1. Determining the Source of Pollution at Filbin Creek, South Carolina

Lydia Beck Nickolas and Vijay Vulava, Department of Geology and Environmental Geosciences

Development in metropolitan areas has a strong potential to alter chemical compositions of urban catchments. The aim of this study is to extrapolate on the potential for runoff-transferred pollutants to impact Filbin Creek (an urban freshwater stream which discharges into an estuary) by measuring ions and trace elements and delineating the sources of water through the use of stable water isotopes. I hypothesize that runoff from surrounding highways and developments is capable of introducing pollutants into Filbin Creek. In this study, water from area was collected and analyzed for ions, heavy metals, and stable isotopes. Results indicated an elevated level of various pollutants, particularly following rain events. Isotopic signatures suggested a high volume of input from isotopically depleted runoff and precipitation in comparison to the more isotopically enriched baseline. The findings signify a need for a more comprehensive assessment of the health of urban waterways like Filbin Creek.

2. Spectral Analysis of Conductive Polymer Nanocomposite Materials

Kyle Clayton and W. Joshua Kennedy, Department of Physics and Astronomy

We analyzed the absorption properties of the conductive polymer Poly(3-hexylthiophene) (P3HT), mixed in solution with single-walled carbon nanotubes (SWNT), as well as with graphene nanoplatelets in various concentrations. We used Raman spectroscopy to characterize the blends. Our results demonstrate that the P3HT / SWNT increases the ordered phase of the polymer as the SWNT concentration is increased. The P3HT / graphene solution did not show an ordered phase shift, but rather a shift in the primary absorption peak in the polymer, indicating a shortening of the polymer chain length with increasing graphene concentration.

3. Degradation Analysis of Sildenafil by ESI-LC-MS
Chase Mabe and Wendy Cory, Department of Chemistry and Biochemistry

Tablets seized as evidence by law enforcement agents in the field have often been exposed to extreme storage conditions. Storage of pharmaceuticals at high temperatures, humidity, and/or light can lead to degradation of the active ingredient. Samples may also be contaminated and degraded by exposure to human saliva. The formation of degradation products, while structurally similar to the analyte, leads to potential complications in the data used to identify the illicit substance. The purpose of this research project was to develop a method for detecting sildenafil (the active ingredient in Viagra®) and its degradation products using liquid chromatography with electrospray ionization - mass spectrometry. Forced degradation studies were conducted by exposing sildenafil citrate to extreme conditions including high temperature and humidity, light exposure, and saliva. The resulting sample was analyzed and the degradation products were identified.

4. Indirect Photodegradation of Naproxen in Simulated Natural Water Systems

Candice Ulmer and Wendy Cory, Department of Chemistry and Biochemistry

Naproxen is a non-steroidal anti-inflammatory pharmaceutical compound that has been detected in natural water systems at the ppb (nM) concentration range. The presence of pharmaceutically active compounds (PhACs) in the aquatic environment poses a risk to humans and aquatic animals. Once introduced these compounds can undergo environmental processes of transformation and degradation. One important pathway is solar photodegradation. Naproxen absorbs UV radiation up to 360+ nm and directly photodegrades within hours, resulting in smaller, more hydrophobic molecules with a higher ecotoxicity than the parent pharmaceutical. Humic acid, a form of dissolved organic matter, has been observed to act as a photosensitizer and lead to indirect photodegradation of other dissolved substances. In this research, both direct and indirect (photosensitized) photodegradation of naproxen were investigated. The role of humic acid as a potential photosensitizers was investigated.

5. Award of Merit: Photochemical Degradation of Cetirizine in Simulated Natural Waters

Danielle White and Wendy Cory, Department of Chemistry and Biochemistry

The presence of pharmaceutically active compounds (PhACs) in natural water systems has garnered a great deal of media attention in recent years. Assessment of the environmental fate of these compounds is critical to an understanding of the risk of these contaminants to humans and aquatic organisms. An important factor in this assessment is photodegradation or the potential that a PhAC may degrade as a result of reactions that occur during exposure to sunlight. In this research, the photodegradation of the antihistamine cetirizine (Zyrtec®) was investigated in water samples to determine its rate of photodegradation. Cetirizine is a zwitterion at pH levels between 3 and 8, which causes intramolecular hydrogen bonding and conformational changes as a function of pH. The effect of these changes on both the UV absorbance of the molecule and its photodegradation at different pH levels was investigated.

6. Gas Chromatography - Mass Spectrometry (GC-MS) for Environmental Analyses in CHEM 522
In spring 2012, the Environmental Chemistry (CHEM 522) class conducted a number of analyses on samples of environmental concern using GC-MS. Benzene, toluene, ethylbenzene and xylenes were detected in stormwater collected near gas stations from different locations in downtown Charleston. Strawberries purchased from local grocery stores (organic and non-organic) and a local farm were tested for the presence of pesticides. An investigation on the degradation of glyphosate (RoundUp) in soil and water was conducted. A description of these investigations and our results will be presented.

7. Exploring the Radiochemistry of Th-232

Noah Bullock and Narayanan Kuthirummal, Department of Physics and Astronomy
Frank Kinard, Department of Chemistry and Biochemistry

Thorium chemistry has become more important recently due to industrial nations interest in developing a thorium based nuclear fuel cycle. Our research focused on developing laboratory experiments using small volumes of natural thorium that generate minimum laboratory waste, but still have the advantage of revealing the complexity of the thorium natural decay cycle chemistry. Our experiments were designed to update older methods and collect new data on the gamma- and alpha-spectra of Th-232 and its daughters. Utilizing a 10% tri-n-butyl-phosphate (TBP) as an extractant, we were able to make a counting sample for alpha-spectroscopy that clearly separated Th-232 and Th-228 nuclei from its radioactive daughters. Our alpha-spectra showed us the ingrowth of daughter nuclei from the Th-232 decay chain. Using electrodeposition, we were able to make counting samples that produced well resolved alpha-spectra for Th-232 and its daughter products.

8. Shallow Marine Lionfish Habitat Characterization of Onslow Bay, NC

Jennifer K. Kist, Emily B. Osborne, and Leslie Sautter, Department of Geology and Environmental Geosciences

Several studies have been conducted to determine the northern most extent of the genus *Pterois*, collectively known as Lionfish. Onslow Bay is a broad crescent-shaped embayment located along the central North Carolina coast and is bordered by two cape promontories. Seven hydrographic surveys were conducted between water depths of 20-40 meters between the years of 2007-2009 using a Kongsberg EM1002 multibeam system aboard the NOAA Ship *Nancy Foster*. These surveys were conducted in order to characterize rocky outcrops and ledges where Lionfish have been sighted. Hydrographic data was collected by the Center for Coastal Fisheries and Habitat Research (CCFHR) Beaufort Lab in North Carolina lead by Dr. Paula Whitfield. CARIS HIPS & SIPS 7.1 was used to process the multibeam data by producing base surfaces. These base surfaces will be used to geologically characterize substrates and to determine the suitability of Onslow Bay for Lionfish.

