1. *Silenus*: An Enceladus Exploration Mission

Gabriel Segarra, Kellen Lawson, Lindsey Lowery, Angela Dapremont, Jameson Gresons, John Youngblood, Harrison Langley, Department of Physics and Astronomy

Enceladus, an icy moon of Saturn, is of growing interest to the scientific community because of its geological processes and its potential to harbor life. Its south-polar region exhibits a unique feature known as the "tiger stripes," where cryovolcanism causes cloudy plumes of material to erupt into space and rain back down onto the surface. NASA science goals regarding Enceladus include examination of its internal structure, composition, magnetism, and biological potential. To achieve these goals, our team designed the *Silenus* interplanetary mission, which utilizes a VVEES trajectory and will launch using a Delta IV Heavy rocket with two propulsion elements. *Silenus* will study Enceladus both remotely (from the *AquaVis* orbiter) and directly (via the *Herschel* probes) using spectrometry, seismometry, LIDAR, photography, and particle analysis. The VVEES trajectory also permits observation of nearby moons — Rhea, Dione, and Titan — as they will be used for gravity assists.

2. Working with Open Source: The Miro Project

Tyler Sawyer, Kyle Sprowles, Hannah Murray, Department of Computer Science

For the Software Engineering Practicum course, teams were formed and chose a FOSS (Free and Open Source Software) project in which to build, develop, and contribute throughout the semester. Our team chose Miro, an all-around media player. Miro is a free and open source media hub that can play virtually any popular media format for music, video, and more.
3. Power Laws, CEO Compensation, and Inequality

Calvin Blackwell\(^1\) and Dyanne Vaught\(^{1,2}\)

\(^1\) Department of Economics and Finance  
\(^2\) Department of Mathematics and the Honors College  
CEO compensation, top incomes, and the net worth of the richest Americans have been increasing rapidly over the last thirty years. We hypothesize that the trends in CEO compensation have been caused by the same economy-wide factors that have contributed to increases in wealth and income. We test this hypothesis by using ExecuComp, Forbes 400, and IRS tax data to estimate power law distributions and compare the behavior of these distributions over time. Using the method of maximum likelihood, we estimate a power law distribution for each year observed for CEO compensation and net worth of the wealthiest Americans. Using linear regression techniques, we estimate a power law distribution for CEO compensation and individual income. We find that the Forbes 400 distribution changes little over time, while CEO compensation changes significantly. We find no evidence for the hypothesis that these two distributions move together. However, the parameters of income distribution and the distribution of CEO compensation are correlated; there is evidence that these distributions move together.

4. Dynamic shadowgraph experiments and image processing techniques for investigating free diffusion in nanocolloids

Alexis Payne and Ana Oprisan, Department of Physics and Astronomy  

We performed small angle light scattering experiments in order to investigate non-equilibrium fluctuations. We used a shadowgraph imaging techniques that allowed the concentration fluctuations occurring in the sample cell to be visualized. The experimental set up involved a CCD camera capturing the fluctuations occurring in a sample cell undergoing a free diffusion process. We performed three experiments with gold, silver, and silica colloidal suspensions with different particle size. For each trial, using image analysis techniques, the colloid’s power spectrum, structure factor, and correlation time were found using a dynamic structure factor algorithm. The correlation time allowed us to estimate the diffusion coefficient for all three colloidal suspensions.

5. Alcohol Consumption in Knock-In Mice Expressing Ethanol-Resistant NMDA Receptors

Daniel H. Lench\(^1\), Carolina R. den Hartog\(^2\), Meghin Gilstrap\(^2\), Hleb Fedarovirch\(^2\), John J. Woodward\(^2\), and Gregg E. Homanics\(^3\)\(^1\) Department of Biology, College of Charleston\(^2\)  
\(^2\) Department of Neurosciences, Medical University of South Carolina,  
\(^3\) Department of Anesthesiology, University of Pittsburgh  

Inhibition of glutamatergic N-Methyl-D-Aspartate receptors (NMDARs) is thought to play an important role in mediating the acute rewarding effects of ethanol. Previous studies with recombinant systems have identified a residue (phenylalanine) in NMDARs at position 639
within the TM3 domain of the NR1 subunit that when mutated to alanine reduces the ethanol sensitivity of the receptor. Through the use of western blotting techniques we measured expression of NMDA subunits in key brain regions. We further examined the effects of the mutation on volitional ethanol drinking. F639A Het mice consumed significantly more ethanol in an intermittent 24h access paradigm. F639A Het mice expressed normal amounts of GluN1 and GluN2B protein in a variety of brain regions but showed a small reduction in levels of GluN2A in the mPFC. Overall, these data support the hypothesis that NMDA receptors are important in regulating a specific constellation of effects following exposure to ethanol.

6. Phase resetting curve of a neuron model subject to realistic presynaptic currents

Davy C. Vanderweyen, Derek Russell Tuck, and Sorinel A. Oprisan, Department of Physics and Astronomy, and Neuroscience Minor Program

Nervous systems are composed of complex networks of neurons. Central Pattern Generators (CPGs) networks control rhythmic and stereotypic actions. CPG’s component neurons are modeled as intrinsic bursters (pacemakers) that fire at regular intervals. When an intrinsic burster receives signals from other neurons, it converts them into changes of its firing rate and passes this output to the next neuron. We investigated how the input-output relationship of individual intrinsic bursters, i.e., the phase resetting curve (PRC) and the coupling between neurons generate complex firing patterns in CPGs. We found that the relationship between the stimulus strength and the response of the neuron was linear both in the case of rectangular and triangular shape synaptic inputs. However, the duration of the presynaptic input induced a non-linear response. This suggests that the neuron does not simply integrate the area under the curve of the stimulus current, but is also sensible to its shape.

7. When brain loses track of time

Derek Novo, Sorinel A. Oprisan, and Catalin V. Buhusi, Department of Physics and Astronomy, and Department 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 experimental results. Here we investigated the response of the SBF model to conditioning stimuli (CS) with distracters. The most common distracter, a brief CS gap, was modeled by strongly hyperpolarizing prefrontal model neurons. The postinhibitory rebound of neurons ensures that the SBF model restarts timing, which shifts the peak response by the sum of the pregap duration plus the gap duration. Our results match this experimentally observed behavioral “reset” response.
8. Contributing to Bootstrap

Jason Daniel, Matthew Wayles, Israel James, Raj Singh, Department of Computer Science

Bootstrap is a front-end framework for fast and easy web development. It supplies tools and standardized templates to allow people with little to no web development experience to create beautiful websites. For our Software Engineering class we took on the responsibility of contributing bug fixes and documentation revisions to the Bootstrap project. Our contributions ranged from CSS and JavaScript code modifications to additions to the project’s documentation. We also had the opportunity to become integrated into the Bootstrap community as respected developers. Communication with the lead developers of the project kept us on track, and a few of our modifications will be implemented in the newest release of Bootstrap.

9. Computational investigation of gamma synchronization using optogenetic modulation of front cortex neurons

Patrick Lynn¹, Sorinel A. Oprisan², Antonieta Lavin³, Tamas Tomp³¹Computer Science Department²Department of Physics and Astronomy³Department of Neuroscience, Medical University of South Carolina

Extracellular recordings of electrical activity from frontal cortex (FC) neurons were used in order to investigate the effect of amphetamines on brain rhythms. Optogenetic mice used in our experiments allowed direct control of the electrical activity of interneurons with rhythmic trains of light flashes. Our analysis showed that by stimulating the FC with light pulses at 40 Hz there is a broad, almost Gaussian, and significant response (resonance) of the neural networks around this driving frequency. When compared control responses against cocaine-addicted mice, we observed a much higher synchronization rate and sharper (Gaussian) distribution of frequencies around 40 Hz. It was suggested that deficiencies in large-scale neural rhythms, such as gamma (40 Hz), could be responsible for schizophrenia and autism. At cell level, it is believed that one possible mechanism that explains gamma rhythm disruption is due to deficiencies in expression of the calcium-binding protein parvalbumin in some interneurons.

10. Bathymetric Analysis of the Monterey Canyon

Charles McHugh, Department of Geology and Environmental Geosciences

The bathymetry of the Monterey Canyon in California was mapped using multibeam sonar. The Monterey Canyon extends 146 kilometers offshore with a vertical relief of nearly 3600 meters, greater in width and relief than the Grand Canyon (Carlson and Normark, 2003). Each year the Canyon serves as a conduit to hundreds of thousands of cubic meters of sediment that barrels downslope between its walls. In the past, these turbidity currents have destroyed expensive scientific sensors. In order to understand turbidity currents and their behavioral patterns, a detailed bathymetric map and numerous cross-sections of the canyon seafloor were created using data collected in 2011 by the NOAA Ship Okeanos Explorer equipped with Kongsberg EM302 multibeam sonar. Bathymetric data were processed using CARIS HIPS & SIPS 7.1 post-
processing software. This study will add to our knowledge of turbidity currents and their processes, which might prevent future damage to instruments vital to research.

11. Multibeam Analysis of the De Soto Valley

Matt Christie, Neah Baechler, and Leslie Sautter, Department of Geology and Environmental Sciences

The De Soto Valley is located in the northeast portion of the Gulf of Mexico, approximately 100 km offshore of Pensacola, Florida. This S-shaped, submarine canyon exhibits many interesting features including a gentle slope, erosional and depositional features, as well as nearby salt diapirs. Although the area has been studied since the 1960s, the most recent mapping expedition was conducted in 2012 by The NOAA Ship Okeanos Explorer, with a Kongsberg EM302 multibeam sonar system. Using CARIS HIPS and SIPS 7.1 for post-processing of bathymetric and backscatter data, suspected hydrocarbon deposits regarding the evident diapirs were examined. The research will allow further exploration of the morphology and sediment characteristics in the De Soto Valley, benefiting both the economy, ecology and geological understanding of the region.

12. Geomorphologic Impact on the Climate Record of the Santa Cruz Basin, CA

Christina Heffron, Tyler Wheelus, and Leslie R. Sautter, Department of Geology and Environmental Geosciences

Part of the California Borderland, the Santa Cruz Basin is located off the southern California coast approximately 87 km west of Los Angeles. The basin reaches a depth of 1957 m and covers an area approximately 1735 km$^2$, trending northwest to southeast. The orientation of the Santa Cruz Basin is consistent with orientations of other basins in the region and is the result of right-lateral movement caused by regional transform faults, including the San Andres Fault. Similar to the anoxic Santa Barbara Basin, the Santa Cruz Basin contains varves with a foraminiferal climate record dating to the Miocene. A study of the basin’s geomorphology three distinct features: the Santa Cruz Canyon, a tectonically derived slumping area, and a dendritic drainage system that provides an outlet for the Pilgrim Banks. The sedimentation that is deposited by these features potentially disturbed any preserved paleo-climate record along the basin edge.

13. Geomorphic Analysis of the Galapagos Spreading Center

William Edwards, Department of Geology and Environmental Geosciences

Multibeam sonar data of the Galapagos Spreading Center were obtained by the Scripps Institution of Oceanography in 2010 from aboard the R/V Melville. Surveys were conducted using a Kongsberg EM122 and processed using the CARIS HIPS & SIPS 7.1.2 software. The Galapagos Islands sit over the Galapagos hotspot, a complicated geologic setting close to the
boundary between the Cocos and Nazca Plates. The Galapagos Spreading Center is located just north of the island cluster. Bathymetry and morphology of the spreading center were observed and analyzed in an attempt to understand and characterize the region’s geomorphological history. Research associated with this area will be beneficial to the understanding of hot spots and related seafloor tectonic features and deep sea volcanism, as well as being potentially useful for benthic habitat characterization.

14. Bathymetric analysis of the northwestern Channel Islands Slopes

Angela M. Dapremont and Leslie R. Sautter, Department of Geology and Environmental Geosciences

The Channel Islands are a series of land masses situated between the Patton Escarpment and the coast of southern California. They are located in a region known as the California Borderlands, which is a continental slope that is separated from the continental shelf. Active seismicity characterizes the Borderlands area, which contains numerous offshore faults, as well as basins and ridges that trend in a northwest-southeast direction. Bathymetric data were obtained in 2011 from the NOAA Ship Okeanos Explorer and processed using CARIS HIPS and SIPS 7.1 software. This bathymetric investigation focused on the northwest geographic region of the Channel Islands in order to provide a more accurate characterization of specific features present. BASE surface generation (depth range of 200 to 2000 m) revealed the presence of older features whose appearance is likely due to erosive processes over time. Younger, smoother features, slumping, and sediment transport pathways were also observed.

