DNA (T-DNA) insertions is a powerful tool to link genes to phenotypes. Our current study aims to elucidate the effects of mutation position on plant phenotype by comparing the phenotypic expressions of single T-DNA insertions in the promoter region and exon region of the same genes. We identified a set of root specific genes and a set of ‘background’ genes for which a T-DNA line was available in both the promoter and exon and grew the plants in common garden. Phenotyping of belowground traits and aboveground traits for this set of lines is ongoing. We expect insertions in exons to differ from insertions in promoter regions by showing greater divergence from natural accessions than insertions in the promoter region.

88. Synthesis of Alkyl Epsilon-Caprolactone Derivatives
Christina Crossley and Brooke A. Van Horn, Department of Chemistry and Biochemistry
Specific epsilon–caprolactone synthesis is of paramount importance in the growing need to develop biodegradable imaging molecules for *in*
vivo imaging. For this project, the synthesis of 6-methyl-epsilon-caprolactone from 2-methylcyclohexanone was performed via a Baeyer-Villiger Oxidation. This reaction ultimately inserts oxygen to the most substituted position of the carbonyl (in this case the methylated position). The resulting cyclic esters (lactones) will serve as specifically substituted monomers, which can then be copolymerized into molecules containing specific reactive groups. This presentation will elaborate on synthesis of these molecules as well as an overall analysis and characterization of these lactones by nuclear magnetic resonance (NMR). We will also outline and discuss our future plans to use these molecules in co-polymerization reactions (with commercially available caprolactone) by means of an organic catalyst.

89. - Award of Merit - Degradable X-ray Imaging Polymers

Samantha E. Nicolau, Lundy L. Davis, Caroline C. Duncan and Brooke A. Van Horn, Department of Chemistry and Biochemistry

X-ray imaging is a common technique used in medical science in which contrast agents injected in the body are illuminated to detect and diagnose disease states. Our lab aims to guide X-ray imaging science away from the current limitations associated with small molecule contrast agents and toward polymer systems. Polymeric systems have the benefit of being tunable in size, biodegradable, and variable in the contrast agent content on the polymer chains. We have (1) synthesized a single iodine-containing hydroxylamine to attach to poly(epsilon-caprolactone) polymers, (2) successfully grafted it to polymers, and (3) performed a synthesis of a new triiodo derivative for which a single graft experiment has been attempted. This poster presentation will highlight the specifics of our small molecule and polymer syntheses as well as their characterization with NMR spectroscopy and size exclusion chromatography. It will also showcase recent X-ray imaging evaluations acquired through collaboration with Clemson University.

90. Sorption Behavior of Pharmaceutical and Personal Care Products in Natural Soils

Kat Johnson, Department of Geology and Environmental Geosciences

Pharmaceutical and personal care products (PPCPs) are an increasing concern for hydrologic and terrestrial environments. There are thousands of PPCPs manufactured and consumed globally; due to improper waste treatment/disposal, these chemicals are frequently released into natural environments. The long term effects of these chemicals are not fully
understood but the physiological effects of these chemicals presents a health risk for many organisms. The purpose of this study was to examine how two common PPCPs—naproxen and cetirizine—interact with soils and to determine how they might react in natural environments. Chromatography principles were used to study the reaction of these chemicals in soils that have varying levels of clay and organic matter (OM). It was determined that naproxen adsorbs more strongly to OM-rich soils and cetirizine to clay-rich soils. Understanding how these PPCPs react with soils can be used to mitigate adverse effects in natural environments.

91. Novel Synthetic P3HT Block Copolymers
Dillon G. Presto, David S. Boucher, and Brooke A. Van Horn, Department of Chemistry and Biochemistry
Abstract: In the search for more efficient solar cells, polymer-based photovoltaic materials have attracted a significant amount of attention. The efficiency of conversion of light to solar energy is largely dependent on the thin-film morphology of photoactive species. The use of organic photovoltaic materials therefore has significant potential in the field of solar energy as their morphology can be manipulated, whereas common inorganic solar materials cannot. Poly(3-hexylthiophene) (P3HT) is a photoactive polymer that has been under the scrutiny of much research due to its electronic and photonic properties. Electron acceptor systems such as quantum dots and fullerenes can be utilized in conjunction with P3HT to promote charge percolation in solar cells. Unfortunately, in common organic solvents P3HT and electron acceptors exhibit phase separation, significantly decreasing the efficiency of charge percolation. Our research focuses the synthesis of diblock copolymers that will circumvent this problem. We seek to couple polymers such as polystyrene and polyvinylpyridine which have an affinity for quantum dots with P3HT in hopes of generating a system that is optimal for energy production in solar panels.