9. Use of an EM3002 Multibeam Sonar in Underwater Archaeological Research

Jennifer K. Kist, Department of Geology and Environmental Geosciences
Jeff Royal, RPM Nautical Foundation
Multibeam sonar has recently been applied to underwater archaeological research, with surveys in 2011 in Italy, Albania and Montenegro. RPM Nautical Solutions utilizes an EM3002 multibeam sonar on board the R/V Hercules to scan large areas of mostly unexplored nearshore coastal regions within the Adriatic Sea. Raw data are actively fed through a suite of post-processing software, including CARIS HIPS & SIPS and Fledermaus. Once data are cleaned, the company’s archaeological team examines 3-d images of the data and, based on object height and shape, determines possible ancient ship wreck sites. An ROV is deployed to examine these sites. Ancient treasures such as amphora, battle rams and roman helmets have been retrieved by using either the manipulator hands of the ROV or by divers. These treasures belong to the countries in whose coastal waters they are found, and will be displayed in museums.

10. Germination in Spanish *Arabidopsis thaliana*

Tanya Hunt and Courtney Murren, Department of Biology

Germination is highly affected by the environment and the genetics of an organism and can influence the entire life history of the plant. Seeds from native *Arabidopsis thaliana* in Extremadura, Spain were collected and grown in different conditions to determine the best conditions for germinating Spanish accessions. Length of cold treatment, amount of sterilization, type of media, and temperature during growth were all varied and germination results were observed. Overall, two weeks of cold treatment, a Murishage and Skoog salt and agarose media, and 15°C growth conditions were found to produce the highest germination rate for all plants. In addition, for all Spanish accessions tested, the median germination time was determined to be 5 days. Knowledge of this information could lead to genetic and maternal effects studies to determine their effect on germination timing and conditions.

11. Overexpression, Purification and Spectroscopy of a Manganese Ribonucleotide Reductase

Corey Seacrist, Joey Cotruvo, JoAnne Stubbe, and Pamela Riggs-Gelasco, Department of Chemistry and Biochemistry

Ribonucleotide reductases (RNR) catalize 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. Recently, the Stubbe lab established that the cofactor of *B. subtilis* and *E. coli* Class Ib enzyme required an additional protein, ndrI, to activate a manganese cofactor in this class of enzyme. The flavodoxin ndrI utilizes FMN to facilitate assembly of a Mn(III)$_2$-tyrosyl radical cofactor. We report here our efforts to express a functional R2-ndrI complex from *C. ammoniagenes*, overexpressed in *E. coli*. In addition, we report initial X-ray absorption spectra of the oxidized and reduced R2 subunit of the *B. subtilis* Class Ib enzyme.

12. The Relationships between Orientation to Life, Perceived Benefits and Quality of Life: A Correlational Analysis

Georgia Mappin, Amanda Nelson, Ellie Lee, Nick Zumpano, and Sarah Robertson, Department of Psychology
One’s experience of stress is dependent upon the way in which stressors are perceived. However, little research examines the variables that influence the way in which one perceives a potentially stressful event. Sense of coherence is an individual’s perception of their ability to effectively cope with stress, and is measured by the Orientation to Life Questionnaire (OTLQ). The Quality of Life Inventory (QOLI) measures one’s quality of life across several domains, while the Perceived Benefits Scale (PBS) measures potential benefits that people experience after stressful events. It is predicted that higher OTLQ scores will be associated with higher PBS and QOLI scores. Participants were 80 young adults (ages 18-25) who were students at the College of Charleston. A correlational analysis was conducted to assess the degree of relationship between OTLQ, QOLI, and PBS scores. Results indicated significant positive correlations between OTLQ, QOLI, and PBS. Clinical implications are discussed.

13. Implementing Update in GNU Image Manipulation Program

Richard Bowers, Nick Guzzardo, Gini Harrison, Benjamin Johnson, and Marianne Rogers, Department of Computer Science

As a contribution to the Free and Open Source Project, GNU Image Manipulation Program (also known as GIMP), our team implemented a plug-in which will communicate with the program to determine the latest version and update the program if necessary. In our original plan, the plugin calls GIMP's Procedural Database (PDB) and compare the program's current version number to the latest stable release of the program using a URI listed on the GIMP.org site. If it is determined that an update is applicable, with the user's consent the program will update the user's GIMP program or direct them to the site holding the appropriate version download link. From this point, our strategy changes, and we discover different methods of reaching our requirements—each with varying degrees of success.

14. Award of Merit: Investigation of Threshold Energy Absorption for HPPH-mediated PDT in Pancreatic Cancer Cells

Pooja Patel and Linda Jones, Department of Physics and Astronomy

Our research group has been working in collaboration with physicians at Mayo Clinic to develop a method of drug and light dosimetry for photodynamic therapy (PDT). We are studying Panc-1 pancreatic cancer cells with the photosensitizer 2-[1-Hexyloxyethyl]-2-devinyl Pyrophenophorbide-a (HPPH) and 670-nm light. The goal of my project is to determine whether there is a threshold of absorbed light for irreversible destruction of photosensitized Panc-1 pancreatic cancer cells. The cells are loaded with 2 mg/kg of HPPH and 670-nm light is applied at 0.5, 1.0, 1.5 and 2.0 J/cm². Clonal assays are used to determine cell viability, accounting for cell death by both necrosis and apoptosis. After plotting the light absorption against cell viability, a threshold may be determined. This project will introduce a new set of data, which will be beneficial for the field of pancreatic cancer and Photodynamic Therapy.

15. Genome Sequencing and Annotation of Mycobacteriophage Astro in Charleston, South Carolina

Christopher Asuzu, Thomas Burnette, Nicholas Calcagno, Emily Carrig, Amanda Collins, Rachel Ekdahl,
Mycobacteriophages, a type of virus that infects mycobacteria, are one of the most common organisms in the world and have many biomedical and genomic applications. In an effort to discover a phage that will infect M. tuberculosis, a member of the SEA Program at the College of Charleston isolated the phage Astro. Astro belongs in Cluster A, Subcluster A8 and is classified morphotypically as Siphoviridae. The genome was sequenced using next generation high throughput sequencing and a large effort has been made to complete the annotation using software such as DNA Master and Phamerator. The genome is over 52 Kb and contains 93 genes which as a class effort were annotated and compiled. The completed annotated genome will be added to the public Mycobacteriophage DataBase.