15. An Exploration into Crustal Subsidence Recorded on the San Juan Seamount

Robin L. Banner and Leslie R. Sautter, Department of Geology and Environmental Geosciences

The San Juan Seamount is a submarine volcano located 255 km west-southwest of Los Angeles. Although it’s northeast-southwest trending peaks now lie 560 m below the ocean’s surface, it formed as an island 19 million years ago. Several surface features record the seamount’s subaerial past, including a slight discontinuity in gradient previously found around 700 m deep. This slope change is the likely boundary between previous subaerial and submarine lava flows. Large weathered cobbles have also been collected from the peaks of the seamount and indicate past wave erosion acting on cobble beaches and coastal cliffs. Data from a 2011 survey was processed to create a Base Surface to better distinguish the previous sea level boundary and a backscatter mosaic to identify the location of coarse sediment over the entire mapped area. Using this information, it has been concluded that the seamount has subsided 550-700 m since the late Miocene.
16. Bathymetry of the Cayman Trench between the Cayman Ridge and Nicaragua Rise

Taylor Intaphan, Department of Geology and Environmental Geosciences

The Cayman Trench (or Trough) is located in the Caribbean Sea, ~100 km west of Jamaica and south of the Cayman Islands. The site is renowned for geologic complexity; it is both a transform fault zone and a "pull-apart" basin which produces many geological features. Within the trench lies a spreading zone, at a depth of between ~4000 and 5000 m, bordering the North American and Caribbean Plates. Bathymetric data were gathered using multibeam sonar aboard the NOAA Ship Okeanos Explorer in 2011, and processed to illustrate bathymetry of the Cayman Trench region. These data show the longitudinal profile of the Cayman Trench as well as the trench’s rise, to the south. Subsurface 3-D and 2-D images and profiles of the Cayman Trench will provide hydrogeologists and geophysicists with detailed bathymetry to identify essential sites for further studies to better understand the subsurface geology.

17. Bathymetric Analysis of the Southern Portion of the Mid-Atlantic U.S. Continental Margin

Per William Lorentzen, Samir Younes, and Leslie R. Sautter, Department of Geology and Environmental Geosciences

Multibeam sonar data were collected by the NOAA Ships Okeanos Explorer (June, 2011 and November, 2012) and Nancy Foster (June, 2011) during three cruises to acquire high-resolution bathymetric and backscatter data of the continental slope due-east of the northern portion of the Outer Banks, North Carolina and southern Delaware coastlines. Surveys were run parallel to the shelf edge, ranging in depth from 100 to 3000 m. This area has relatively steep gradients. The shelf is well incised by many medium-sized submarine canyons in close proximity of each other as well as the large Norfolk and Washington Canyons that characterize the slope and rise. High-resolution bathymetry can help with predicting areas where tsunamis may occur as a result of major sediment slumping. The continental rise is seldom the focus of mapping projects, but within our data are three examples of sediment travelling from shelf to rise.

18. Bathymetric Analysis of Continental Shelf-Edge Marine Habitat off the Coast of Charleston, SC

Kyle W. Ford, M. Montgomery Taylor, Leslie Sautter, and Scott Harris, Department of Geology and Environmental Geosciences

A delta-like feature was identified at the continental shelf edge, 85 km southeast of Charleston, SC and named the Geneva Delta. This feature may once have been an active river delta during a lower stand of sea level approximately 30 meters below present day. Bathymetric data were collected by College of Charleston BEAMS Program students during a research cruise in May 2012 aboard the NOAA Ship Nancy Foster. The survey area ranges in water depths from 40 to 70 meters. Analysis of ROV images revealed areas of low relief interspersed with rocky
outcrops. Additionally, a variety of fish and marine invertebrates was observed, including the invasive species, *Pterios volitans*, commonly known as the lionfish. These data are crucial to understanding essential fish habitats on the southeast continental margin in order to determine potential locations for establishing Marine Protected Areas.

19. The Bathymetric and Morphological Analysis of the Mississippi Slope

Harris Pantlik, Matt Hughes and Leslie Sautter, Department of Geology and Environmental Geosciences

Multibeam sonar and backscatter data were collected in August, 2011 aboard the NOAA Ship *Okeanos Explorer* along the Mississippi continental slope, 70 km southeast of the Mississippi River Delta. Data were collected using a Kongsberg EM302 and were processed with CARIS HIPS 7.1. This region has been heavily investigated by the petroleum industry and academia due to its archetype marine petroleum-bearing basin. Bathymetric data yielded high resolution images of several geomorphologic features to included wave-cut terraces, salt diapirs, large scale slumping, gas vents, sediment fan lobes and other structures formed during the Late Pliocene.

20. Bathymetric Study of Four Submarine Canyons on the Southern Edge of Georges Bank

Savannah Norvell and Leslie R. Sautter, Department of Geology and Environmental Geosciences

Georges Bank is a large submerged plateau, encompassing an area of 42,000 m² on the northeastern continental shelf. On its seaward boundary it is incised by several submarine canyons, which play a significant role in the high levels of productivity that have historically characterized the area. Marine organisms thrive in submarine canyons, and recent approaches to protect fish populations have emphasized the importance of these benthic habitats. Raw bathymetric data of four submarine canyons that incise the bank were acquired with a Kongsberg EM302 multibeam sonar system from aboard the NOAA Ship *Okeanos Explorer* in 2012. These raw data have been processed and analyzed in this study with the CARIS HIPS 7.1 software. These data have been used to predict coral habitats on the basis of canyon depth, relief of canyon walls, and location of hard substrate.


Chad Hobbs, Daniel Anderson, Jon Loy, and Reece Long, Department of Computer Science

Django is an open source python based web development application framework. Website developers use this framework to build robust and feature rich websites. Our student development team has become a contributor to this open source project in order to improve the
user experience, aid new users in getting started with Django, and repair software bugs in the project code. Contributors to Django must become familiar with software tools such as Github, Sphinx, Trac, and software editors. Our project documents this process and our experiences with contributing to Django.

22. The effects of caffeine on ethanol-induced locomotor stimulation and reinforcement

Megan L.T. Hilbert¹, William C. Griffin III²Department of Biology, Honors College, and Neuroscience Program³Center for Drug and Alcohol Programs, Department of Psychiatry & Behavioral Sciences, Medical University of South Carolina

Alcohol (ethanol) mixed with caffeinated energy drinks is an alarming trend in today’s society. Previous studies have found that ethanol and caffeine mixtures significantly increase locomotor activity in C57BL/6J mice compared to either drug alone. These experiments hoped to further elucidate the effects of caffeine on ethanol-induced locomotion and reinforcement. Consistent with earlier experiments, results indicated that caffeine increases activity of mice co-treated with ethanol. The second experiment examined the ability of caffeine to influence ethanol-induced conditioned place preference. As expected, ethanol administered alone produced significant place preference; that is, it increased time spent on the ethanol-paired side. Given alone, caffeine evoked no consistent preference. The ethanol-caffeine combination group demonstrated preference like ethanol given alone. Thus, caffeine did not alter ethanol reinforcement in this behavioral test. In summary, our findings indicate that caffeine modulates ethanol-induced changes in locomotor activity, but does not alter ethanol reinforcement in the place preference procedure.

23. Dendritic spine plasticity in PFC may contribute to a negative affective state during chronic pain

Hannah Hughes¹, Rochanya Generous², and Arthur Riegel³Department of Chemistry and Biochemistry, Program in Neuroscience³Department of Biology³Department of Neuroscience, Medical University of South Carolina

Chronic pain is a serious public health problem. The affective component of pain (emotional) is mediated by the prefrontal cortex (PFC). We hypothesize that cortical rewiring of neurons that start with structural changes in dendritic spines is responsible for the development of the affective component of pain. To test this, rats were subjected to an animal model of neuropathic pain, the Spared Nerve Injury (SNI). At 7 or 30 days post-surgery, rats were perfused with paraformaldehyde and dI was ballistically loaded into the prelimbic region of the PFC using a gene gun. Spine density and morphology was analyzed with confocal microscopy and Imaris software. Results show that there is a significant increase in the density of long thin and filopodia-type spines, which are classically associated with learning. This suggests that structural changes in PFC neurons may contribute to the development of pain-related affect.
24. Pharmacological Manipulation of Glutamate Transmission Enhances the Extinction of Alcohol Cues and is Associated with Plasticity Changes in the Prefrontal Cortex

A. S. Kassab\(^1\) and J. T. Gass\(^2\)
\(^1\)Department of Psychology and Program in Neuroscience
\(^2\)Department of Neurosciences and Center for Drug and Alcohol Problems, Medical University of South Carolina

Overlearning the associations between the drug effects and cues predicting drug availability occurs through classical and operant conditioning. Exploring neural mechanisms of extinction would be helpful as recent evidence indicates it is an active learning process involving glutamatergic mechanisms. Positive allosteric modulator (PAM) CDPPB has been shown to extinguish cocaine cues through glutamate modulation at the mGluR5 receptor. This study aims to determine the efficacy of CDPPB in potentiating the extinction of alcohol-seeking. Wistar rats were trained to self-administer 10% alcohol solution. Rats underwent extinction training receiving s.c. injections of either CDPPB (30mg/kg) or vehicle, 20 minutes prior to each session. Active and inactive lever presses paired with a light-tone complex stimulus were recorded until criteria were met. CDPPB significantly reduced active lever pressing during extinction training and the number of sessions required. These data provide that mGluR5 PAMs facilitate extinction of alcohol-seeking and could act as novel, pharmacological treatment.

25. Three-Dimensional Analysis of a Novel Mouse Model Demonstrating Bicuspid Pulmonary and Aortic Cardiac Valves

Rachel Ekdahl, Ariel Washington, Loren Dupuis, and Christine Kern, Biology Department and MUSC Department of Regenerative Medicine and Cell Biology

A bicuspid aortic valve (BAV) is a cardiac malformation resulting in two rather than three mature cusps in the cardiac outflow valves. BAV is the most prevalent cardiovascular malformation; however, its development is poorly understood. To test the hypothesis that versican cleavage via ADAMTS5 is required, in part, to induce Smad2 phosphorylation, we generated a mouse model using \textit{Adamts5}\(^{-/-}\) with \textit{Smad2}\(^{+/+}\). The cardiac valve phenotype of the \textit{Adamts5}\(^{-/-}\);\textit{Smad2}\(^{+/+}\) mice was compared to wild type littermates using Amira\textsuperscript{TM} software to create three-dimensional valve reconstructions. Analysis revealed myxomatous bicuspid valves and high penetrance of BAV in \textit{Adamts5}\(^{-/-}\);\textit{Smad2}\(^{+/+}\) mice compared to control mice.

26. PanaView

Drew Hendricks, Kathryn Kirchoff, Raj Singh, Johan Van Cauwenberghhe, and Ronald Zielaznicki, Department of Computer Science

In today's increasingly virtual world, there is a growing demand for interactive phone apps. Our app "PanaView" will take panoramic views of locations and upload them to its database. Users may then add descriptions or tags, so the information is readily available to other users of the database's panoramic gallery. Potential tourists, museum visitors, and those wishing to tour
college campuses would benefit from this type of app. Our goal is to demonstrate how panoramic apps may create useful content for users and to explore the uses of panoramic video versus photo.

27. Forget The App Stores - Web Based Apps with HTM5 and CSS3

M.T. Bourque, Corey Brown, James Thompson, and Sage Pacheco, Department of Computer Science

The technological world is looking for a one size fits all solution. Cross compatibility between various phones, tablets, and computers have driven the need for web based apps. Mobile usages has increased to outpace the personal computer. Companies are more frequently designing for mobile first and with a need for flexible design. In our project, we a look into how HTML5 and CSS3 are now the new standards for design and building web based applications due to their compatibility and ease of use. By designing a mobile app for the local restaurant company, Ladles, we will exhibit the fluidity and ease offered by using the HTML5, CSS3, and Jquery mobile technologies in mobile application development.

28. Mobile Device CPU and GPU utilization in a Distributed Computing Environment

Denny Nolan, Jacob Jameson, Julia Margolis, and Lancie Affonso, Department of Computer Science

A large setback in some scientific research is the lack of adequate computing resources for analyzing large datasets, exploration of large search spaces, simulations of physical systems, and other scientific processes. Now that smartphones and tablets are gaining larger and larger computing capabilities, ResourceShare seeks to allow the average smartphone or tablet owner to volunteer CPU and GPU time to computing projects such as Folding@Home, SETI@Home, LHC@Home, etc. The app would be enabled only when an active Wi-Fi connection is available, and as a default, when the mobile device is connected to a power source and charging. Another key feature of the app would be its ability to let the user choose between a number of different BOINC-based volunteer computing projects.