92. Cysteine Modification via Nucleophilic Aromatic Substitution
Jessica Kapp and Marcello Forconi, Department of Chemistry and Biochemistry
Literature reports suggest that hexafluorobenzonitrile selectively reacts with cysteine to produce a single product, with a fluorine atom on the ring being replaced by cysteine residue. Substitution of cysteine with benzonitriles will provide a simple method to introduce nitrile groups into proteins for IR analysis. Multiple fluorobenzonitrile rings were tested with cysteine against
other amino acids in order to determine the selectivity of the of the aryl compounds. We found that 3,4,5-fluorobenzonitrile selectively reacts with cysteine to produce the para product and an elimination byproduct. Production of the byproduct was reduced by over 50% when the reaction was run under nitrogen and when water was used as the solvent. Further trials will test peptide chains and proteins containing cysteine with this aryl ring.

93. Effect of stimulus direction on electroretinogram recordings from three cockroach species
Edward S. Johnson and Jeffrey D. Triblehorn, Department of Biology, Program in Neuroscience
Electroretinograms (ERGs), a minimally invasive extracellular recording technique, record the summed electrical activity of photoreceptor cells. We investigated the effects of stimulus direction on the ERG in three cockroach (Blattaria) species: Periplaneta americana, Blaberus craniifer, and Gromphadorhina portentosa. Tungsten electrodes recorded ERG responses to a white LED light stimulus presented at eight different intensities from three directions (front, 90° side, and rear; one direction tested per animal). ERGs were signal averaged from 30 presentations per intensity to generate Stimulus-Response (S-R) curves normalized to the largest ERG amplitude. *P. americana* had similar S-R curves to light from all directions. *B. craniifer* and *G. portentosa* S-R curves were shifted to the left for the side and rear, indicating greater sensitivity to light at these directions. *G. portentosa* and *B. craniifer* were more sensitive to light from the front and side. All species exhibited similar S-R curves to light from the rear.

94. Neurocircuitry Underlying Resistance to Punishment
Dominika Pullmann¹, Peter Vento² and Thomas Jhou²
¹Department of Psychology and Program in Neuroscience
²Department of Neurosciences, Medical University of South Carolina
The rostromedial tegmental nucleus (RMTg) and the lateral habenula (LHb) have been shown to activate in response to aversive stimuli. There is a large degree of variation in tolerance to these stimuli (e.g., footshock) between individuals indicating that there may be variability in the neurocircuitry involving the LHb and the RMTg in punishment resistance. The present study examines the underlying differences that contribute to this individual variation. Rats were trained to lever press for food reward, and then received daily sessions in which response to the lever was punished by variable intensity footshock until an intolerable intensity was reached. Thus we
quantified activation within the LHb and the RMTg using immunohistochemistry in response to this behavioral paradigm. Ablations to the RMTg have been shown to raise the tolerance to shock, and thus, we hypothesize that individual variation in the sensitivity of the neurocircuitry influences resistance to punishment.

95. The Myoproteome of *Manduca sexta*: Gene Annotation and Transcript Analysis
Agnes Southgate and Sam Feldman, Department of Biology
Insects have been classified based on the physiology of the thoracic flight muscles as either synchronous or asynchronous. Insects with asynchronous muscles, such as *Drosophila melanogaster*, have myofibrillar protein isoforms that are only found in indirect flight muscles. The current hypothesis states that these specific isoforms are unique to asynchronous flight muscles. *Manduca sexta* (Carolina sphinx moth) has synchronous flight muscles, and it was therefore hypothesized that *Manduca sexta* would have no flight muscle-specific protein isoforms. Analysis through the use of bioinformatics, gene sequencing, and transcript evaluation has provided insight on an array of different proteins such as actin, troponin C, and kettin/sallimus. The characterization of these proteins has indicated that specific isoforms do exist in *Manduca sexta* flight muscle, for example troponin C has 2 flight isoforms and kettin/sallimus contains extended PEVK domains. The data lead us to an alternate explanation for the difference in the synchronous/asynchronous flight systems.