16. Effects of Ethanol Dependence on BDNF Expression in Specific Brain Regions

Guilherme Porto\textsuperscript{1,2}; Melissa Overstreet\textsuperscript{2}, Marcelo F. Lopez\textsuperscript{2}, and Howard C. Becker\textsuperscript{2}

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\textsuperscript{2}Department of Psychiatry and Neurosciences, Medical University of South Carolina

BDNF is thought to be involved in the neurobiological mechanisms underlying alcohol and drug dependence, including neuroadaptations resulting from chronic alcohol exposure in animals and humans. The main goal of the present study was to determine whether ethanol dependence produces brain-regional as well as time-dependent changes in BDNF expression. To accomplish this, a mouse model of ethanol dependence that involves repeated cycles of chronic intermittent ethanol exposure was used. BDNF peptide levels were measured by using an ELISA assay procedure. Preliminary data indicate that repeated cycles of chronic intermittent ethanol exposure produce significant reductions in BDNF peptide levels in prefrontal cortex, and this effect extends to later time points after withdrawal. Analysis is currently underway for the additional brain regions. It is anticipated that this study will provide new and valuable information regarding the role of BDNF in neuroadaptations that result from ethanol dependence.

17. Mitochondrial-Mediated Sources of Reduced Nicotinamide Adenine Dinucleotide Phosphate (NADPH) in Mouse Rod Photoreceptors

Leopold Adler IV\textsuperscript{1}, Yiannis Koutalos\textsuperscript{2}, and Chunhe Chen\textsuperscript{2}

\textsuperscript{1}Department of Physics and Astronomy, College of Charleston
\textsuperscript{2}Department of Ophthalmology, Medical University of South Carolina

Reduced nicotinamide adenine dinucleotide phosphate (NADPH) is the primary reducing equivalent for reactions in the cytosol. NADPH is generated via two metabolic pathways: the pentose phosphate pathway, a branch of glycolysis, and mitochondrial-mediated pathways. NADPH generation can be examined in single living photoreceptor cells from the reduction of all-\textit{trans} retinal to retinol. Retinal is released following light detection and its reduction utilizes NADPH. The kinetics of retinal release have previously been determined, while those of retinol formation can be measured from retinol fluorescence with microfluorometry. NADPH production can be estimated from the time delay between retinal release and retinol formation. Incorporating
NADPH production, a model describing retinol formation was developed and fit to experimental data to estimate NADPH production parameters. Under normal physiological conditions, NADPH concentration and production rate were 0.19 mM and 0.07 mM/min, respectively. With glycolysis inhibited and 0.5 mM pyruvate added, NADPH production was restored by mitochondrial pathways to 0.06 mM/min.

18. Fluorescence Quantification of a Photosensitizer in Pancreatic Carcinoma Cells

Alexandra Gotshall and Linda R. Jones, Department of Physics and Astronomy

The project involves the study of a fiber optic method to detect the fluorescence emission of HPPH (2-[1-hexyloxyethyl]-2 Devinyl Pyropheophorbide-a), a photosensitizing drug used in photodynamic therapy (PDT). The main goal was to develop a calibration curve that would allow us to determine the amount of photosensitizer present in cultures of PANC-1 cells, a line of human pancreatic carcinoma cells. By adding known concentrations of the drug, measuring the total emissions using the Ocean Optics Jaz system with an excitation of 405 nanometers, extracting the dye and measuring the fluorescence using a UV spectrophotometer, we were able to calculate a ratio of drug emission and autofluorescence. The data will be used to quantify the photosensitizer in vivo.

19. Preparation of Isoquinolinones from Trilithiated 2-Methylbenzoic Acid Hydrazides and Select Esters

Philip J. Mabe, William G. Shuler, Sarah S. Carlisle, Clyde R. Metz, and Charles F. Beam, Department of Chemistry and Biochemistry

The entry compounds, 2-methylbenzoic acid hydrazides, prepared by the straightforward condensation of 2-methylbenzoic acid chloride with either benzoylhydrazine, benzenesulfonylhydrazine or phenylhydrazine have received limited study, and they have been used in limited investigations, with none of these involving strong base metalation followed by condensation with electrophilic reagents.

During our series of recent studies, the three substituted carboxylic acid hydrazides were trilithiated with lithium diisopropylamide(LDA) to form trilithiated intermediates that were successfully condensed with a variety of substituted aromatic esters ranging from methyl 4-dimethylaminobenzoate to methyl 4-methoxybenzoate to afford C-acylated intermediates that were not isolated but immediately acid cyclized to the targeted isoquinolinone. In one confirmed instance, an N-acylated hydrazide was isolated, whose structure was confirmed by X-ray crystal analysis. The structures of several other substituted isoquinolinones were also confirmed with X-ray single crystal analysis.

20. Strong-Base Preparation of Unsymmetrical Triketones and Select Heterocyclic Compounds from 1-Benzoylacette

William G. Shuler, Philip J. Mabe, Sarah S. Carlisle, Clyde R. Metz, and Charles F. Beam, Department of
Lithium hexamethyldisilazide (LHMDS) and lithium diisopropylamide (LDA) were used in a comparative study for the metalation of 1-benzoylacetone by the formation of a dilithiated dianion type intermediate, followed by the condensation with a variety of electrophilic reagents such as methyl 2-phenylquinoline-4-carboxylate and 5-chloro-isatoic anhydride.

The condensation of the 1-benzoylacetone dianion type complex activated by LHMDS proceeded to the unsymmetrical trione in high yield, ~95%, and the structure of the tautomer obtained after recrystallization was confirmed by X-ray single crystal analysis.

Dilithiated 1-benzoylacetone prepared in excess LDA [diketone: LDA: ahydride, 1:3:1] was condensed with 5-chloroisatoic anhydride followed by acid cyclization of intermediate(s) that were not isolated to afford the quinoline type product, the 2-phenacylquinolinone and not the quinolinol. The quinolinone was shown to be the tautomer isolated and purified based on proton NMR and X-ray structural analysis.

21. Novel Aldol-Type Condensation Processes Involving 1-Benzoylacetone, Two Strong Bases, and Select Ketones

Sarah S. Carlisle, Philip J. Mabe, William G. Shuler, Clyde R. Metz, and Charles F. Beam, Department of Chemistry and Biochemistry

Lithium diisopropylamide (LDA) or lithium hexamethyldisilazide (LHMDS) were used to form dilithiated an intermediate (dianion type) with 1-benzoylacetone. These activated intermediates were condensed with a variety of aldehydes or ketones to afford hydroxyl intermediates that could be isolated after protonation when electron withdrawing groups were in a resonance position on a ring bonded to the carbonyl carbon. When electron donating groups were in a resonance position, linear dehydration occurred, and the tautomer that resulted underwent X-ray crystal analysis.

The lithiated complex (or dianion) resulting from treatment of 1-benzoylacetone with LHMDS was condensed with 2-hydroxy-1-naphthaldehyde, a new naphthopyranylidene resulted. The conformation of its structure is also being undertaken with the aid of X-ray crystal analysis.

When the dilithiated 1-benzoylacetone dianion was condensed with 2-amino-acetophenone, the hydroxyl intermediate underwent two dehydration processes, linear dehydration followed by cyclodehydration, to form the substituted quinoline.