29. Crowd-Sourcing College Dining with a Mobile App

Tanner Hoisington, Logan Turner, Kate Wilson, Allen Edwards, Cody Jackson, and Lancie Affonso, Department of Computer Science

Our app, Food with Friends, will provide the College of Charleston with the dining app it is lacking by offering key features not found in the cross-campus app OpenDish. Besides being able to access menus and nutritional facts, our app lets the user make meal groups that can be notified when a member is at a dining hall. Friends for the meal group will be found by accessing Facebook’s API to find other people with the app the user knows. If the school allows it, we would also like to be able to allow students to rate dishes served in the dining halls.
30. - Award of Merit - Obsidian: Generator of pattern based unit test implementations for java classes

Hunter Hegler, Michael Cole, Joanna Illing, Laryea Quaye, and Micah Jenkins, Department of Computer Science

Obsidian is a unit test generator for java built for the JUnit framework. Obsidian concentrates on building standardized test implementations that are comprehensive and easy to maintain, allowing the test engineer to concentrate on test case instantiation. This is in contrast to the strategies of many unit test generators, which focus on generating test cases. These generated test cases are coupled with implementations that are often difficult to maintain or non-comprehensive. Obsidian employs a set of design patterns that are built around a method test’s necessities for compilation, exception handling, and test case iteration to generate these implementations.

31. Open Source Bug Fixes for Sahana Eden Project

Robert Fitz, Jeff Hurvitz, Woodrow Binnicker, and Alex Schroeder, Department of Computer Science

Sahana Eden is a Humanitarian Free Open Source Software (HFOSS) project which manages and coordinates resources for disaster prevention and response in the international community. Participating in the HFOSS effort, we have corrected, submitted, and tracked inclusion of several software bugs within the Eden resource logistics application. The bug fixes provide more efficient data input, tracking, and analysis.

32. Advanced Materials for Biomedical Applications: Chitosan-Ag Films

Sean Flanagan¹, Narayanan Kuthirummal¹, and Nicole Levi-Polyachenko²³; Department of Physics and Astronomy²Wake Forest University, Winston-Salem, NC

The mechanical properties and vibrational spectra of pure chitosan films were compared to those containing silver nanoparticles. The set of films consisted of pure chitosan, and chitosan samples doped with 10 ppm, 500 ppm, and 2000 ppm silver nanoparticles. The chitosan was listed as 75-85% deacetylated and the silver nanoparticles were charged at +18 mV and were ~75 nm in diameter. The mechanical properties of chitosan-Ag films were measured using a motorized vertical stand with a force gauge and distance meter, while the vibrational spectra were measured using the Fourier transform infrared photoacoustic spectroscopy (FTIR-PAS) technique. The FTIR-PAS data showed that there was no broadening or shifting of peaks, indicating that there was no IR active interaction between the silver and chitosan. The mechanical studies showed that the 500 ppm films had the largest Young’s Modulus, but must undergo more rigorous testing to obtain a higher level of certainty.
33. The Myoproteome of *Manduca sexta*: Gene Annotation and Transcript Analysis

Agnes Southgate and Sam Feldman, Department of Biology

Traditionally, insects have been classified based on wing morphology and the physiology of the thoracic flight muscles that move their wings. Insects use two different types of flight muscle, known as synchronous and asynchronous. Synchronous flight muscle physiology is considered a basal characteristic and is found for example in *Manduca sexta* (Lepidoptera). Insects that have asynchronous muscles, such as the model organism *Drosophila melanogaster*, are considered derived and are known to have protein forms that are only found in flight muscles. The current hypothesis states that these specific isoforms are necessary for asynchronous flight. We propose that *Manduca sexta* will have no flight muscle specific protein isoforms. We will focus our initial analysis on two proteins: actin and troponin C. The data from the different isoforms of both actin and troponin C will be evaluated in respect with the hypothesis.

34. - Award of Merit - The effects of the parasites, *Cardicola laruei* and *Kudoa inornata*, on the swimming performance of Spotted Seatrout, *Cynoscion nebulosus*

Andrew George, Isaure de Buron, and Eric McElroy, Department of Biology

Parasites are often associated with detrimental impacts on host physiology, but few studies have examined the impact of parasites on the swimming performance of fish. In this study, we aimed to determine the impacts of two parasite species, *Cardicola laruei* and *Kudoa inornata*, on the swimming performance of Spotted Seatrout, *Cynoscion nebulosus*. For 18 fish, we quantified burst swimming speed, \( U_{\text{Burst}} \), and critical swimming speed, \( U_{\text{Crit}} \), as indicators of anaerobic and aerobic swimming abilities, respectively. Significant positive relationships were observed between *C. laruei* infection density and \( U_{\text{Crit}} \) and between *K. inornata* infection density and \( U_{\text{Burst}} \). No significant relationships were observed between *C. laruei* infection density and \( U_{\text{Burst}} \) or *K. inornata* infection density and \( U_{\text{Crit}} \). The positive correlations between *C. laruei* infection density and \( U_{\text{Crit}} \) and *K. inornata* infection density and \( U_{\text{Burst}} \) suggest that the parasites are impacting host morphology and physiology in an unexpected way.

35. Microscopic evaluations of differences between synchronous and asynchronous insect flight muscles

Mary Crowe and Agnes Ayme-Southgate, Department of Biology

Projectin and mp20, proteins of insect muscle are under investigation for their role in muscle contraction and asynchronous/synchronous physiologies. Studies in *Drosophila melanogaster* flight muscles indicate that projectin is found between the Z and I band regions, whereas mp20 is absent. In this study we used locations reported in *D. melanogaster* as a model to investigate the location of projectin and mp20 in *Danaus plexippus* (monarch butterfly), *Manduca sexta*
(tobacco hornworm), *Apis mellifera* (bee) and *Acheta domesticus* (cricket). Except for *Apis mellifera*, all insects listed have synchronous flight muscles, different from *D. melanogaster*. Using indirect immunofluorescence and confocal microscopy, the protein locations were studied in each insect model. Also, RT-PCR data were collected to determine the presence or absence of mp20. Data suggest that the projectin location in the four insect models agree with the predictions from *D. melanogaster*.

### 36. Pour Some Sugar On Me

Ryan Rachford, Thomas Raab, Jalisa Greene, and Jesse Rigdon, Department of Computer Science

Sugar Labs is a humanitarian free and open source software (HFOSS) project associated with the One Laptop Per Child (OLPC) foundation that strives to distribute computers to the impoverished. Sugar Labs is an operating system that runs on laptops distributed by the OLPC. It is open source meaning anyone can see the code and alter it to make their own contributions to a project. Our team joined up with the Sugar Labs community to find out what we could do to help. Our contributions ranged from bug patches to documentation enhancements, which allowed us to gain a foothold into the Sugar Labs community and make a difference in the project.

### 37. Glutamate Kinetics in Middle-Aged Mice with a Partial *GDNF* Reduction

Ariana Quattlebaum¹, Rebecca A. Gregory², Kristi L. Helke², Ann-Charlotte Granholm³, and Heather A. Boger³

¹Department of Chemistry and Biochemistry, Program in Neuroscience²Department of Comparative Medicine, Medical University of South Carolina³Department of Neurosciences and Center on Aging, Medical University of South Carolina

GDNF, a known growth factor, is important for maintaining the health of dopamine neurons. Parkinson’s patients have a greatly decreased number of dopamine neurons in the substantia nigra while existing neurons have less GDNF and show signs of oxidative stress. Animal models with GDNF reduction show an accelerated decline in this dopaminergic system and motor function similar to Parkinson’s patients. The purpose of this study is to help determine the role of GDNF in glutamate release. Following motor activity assessment, KCl-stimulated glutamate release was assessed in wild-type and *Gdnf⁺⁻* mice. After this procedure, tissue was stained to determine levels of cytokine expression and SOD-1 (endogenous antioxidant expression). Initial results indicate the *Gdnf⁺⁻* mice have greater glutamate release into the nigra compared to wild-type mice as well as greater cytokine expression and SOD-1. These data support that increased glutamate release promotes nigral oxidative stress and DAergic cell loss.
38. The Patching and Extension of Galaxy with Cloud-based File Storage Solutions

Jeremy Morgan, Matt Paul, Brett Ostwalt, and Ronak Raithatha, Department of Computer Science

Galaxy Bioinformatics is an open-source workflow management system that functions by adding a web-based GUI frontend to otherwise local command line tools. This allows for researchers who otherwise have no experience with command line execution to take advantage of powerful tools. As it currently functions, the files that these tools operate on are stored on the Galaxy server, which the user must upload from their local system or fetch from a predefined database. Accumulation of previous work led to the goal of implementing a cloud-based storage file-fetching tool to download user files from remote sources such as Google Drive and Dropbox. In order to become familiar with this project our team patched the grep filter tool, which was accepted, and so work began on cloud integration.

39. Phenotypic plasticity of the sensory nervous system in *Alpheus angulosus* claws

Ariane Pereira, Erica Tracy, Melissa Hughes, and Christopher Korey, Department of Biology

The snapping shrimp, *Alpheus angulosus*, have a larger snapper claw used in agonistic interactions, and a smaller pincer claw used for manipulating the environment. The claws undergo a unique transformation upon the loss of the snapper claw where they swap handedness as they regrow. Our research is aimed at understanding how the sensory pathways associated with the claws rewire as this transformation occurs. We hypothesized that the sensory nervous system will be remodeled at the level of the sensory setae and back to the thoracic ganglion. We used Scanning Electron Microscopy to quantify the amount and type of sensory setae present on the exoskeleton before and during claw transformation to produce a map of sensory process changes. Preliminary results showed changes in setae type and distribution as the transformation occurs which indicates there is likely a remodeling of the nervous system underlying the sensory structures.

40. - Award of Merit - Volcano Mapping in the Central Sahara Desert Using Landsat ETM+ Data

Eli Webster and Robert L. Nusbaum, Department of Geology and Environmental Geosciences

Emi Koussi, a stratovolcano located on an intraplate hotspot in the Tibesti Mountains of northern Chad, is the highest peak in the Sahara Desert. Due to remote location and an arid climate, the region is well suited for geologic mapping using image classification of satellite imagery. We have produced a geologic map of the volcano that highlights distinctive lithologies, caldera boundaries, maars, and relative ages of some tuffs and lavas. To accomplish this, Landsat radiance data were calibrated to apparent surface reflectance with results validated by comparison of spectra to known vegetation targets. A Minimum Noise Transformation (MNF)
algorithm was applied to calibrated spectra to segregate noise into a 6-band image, the first being the sharpest containing the most coherent information followed by the second and so forth. The first three MNF bands were used spectrally validated and used to produce the map in ArcGIS.

41. Effect of Human Disturbance and Seasonality on Habitat Preference of Wading Birds, *Ardea alba* (Great Egret) and *Egretta thula* (Snowy Egret)

Erica Levine, Department of Biology and the Honors College

Human disturbance such as rapid urbanization is a growing concern for the conservation and management of biological communities. The effect of human disturbance and seasonality on marsh communities was evaluated by examining the abundance of two bioindicator species of wading birds, Great Egret and Snowy Egret. Observations were conducted from June to December in three habitats classified by the Tidal Creeks Project as forested, suburban, and urban. Locations were further identified by human activity levels as low, recreational, moderate, and high. Bird populations were larger in summer and both species changed their habitat preferences with the season. In winter, Snowy Egrets were more abundant in suburban habitats than in less disturbed, forested habitats. Human activity level influenced Great Egret presence more with low and recreational preferred overall and during summer while in the winter high level habitats were preferred over moderate. Based on species habitat preference, implemented management policies combined with urbanization policies can allow for cohabitation by humans and marsh species.

42. Coiling Direction of *Neogloboquadrina pachyderma* as Proxy for Climate Change, Tanner Basin, California Margin

Katherine Johnson, Alicia Raimann, and Leslie R. Sautter, Department of Geology and Environmental Geosciences

Coiling directions of the planktonic foraminifera *Neogloboquadrina pachyderma* are used as proxies for glacial/interglacial climate changes. Downcore variability of this species was examined in an IODP core from the Tanner Basin in the California Margin, Leg 167, Site 1014. Coiling directions of *N. pachyderma* specimens revealed a cooling period in the early-middle Pliocene Epoch, from 3.0 to 2.6 mybp, followed by a warming period through the Middle Pleistocene (2.2 – 1.2 mybp). The middle-late Pleistocene contained a period of cooling (1.2 – 0.3 mybp) followed by a warming period (0.3 to 0.1 mybp). Cooling periods can be correlated with Northern Hemisphere glaciations that led to strengthened upwelling along the California Margin and increased dominance of the left-coiling form of *N. pachyderma*. These data were compared to published data from Hole 1014 and support the interpretations for climatic oscillations during the past 3 million years.
43. The *Pachyderma* Proxy, Bringing Scientific Data into a Laboratory Classroom

Alicia Raimann, Katherine Johnson, and Leslie Sautter, Department of Geology and Environmental Geosciences

Down-core coiling variability of *Neogloboquadrina pachyderma* was examined using an Integrated Ocean Drilling Program core from the Tanner Basin in the California Margin. The core was collected on the Drilling Vessel JOIDES Resolution, Leg 167 at Site 1014. Coiling direction data were the basis for developing the *Pachyderma* Proxy supplementary laboratory exercise created for a College of Charleston Marine Geology class. A series of exercises allowed students to examine *N. pachyderma* specimens using prepared micropaleontological slides, plot down-core variations, interpret real scientific data, and compare their data to published data sets to understand the overall climate shifts during the late Pliocene to early-late Pleistocene. For the first trial of this laboratory exercise, the students did extremely well identifying the overall coiling trends from the core samples despite technical difficulties with sample slides. This lab exercise will be submitted for publication.