96. Shoal Attachment on the Northeast End of Dewees Island, SC
Seema Shah and Leslie Sautter, Department of Geology and Environmental Geosciences
Dewees Island, South Carolina is classified as a prograding barrier island, however in the last 8 years the island has undergone significant erosion. College of Charleston's Project Oceanica has been conducting a study of Dewees' shoreline since 2006 and has monitored the landward migration of an offshore, large sand shoal that detached from Capers Inlet. Prior to shoal attachment, between 2004 and 2013, the shoreline in the area near to the shoal eroded 15m in the north, the center eroded 56m, and the south area accreted 13m. Beach surveys conducted in March 2014 in the same area show the shoal's migration and attachment onto the shoreline, resulting in a widened and elevated berm. We predict that the shoal sands will be distributed by longshore currents to the central and southern portions of the island, causing accretion of the shoreline downdrift.
97. Geomorphology of Submarine Canyons and Related Slope Features along the Eastern New England Continental Margin, USA
Isadora Kratchman, Seema Shah, and Leslie Sautter, Department of Geology and Environmental Geosciences
Multibeam sonar data of submarine canyons and slump features was analyzed along a 390 km segment of the Eastern New England continental margin. Submarine canyons are erosional features located on continental margins that transport sediments from shelf regions to the deep ocean. Major slumping along the margin can alter seafloor morphology and has the ability to generate dangerous tsunamis. In the study area, eight incised canyons and numerous slope canyons were identified, from Veach Canyon to Munson Canyon. Incised canyons were classified based on canyon length, relief, sinuosity, and general morphology. In between incised canyons, the study area displays a transition between areas of dominant slumping features to areas dominated by slope canyons. All incised canyons narrowed in width as depth increased. However, Hydrographer and Lydonia Canyons had the highest degrees of sinuosity, and canyon width increased before ultimately narrowing as depth increased.

98. The Homebrew Package Manager
Dirk Gadsden, Drew Rodman, Cassio Greco and Jake Wisse, Department of Computer Science
Homebrew is an Open Source package manager for Mac OS X similar to Ubuntu’s Advanced Packaging Tool that can be used to ease the process of installing libraries, programming languages, and applications. Contributors define their own Formulas that users can run with Homebrew to automate compilation, setup, and installation of software across various environments in order to remove as much manual configuration as possible. At this point in time the project is approaching version 1.0 and evolving very quickly as issues are addressed and features are added by its supporting community. As an Open Source application, developers are encouraged to get involved in its contribution workflow in order to resolve issues and add functionality.

99. The Application of Dasymmetric Resampling of Census data to the South Carolina Berkeley-Charleston-Dorchester region
Nicholas Capps\textsuperscript{1} and Christina Carmack\textsuperscript{2}
\textsuperscript{1}Department of Geology and Environmental Geosciences
\textsuperscript{2}Department of Computer Science
Analyzing population data over several decades can prove difficult due to poor precision in older data sets. Normalizing data sets through the dasymmetric resampling provides an avenue for the analysis of data, despite the disparities in precision. Dasymmetric resampling is a method of subdividing spatial information from larger regions into smaller regions using heuristic and proportional methods. By employing a dasymmetric resampling algorithm, we are able to take extremely coarse track data and view trends that would only be accessible in higher resolution Census block data. Using this method we are able to map the urban growth in the BCD area from 1980 to 2010. The visual displays developed in ArcGIS show general growth in the region, as well as pockets of slow and accelerated growth. Data from this resampling technique can be used to better understand the Lowcountry region and help planners and managers better support the community.