22. Inducible costimulator is essential for Type 17 CD8+ T cell-mediated tumor immunity

Carolyn Rogers\textsuperscript{1,2}, Logan Huff\textsuperscript{2}, Michelle Nelson\textsuperscript{2}, Sreenath Kundimi\textsuperscript{2} and Chrystal Paulos\textsuperscript{2}

\textsuperscript{1}Department of Chemistry and Biochemistry, College of Charleston
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We discovered that Type 17 CD8+ T cell activation, differentiation, and immune function are regulated by the inducible costimulator ICOS. In this study, we examined the role of ICOS in tumor immunity using a
clinical relevant adoptive cell transfer therapy mouse model. We found that blocking ICOS signaling in mice completely impaired Tc17-mediated tumor immunity. Conversely, activating Tc17 cells with an ICOS agonist dramatically potentiated their functionality, thereby improving their capacity to eradicate large tumors. This improved antitumor immunity was associated with increased expression of IL-7R-alpha, CD103, and ICOS expression on the Type 17 CD8+ T cells, and enhanced persistence of the adoptively transferred cells. These findings have implications for the improvement of CD8+ T cell-based adoptive immunotherapy.

23. The Firefox Experience

Jeffrey Decker, Chad Freeman, Carla Goodman, Erin McCall, and Bryan Von Dohlen, Department of Computer Science

As open-source software has begun to grow in both popularity and relevance, so has the importance of involving students in these communities to expand our knowledge and prepare us for what lies ahead after graduation. As part of the Software Engineering Practicum course offered to Computer Science majors, Team Foxy chose to contribute to Mozilla’s open-source web browser Firefox. With nearly half a billion users worldwide, Firefox has proven to be an excellent starter project with a welcoming community, allowing us to get involved quite easily. Through interaction with the Mozilla community using resources such as Internet Relay Chat and Bugzilla (a bug-tracking tool), our team was able to successfully submit several fixes to bugs that will affect nearly 500,000 end-users. The unconventional nature of this course has been an invaluable experience for our team in our transition from academic studies to professional careers.

24. Contributing to XBMC

James Joy, David Schirduan, Julie Norris, Matt Vaveris, and Jason Leonard, Department of Computer Science

The Software Engineering Practicum course taught by Dr. James Bowring focuses on the development of open source software. Open Source Software is built on public contributions, or donations of time and skill made by programmers. Team Triple J chose to contribute/donate to XBMC, formerly known as Xbox Media Center, which is multi-functionally designed to be used for personal entertainment systems. Team Triple J made itself known in the XBMC community by contributing to several bug reports and updating outdated and/or incorrect documentation. We were lucky to be involved during a time of heavy development and multiple releases. This gave us great insight into software engineering, testing, updating, and releasing. By actively contributing and participating in a vibrant, active community, we experienced a "trial-by-fire" insight into real-world software development.

25. Applications of Open Source Software in Computer Science Education

Matthias Burrell, Stephen Davidson, Jennifer Green, James Rajabi, and Tatiana Taylor, Department of Computer Science

Open source software has a wide variety of popular uses within culture today, including education. The purpose of this project is to demonstrate how working on software of a significantly large scale, namely open
source projects, provides a better learning experience for the student. Our open source experience came from the use of the website management software, Drupal. Through community involvement within Drupal, developing patches for Drupal, and these submitting patches to Drupal, we were able to demonstrate the advantages of using open source software in software engineering education. This project provides evidence that open source software is a more effective method for teaching students the core principles of software engineering than exercises and keystone projects.

26. High Quality Image Improvement Using the CofC Telescope

Andrei Zorilescu and Joseph C. Carson, Department of Physics and Astronomy

High resolution, image improvement codes offer the opportunity to improve the quality of astronomy images that have been degraded by problems such as poor telescope tracking, telescope vibrations, and blurring effects from the atmosphere. The Cassegrain Telescope at the College of Charleston (CofC) was used to collect images of an object in sets of different exposure times which were later analyzed for quality improvement. The purpose of this project was to show that images can be shifted and aligned to a certain point through software so that when the multiple images are combined, the effective resolution and overall image quality is substantially improved. We also investigated the effectiveness of combining a carefully selected subset of images, identified by the sharpness of the star features, to try and improve the final image quality. The object of focus was the double binary system Epsilon Lyrae.

27. Spawning Frequency Composition of Female Cobia, *Rachycentron canadum*, over 4 years in South Carolina

Cassandra Jansch and Bill Roumillat, College of Charleston Department of Biology and South Carolina Department of Natural Resources

Cobia, *Rachycentron canadum*, is a migratory pelagic fish that spawns along the southeastern United States coast from April to September. Being indeterminate batch spawners, cobia release eggs and sperm multiple times per spawning season. In South Carolina, cobia spawn in the southern estuaries Port Royal Sound and St. Helena Sound. Peak spawning season is during the months of May and June, which is when cobia are most susceptible to capture by recreational fishermen. Through studying postovulatory follicle degeneration of spawning cobia, I determined that the fish spawn once every six days and ten times per season. Each batch of eggs produced yields anywhere from 337,000 to 1,980,000 eggs per fish. I suggest that current regulations should be altered such that the cobia recreational fishing season is delayed one month to allow for increased potential progeny production.

28. Health related quality of life (HRQOL) in Malignant Glioma Patients Treated With Bevacizumab

Ellen Innis and Teri N. Kreisl

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2Neuro-Oncology Branch, National Cancer Institute, National Institutes of Health, Bethesda, MD
Primary brain tumors such as anaplastic glioma and glioblastoma multiforme have a poor prognosis. Therefore, quality of life while receiving treatment is an important factor. Because curing patients of malignant brain tumors is often not possible, extended survival and delaying progression of disease are important, but need to be balanced with the negative effects of treatment.

The FACTBr is a validated tool for assessing quality of life for brain tumor patients. This 50-item questionnaire is divided into five sections assessing general physical, social, emotional, and functional well-being, as well as brain tumor specific concerns. Each item is scored 0 (not at all) to 4 (very much). This study investigated whether baseline total FACTBr or subsection scores predict overall survival in 165 patients with malignant brain tumors. Data indicated that only baseline total FACTBr score and baseline physical well-being score were statistically significant for predicting overall survival.

29. Applying Analytical and Visual Algorithms to Water Quality Data Sets to Increase Data Utility Across a Spectrum of Target Constituencies

Matthew Vaveris and Christopher Starr, Department of Computer Science

The Knowledge Discovery in Databases process is a powerful analytical tool that can reveal new and thought-provoking interpretations of sources of data. I applied a variety of major data mining tools towards water quality data as a form of creative empiricism. This project amalgamated the studies of water quality with a creative and unorthodox analytical approach to find patterns in the data that may be useful for the community interested in the topic. At the same time, I applied data visualization techniques in such a way that it is easily consumable for people with a variety of backgrounds. The approach is designed to apply multiple views of a data set to potentially expose new value that would be missed by a targeted approach. By not defining the outcome a priori then matching a tool to enable that outcome, our approach opens up the range of analytical results for evaluation.