44. Longleaf Pine Population Dynamics and Interspecific Competition and the Effect on Growth and Carbon Storage

Jacob Oblander and Phillip Dustan, Department of Biology

In a fire maintained longleaf pine forest interspecific competition between tree species is limited or nonexistent due to the controlling effects of periodic burning. Without fires a longleaf forest is invaded and dominated by hardwood and less fire tolerant pine tree species. Following Hurricane Hugo an eight acre patch of pine and deciduous hardwood forest that had suffered severe damage was divided into two experimental plots to study the growth rates of individual longleaf pine seedlings. One half was clear-cut and the other half partially cleared, leaving the larger oaks and pine trees to create a competitive environment. The study site was burned every two-three years from 1996-2006, measurements were taken from 1996-2004 by Ecology students. In 2006, the trees were carefully measured using triangulation and mapped with high resolution GPS. Trees were again measured in 2012-2013 in an to estimate the rates and variability of Longleaf seedling mortality, growth, and carbon storage.

45. Preliminary Results of Analysis of Non-Quartz Minerals in Lowcountry Barrier Systems through Time

Seema Shah, Robert Nusbaum, and Scott Harris, Department of Geology and Environmental Sciences

South Carolina barrier systems consist of sands containing a variety of minerals besides quartz, some of which (e.g., hornblende, ilmenite, and monazite) are useful to refine provenance studies. These minerals were isolated to analyze weathering trends over time. Prior to analysis, samples were processed using sonic dismemberment to remove clays and magnetic separation to isolate
minerals of interest. Analytical techniques included reflected and transmitted light microscopy, along with scanning electron microscopy in conjunction with x-ray analysis for composition. Hornblende displayed abundant en echelon etched features in the Santee Watershed suggesting enhanced weathering compared to those from the Coastal Plain Watershed (CPW). Ilmenite Ti/Fe ratios increased with age in the CPW. Monazite, a rare earth element phosphate mineral, was detected in a CPW younger barrier system. This particular mineral has the potential to record metamorphic events that might otherwise be missed, thus fine-tuning provenance studies of the future.

46. Hemodynamic variables in stroke patients with diabetes and hypertension

Amanda C. Coker¹,², Andrea D. Boan², and Daniel T. Lackland²¹ Department of Psychology and Program in Neuroscience² Department of Neurosciences, Medical University of South Carolina

Stroke is a leading cause of death and disability in the United States, especially in the Southeast. Hypertension and diabetes are risk factors for stroke incidence and recurrence. Also, hyperglycemia is associated with poor recovery. This project assessed admission blood pressure (BP) and hemoglobin A1c (HbA1c) levels, antihypertensive and anti-diabetic medication regimens prescribed post-stroke discharge, and stroke severity (NIHSS) scores among patients ≥45 years old at MUSC between Oct 2008-Oct 2009. Patient demographics, comorbidities, hemodynamic values, and discharge medications were compared by age, race, and gender. Preliminary analyses found that 26.6% of the patients were diagnosed with diabetes, with significantly higher proportions among African Americans than Caucasians (p=0.03). Medication regimens controlling hypertension and hyperglycemia are important in secondary stroke prevention, but a significant proportion of diabetic patients were not prescribed anti-diabetic medications post-stroke. Stroke severity was not associated with comorbidity status.

47. Phage Hunters: Isolation and Annotation of Mycobacteriophage Dirt Mcgirt

John Brooker, Tomika Caldwell, Rachel Ekdahl, Chad Froes, Taylor Hammock, Daniel Hinson, R. Elliot Murphy, Pooja Patel, Ariane Pereira, Mai-Trinh Pham, John Raymond, Gabriel Segarra, Ditte Thomas, Erin Richard, and Ana Zimmerman, Department of Biology

Other than HIV/AIDS, Tuberculosis infection causes more deaths annually than any other infectious disease in the world. Because of the similarities between Mycobacterium smegmatis and Mycobacterium tuberculosis, phages isolated using a culture of M. smegmatis are expected to also have the ability to infect M. tuberculosis cultures. The purpose of this project is to obtain a pure sample of bacteriophage and to annotate the complete genome of the isolated phage. The purification of our phage (appropriately named: DirtMcgirt) was achieved using plaque streaking methods. Once an isolated plaque was obtained, samples were sent off to VA Commonwealth University, where the complete sequence was acquired through 454 Pyrosequencing for annotation using BLAST and Phamerator.
48. Cyclophosphamide-induced bladder inflammation is mediated by urothelial inflammasomes

Nivardo P. Vivar¹, F. Monty Hughes², and J. Todd Purves²¹Department of Biology²Department of Urology, Medical University of South Carolina

Bladder inflammation, known as cystitis, is a common ailment associated with patients undergoing Cyclophosphamide (CP) chemotherapy treatment. Specifically, CP and other cystitis-inducing agents have been shown to generate symptoms associated with Overactive Bladder (OAB) such as increased urination urgency, frequency, pelvic pain, and urinary incontinence. These cystitis-inducing agents are believed to activate inflammasomes, components of the innate immune system, in bladder epithelia (urothelia). After demonstrating the presence of NLRP3 and NLRC4 urothelial inflammasomes, we hypothesized that they play a critical role in the regulation of cystitis. To demonstrate their importance in vivo, we treated rats with CP in the presence or absence of Glyburide, a known inflammasome inhibitor. Bladder function was evaluated through conscious urodynamics 24 hours after treatment. Results indicate that CP-induced bladder inflammation symptoms are reversed upon treatment with Glyburide. This suggests that inflammasomes are important mediators of bladder inflammation and are optimal targets for pharmaceutical intervention.

49. Correlation between size of hearts and granuloma density of Cynoscion nebulosus infected with the blood fluke, Cardicola laruei

Candice Alge, Isaure de Buron, and Eric McElroy, Department of Biology

Cynoscion nebulosus, the spotted seatrout, is commonly infected with Cardicola laruei, a blood trematode that causes an accumulation of granulomas in the heart muscle. Data from our laboratory indicated that the fish that were infected with high number of C. laruei granulomas had an unexpected increase in swimming performance. We hypothesized that granuloma accumulation in the heart causes it to enlarge, allowing more oxygenated blood to be transported to the body muscle. The objective of this study was to determine if there is a correlation between granuloma density and heart size in C. nebulosus. Thirty-one heart samples, eight from males and twenty-two from female fish were measured using various morphometric parameters, and granuloma density was determined for each. No hypertrophy was shown to occur but a significant negative correlation in female fish occurred between apex wall thickness and granuloma density. Significance of this result has yet to be understood.

50. High Density Lipoproteins Promote Endothelial Cell Barriers via Up-regulation of Vascular Endothelial Cadherin

Kelley M. Argraves, Mark D. Lazarro, and Joshua R. Voltin, Department of Biology

Elevated levels of high density lipoproteins (HDL) have been associated with lower occurrences of ischemic heart disease in humans. HDL has also been observed to promote endothelial cell barriers in conjunction with sphingosine-1-phosphate (S1P). We observe a decrease in
endothelial cell barrier permeability in electric cell-substrate impedance sensing (ECIS) experiments in which we treat endothelial cells with GM6001, a matrix metalloproteinase (MMP) inhibitor. Vascular endothelial cadherin (VECad) is an adhesion protein associated with cell-to-cell connections between endothelial cells and is cleaved by MMPs. We treated plates of serum-starved human umbilical vascular endothelial cells (HUVECS) with GM6001 and HDL and collected cell lysates. Using western blot analysis, we observe that there is a significant increase in the levels of VECad in cells treated with HDL as compared to controls.

51. - Award of Merit - Photodegradation Mechanism of Vardenafil

Logan Herbert and Wendy C. Cory, Department of Chemistry and Biochemistry

An understanding of the photodegradation of pharmaceuticals is an important part of assessing the environmental fate of these contaminants. Investigating what new compounds are formed is important in assessing any potential toxicity. We have studied the solar photodegradation of vardenafil, the active ingredient in Levitra. Our data indicates the photodegradation involves a progressive breakdown of the substituted piperazine ring. These findings were confirmed using MS/MS and methylation of the photodegraded sample. The methylation allowed us to distinguish between the amines and the amides formed during photodegradation. To determine the rate of degradation in natural waters, aqueous solutions were prepared with a phosphate buffer and varying concentrations of humic acid, simulating the dissolved organic matter found in natural waters. The half-life of vardenafil was 2 hours in the phosphate buffer and ranged from 40 minutes to 1 hour in humic acid-treated water.

52. Aerosol Concentration Fluctuations

Mike Chute and Mike Larsen, Department of Physics and Astronomy

Modified optical particle counters were used to study the statistical characteristics associated with concentration fluctuations of indoor aerosols. An aerosol detection code capable of determining the arrival of individual aerosols to the nearest tenth of a millisecond was developed and utilized. This code was used to explore the impact that active (forced air) sampling has on the underlying statistical measures of concentration fluctuations. Results revealed qualitatively different statistical behavior in the two sampling methodologies. Unexpected timescale dependent statistical structure was also observed and suggests further study.

53. - Award of Merit - Forensic DNA genotyping of pelagic marine fish larvae sampled across the Western North Atlantic Continental Shelf

Amanda M. Cole and Andrew M. Shedlock, Department of Biology

This project generated an archive of purified genomic DNA from 300 pelagic marine fish larvae collected through the CofC Transects program at 20 oceanic sampling stations spanning the continental shelf of South Carolina. High phenotypic plasticity of open-ocean larval organisms
prohibits their reliable identification by conventional morphological character analysis. We therefore used PCR amplification and DNA sequencing of COX1, a protein encoding gene, and the non-coding mitochondrial D-loop to forensically genotype larvae at two distinct loci. Of the 300 samples processed, over 100 yielded clean target sequences. PCR products were analyzed by agarose gel electrophoresis prior to sequencing, and online BLAST-based informatics of genomic data revealed taxonomic diversity of more than 25 distinct families of fishes. These successful genotyping results are being integrated with physical oceanography and biogeography to help bridge a large gap in our ability to model juvenile recruitment and community dynamics of ecologically important pelagic fish populations.

54. Investigation of the Threshold Photodynamic Dose for HPPH-sensitized PDT of Panc-1 Pancreatic Cancer Cells

Pooja Patel, Department of Biology, and Linda Jones, Department of Physics and Astronomy

My bachelor’s essay project was developed in collaboration with Ken Wang, MD from Mayo Clinic. Our aim was to improve the result of photodynamic therapy (PDT) for the treatment of pancreatic cancer. My project involved study of the threshold light dose for Panc-1 pancreatic cancer cells with the photosensitizer 2-[1-Hexyloxyethyl]-2-devinyl Pyrophenorphorbid-a (HPPH) and 670-nm light. The cells were loaded with 1mg/kg of HPPH and light was applied at the range of 0.025-3.0J/cm2. Clonal assays were used to determine the cell viability, accounting for cell death by both necrosis and apoptosis. After plotting the light absorption dose against cell viability, the light dose necessary to kill 50% of the cells (LD50) for HPPH-mediated PDT was determined to be 0.15 J/cm². The data was also used to estimate a light threshold of of 3.5 x 10¹⁰ per cell, yielding a clinical LD-50 dose of 1.11 x 10¹⁹ photons per gram of tissue.