100. Bathymetric Comparison of Submerged Headland Features of the US South Atlantic Bight
Hunter J. Miles and Leslie R. Sautter, Department of Geology and Environmental Geosciences
The geomorphology of three offshore submerged headlands was examined using multibeam sonar. These headlands occur along the north-south trending South Atlantic Bight (SAB) continental shelf edge, approximately 100 km east of the South Carolina and North Carolina coasts. The Gulf Stream runs northward along the SAB’s shelf edge before deflecting eastward into the open ocean near Cape Hatteras. The three sites compared are Bull Scarp, in the southern-most location, Cape Fear Terrace, and the northern-most Cape Lookout Terrace. Depths of these features range from approximately 40 to 235 m. Multiple bathymetric features were analyzed, compared, and contrasted to characterize the seafloor along this dynamic continental shelf edge. Features include escarpments, sand waves and rocky reefs. Characterizing and describing these seafloor areas will allow for improved understanding of the relationship between seafloor geomorphology and the Gulf Stream, as well as their roles in providing flourishing fish habitats.

101. Phenotypic effects of different mutation types in GLABRA1 in Arabidopsis thaliana
Alexander DePue and Matt Rutter, Department of Biology
Mutation of GLABRA1 (GL1) in the model organism Arabidopsis thaliana is known to result in reduced presence of epidermal trichome cells – small
defensive “hairs” that aid in herbivory resistance. GL1 encodes a MYB-related transcription factor that is first in a cascade of cofactors that regulate trichome production. Phenotypic trichome data were recorded for five GL1 alleles including spontaneous, X-Ray, and tDNA knockout mutants. It was found that trichome densities were highly variable and dependent on the nature and location of the mutation. Additional analyses examining fitness costs of trichome production showed that there was no significant relationship between trichome density and fruit number.

102. - Award of Merit - The Control of Ethanol-Seeking Behavior Directed by the Lateral Hypothalamic Orexin Neurons
Elisabeth Kilroy¹, David Moorman¹ and Gary Aston-Jones²
¹Department of Exercise Science and Program in Neuroscience
²Department of Neurosciences, MUSC

The lateral hypothalamus (LH) is a targeted region in the reward circuitry that plays an important role in motivation and reward. In the rat model, the activation of localized orexin neurons in the LH following alcohol consumption triggers the subsequent release of dopamine from the ventral tegmental area. This further excites the mesolimbic dopamine system, the most prominent of the natural reward circuits. As a proposed mechanism for reducing ethanol self-administration and reinstatement of ethanol-seeking behavior, we administered an orexin-1 receptor antagonist, SB-334867 (SB). Rats were trained to self-administer ethanol on a fixed-ratio 3 schedule. Our results demonstrate that SB significantly decreased ethanol consumption as a measure of active lever presses (ALP) and well entries (WE) during the conditioning phase and during cued-reinstatement. Further, a significantly greater effect of SB on reducing ALP and WE during self-administration and cued-reinstatement was found in rats with a greater preference for ethanol.

103. Potential Evidence for Coal Ash Contamination in the Lower Saluda River
Larissa Almeida, Taylor Intaphan, Megan Jackson, Kori Ktona, Alex Porter and Nicholas Roach, Department of Geology and Environmental Geosciences

A coal-fired power plant, McMeekin Station sits at the source of the Lower Saluda River, which later flows through the major population center of Columbia, South Carolina. Coal ash, a hazardous byproduct of coal burning, is known to be stored in ponds on site at McMeekin. The objective was to analyze surface water near McMeekin to determine if coal ash from the plant has contributed to contamination of the local watershed. Surface water
samples were taken both upstream and downstream of the power station. Based on previous studies reporting groundwater contamination from coal ash storage at the site, we expect that geochemical analysis of water downstream of McMeekin Station will find elevated levels of analytes such as chromium, iron, lead, mercury, and sulfate. While sulfate levels did not show a difference, measurements of metals by ICP-MS are pending.