30. Award of Merit: A Developmental Rat Brain Atlas Using Diffusion Tensor Magnetic Resonance Imaging

Matthew C. Sherrier\textsuperscript{1}, Evan Calabrese\textsuperscript{2}, and G. Allan Johnson\textsuperscript{2}

\textsuperscript{1}Department of Psychology, College of Charleston

\textsuperscript{2}Duke University Center for In Vivo Microscopy

Diffusion Tensor Imaging (DTI) is a Magnetic Resonance Imaging (MRI) technique based on the diffusion properties of water in biological tissues. The directional restriction of water diffusion between and within axons allows for detailed visualization of white matter connectivity in the brain. This technology is being used at the Duke University Center for In Vivo Microscopy to establish a three-dimensional atlas of white matter development in the rat brain. Critical areas of the brain involved with vision and perception were segmented from the DTI data, including the optic nerve, optic chiasm, optic tract, lateral geniculate nucleus, and primary visual cortex, across multiple time points to follow their development. The software involved in the analysis of the DTI-MRI data, Avizo and TrackVis, can be used to gather quantitative metrics of white matter integrity. These statistics elucidate the normal course of white matter development in the rat visual system, and allow quantitative comparisons to human disease models. By mapping specific structures and projections as the rat brain develops, the developmental rat brain atlas will provide a highly detailed, three-dimensional atlas of white matter to complement existing histology-based atlases.
31. New Class of Green Chemistry Surface Active Materials based on Natural Polyols for use in Rigid and Flexible Polyurethane Foams

Patrick L. Coterillo and Neal Tonks, Department of Chemistry and Biochemistry

The primary goal of this research project is to synthesize a series of surfactants. The surfactant molecules utilize poly functional alcohols, also known as polyols, and hydride substituted silicone oils to in the synthesis reactions to produce surfactants that will have surface active properties needed to improve foam formation in the production of polyurethane foams. This project is also heavily involved in the application of “green chemistry” and environmentally safe practices. Throughout the course of this project a series of nine polyol intermediates have been created, and then reacted with silicone oils to form surfactants. The next phase of the project will be to have them tested in the production of polyurethane foams. Future plans for this project involve the creation of new surfactants based on polyols with higher hydroxyl content.


Jesica Trucks and Joseph C. Carson, Department of Physics and Astronomy

With applications for the Subaru SEEDS Exoplanet survey, I developed Monte Carlo simulations to determine the population statistics of extrasolar planets around high mass A and B type stars, based on observational imaging data. The numerical codes also determine the probability of successfully imaging a planet around a star, as a function of planet temperature and orbital characteristics. For an example imaging data set, I performed a maximum likelihood analysis to determine the exoplanet frequencies most consistent with the observational results.

33. A Genome-wide Survey of Evolutionarily Conserved Nuclear Transport Genes in the Sea Urchin

J.P. Smith, M.C. Bridges, M.R. Easterling, L.A. Jackson, and C. A. Byrum, Department of Biology

Due to its ecological, commercial and biomedical significance, the genome of *Stronglylocentrotus purpuratus* was sequenced in 2006. This genome revealed greater than 23,000 genes and most sequences were annotated at that time. Two gene families were not annotated in the initial effort: the karyopherin-α and karyopherin-β families. These nuclear transport genes are vital to movement of macromolecules into and out of the nucleus and currently only one, exportin-5, has been confirmed in *S. purpuratus*. Using reciprocal blasting and phylogenetic analysis, we have identified likely homologues to human karyopherins. Among the karyopherins, we found strong homology between each of the *S. purpuratus* genes and those from the human genome. Our results suggest gene duplications occurred in the evolution of importin-α, leading to the accumulation of additional importin family members within the human genome. Reverse transcriptase PCR, qPCR, and DNA sequencing confirm that the karyopherins Xpo1, Ipo7/8, and KPNA2/7 are expressed during development.
34. Characterizing the Surface and Subsurface Environment of Raditladi Basin on Mercury

Heather Meyer\textsuperscript{1}, Josh Moore\textsuperscript{2}, and David Ruwadi\textsuperscript{1}
\textsuperscript{1}Department of Geology and Environmental Geosciences
\textsuperscript{2}Department of Computer Science

As the major component of the NASA Mission Design Project, we were given the opportunity to design a Lander mission to Mercury for the purposes of determining the local surface composition, the processes currently reshaping the surface, the interaction between the surface and solar radiation, and the planetary heat flow through Mercury. Furthermore, the Lander operations will provide verification of existing orbiter data and will serve as a point of reference for the integration of magnetic field data. In cooperation with an engineering team at the University of Alabama-Huntsville, we have developed a mission scenario involving the analysis of surface and subsurface samples, magnetic field, and radiation measurements within Raditladi Basin on Mercury, an area known to contain features unique to Mercury called the 'hollows.'

35. Testing Structural and Computational Models of Enzymes Active Sites through Chemical Modifications: Metal Ion Interactions in the Hammerhead Ribozyme

Thomas Struble and Marcello Forconi, Department of Chemistry and Biochemistry

Recent computational and structural work on the full version of the hammerhead ribozyme have put forward novel models for its catalytic mechanism. In one model a metal ion involved in catalysis is coordinated to the N7 atom of residue G10.1 in the ground state of the reaction, but loses this coordination in the transition state. Thus, this ground state contact would be anticatalytic. A ribozyme modified to disrupt such ground state contact would be predicted to display enhanced activity relative to the unmodified ribozyme. To test this model, we have constructed a variant of the hammerhead ribozyme containing a CH group in place of the N7 of G10.1, and measured its reactivity using single-turnover kinetics. Our results suggest that the contact between the N7 atom of residue G10.1 and the active site metal ion is maintained in the transition state of the reaction.

36. Award of Merit: Temporal variations in bathymetry and morphology at Gray’s Reef National Marine Sanctuary

J. Ryan Rembert, Jim Niergarth, and Leslie Sautter, Department of Geology and Environmental Geosciences
Greg McFall, Gray's Reef National Marine Sanctuary

NOAA’s Gray’s Reef National Marine Sanctuary, located on the mid-continental shelf off the Georgia coast, was mapped in 2001 elucidating understanding of marine habitats and providing means to conceptualize the recent and ancient geologic history of the southeastern United States continental shelf. New multi-beam data was collected during a 2011 expedition on the NOAA Nancy Foster and was compared with previously collected data to understand how the bathymetry of Gray’s Reef has changed over time. Three-dimensional imagery and data processing were performed using CARIS HIPS/SIPS 7.1 software. The reef consists of mostly low-relief sandy bottom sediment interspersed with rocky outcrops and emergent limestone.
Sediments have been eroded into ledges and low-relief features populated by a diverse community of fish and marine invertebrates. Observing how the morphology of these features change over time aids long-term habitat characterization not only at Gray’s Reef, but also at other physiographical and ecologically similar areas.