55. The effects of pesticide and salinity on early life stages of the green tree frog (Hyla cinerea)

Anneke Wilder and Allison Welch, Department of Biology

Increased salinity in freshwater habitats is an emerging threat to freshwater species, and pesticide contamination has been well documented to negatively affect freshwater species. Amphibians are sensitive to changes in their surroundings, making them good indicators of environmental quality. This study examined the effects of increased salinity and a common insecticide, carbaryl, on early life history stages of the green tree frog (Hyla cinerea). Mean sperm motility and velocity were both found to decrease as salinity concentration increased. Differing concentrations of carbaryl had no significant effect on sperm activity. Females tended to avoid ponds with increased salinity when ovipositing, and ponds received no eggs when freshly dosed with carbaryl. These findings suggest that increased salinity could negatively affect reproductive success of H. cinerea. However, females may be able to avoid some of these effects through depositing eggs in suitable sites, increasing the ability of amphibian populations to persist in degraded habitats.
56. South Carolina Storm Surge Frequency Analysis

Matt Mazzarell, Discovery Informatics Program and Norman Levine, Department of Geology and Environmental Geosciences

The South Carolina Storm Surge Analysis is a project under FEMA to annually re-assess storm surge risk at 527,353 points across the South Carolina shoreline. FEMA is interested in obtaining a 10, 50, 100, and 500-year storm surge event level for each of these points. Input data for this project comes straight from the ADCIRC model that is used to simulate hurricane storm surge and flooding. 122 historic storms were simulated through the model and the data was then put up for statistical analysis. The contract was accepted by AECOM. The production engineer Dave Divoky, fell victim to a heart attack and passed away before completing the project. Chris Mack, a coastal engineer saved the project by putting CofC Senior Matt Mazzarell in the main engineering role. The project was completed successfully and submitted to FEMA to be used as a basis to influence SC flood insurance rates.

57. - Award of Merit - Using Stable Water Isotopes to Delineate Groundwater-Surface Water Interactions in Low-Gradient Watersheds

Lydia Nickolas, Vijay M. Vulava, and Timothy J. Callahan, Department of Geology and Environmental Geosciences

Rates of urbanization and climate change are rapidly increasing and pose a significant threat to sensitive coastal systems. Understanding water sources and hydrologic dynamics within lowland watersheds is crucial to assessing current and future impacts of these changes. The aim of this study was to profile and delineate sources of water that contribute to stream flow and groundwater in two coastal watersheds using stable isotopes of water. Precipitation, surface water, and groundwater samples collected from each site were analyzed for stable water isotope signatures. At these sites, during periods of high antecedent soil moisture (ASM) infiltration is limited, causing precipitation to route directly into streams. During periods of low ASM, precipitation more rapidly infiltrates and mixes with groundwater sources, limiting its contribution to streams. Isotopic analysis suggests that clay layers underlying the streambeds may be isolating the streams from groundwater input, while other sandier areas exhibit a larger groundwater component.

58. Synthesis and Analysis of the Dual Active Derivatives of Novel Antibiotic Cytosporone E

Brenna Norton-Baker and Justin Wyatt, Department of Chemistry and Biochemistry

As the emergence of more drug-resistant strains of microorganisms portends global crisis, the development of novel antibiotic agents becomes crucial. The new antibiotic cytosporone E originates from the fungus Cytospora sp. and demonstrates weak antibiotic activity. The purpose of this study is to synthesize and analyze the derivatives of cytosporone E for cytotoxicity. The
derivatives share the same phthalide chromophore with a 4-position hydroxyl group determined to be necessary for activity. In synthesis of the analogs, we utilized an electrophilic aromatic substitution followed by Fischer esterification to generate 5,6-dimethoxy phthalide from 3,4-dimethoxybenzoic acid. The phthalide will be alkylated to afford a common intermediate that will be used to incorporate secondary antibiotic characteristics: a triazole moiety or a citric acid silver or gold ion chelator (both have been shown effective in other antibiotics). These novel and potentially more potent antibiotics hold promise for treatment of the continually increasing drug-resistant bacterial strains.

59. Methane Purification For Oxygen Recovery

Michelle Iannantuono, Morgan B. Abney, Zachary Greenwood, and Lee Miller, Department of Chemistry and Biochemistry

For long-term space missions, maximized resource recovery is essential to sustain the health and supplies of astronauts. At Marshall Space Flight Center, the Environmental Control and Life Support Systems branch designs state-of-the-art CO$_2$ reduction hardware, such as the Sabatier Development Unit (SDU). The products of the Sabatier reduction are water, methane (CH$_4$), and unreacted CO$_2$. For this reason, the Methane Purification Assembly (MePA) was designed with a bed of 13X zeolite, a commercial sorbent with an affinity for CO$_2$ and water. The CH$_4$ stream passes through the zeolite and size-exclusion removes the unwanted molecules, thus purifying the methane for downstream processing into oxygen. A temperature control system cools the zeolite for better adsorption, and can heat the bed to “empty” the zeolite afterwards. Future testing of the system will provide crucial data for the development of life support systems.

60. The Use of LIDAR and LIDAR Multispectral Fusion Techniques For Coastal Land Cover Delineation

Norm Levine and Daniel Sieger, Department of Geology and Environmental Geosciences

LIDAR has become an essential tool for environmental and engineering geologists. LIDAR is under-used in the coastal region, due to the fact that coastal ecozones are often difficult to delineate using automated remote sensing techniques. This study looks at a method of using LIDAR to better subdivide the coastal environment by combining textual analysis with classification techniques to extract enhanced information about the coastal zone. The study then takes the techniques one step further by fusing multi-spectra imagery with the LIDAR to enhance classifications. Both the LIDAR and LIDAR fusion analysis techniques can be used for multiple purposes in the dynamic coastal zone. The land use / land cover inventories developed are necessary for emergency management response and sea level rise modeling. The techniques presented are faster than direct digitizing of aerial photography and produce a quality analysis for much of the work being done in the coastal zone.
61. Rate acceleration of retroaldol reactions by detergents: implications for the de novo design of enzymes

Marcello Forconi and Joshua Schmidt, Department of Chemistry and Biochemistry

The production of efficient computationally-designed enzymes has the potential to provide enormous long-term benefits for several fields, including medicine and bioremediation. Only a handful of de novo computationally-designed enzymes have been developed, with rate accelerations only modest relative to those achieved by natural enzymes. We have used detergent solutions to mimic an enzyme active site with no precise positioning of the catalytic group and of the substrate. We found that this system can accelerate the reaction catalyzed by the retroaldolase RA-61 by a factor of at least 1,000. A Brønsted plot representing different pKa amines confirms the rate acceleration expected in the literature. Currently, we are expanding this hypothesis by using mutant variants of RA-61 to determine the importance of precise positioning in this system. Our findings have implications for the design process, and suggest that more sophisticated algorithms need to be developed and implemented to produce efficient enzymes.

62. Laboratory-induced changes of hemolymph octopamine levels in the honey bee, *Apis Mellifera*

M. Maier¹², W. Cory¹, and J. Vance³¹Department of Chemistry and Biochemistry²Program in Neuroscience³Department of Biology

The honey bee, *Apis Mellifera*, adapts quickly to unpredictable situations, often by means of neuromodulation that targets flight behavior. Octopamine, the invertebrate hormone analog to norepinephrine, is involved in initiating flight motor patterns and modulating sensory proprioception during flight. Although octopamine’s effects on flight outputs are well-described, little is known about how octopamine affects sensory receptors. We investigated octopaminergic neuromodulation of the bee hind wing during flight movements using extracellular recordings. However, experimental procedures leading up to the electrophysiological recordings could cause octopamine release, resulting in unknown elevations prior to experimental manipulation of octopamine levels. To address this, we investigated octopamine concentrations in bees at various stages of our experimental procedures leading up to our extracellular recordings. Octopamine concentrations were measured from bee hemolymph using High Performance Liquid Chromatography. With this data, we can account for the average increase in octopamine in subsequent electrophysiological measurements of afferent wing nerve activity.

63. A Real-time Collaboration Solution -- Cougar Collab

Camden Gaba¹, De'Asia McNeill², and Jesse Reiter¹Department of Computer Science¹Department of Psychology

At Cougar Collab, our goal is to provide a real-time collaboration solution for professors and students to use in class for instant feedback. With Cougar Collab, students will be able to participate in class through their laptops, tablets, or smart phones. As a teacher asks a question,
students can chime-in with answers or opinions that are shown on the professor's display (ideally projected in the front of the classroom). This software will provide a new way to teach and learn, effectively increasing student interaction and participation.

64. Locations and Focal Mechanisms of Earthquakes in Summerville, South Carolina

Jacqueline Alexander and Steven Jaume, Department of Geology and Environmental Geosciences

We located and determined basic focal mechanisms for 6 earthquakes in the Summerville, South Carolina region using digital seismic data from both established seismic stations and an array of six temporary stations deployed by Dr. Martin Chapman of the Virginia Tech Seismological Laboratory. P-wave arrival time and first motion picks were made using Seismic Analysis Code software and the arrival times were input into an earthquake location and focal mechanism spreadsheet. These spreadsheets were developed as part of Special Topics course during Spring 2012. We compare our locations to published U. S. Geological Survey locations for the same earthquakes and the pattern of P-wave first motions to published focal mechanisms. Our results show mainly reverse and some strike slip faults which corresponds with the literature.

65. Possible Correlation Between Active Tectonics and Surface Features in Dorchester County, South Carolina

Jacqueline Alexander and Erin Beutel, Department of Geology and Environmental Geosciences

Using LiDar imagery and geophysical data for Dorchester county, we made a correlation between the Mesozoic crystalline basement features and the beach ridges located just outside of Summerville, South Carolina. Additionally, earthquakes collected from the South Carolina Seismic Network, show a clear linear pattern along the beach ridge over the crystalline basement feature. This linear pattern suggests that there is a correlation between active tectonics and surface features in the region. Further, the earthquakes correlate with the basement scarp which suggests that there could be reactivation of the Mesozoic crystalline basement. It is unclear if there is any direct correlation with the beach ridge and this reactivation but there is some suggestion based on maps produced. ArcGIS 10.1 was used to create maps and topography graphs in order to compare the earthquakes, beach ridges and basement contours.

66. Bringing North Carolina Vineyard Terroir to Google Earth

Alice J. Gaynor, Francis Bustard, and Robert L. Nusbaum, Department of Geology and Environmental Geosciences

The Yadkin Valley AVA is an American Viticulture Area located in northwestern North Carolina. Geological and geographic data from nine counties were used to create maps in a Geographic Information System (GIS). Maps include digital elevation, hillshade, aspect, and slope. When combined with vineyard locations, an attribute table was compiled which also
shows grape varieties grown at each vineyard. The map from GIS was then used to create a
Keyhole Markup Language (KML) file that can then be displayed in Google Earth. The points
for each vineyard are superimposed over the terrain that Google Earth provides and can be
selected to show the information for a vineyard.

67. Role of MKP-1 in Inflammation-Induced Osteoclastogenesis

Courtney Browne, Department of Biology

Osteoclasts (OCs) are bone resorbing cells that play a vital role in bone turnover. Receptor
activator of nuclear factor kappa-B ligand (RANKL) is the physiological regulator of
osteoclastogenesis (OCgen). Gram-negative bacteria involved in pathogenesis of periodontal
disease contain the endotoxin, lipopolysaccharide (LPS), which increases RANKL expression by
activating innate immune inflammatory cascades including mitogen activated protein kinase
(MAPK). MAPK activity is negatively regulated by MAPK phosphatase (MKP)-1, which is
encoded by the gene Dusp-1. This study investigates Dusp-1 when exposed to LPS on RANKL-
primed OC progenitors (OCPs). We hypothesize that Dusp-1−/− OCPs will form more OCs in
response to LPS stimuli. Cells were primed with RANKL for 48 hours and stimulated with A.
actinomycetemcomitans LPS (10ng/ml) for 2-4 days. LPS induced more OCgen in female
Dusp-1−/− than Dusp-1+/+. Males show more Dusp-1−/− cells that are larger than their Dusp-1+/+
counterparts. Therefore, these studies indicate that increased OC differentiation promotes
inflammatory bone resorption.

68. Magnified Views of the Ultrafast Outflow of the distant Quasar HS0810+2554

Matthew Marvin and George Chartas, Department of Physics and Astronomy

We present results from the analysis of an X-ray observation of the gravitationally lensed narrow
absorption line (NAL) quasar HS0810+2554 performed with NASA’s Chandra X-ray
Observatory. Our spectral analysis shows two absorption lines with rest-frame energies of 7.73
and 11.0keV. The maximum blueshift of the lines imply a wind velocity of ~0.4 the speed of
light. We estimate the efficiency of the outflow to be epsilon ~2.1. A value of epsilon greater
than unity implies that radiation driving cannot explain the acceleration of the wind. It is likely
that magnetic driving is a significant contributor to the acceleration. We also estimate the mass-
outflow rate to be dM/dt ~1.9 M_solar per year. Assuming that the energetic wind detected in
HS0810+2554 is a common property of most quasars it suggests that the X-ray winds of quasars
provide significant feedback to the intergalactic medium and regulate the growth of their host
galaxies.
69. - Award of Merit - Holocene marsh evolution due to inundating sea level near Hollywood, SC

Sonja Tyson, Lindsey Lowery, and Scott Harris, Department of Geology and Environmental Geosciences

Evolution of the marsh ecosystem responds to the interaction between sea-level changes and the land surface across which it migrates. Accretion of sediment controls elevation of the marsh surface, keeping it in equilibrium with sea level. In the Wallace Creek area near Hollywood, SC, cypress stumps are buried beneath the modern marsh system indicating a flooding of the region due to sea-level rise.