104. Working with Django
Lynn Kitchner, Chris Moore, Bobby Jenkins, and Johanna Wiel, Department of Computer Science
For our computer science capstone class, we were tasked with contributing to an open source software project. We chose Django because of our previous experience with the Python programming language and our enthusiasm for web development. Django is an open source framework that uses Python to connect a database and a set of server side functions to a front end website. Our team has become part of the Django community, learning about the inner workings of bug tickets, triaging, and communication with other developers. While contributing to Django, we became familiar with tools such as GitHub, Sphinx, and Trac. Throughout the project, we maintained a team Wikispace and individual professional blogs to document our progress. The experience we have gained during this process will be valuable as we begin our careers as software engineers.

105. Analysis of Dramatic Shoreline Changes on Dewees Island, SC
Isadora Kratchman and Leslie Sautter, Department of Geology and Environmental Geosciences
Changes in beach morphology of Dewees Island, SC were analyzed by students and faculty from the College of Charleston’s Project Oceanica program with support from the Dewees Island Conservancy. Five surveys of the beach were conducted between 2010 and 2014 along twenty transect lines. Data from these surveys and aerial photographs were used to quantify and determine the cause of changes in beach morphology. Since 2010 the southwestern portion of the island has eroded approximately 1 m in elevation, the central portion has experienced both accretion and erosion, and the northeastern portion has accreted in elevation and dramatically lengthened seaward. The chief contributor to the island’s shoreline changes is shoal bypassing at the northeastern end, influenced by the direction of Capers Inlet. Monitoring of the beach provides insight into processes that control beach morphology and island stability, and assists with developing future management plans.
106. Searching for extrasolar planets with the Subaru SEEDS survey
Kellen Lawson, Joe Carson, and the SEEDS Science Team, Department of Physics and Astronomy
Strategic Explorations of Exoplanets and Disks with Subaru (SEEDS) is an international astronomical survey that uses observations with the Subaru Telescope to directly image extrasolar planets and disks in order to better understand their nature and evolution. As a part of this survey, we use the Angular Differential Imaging (ADI) technique, which utilizes the symmetrical nature of a star throughout a set of rotated images in order to isolate asymmetries such as planets. Additionally, we make use of the Locally Optimized Combination of Images (LOCI) algorithm, which combines a large number of images to effectively strip away starlight while leaving the faint planetary light intact. Once a planet is confirmed, additional observations can allow direct imaging to reap information such as planet temperature and composition. This information aids in filling a gap in the census of exoplanets, and will help to reach a more complete understanding of their nature.

107. Development of a Reflectivity Based Storm Simulator
Joerael C. Harris and Michael L. Larsen, Department of Physics and Astronomy
It was hypothesized that RADAR returns could be utilized to develop a tool to simulate and infer properties of storms. To test this hypothesis, an evolutionary model of RADAR reflectivity change was constructed. In an effort to characterize this model, simulated storms were compared to an ensemble of real storms from 2008-2013. The model was able to realistically create individual storm time series of reflectivity, but was unable to reliably model peak storm intensity or storm duration.

108. - Award of Merit - The Effects of Fingolimod Administration in a Genetic Model of Cognitive Deficits
Darius D. Becker-Krail\textsuperscript{1,2} and Antonieta Lavin\textsuperscript{2}
\textsuperscript{1}Department of Biology and Program in Neuroscience at the College of Charleston
\textsuperscript{2}Department of Neuroscience at the Medical University of South Carolina
Several studies link schizophrenia related deficits in cognition with diminished expression of the dysbindin-1 protein. We have previously shown that lacking dysbindin-1 reduces glutamate release in the prefrontal cortex (PFC) through decreased expression of L- and N-type Ca2+ channels.
Fingolimod (Gilenya ®) is known to increase endogenous brain derived neurotrophic factor (BDNF) levels, and in turn, BDNF is known to increase N-type Ca2+ channels. We investigate fingolimod’s effects on cognitive deficits in a dysbindin-1 null mutant mouse. Three genotypes of male mice (WT, HET, MUT) were divided into two treatment groups, saline or fingolimod, and tested for both social interaction (SI) and working memory (WM). We then assayed [BDNF]pfc and intracellular [Ca2+]pfc across both groups. Fingolimod treated MUT mice show increased SI, improved WM, higher [BDNF]pfc, and increased presynaptic [Ca2+]pfc. These results show promise for counteracting schizophrenia associated cognitive deficits, and may illuminate the possible role of dysbindin-1 in symptom pathogenesis.