37. Transport of Naproxen and Ibuprofen in Homogeneously-packed Quartz Sand Columns

Bradley D. Sion and Vijay M. Vulava, Department of Geology and Environmental Geosciences

Emerging contaminants such as pharmaceuticals and personal care products (PPCP’s) have become a concern due to the potential threat they pose in the environment. Low PPCP-concentrations in natural waters have been shown to adversely affect aquatic and non-aquatic organisms. Environmental fate of PPCPs is largely unknown, but one main degradation mechanism in natural waters includes sorption to soils and stream sediments. Mineral surfaces in soils and reactive fractions of natural organic matter (OM) can potentially sorb PPCPs. Complex structures of PPCPs include functional groups that can interact with reactive fractions in soils and sediment. The purpose of this study was to investigate the geochemical fate of two PPCPs, ibuprofen and naproxen in porous media. Preliminary data suggested that these compounds sorb onto clay surfaces and reactive fractions of OM. We expect that this preliminary data will help us develop better insights into transport of pharmaceutical chemicals in soils and groundwater.

38. Comparison of water table response dynamics and an energy budget model to estimate evapotranspiration rates at Dixie Plantation, Church Flats Watershed, Charleston County, South Carolina

Bradley D. Sion and Timothy J. Callahan, Department of Geology and Environmental Geosciences

The objective of this study was to examine the effects of storm and drought conditions on the water budget and hydrology dynamics at Church Flats watershed of the Stono River basin in Charleston County, South Carolina. We used water table data to estimate evapotranspiration (ET) rates for a groundwater seep that discharges to a salt marsh. Severe drought conditions in 2007 and wet conditions from large storm events in 2008 and 2010 were inspected, and the water table behavior from these time sequences were compared to discern any trends in diurnal water table fluctuations. Shallow groundwater and meteorological data were then analyzed using White’s method to measure ET and compared to Turc’s method for estimating potential evapotranspiration (PET). As expected, calculated Turc’s PET values were larger in relation to measured ET because the water table method inherently accounts for antecedent soil moisture conditions, a factor not included in PET calculations.

39. Bathymetric analysis of a complex promontory extending into the Gulf Stream off Charleston, SC

M. G. Smythe, P.J. Bierce, L.R. Sautter and M.S. Harris, Department of Geology and Environmental Geosciences
Bulls Scarp is a cape-like promontory located at the continental shelf edge, 100 km off the coast of Charleston, SC. Multibeam sonar data collected in July 2011 aboard the NOAA Ship Nancy Foster reveal a variety of complex bathymetric features. The 1.8 by 10.9 km survey area ranges in water depths from 40-210 m. Data were analyzed using CARIS HIPS and SIPS 7.1 software and reveal seafloor features including sand waves, current scours, depressions, a small canyon, multiple ledges and a possible iceberg plough mark—the southern-most feature of its kind identified in the western North Atlantic. This survey fills a gap along a 100 km section of the 50 m isobath of essential fish habitat within the South Atlantic Bight. Such bathymetric information is contributing to the designation of possible essential fish habitat and marine protected areas.

40. Oxytocin Receptor Distribution in the Extended Amygdala in Response to Cocaine Withdrawal

Stephanie Johnson¹, Parrish Waters², and Ronald See²

¹Department of Biology, College of Charleston
²Department of Neurosciences, Medical University of South Carolina

Relapse is the main obstacle in the treatment of drug addiction. Anxiety experienced during withdrawal from a drug of abuse is thought to trigger relapse. Stress hormones, such as CRF (corticotropin releasing factor) and NE (norepinephrine) are released into the body upon activation of the stress feedback loop. Oxytocin has emerged as a potential contributor to this system. To better understand the role of oxytocin in withdrawal from cocaine, we used an animal model of drug addiction, in which rats self-administered cocaine for two weeks. Following self-administration and two days of abstinence, we assessed anxiety levels and found animals that self-administered cocaine exhibited higher levels of anxiotypic behavior. To identify changes in oxytocin receptor levels, we isolated the extended amygdala of these animals and quantified protein expression. Evaluation of oxytocin receptor expression is ongoing and will provide a neurochemical correlate to the anxiety reported during withdrawal from cocaine.

41. The Effects of Paclitaxel on Ceramide Composition and CerS2 Expression in Breast Cancer Cells

Christopher C. Asuzu¹,² and Stefka D. Spassieva²

¹Department of Biology, College of Charleston
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Patients becoming resistant or unresponsive to paclitaxel treatment are hindering its success. In a genomic screen it has been shown that the ceramide pathway can increase cancer cell sensitivity to paclitaxel, including breast cancer cells. In addition, down regulation of ceramide synthase 2 by siRNA has been shown to increase breast cancer cell sensitivity to paclitaxel. In an effort to improve and understand these phenomena a paclitaxel resistant cell culture model is being made. Lipid chromatography coupled with mass spectrometry was used to analyze the ceramide composition of the paclitaxel treated cells at different time points during paclitaxel incubation. CerS2 expression in these paclitaxel treated cells was quantified using RT-PCR. The current results show a decrease in ceramide composition and CerS2 expression in paclitaxel treated cells. In the future, other ceramide synthases will be observed and we will continue to analyze the ceramide composition of the cells at different concentrations of paclitaxel.
42. Effect of Social Isolation on Adult Neurogenesis in the California Mouse
S. Bradley King and Michael G. Ruscio, Department of Psychology and Program in Neuroscience

The production of new neurons (neurogenesis) in adult mammals is known to be affected by various extrinsic factors including social environment. The California mouse, a highly social rodent species, displays monogamy and bi-parental care; consequently, this species should be particularly sensitive to manipulations of its social environment. In the present experiment, the effect of isolation on neurogenesis in the brains was examined using a neural marker, BrdU. Cells were visualized and quantified using immunofluorescence. We predicted that neurogenesis would decrease due to isolation. Preliminary results, however, show no significant difference in the number of new cells in the dentate gyrus of the hippocampus due to isolation. Additional data from our lab shows new cells in less established limbic system structures: bed nucleus of the stria terminalis and medial amygdala. These results could offer a better understanding of the neural mechanisms that underlie the behavioral deficits associated social deprivation.

43. Award of Merit: The Accumulation of Proteoglycans Contributes to Myxomatous Valve Disease in the ADAMTS5 Mouse Model
Matthew Berger, Loren E. Dupuis and Christine B. Kern, Department of Biology

Myxomatous valve disease is a type of congenital heart disease in which heart valves are enlarged and cannot function properly, the etiology of which is not well understood. Previous research showed that Versican, a proteoglycan, is a substrate of the ADAMTS5 protease and accumulates in ADAMTS5 deficient mice. Through my independent study, I sought to test the hypothesis that the over-accumulation of proteoglycan substrates in ADAMTS5 deficient mice contributes to their myxomatous morphology. Mice bred from two heterozygous parents were dissected and their hearts sectioned and stained with fluorescent tags to indicate the presence of the proteoglycans in question. When compared to hearts of wild type mice, knockouts were observed to have an increased accumulation of fibromodulin and a malformed decorin structure in the pulmonary valves. This suggests that these two proteoglycans are substrates of the ADAMTS5 protease and that their accumulation contributes to the progression of myxomatous valve disease.