Research was conducted to identify changes in the marsh ecosystem in response to sea level rise in this area. Sediment cores were obtained using a vibracore and gouge auger in 22 areas across the marsh. Cores were analyzed, interpreted and correlated across the marsh from the mainland to the modern tidal river. Samples were taken from cores for textural analysis. Stratigraphic analysis combined with textural analysis identified a fining upward sequence that is common with sea-level rise, and a typical migration across the ancient terrestrial landscape.

70. Searching for AGNs Formed in Protogalaxies

Abigail Asper and George Chartas, Department of Physics and Astronomy

We present results from a mini X-ray survey of 21 quasars known to contain sub-Damped Lyman-alpha Absorbers (sub-DLAs) in their spectra. The sub-DLAs are thought to be produced by protogalaxies in our line-of-sight towards the quasars. The X-ray observations were performed with NASA’s Chandra X-ray Observatory. In six cases we find possible X-ray emission within ~1 arcsec of the background quasar consistent with the presence of a nearby X-ray source. Assuming these nearby X-ray sources are at the redshifts of the sub-DLAs, their estimated 0.2–10 keV luminosities range between $0.9 \times 10^{44}$ and $5.4 \times 10^{45}$ erg/s, thus ruling out a normal late-type galaxy origin. However, they are consistent with emission originating from Active Galactic Nuclei (AGN) near the centers of protogalaxies. The projected distances of these nearby X-ray sources from the background quasars lie in the range of 3–8 kpc, consistent with our hypothesis that they represent AGN centered on the sub-DLAs.

71. Foraminifera Genera in Subtidal Habitats of Graham's Harbor, San Salvador, Bahamas

M. Montgomery Taylor and James L. Carew, Department of Geology and Environmental Geosciences

Benthic and planktic foraminifera are single-celled marine organisms which can act as a proxy for past and present climate change. In this study, dominant taxa were determined of the amoeboïd foraminifera (Kingdom Prototista, Order Foraminiferida) in various habitats in Graham's Harbor, San Salvador Island, Bahamas. Other organismal parts of Kingdom Animalia,
specifically Class Bivalia and Phylum Porifera, were also found. After the dominant genera of forams were identified, their abundance and diversity was calculated. Samples were taken from four specific subtidal habitats including a coarse sand flat, fine sand flat, grass-algal flat, and grass flat. The highest diversity within the assemblages was found in the coarse sand flat sample, the next highest was in the grass-algal flat, then the grass flat, and finally the fine-sand flat. Understanding current assemblages of foraminifera genera is critical for understanding past and possible future geologic/climatic changes.

72. Behavioral and molecular analyses of biological rhythms in *Nematostella vectensis*

Erin McPherson, Brad Long, and Elizabeth Meyer-Bernstein, Department of Biology

Circadian and circatidal rhythms are endogenous biological oscillations that occur over a 24 hour and 12.4 hour period, respectively. External cues, such as temperature, light, and hydrostatic pressure can potentially synchronize an animal’s internal clock to the environment. Previously, we have shown that the locomotor behavior of the sea anemone can be synchronized to a 24hr photoperiod. Here, we sought to determine if hydrostatic pressure can also act as a temporal cue. Animals were exposed to a simulated tide (12hr) and a concurrent 24hr photoperiod. After monitoring locomotor behavior, we found that tidal and photic cues can both influence locomotor activity rhythms. Furthermore, we have localized known circadian genes using in-situ hybridization. In order to characterize the cells in which the circadian genes are localized, we have employed the use of various neuronal markers. These behavioral and molecular experiments will enhance our knowledge of the circadian system in *N. vectensis*.

73. Circadian Rhythms of Temperature Entrainment in *Nematostella vectensis*

Melissa James and Elizabeth Meyer-Bernstein, Department of Biology

We have been investigating the circadian system of the sea anemone, *Nematostella vectensis* to determine if temperature can act as a temporal cue to the circadian clock. The animals’ locomotor activity was initially synchronized to a 24hr photoperiod, and subsequently exposed to a temperature cycle (22°C:32°C). We have found that temperature can be effective in synchronizing the circadian clock in *N. vectensis* and that the animals are more active in the cooler temperature. In addition to the behavioral analysis, we have recently identified a temperature sensitive protein, hyperoxidized peroxiredoxin, which regulates peroxidase levels and oscillates with temperature. Our preliminary results suggest that this protein expression is found to oscillate with higher expression at cooler temperatures. We plan to identify components of the temperature entrainment pathway that provides input to the molecular clock. This will provide insight into the circadian system of Cnidarians and circadian clock evolution.
74. Novel Targets of Nkx2.5 Regulation in Outflow Tract Formation

Anthony J. Horton¹, Boding Zhang², Christopher Clark², and Kyu-Ho Lee³

¹Department of Biology ²Department of Pediatrics, Children’s Hospital, and Regenerative Medicine and Cell Biology Department, Medical University of South Carolina

Nkx2.5 is an early cardiac specific transcription factor essential for normal outflow tract (OFT) formation from precursor cells in the second heart field (SHF). In mice, Nkx2.5 mutations result in a single ventricle phenotype with hypoplastic OFT due to abnormal SHF regulation. Mutations in live-born humans result in OFT abnormalities, as well as ventricular and atrial septal defects (VSD/ASD), and cardiac conduction defects. The set of genes directly regulated by Nkx2.5 in the SHF is largely unknown. A previous study from our lab identified several potential direct target genes of Nkx2.5 in the SHF region of mice. Among these genes is Ccdc117, which encodes a protein of previously uncharacterized function, evolutionarily conserved in sequence among placental mammals. We describe here the preliminary characterization of Ccdc117 as a novel target of Nkx2.5 that may be linked to the regulation of metabolic gene regulation in the SHF and developing OFT.

75. Characterization of the Manganese Cluster of the Class Ib Ribonucleotide Reductase from C. ammoniagenes

Corey Seacrist and Pamela Riggs-Gelasco, Department of Chemistry and Biochemistry

Ribonucleotide reductases (RNR) catalyze the conversion of ribonucleotides to deoxyribonucleotides, using two subunits, R1 and R2. Class I RNRs utilize a diferric cluster/tyrosyl radical cofactor in the R2 subunit to initiate radical chemistry on the substrate bound in the R1 subunit. In the 1980s, a manganese containing RNR was isolated from C. ammoniagenes and was proposed to be a fourth class of RNRs, a finding that remained controversial when the gene sequence established the C. ammoniagenes enzyme to be a Class I RNR capable of binding iron. It was recently established that the C. ammoniagenes, B. subtilis and E. coli Class Ib orthologs require an additional flavodoxin, nrdI, to facilitate assembly of a Mn(III)2-tyrosyl radical cofactor. Here we report our efforts to structurally characterize the C. ammoniagenes Class Ib R2 Mn(III)2 cluster via X-Ray Absorption Spectroscopy.

76. Habitat preference of southern toads (Anaxyrus terrestris) in response to substrate salinity

B. Paige Wallace and Allison M. Welch, Department of Biology

Habitat selection is important for survival and reproduction. Amphibians are sensitive to the environment due to their permeable skin. Human activities like over-irrigation and road de-icing can lead to increased soil salinization. These salinized habitats are inhospitable to amphibians because their permeable skin allows for dehydration in hyperosmotic environments. We investigated whether female southern toads (Anaxyrus terrestris) avoided saline substrates by preferring non-saline substrates. Toads were placed in an arena with two sides differing only in
substrate salinity. Salinity was manipulated by moistening the substrate on one side of the arena with brackish water and the other with freshwater. Time spent and activities on each side were measured. At each salinity level tested (4, 6, 8 parts per thousand), toads did not spend significantly more time on either side. The toads may not have shown avoidance because they were so well hydrated and experienced no real pressure to choose.

77. Numerical Simulations of Optically Thick Accretion onto a Black Hole II: Rotating Flow

Ally Olejar and P. Chris Fragile, Department of Physics and Astronomy

The understanding of black hole accretion disks and their properties has increased with the advancement of technology and development of complex, computational tools for astrophysics research. Supercomputing codes used for astrophysical applications provide models and insight into the nature of these objects. By upgrading our state of the art general relativistic radiation magnetohydrodynamic (MHD) code, Cosmos++, with a hybrid implicit-explicit numerical scheme and a more general closure relation more realistic models of black hole accretion disks can be processed with less computational expense than previously. The goal for the proposed research is to prepare our code for high fidelity, numerical simulations of black hole accretion with the full physics, this is one step towards that end goal.

78. - Award of Merit - Stimulus velocity encoding by primary afferents in the wind-sensitive cercal systems of three cockroach species

Anne C. K. Olsen and Jeffrey D. Triblehorn, Department of Biology, Program in Neuroscience, and Department of Psychology

Extracting information from the environment is an important function of sensory systems. How this information guides behavior can vary between closely related species. In cockroaches, Periplaneta americana exhibits a distinct wind-mediated escape response unlike its close relatives (Blaberus craniifer and Gromphodhorina portentosa) despite possessing the same underlying neural circuit. Our lab previously discovered that wind evoked more activity in the wind-sensitive interneurons (WSIs) of P. americana and B. craniifer than of G. portentosa. To determine how afferent activity differed, we extracellularly recorded the summed wind-evoked responses from the cercal nerve afferents to 0-250 cm/s wind puffs. Stimulus-Response (S-R) curves were generated for the First 100 ms and Second 150 ms of summed response for all species. P. americana consistently showed stronger afferent activity compared to G. portentosa. Preliminary results are currently inconclusive for B. craniifer. Future experiments will investigate the transfer of neural information between the afferents and the WSIs.
79. Evoked escape motor neuron responses in *Periplaneta americana* by different wind puff velocities

Nada Joudeh¹ ² and Jeffrey D. Triblehorn² ³

¹Department of Psychology ²Program in Neuroscience ³Department of Biology

Nervous systems transform sensory information from the environment into neural signals that underlie behavior. The wind-mediated turn-and-run escape response of the cockroach (i.e. *Periplaneta americana*) is a good model for studying this sensorimotor transformation since cockroaches have a reasonably complex neural circuitry that is easily accessible for neurophysiological experiments. We presented wind puffs of different velocities (0-270 cm/s) to cockroaches and simultaneously recorded responses extracellularly from nerves 5 and 6, which contain the leg motor neurons. We measured the change in spike counts elicited by wind. In nerve 6, wind increased the spike count, but either increased or decreased it in nerve 5, depending on the animal. Using spike sorting analysis, we identified three individual units in nerve 6 and two in nerve 5. Future work will compare these motor responses to other cockroach species that have the same escape circuitry, but do not exhibit wind-evoked escape behavior.

80. Enceladus: A Whole New World

Zach Griggs, Hunter Baker, and Phillip Emaikwu, Department of Physics and Astronomy

Enceladus is a small, icy moon of Saturn that we have proposed a NASA funded mission to reach and observe. Our team, entitled Terra Nova, has a list of mission goals and, more narrowly, mission objectives that we have planned to accomplish along the way. These pertain to things such as the solar system's biologic potential, mapping the exterior and interior structure of the moon, and determining the chemical composition of the moon and its geysers that jettison H₂O from its South Pole. In order to fulfill the mission, we have provided a full science traceability matrix including all the instruments we plan on using to collect our date and meet our goals. Specifications for power and data usage and a short explanation of each instrument are also included.

81. Investigations of the Products of Cetirizine Solar Photodegradation

Adam Jenkins and Wendy Cory, Department of Chemistry and Biochemistry

The ever-increasing use of prescription drugs and over-the-counter medicines have resulted in the detection of these pharmaceuticals at trace amounts in our water supplies, leading to concerns about the aquatic ecosystem and public health. In this research we investigated the environmental fate of a widely-used antihistamine, cetirizine (CTZ.) Studies included the photodegradation of cetirizine in solution with humic acid (HA) and phosphate buffer to simulate natural water systems. In order to quantitatively and qualitatively study this photodegradation, we measured...
the solar photodegradation rate of CTZ and identified the products of this photodegradation using high performance liquid chromatography (HPLC) and liquid chromatography-mass spectrometry (LC-MS). We were able to conclusively identify one of the photodegradants using a di-amino solid phase extraction.