Helen Olmi, Department of Biology
The efficacy of two equine worming systems was tested. One group of equines was de-wormed every third month with moxidectin, an equine anthelminthic. The other group of equines was de-wormed, with moxidectin, only when necessary as indicated by their fecal egg count. Fecal egg count tests were performed on each equine every three weeks to document the efficacy of each method. Results indicated that the two methods are equally effective in keeping equine’s fecal egg counts at a safe and healthy level. This indicates that the antiquated method of worming every third month may be effectively replaced by the fecal egg count based method in order to reduce and prevent parasite resistance to equine anthelmintics.

110. Drupal Development Project
James Roth, Nelson Hazelbaker, Alex Wang and Cristovam Segundo, Department of Computer Science
Drupal is a free software package that allows you to easily organize, manage and publish your content, with an endless variety of customizations. It’s built, used, and supported by an active and diverse community of people around the world. The project is open source which makes it free to use by everyone. Drupal implements modularity and extensibility, which is one of the reasons why Drupal is so popular, with a multitude of free modules and extensions. Another governance of Drupal is their effort to have quality coding. Drupal is standards-based, meaning that it supports established and emerging standards. Drupal is also dedicated to having low resource demands on their system. They attempt to provide excellent performance by
putting a premium on low-profile coding. Drupal aims to have an ease of use for their users. Drupal governs on collaboration, supporting open, collaborative information sharing systems and approaches.

111. Geomorphology of Submarine Canyons and Related Slope Features along the Western New England Margin, USA
Sonja Tyson, Kristine Rollings, and Leslie Sautter, Department of Geology and Environmental Geosciences
Submarine canyons are erosional features located on continental margins, acting as conduits for sediment transport from coastal and shelf regions to deep oceans. However, submarine canyons have an array of morphologies and these differences change erosional and depositional processes, and sediment distributions. Major slumping along the margin can alter morphology and generate tsunamis, potentially threatening nearby coastal communities. Two main types of submarine canyons exist along the New England margin from Middle Toms Canyon to Atlantis Canyon: 1) incised canyons, which originate on the continental shelf; and 2) slope canyons that initiate on the margin’s slope. Multibeam sonar data collected were used to develop a canyon classification system, based on canyon length, relief, sinuosity, margin gradient, and general morphology. Based on observations, slumping is highly associated with margin gradient and canyon type. Slumping is found in canyons along a steep margin gradient and between canyons on gradual margins.

112. A Bathymetric Analysis Comparing the Geomorphology of Two U.S New England Seamounts
Caitlyn Coker Mayer and Leslie Sautter, Department of Geology and Environmental Geosciences
An east-west trending seamount chain occurs off the New England coast in the western Atlantic Ocean. This chain of submarine volcanoes ranges in age from 80 to 103 million years old, formed when the North American Plate began to diverge from the Mid-Atlantic Ridge, moving westward over the Great Meteor hotspot. The two largest seamounts, Kelvin and Atlantis II Seamounts, were characterized using multibeam sonar, and seamount volumes and vertical reliefs were calculated. Volumes of 3291 and 3037 km3, and vertical reliefs of 3422 and 3277 m for Kelvin and Atlantis II Seamounts, respectively suggest that both seamounts formed over the same length of time. Gradient, alignment, and age similarities indicate that the seamounts formed by the same method, presumably by eruptions from a hotspot.
113. Relationship of Submarine Canyon Morphology and Tsunami Propagation for the Northeast Pacific Continental Margin
Brendan Guthrie, Skyler Hurley, Matt Platt and Leslie Sautter, Department of Geology and Environment Geosciences
Multibeam sonar data for four submarine canyons from the Washington (US) and Vancouver (Canada) continental margin were used to examine the effect of tsunami propagation. Depths from canyon cross-section profiles were used to calculate wave amplitude and wave celerity for a potential tsunami. The seafloor flanking the canyons show increase in tsunami wave amplitude in comparison to amplitude along the canyon axes. Canyon flanks also show decrease in wave celerity in comparison to celerity at canyon axes. Observations show correlation with prior studies confirming that the presence of a submarine canyon prevents an increase in wave amplitude along the canyon axis and increases tsunami arrival time to the shore relative to non-canyon areas.