44. Isolation and Characterization of Mycobacteriophages in Charleston, South Carolina
Christopher Asuzu, Thomas Burnette, Nicholas Calcagno, Emily Carrig, Amanda Collins, Rachel Ekdahl, Alana Guziewicz, Stephanie Haney, Tanya Hunt, Charlotte Kelsey, Laura Jackson, Charlotte Kelsey, Brad Long, Ben McWhite, Wesley Murphy, Marshall Oelsen, Pooja Patel, Ariane Pereira, Ben Perrin, Thomas Pittman, Eric Robertson, Allysan Scatterday, Corey Seacrist, Gabe Segarra, Elliott Smith, Kareen Taha, Christopher Korey, Erin Morris, Ana Zimmerman, Department of Biology

Soil samples were collected from College of Charleston campus and surrounding areas. The particle matter and bacterial cells from the samples were then pelleted through centrifugation and filtered further to rid the samples of bacterial cells. The filtrate underwent a serial dilution and the was incubated with Mycobacterium smegmatis for the potential mycobacteriophage to infect. The M. smegmatis mixtures were then plated and incubated and any resulting plaques observed on plates were labeled individually and "picked" for phage.
Plates with M. smegmatis lawns were used to spot test each plaque for viable phage. The resulting phage were streaked and diluted until a web pattern resulted upon streaking and incubation with *M. smegmatis*. Phage was prepared for PCR and a restriction digest with primers to determine which cluster or subcluster the phage belonged to. Samples of phage were also prepared for electron micrograph. Samples of every viable phage found from soil samples were sent to the University of Pittsburgh for their genomes to be sequenced.

**45. The Future of Visual Search**

Thomas Dameron, Alyssa Finn, James Raptis, John Stromberg, and Caroline Sylvia, Department of Computer Science

What if visual search was incredibly easy and convenient? In the future of visual search, we visualize pointing your mobile camera at an object and nearly instantly receiving links and text, informing and educating the user about the specific object. With a virtual world of pictures connected to information, typing into a search bar may become less common. In the web-based world we live in, we have essentially all searchable information accessible at our fingertips, whenever we need it. Although this process of searching using text is incredibly effortless compared to the results we discover, we believe the advanced society we live in should be able to reduce or eliminate typing from search and manual search in general.

**46. Is Google TV the Future of Television?**

Walter Fulbright, Charlee Sullivan, Matt Turner, and Luxi Zeng, Department of Computer Science

Google has expanded their market into a wide variety of businesses all the way from Search to YouTube and now they have expanded to television. Google plans on bridging the gap between cable and the Internet. This project will explore the future of streaming multimedia with their latest creation, Google TV. Google TV offers similar accommodations as a computer but just on a TV. It allows the user to watch YouTube and Netflix from the TV. With Google TV the user access to the same apps found on cell phones and tablet. Google TV isn’t seen as a problem solver but instead it is a luxury item for those that can afford it.

**47. Predictive Analytics: We Know Where You Will Be in the Future**

Sarah Bensema, Andrew Hendricks, Kristen Smith, John Tammany, and George Warburg, Department of Computer Science

Predictive Analytics (PA) is used in almost every industry to predict future trends based on decisions made in the past. PA works by compiling and storing data and using previous trend analysis to predict future trends. We believe that this idea can be applied to geolocation as well. For our project, we focus primarily on the ability of smart phones to track geolocation and store data. Smart phones have access to information from all different kinds of accounts. By using this stored data, and applying predictive analytics, we believe that smart phones will be able to generate possible outcomes and choices that the user will make in the future. Our project focuses on how predictive analytics can be used to predict the physical location of the user in the future.
48. Virtual Migration: Feeling The World Through The Network

Sergio Martinez Calderon, Parker Galloway, Matt Johnson, and Shane Rogan, Department of Computer Science

Millions of people each day are using some sort of social networking in order to stay connected with their social world. One thing they lack though is face to face communication. With the invention of virtual migration people will be able to see what the other person is seeing through a virtual world and experience what they are seeing. This new technology benefits from geolocation systems to transport you in real time to any place so that you can see and feel what your connections are experiencing. In addition, virtual reality will enable people to also experience social media in a whole new way by making it seem like they are really there.

49. App Inventor Edu

Eric Brown, Keith Duncan, Rollins Burnam, and John Crepeau, Department of Computer Science

Mobile applications are triggering a fundamental shift in the way people experience computing. Today, smartphones have become computers in our pockets, serving our communication and information needs and making the web part of all that we do. App Inventor for Android is a programming tool that makes it easy for anyone — programmers and non-programmers, adults and kids — to create mobile applications for the Android phone. App Inventor was piloted by Google Research in 2010 and App Inventor development continues at the MIT Center for Mobile Learning (CML). Because it already has a web-based interface for app design, users do not need to go into Java programming specifics with the software development kit. This will influence other educational institutions to use the open source as a way to build Android applications. In turn, this will get more students interested in Android applications development.

50. Breeding wetland selection of the Carolina gopher frog

Kevin Maginn¹, Joyce Marie Klaus², and Allison Welch¹

¹Department of Biology, College of Charleston
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The Carolina gopher frog (Lithobates capito) is a habitat specialist with a limited range within the southeastern coastal plain of the United States, and it is therefore a species of conservation concern. In order to maintain viable gopher frog populations on a local scale it is important to identify and maintain suitable breeding wetlands within the limited matrices of upland habitat they inhabit. To determine which factors influence the use of breeding wetlands by gopher frogs, we compare several environmental variables with the presence of L. capito as determined by a chorus survey. Environmental data were collected, including vegetation characteristics, water quality, forest management regime, and biotic community composition for each of the 24 wetlands included in the chorus survey. We determined what relationships exist between environmental variables and gopher frog presence. Understanding what factors influence the selection of breeding sites by rare amphibians is essential for their conservation.
51. Stress Effects on Alcohol Consumption

Paige Brubacher\(^1\), Marcelo Lopez\(^2\), and Howard Becker\(^2\)

\(^1\)Department of Psychology, Program in Neuroscience, College of Charleston
\(^2\)Department of Psychiatry, MUSC

Alcohol is known to activate stress systems in the brain. Conversely, alcohol can have an anxiolytic effect, which in turn can motivate drinking. This study looked at alcohol consumption in alcohol dependent and non-dependent mice after undergoing one of three stress challenges: restraint, forced swim or social defeat. We were also interested in the effect of 24h ethanol access compared to limited 2h access paradigm often used in drinking studies. After training C57BL/6J mice to have a baseline level of ethanol consumption, we started a schedule of alternating weeks chronic intermittent ethanol exposure and 24h continual ethanol access. In the fifth cycle of this schedule, stress challenges were applied daily for five days prior to alcohol access. Results showed decreased drinking following social defeat stress in both alcohol dependent and non-dependent mice. Escalation in alcohol consumption was shown more significantly in the recordings of 24h consumption than the initial 2h alone.