**82. Determining the Optical Properties of Engineered Tissue Phantoms**

Hunter Moss and Linda R. Jones, Department of Physics and Astronomy

Three-dimensional tissue phantoms have been engineered to model the optical properties of a three-dimensional tumor for use in realistic light dosimetry projects. The objective was to develop a light-scattering matrix in which to grow a three-dimensional mass of cultured head and neck cancer cells. One phantom was composed of methyl-cellulose which included serum, blood, saline and intra-lipid. A second was composed of an egg white matrix, both cultured under sterile conditions. Diffuse reflectance and transmittance spectra of the phantoms were collected with an integrating sphere spectrophotometer that was interfaced with a data acquisition card to LabView software. The new instrumental set-up also allowed collection of collimated transmittance. The spectra were used to calculate absorption and scattering coefficients plus scattering anisotropy of the tissue phantoms using an inverse adding-doubling method. The optical coefficients are necessary for researchers to study the effects of phototherapy on tumors in vivo.

**83. NASA Flagship Mission To Enceladus: Mission Pytheas**

Michelle Iannantuono, Amanda Brueser, Elliott Harrington, and Ryan Sullivan, Department of Geology and Environmental Geosciences

Enceladus, the sixth largest moon of Saturn, offers NASA the opportunity to non-invasively sample the interior of a Jovian satellite. In the mid-2000s, the Cassini spacecraft discovered that cryovolcanism in the south polar region of Enceladus is the source of Saturn’s E-Ring. Mission Pytheas will investigate geological processes of Enceladus, interactions between Enceladus and the Saturn system, and habitability - all of which are linked by this cryovolcanism. The proposed $3 billion dollar flagship mission is an orbiter-lander operation. Threshold objectives will be satisfied within the first 100 days of the science mission, using instrumentation such as visible imagers, a radar sounder and HDTV. The orbiter will ultimately operate for up to 2.7 years, and the lander will operate for at least 8 days on the surface. Exploring Enceladus will address 5 out of the 6 strategic goals presented in the 2011 NASA Strategic Plan.

**84. Silver Nanoparticles: Morphology and Localized Surface Plasmon Resonance**

Benjamin Rickman, Narayanan Kuthirummal, and Nicole Levi-Polyachenko, Department of Physics and Astronomy, Wake Forest University, Winston-Salem, NC

In this work, an array of silver nanoparticles (spherical, rods, and mixed) were characterized
using transmission electron microscopy (TEM), UV-Vis spectroscopy, dynamic light scattering, inverse double addition method, and the method of standard subtraction in order to understand their morphology and localized surface plasmon resonance (LSPR). From the transmission electron microscopic data, spherical nanoparticles are estimated to be nm, rods are estimated to be. The optical absorption spectra show the plasmon absorptions in the visible region of the electromagnetic spectrum. The absorption varied from 402 nm to 770 nm. The shapes and characteristic absorption peaks complement each other. Only the mixed geometry sample had high enough reflectance to calculate its extinction and scattering spectra. Particle concentration was derived from the extinction, and was found to be $2.4 \times 10^{13}$ particles/cm$^3$. We are in the process of calculating the cross-section from the data on particle concentration.

85. Temporal characterization of karyopherin-beta protein importin 5 in sea urchin *Lytechinus variegatus*

M.B. Overcash and C.A. Byrum, Department of Biology

The karyopherin-beta family of proteins bind to other proteins and transport cargo into the nucleus through the nuclear pore complex. This study focuses on characterizing temporal expression of the karyopherin-beta protein importin 5 in the sea urchin *Lytechinus variegatus*, through the process of reverse transcriptase PCR (RT-PCR). In other organisms, we know that importin 5 is necessary for the transport of histones that package DNA into nucleosomes and of ribosomal proteins into the nucleolus for assembly of eukaryotic ribosomal subunits. There is very little known about roles of the karyopherin-beta proteins in *L. variegatus* and one goal of this study is to determine when they are expressed in this model organism and form preliminary hypotheses about their roles in developmental processes. This information may also reveal new roles of these proteins relevant to the development of other organisms.

86. - Award of Merit - The Subaru SEEDS Imaging Search for Exoplanets Around High-Mass Stars

Thea Kozakis$^1$, Laura Stevens$^1$, Joe Carson$^{1,2}$, Christian Thalmann$^{2,3}$, Markus Janson$^4$, Miwa Goto$^5$, Thomas Henning$^5$, Wolfgang Brandner$^5$, Markus Feldt$^5$, Mickael Bonnefoy$^5$, Beth Biller$^5$, Palmer Wong$^5$, Michael McElwain$^6$, Thayne Currie$^7$, Amaya Moro-Martin$^8$, Tomonori Usada$^9$, Ryo Kandori$^{10}$, Timothy Brandt$^4$, Kevin Gainey$^1$, Motohide Tamura$^{10}$, SEEDS Science Team, and HiCIAO/AO188 Instrument Team$^1$Department of Physics and Astronomy$^2$Max Planck Institute for Astronomy$^3$Anton Pannekoek Astronomical Institute$^4$Princeton University$^5$Universitats-Sternwarte Munchen$^6$NASA Goddard Space Flight Center$^7$University of Toronto$^8$Instituto Nacional Tecnica Aerospacial$^9$Subaru Telescope$^{10}$National Astronomical Observatory of Japan

We present a status report on the Subaru SEEDS subprogram to search for extra-solar planets around high-mass stars. We describe our target sample, observing procedures, and early results, including the discovery of a 'super-Jupiter' around the 2.6 M$_\odot$ star $\kappa$ Andromedae. SEEDS, the Strategic Explorations of Exoplanets and Disks with Subaru, is a multi-year, direct imaging survey to explore the link between planets and disks, and the evolution of protoplanetary systems and debris disks. All observations are done with the Subaru 8-meter telescope in the near-infrared. Confirmed in July 2012, our discovered exoplanet ($\kappa$ Andromedae b) is a particularly
exciting discovery due to the fact that its predicted mass (~12.8 M\textsubscript{Jupiter}) lies very close to the theoretical brown dwarf mass limit. Along with this, the parent star, \( \kappa \) Andromedae, is the most massive star known to host a planet. As of now, we have observed 28 targets.

87. Olympus Mons, Mars: Subsidence Modeling Using Lava Flows as Paleo-Slope Indicators

Ashleigh Reeves, Mariel Simpson, and John Chadwick, Department of Geology and Environmental Geosciences

Olympus Mons is an enormous volcanic edifice on Mars with a basal diameter over 600 km and a height of 23 km. Such a large volcano might be expected to subside and create a topographic moat in the crust, but no obvious moat has previously been detected. In this study, we mapped lava flow orientations on the plains adjacent to Olympus Mons, showing they are no longer oriented in a downhill direction, and deviate from modern topographic slopes by an average of about ten degrees. The orientations of the misaligned flows are consistent with minor subsidence of the volcano. Geophysical modeling shows that subsidence of the volcano by about 1 km from the addition of \( 3.8 \times 10^5 \) km\(^3\) of magma would lead to the observed topographic changes. Crater size-density measurements of the affected plains around Olympus Mons show that the detected subsidence occurred within the past 537 ±58 my.

88. Development of a \textit{Caenorhabditis elegans} model to study ABC294640-induced autophagy

Jeff Bodner, Katie Randall, and Jody Mack, Department of Biology

ABC294640, a sphingosine kinase inhibitor, has been shown to induce autophagy in mammalian systems. This drug, currently in Phase I clinical trials at the Hollings Cancer Center, causes autophagic cell death in human cancer cells. For this study, an autophagy-reporter strain of \textit{C. elegans} (LGG-1::GFP) was employed. These transgenic worms form GFP-positive autophagosomes visible as puncta during the process of autophagy. GFP-positive puncta were observed in worms treated for 48h with \( \geq 12.5 \) microM ABC294640. A significant decrease in body size (60-80\%) was observed in 25-100 microM ABC294640-treated animals suggesting developmental inhibition and/or induction of dauer formation. Drug treatments with concentrations up to 50 microM showed decreases in viability upon analysis using an MTT assay. In this study, we defined a new utility for \textit{C. elegans} in the study of cellular autophagic response to ABC294640.

89. The Hubble Exoplanet Classroom

Laura Stevens\(^1\), Joseph Carson\(^1\), Kat Low\(^1\), Starr Jordan\(^1\), David Ruwadi II\(^1\), and Glenn Schneider\(^2\)\(^1\)Department of Physics and Astronomy\(^2\)\(^\text{Department of Astronomy, University of Arizona}

I present a status report on the Hubble Exoplanet Classroom, an interactive website designed to
engage 8-12th grade students in physical science concepts using the exciting field of exoplanet studies. Addressing national teaching standards, the webpage allows educators to enhance their physical science, physics, and astronomy curriculum with student-driven lessons. The webpage records students’ performance in lessons and quizzes and compiles the results, which can be accessed by the instructor using a secure website.

90. Advanced Semiconducting Materials: Cobalt-doped Nanostructures of Zinc Oxide Tetrapods

Marco Rodriguez-Cote and Narayanan Kuthirummal, Department of Physics and Astronomy

Through photoacoustic spectroscopy we study the contribution of defect levels on the absorption behavior of a pure ceramic zinc oxide sample containing nanostructured tetrapods as well as ZnO samples with 1 mol.% and 2mol.% doping concentrations of cobalt (Co). By modeling distinct regions of the absorption spectra we determined that the band gap energy $E_g$ decreased from 3.368 eV to 3.313 eV to 3.311 eV with increasing concentration of Co. The optical onset energy $E_0$ follows the same trend with values of 3.093 eV, 3.063 eV and 3.057 eV. Similarly, the Urbach energy parameter, which describes the width of the exponential absorption edge, decreased from 0.3223, to 0.2309, to 0.2199 revealing increased density of defect states. Scanning electron microscopy was additionally performed to obtain the surface morphology of the bulk ZnO and of the nanostructured tetrapods.

91. Saltwater Intrusion in Shallow Groundwater at Dixie Plantation

Garrett Boudinot, Mariel Simpson, Kristen C. Abberley, Casey Rutherford, Kyle Bostick, Xan Schlegel, Nicholas Luck, Charles McHugh, Katherine Faust, Jennifer Brennan, Elias Webster, Alice Gaynor, Katie Kerns, and Vijay Vulava, Department of Geology and Environmental Geosciences

Groundwater at the eastern edge of the Dixie Plantation may be intruded by saltwater from Stono River. With plans for increased use of this site for research and teaching, freshwater sources at this site need to be characterized. The main goal of this project is to measure the extent of saltwater intrusion on the ground water used at the Student Garden where groundwater is used for irrigation. We analyzed surface and groundwater samples from various sources at Dixie Plantation for total dissolved solids (TDS), anion chemistry, and stable isotopes of water. TDS and anion data are much higher than that observed from a groundwater seep at a higher elevation, and are closer to concentrations measured in Stono River. Enriched $^{18}$O values at this site suggests influence from ocean water, which is typically depleted in $^{16}$O. Groundwater data has implications for the ecosystems and future development plans for Dixie Plantation.
92. An Analysis of the Biological and Physical Relationships in the Coral Reefs of Menjangan Island: Effect of declining coral cover on ecological complexity

Amber Lehman and Phillip Dustan, Department of Biology

The Biosphere Foundation carried out a four month expedition to Bali, Indonesia to access the vitality of Menjangan Island's coral reefs. We found that Balinese coral reefs with greater structural complexity (rugosity) contain more fish most probably due to increased niche diversity. Additionally, reefs with more diverse coral communities also tend to have greater fish species diversity. Thus both physical and biological complexity are significant components of coral reef ecological integrity. However, the correlation between coral and fish biodiversity degrades as a function of decreasing coral cover. The greatest rate of change occurs when coral cover drops below 50%. This inflection in the statistical unraveling of the interdependence between fish and coral communities is indicative of an ecological tipping point for accelerated reef degradation.

93. A Study of MEF2 in the sea urchin *Lytechinus variegatus*

Easterling M.R., Morehead H.R., and Byrum C.A., Department of Biology

Myocyte enhancement factor (MEF2) is a highly conserved transcription factor necessary for the differentiation of muscle cells. Though it is not the primary determinant in myogenesis, MEF2 is an essential co-factor in this process and is also utilized in other developmental pathways. In this study, we will use reverse transcriptase PCR and real time PCR to provide a detailed timeline of MEF2 activity during the development of the sea urchin *Lytechinus variegatus*. Understanding roles of MEF2 is biomedically relevant for various reasons. MEF2 is a downstream regulator for several target genes known to influence estrogen receptor positive breast tumors and it is also a known coregulator of several autism-linked genes. Our study provides preliminary information about the distribution of MEF2 in the sea urchin that will allow us to use this species as a model for further research.