114. The Mississippi Margin: A Comparison of Continental Margin Geomorphologic Features
Nicholas C. Damm, Robert W. Rivers and Leslie R. Sautter, Department of Geology and Environmental Geosciences
The Mississippi Margin is located on the continental shelf and slope off the Mississippi and Louisiana coasts in the Gulf of Mexico. The two sites for this study consist of a deltaic region located 45 km south of the Mississippi Main Pass and a non-deltaic region located 160 km south of Atchafalaya Bay. The study area located south of the Mississippi Main Pass has a gradual slope, contains various erosional features, and salt domes. The study area south of the Atchafalaya Bay includes a large salt dome with various slump deposits and evidence of turbidity currents. Salt dome dimensions, relief, and gradient were unaffected by their location along the margin. However, continental margin relief and gradient in areas where salt domes are not present is much greater in deltaic-regions versus non-deltaic regions, likely due to influx of terrestrial sediments from the Mississippi River into the deltaic region.

115. The Biological Mechanisms of Cocaine-Seeking
Kristina Bruce, Sarah Barry, and Jacqueline McGinty, Department of Psychology, Program in Neurosciences and Department of Neurosciences, Medical University of South Carolina
The relapse behavior associated with drug addiction is one of the most
difficult aspects of the addiction cycle to treat, thus making it our target. The dorsomedial prefrontal cortex (dmPFC) plays a critical role in the reinstatement of cocaine-seeking. Following forced abstinence, brain-derived neurotrophic factor (BDNF), when infused into the dmPFC, has been shown to attenuate drug-seeking. The goal of this study is to use a SFK inhibitor to determine if SFKs are necessary for BDNF's attenuation of cocaine-seeking and normalization of ERK deactivation following cocaine self-administration. In this experiment, a SFK inhibitor, PP2, and its inactive isomer, PP3, were infused into the dmPFC prior to BDNF in order to test whether SFK inhibition blocks BDNF's effects on cocaine-seeking as well as ERK phosphorylation. An understanding of the mechanisms underlying BDNF's ability to attenuate drug reinstatement could lead to advancements in the prevention of relapse in a reinstatement paradigm.

Kristine Rollings and Tim Callahan, Department of Geology and Environmental Geosciences
Dixie Plantation is a historic property in Meggett, SC owned by the College of Charleston Foundation. The plantation holds much value to the college for education and research purposes. Groundwater wells and a weather station have been operating at the site for the past 10 years; this study makes use of two wells recently installed by Dr. Callahan’s hydrology students and the weather data to calculate a water budget for a spring-fed freshwater reservoir. The project goal is to predict the amount of water in the reservoir. This study is an example of providing science data to support management decisions. In this case, wildlife make use of the freshwater ponds at the site. We will explain the hydrogeologic characteristics of the site to help inform planning and management decisions at similar locations.

117. Spectral, Theoretical, and SEM Studies of Chitosan-Ag Films
Sean Flanagan¹, Narayanan Kuthirummal¹, and Nicole Levi-Polyachenko²
¹Department of Physics and Astronomy
²Wake Forest University
In our previous study the vibrational spectra of pure chitosan films were compared to a set of films containing 10 ppm, 500 ppm, and 2000 ppm silver nanoparticles. The studies showed that there was no detectable interaction in either the Infrared or UV-Vis spectra, which implied that if there was an interaction, it was a weak one. In the current study, we built a model of the chitosan-Ag system using the biomolecular modeling program
Abalone. This theoretical model along with Scanning Electron Microscope (SEM) images were used to verify that the interaction between chitosan and silver nanoparticles is dominated by Van Der Waals forces. The SEM images also showed that there was no ordered structure to the system, with silver nanoparticles randomly dispersed within the chitosan matrix.

118. Urbach Tail Studies of Argon-doped Zinc Oxide Nanostructures
Shea McSween, Narayanan Kuthirummal, Marco A. Rodriguez-Cote, Ramakrishna Podila and Apparao Rao, Department of Physics and Astronomy
Photoacoustic spectroscopy in the visible and infrared was used to analyze the contribution of defect levels on the absorption behavior of pure zinc oxide as well as ZnO samples irradiated with Argon for lengths of 30, 60, and 90 minutes. Regions of the visible absorption spectra were fitted to Urbach energy models allowing the band gap energy $E_g$ and onset energy to be determined. $E_g$ increased with increasing defect levels from 3.549 eV, 3.595 eV, 3.663 eV and finally 3.729 eV, while the optical onset energy decreased with values of 2.868 eV, 2.827 eV, 2.812 eV and 2.827 eV. The Urbach energy parameter, which describes the width of the exponential absorption edge, decreased from 0.122, 0.102, 0.097 and increasing to 0.101 revealing increased density of defect states. Scanning electron microscopy was additionally performed to obtain the surface morphology of the bulk ZnO and of the nanostructures.

119. The Effects of Stimulated Activity on Zebrafish Circadian Rhythms
Jessica A. Dugan$^{1,2,3}$ and Mark W. Hurd$^{1,2,4}$

$^1$Department of Psychology
$^2$Program in Neuroscience
$^3$Honors College, College of Charleston
$^4$Department of Neurosciences, Medical University of South Carolina
Circadian rhythms are behavioral and physiological patterns that cycle daily and synchronize to environmental stimuli. Zebrafish are a useful model for studying vertebrate circadian rhythms due to their diurnal pattern of activity. It was recently shown that forced exercise in the late afternoon improves rhythm robustness in adult mice. We sought to test similar manipulations on zebrafish circadian period. Adult zebrafish maintained on a 14:10 light:dark (LD) cycle were transferred to either constant dark (DD) or constant light (LL) conditions; animals were allowed to acclimate for 24 hours. Individual locomotor activity was then recorded for three days to establish a baseline
using the EthoVision 7 system. On day 4, activity was stimulated for 30 minutes. Activity was tracked for six days following stimulation. Analyses indicated a significantly longer period in DD following stimulation ($t=2.06$, $p<.04$). Manipulations like these in humans could serve as a potential remedy for common sleep problems.

120. Biological effects of ibuprofen and its photodegradant on southern toad tadpoles (Anaxyrus terrestris)
Jonathan Brown, Jessica Ramirez, Wendy Cory and Allison Welch, Department of Biology
Ibuprofen is one of the most commonly used pharmaceuticals today and exists in appreciable concentrations in environmental wastewater. Ibuprofen also photodegrades into different metabolites that may confer human toxicity under conditions of significant exposure. Therefore the purpose of our research was to ascertain if photodegradation-derived metabolites were more toxic than their parent compounds. We measured LC50 of each parent compound and metabolites using tadpoles of Anaxyrus terrestris, and observed that ibuprofen metabolite(s) were more toxic than the parent compound. Future research will include testing mixtures of parent compounds in metabolites to ascertain if mixtures are more toxic than single compounds alone. Previous studies suggest that combinations of these drugs or more deleterious to aquatic organisms than single-drug exposures. Data from our studies will inform future investigations to study the significance of pharmaceuticals in environmental waters and these findings may assist efforts to protect animal and human health.

121. Triboelectric Power Generation
Luther Meyer and Alem Teklu, Department of Physics and Astronomy
Triboelectric generators for energy harvesting and production purposes have been optimized within the last two years to the point that relatively small ones are now capable of supplying the power necessary to charge batteries and power small electronics. The generators rely on two triboelectric matericals (Teflon and Nylon for this experiment) from opposite sides of the triboelectric series being in frictional contact such as pressing or sliding. The friction induces an electrical gradient and with the presence of electrodes on either side of the materials, the electrons flow through an external circuit. We classified the triboelectric series based upon physical and chemical structure in order to make the material selection process less cumbersome for different applications. We then built a triboelectric
generator and characterized the mechanism of electron flow and current dependence.