94. The Monarch Butterfly: Butterfly of Wonders!

Mary E. Rumble and Agnes J. Southgate, Department of Biology

Monarch butterflies (*Danaus plexippus*) are an amazing species that perform a feat of migrating over a thousand miles from Canada to Mexico in one lifetime. We hypothesized that in order to accomplish the migration, the butterflies may have a different flight muscle structure than other insect species. To test this hypothesis, we studied muscle function, and then picked three proteins to analyze through bioinformatic work and PCR/ gel electrophoresis: actin, mp20, and TroponinT. We used both the Painted Lady and *D.melanogaster* as a standard of comparison for our work. We annotated all three of these protein sequences and then checked our findings in the
lab. This work showed a recent duplication of the second actin protein in Lepidoptera and different gene splicing of Troponin T in flight muscle versus the head of the Danaus plexippus. Both of these results show the species to have some significant differences in comparison to D. melanogaster.

95. Behavioral and molecular consequences of concurrent cocaine and ethanol use

Morgan Zipperly1,2 and Lori Knackstedt2,3Department of Psychology, Honors College, and Program in Neuroscience, Neuroscience Institute, Medical University of South Carolina3
Department of Psychology, University of Florida, Gainesville, FL

Concurrent cocaine and ethanol use is more common than any other drug combination, and such polydrug use often results in increased consumption of both substances. We developed an animal model of cocaine and alcohol co-abuse in which rats self-administered cocaine for two hours, followed by alcohol for six hours. We hypothesized that subjects permitted access to both drugs would consume more compared to groups permitted access to only one drug. We also expected elevated levels of Homer protein, which is associated with biochemical sensitivity to both drugs. No significant difference in substance consumption was found between drug-consuming groups. There was a significant interaction between cocaine and ethanol on Homer protein expression. These results indicate that there are molecular and behavioral interactions between cocaine and ethanol when consumed concomitantly. The fact that subjects chose to consume both substances indicates that this polydrug use results is reinforcing, possibly reducing negative side-effects.

96. American Strategy for Cybersecurity

Krista Grooms, Department of Computer Science

In February 2013, President Barack Obama signed an executive order to discuss how the United States of America should proceed with cybersecurity. This policy acknowledges that cyberspace is widespread and the results of an attack on the digital infrastructure of the United States could be harmful to America and her allies. It continues that the United States does not currently have a strategy in place to establish cybersecurity policies on a national level. An investigative study was performed that analyzed the current policies, the proposed strategy, recent cyber attacks, and the potential effects a corrupt digital infrastructure could have on American security. The results of this study indicate that for our national security to be safeguarded, the United States will need to collaborate not only with national and foreign governments, but also with private entities.

97. Brown Dwarfs around Radial Velocity Planet Systems

K. Gainey1, J. Carson1, M. Marengo2, T. Henning3, W. Brandner3, M. Feldt4, J. Bent1, A. Hulsebus2, C. Schnupp3, and J. A. Greene4Department of Physics and Astronomy, Iowa State University5Max Planck Institute for Astronomy, Germany

Conventional planetary formation theories predict that planets should form in nearly circular
orbits, similar to those in our own solar system (mean eccentricity=0.06). Perplexingly, the majority of discovered extrasolar planets have unusually high eccentricities (mean eccentricity=0.3). Orbital dynamics models predict that the unusually high eccentricities could be explained by a high frequency of wide separation (100 AU to a few thousand AU) brown dwarfs. In an effort to identify such potential companions, we analyzed infrared data from NASA’s Spitzer Space Telescope for 101 stars with known planets. Candidate wide-separation brown dwarfs were identified based on their 3.6 and 4.5 micron magnitudes and colors. We followed up the most promising candidates with ground-based observations from the 3.5 meter Calar Alto Telescope in Almería, Spain. We have since been awarded follow-up observations with the Spitzer Space Telescope to search for common proper motion between the candidates and their parent stars.

98. Effect of Low Level Light Therapy on Muscle Fatigue

Brock Richard¹, Tara Gagnon², Michelle Robles², Anna Walker², Tim Scheett² and Linda Jones¹

¹Physics and Astronomy Department
²Health and Human Performance Department

Low level light therapy (LLLT) has been shown to influence muscle fatigue during exercise. We applied light during exercise while previous studies have applied light prior to exercise. Participants were tested for maximal hand grip strength (50 reps, 2.5 sec rest) with and without the application of 830-nm light. The hypothesis was that the light would delay muscle fatigue by energizing mitochondria in forearm muscles. LLLT resulted in a significant increase in total (6.0%; p<0.01) and mean (5.8%; p<0.05) work performed. A second part of the project involved an analysis of the amount of 830-nm light that is expected to reach the muscles in the forearm. Optical properties of normal human tissue were determined from 400 to 900 nm. Light flux was estimated using a multi-layered Monte Carlo simulation. The thickness of adipose tissue on each participant was estimated and the theoretical light flux was compared to the actual outcome.


William Southgate and Woodrow Binnicker, Department of Computer Science

The aim of the College Digitally Assisted Recycling project was to solve two common problems. First, how to make more efficient the collection of distributed recycling within a city or organization. Second, how to quantify recycling programs at a finer level of granularity. The solution developed to rectify these issues took the form of the CDAR project. At the core of this is the Arduino single-board microcontroller coupled with distance-sensing hardware. By attaching an Arduino to each recycling bin within a distributed network of several and using readings obtained from CDAR software, an accurate (±1 cm) measurement of bin capacity could be obtained. In this manner, it can be determined when each bin reaches full capacity and, coupled with predictive analytics, it could also be determined when each might be full in advance. This will allow for much more accurate measurement and more efficient collection of recycling.
100. The combined effects of caffeine and alcohol on zebrafish locomotor activity

J. Tyler and M. Hurd, Department of Psychology and Neuroscience Program

Zebrafish (Danio rerio) is an increasingly popular model in neuroscience research. Previous research shows that acute alcohol exposure leads to disinhibition and hyperlocomotor activity, exhibited by an increase in exploratory behavior. In contrast, acute caffeine exposure leads to anxiety, behaviorally seen as hypolocomotion. However, there is little research on the co-administration of these two drugs. We studied how the combination of caffeine and alcohol affects zebrafish locomotor activity. Subjects were randomly selected and assigned to either a drug condition (2%, 0.25%, or 0.1% v/v EtOH combined with 10mg caffeine) or control for 5 minutes before recording 10 minutes of activity. Locomotor activity, measured by the total distance moved (cm) of the fish, was recorded and a one-way ANOVA with Tukey’s HSD post hoc determined differences among concentrations.

101. - Award of Merit - The Influence of Genotype on Arabidopsis thaliana fitness

Olivia Wilson, Bradley Watson, Alex DePue, Amber Frazier, Annie Jean Rendelman, Christa Caperton, Clare Kohler, Gloria Wilson, K. Andrea Creech, Kelly Grant Purvis, Rebecca Leisen, Allan Strand, Courtney Murren, Matt Rutter, and Yana Wieckowski, Department of Biology

The Undergraduate Phenotyping of Arabidopsis Knockouts (unPAK) is a research collaboration among professors, graduate students, and undergraduates at multiple universities. unPAK aims to contribute to the body of knowledge of the model organism Arabidopsis thaliana through investigations into the ecological genomics and fitness of T-DNA mutants. The aim of our initial study is to assay phenotypic plasticity and fitness of different genotypes grown in different locations. The four genotypic categories used include a genetic control line; environmental control lines; single insert mutants; and mutant lines with an unknown number of inserts. Replicates of these mutants were grown in multiple growth chambers across two different universities. Significant differences in fitness were found among genotypes, growth chambers, and institutions. There was no significant effect of T-DNA insertion number or position on mean fitness. These findings may have implications for compensatory mechanisms, and/or differential insertion effects which are also analyzed and discussed here.

102. Phenotypic effects of salt stress and soil quality on mutant and natural populations of Arabidopsis thaliana

Alexander DePue, Courtney Murren, Matt Rutter, Allan Strand, and Yana Wieckowski, Department of Biology

A population of nearly 300 A. thaliana plants representing seven genotypes, including the natural accession COL_70000 and six different tDNA insert mutant lines were cultivated in different treatments of soil composition and sodium ion content. We found that saltwater treatments
generated uncommon phenotypes in both the natural and mutant accessions and that certain mutant lines were better able to survive the compounding effects of poor soil composition and saltwater stress. The experiment was a companion to a BIOL-211 CURE semester long project and will be a springboard for future course-based undergraduate research experiences, and summer research.

103. Water Use Efficiency in Mutant and Natural Variations of Arabidopsis thaliana

Christa Caperton, Matthew Rutter, and Courtney Murren, Department of Biology

The genetic factors underlying plant response to lack of water availability is crucial knowledge. There are three general categories for a plant’s response to dry conditions: drought resistance, tolerance and avoidance. A. thaliana has been shown to use different strategies depending on its genome. A. thaliana is locally adapted to precipitation conditions, leading to natural variation in the greenhouse, under drought conditions. Working with both ecotypes and single knockouts, this project provides a functional program for exposing previously considered "junk DNA" as functional under certain environmental conditions. This type of research is and will be used to increase agricultural yield during upcoming changes in precipitation patterns.

104. Spectroscopic Investigation of Poly-(3-hexylthiophene) Aggregates in Binary Solvent Systems

Calynn E. Johnson and David S. Boucher, Department of Chemistry and Biochemistry

Our research explores the impact that different solvents have on the organization and assembly of poly(3-hexylthiophene) (P3HT) in solution. We are concerned with the generation of very well-ordered P3HT arrangements known as J-aggregates as a route to P3HT nanofibers. We have successfully produced P3HT J-aggregates and our characterization techniques have revealed new information about their structure and optical properties in a multitude of binary solvent systems. Dynamic light scattering was used to study the solvent-dependent stability of the aggregates, as well as the evolution of their size and shape as a function of varying solvent properties. Absorption and photoluminescence spectroscopic techniques revealed detailed information about the nature of the singlet excitons within the aggregates. Additionally, we carefully selected the binary solvent systems to obtain correlations between the Hansen Solubility Parameters (HSP) and the level of intra- and intermolecular order within the aggregates.

105. Determining Insert Gene Frequencies in Arabidopsis Thaliana

Matt Paul, Matt T. Rutter, Allan E. Strand, Courtney Murren, Yana Wieckowski, Magy Torres, and Alish Cassidy, Department of Biology

Mutant plant lines of Arabidopsis thaliana have been engineered to individually knock out genes using a T-DNA (transfer DNA) vector. The Salk institute has developed a library of over 17,000 mutant plant lines in this manner. By studying these lines, we are able to determine gene to
phenotype interactions. However, a proportion of the lines contain either no gene inserts or an excess of inserts. Therefore, to directly interrogate gene function we must first discover which lines are homozygous knockouts for an individual gene. To determine the amount of T-DNA inserts there are in a mutant line, we are comparing their relative amplification to an endogenous gene, PET-C. The poster describes the methods used and our progress thus far.

106. Synthesis and Assessment of Chemotherapeutic Phthalazinones on Prostate Cancer

Brett Hoover¹, Kimberly Klas¹, Craig Beeson², Gyda Beeson², and Justin Wyatt¹¹Department of Chemistry and Biochemistry Department of Pharmaceutical and Biomedical Sciences, Medical University of South Carolina

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 first designing and utilizing a 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, which causes tumor cells to die by binding to the colchicine binding site within a cell’s microtubules, a globular protein, causing cell death. The three designed compounds have been predicted, based on this computer model, to be potent against tumor cells. Currently they are being tested specifically against prostate cancer cells (DU-145), and thus far the compounds are actively inducing cell death as predicted and show promise as possible anti-tumor drugs.

107. Rain Garden Design and Efficacy

Timothy Callahan and Joshua Johns, Department of Geology and Environmental Geosciences

Approaches to reduce storm water runoff in urban environments require interdisciplinary points of view including building design, landscape architecture, benefit-cost analysis, fluid dynamics, hydraulic engineering, and plant biology and horticulture in order to achieve maximum benefit for a proposed project. The College of Charleston’s Water Resources class developed a design project for the Environmental Protection Agency’s Campus RainWorks Challenge—http://water.epa.gov/infrastructure/greeninfrastructure/crw_challenge.cfm We created a design proposal for a set of rainwater harvesting storm water mitigation, and rain garden installations that illustrated the design elements but also described the data requirements prior to implementation. Proposals are currently in review at EPA but certain research components have been investigated further, and this presentation will show aspects of the design boards for the installation as well as describe research needs of various elements such as the efficacy of rain gardens to absorb storm water runoff and reduce pollutant loads.