52. Analysis of Traffic Patterns at a Four-Way Stop

Jaime Thrift, Department of Physics and Astronomy

Traffic patterns at a four-way stop, three miles southwest of exit 194 on SC Interstate 26, were studied. Rush hour, 5-6pm, was of special interest. The flow, q, was determined for each day and turn choice during this hour. Two different turn choices, designated ab and ba, had significantly higher q each day than other choices, leading to the calculation of Peak Hour Factor, PHF, which is an indicator of traffic fluctuation. High PHF corresponds to a longer period of high q. PHF, calculated for each turn each day, was 0.85, 0.98, 0.84, and 0.86 for turn ab and 0.83, 0.89, 0.94, and 0.95 for turn ba. By comparing PHF for each day, turn choice and the times it occurred, PHF was determined to be a possible indicator of longer travel time when departure time changes by a few minutes.

53. Influence of Barefoot Running on Running Economy In Recreational Runners

M.M. Koehler, J.T. Repshas, E.E. Hawkins, K.L. Hines and M.G. Flynn, Department of Health and Human Performance

Running economy provides a proxy measure for running efficiency. The purpose of this study was to determine if running economy differed between running with shoes, running barefoot, or weighted running (weights added that were equivalent to shoe weight). The subjects were active college students (n=18) who had previous running experience and were training to run in a local 10 kilometer race. Subjects performed three, seven minute, randomly assigned, sub-maximal running trials either barefoot, shod, or weighted. There were no significant differences between heart rate, rating of perceived exertion, or running economy for the three trials. We conclude that there was no benefit of barefoot running, with respect to running economy, perception of effort or heart rate. We conclude that running economy is not affected by barefoot running in college-aged, recreational runners who have not had significant experience with barefoot running.
54. Functional characterization of SdsA1, an alkylsulfatase from *Pseudomonas aeruginosa*

Avery Zierk, James Holt, and Marcello Forconi, Department of Chemistry and Biochemistry

SdsA1 is a 72-kDa protein used by the pathogenic bacteria *Pseudomonas aeruginosa* to hydrolyze sodium dodecyl sulfate (SDS), a common surfactant used in soaps and detergents because of its proposed microbicidal properties.

We have undertaken a comprehensive study to understand the mechanism of catalysis of this enzyme, using proposals from the published crystal structure. To date, we have expressed and purified SdsA1, and tested for sulfatase activity using a colorimetric assay.

Our work will provide important information regarding an enzyme used by a pathogenic bacteria, and will also have implications for a systems biology-oriented approach to the bioremediation of SDS-contaminated sites. Further, future comparison between the catalytic strategies used by SdsA1 and other enzymes belonging to the same protein superfamily of SdsA1, the metallo-beta-lactamase superfamily, will elucidate factors that contribute to the evolution of new substrate specificities using a common three-dimensional scaffold.

55. Comparison of Startle Response in Two Ambystomid Salamander Species

Z.J. Taylor and G.W. Milliken, Department of Psychology

The ontogeny of the startle response in larval tiger (*A. tigrinum*) and spotted salamanders (*A. maculatum*) was tracked from the early to late aquatic developmental stage. To evaluate the startle response, larvae were subjected to a brief vibrotactile stimulus and the behavioral response was recorded. Responses were evaluated using a Z-test. The two species demonstrated different responses to the stimulus. In the legless early aquatic stage (10 days post hatching), tiger salamanders exhibited the startle response while spotted salamanders remained immobile. In the quadrupedal late aquatic stage (23 days post hatching), tiger salamanders continued to exhibit startle responses while spotted salamanders showed increasing propensity to respond. Differences in escape response serve as distinct examples of different species typical behaviors. Species differences are attributed to these morphological and ontogenetic characteristics: tiger salamanders are larger, with a slower ontogenetic rate while spotted salamanders are a smaller but exhibit comparatively rapid development.

56. Hip Range of Motion Predicts Dynamic Lower Extremity Alignment in Adolescent Athletes

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Inward collapse of the hip and knee has been theorized to be a risk factor for anterior cruciate ligament
(ACL) injury. Hip range of motion (ROM) is thought to influence joint motion during dynamic tasks and may be leading to this inward collapse. While this relationship has been observed in adults, there is little research investigating the influence of hip ROM on dynamic joint angles in the adolescent athlete, who may be at greatest risk for ACL injury. Therefore, the purpose of this study was to determine the influence of hip ROM on knee excursions during a jump landing task in 73 adolescent athletes. In males, more hip external rotation (HER) predicted more inward collapse of the knee at initial contact explaining 8.6% of the variance ($P=0.046$). In females, more HER predicted less knee valgus at initial contact, less knee valgus excursion, and less knee external rotation excursion.

57. Variation in Projectin Isoforms and Flight Performance in *Drosophila melanogaster*

K. Corder and A. Ayme-Southgate, Department of Biology

Insect flight muscles are extraordinary in their diversity at the anatomical, physiological and molecular levels. The myofibrillar structure provides the muscle with its contractile properties and contributes to muscle stiffness. Insect sarcomeres contain relatively inextensible filaments linking the Z-band to the myosin filaments, which are known as C-filaments and contain two proteins, projectin and kettin/Sls. The molecular characterization of projectin in basal and derived insects reveals the presence of a unique PEVK region, which is extensively alternatively spliced. In *D. melanogaster* the PEVK region ranges from 100 to 600 amino acids. The unusual amino acid composition of the PEVK segment, as well as its variable length may contribute to its proposed role as the elastic segment. We will present data investigating the possible correlation between the relative abundance of different projectin PEVK isoforms and two parameters affecting the fly’s flight property, sex and age.

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

Rachel Ekdahl\textsuperscript{1}, Loren Dupuis\textsuperscript{2}, Deidra Weber\textsuperscript{1} and Christine B. Kern\textsuperscript{2}

\textsuperscript{1}Biology Department, College of Charleston
\textsuperscript{2}Department of Regenerative Medicine and Cell Biology, Medical University of South Carolina

Bicuspid pulmonary and aortic valves (BPV, BAV), instead of normal tricuspid cardiac outflow valves, are the result of abnormal cusp formation during valvulogenesis. BAV leads to cardiac valve dysfunction, which requires risky and expensive surgical intervention. Although BAV is the most prevalent cardiovascular malformation, very little is known about the mechanisms involved in disease progression. We hypothesized that changes in the extracellular matrix (ECM) during valvulogenesis mediate the development of a bicuspid or tricuspid cardiac outflow valve. Therefore, we generated a mouse model deficient in the ADAMTS5 ECM protease containing a reduction of Smad2, an intracellular signaling molecule critical for valve development. Amira three-dimensional reconstructions of the ADAMTS5-/-;Smad2+/- outflow tract valves were used to reveal the formation of myxomatous bicuspid valves compared to control mice. Investigation of the novel ADAMTS5-/-;Smad2+/- mouse model of bicuspid valve formation may lead to important mechanistic information necessary for the development of effective therapeutic treatments.
59. Mercury's Magnetosphere, Mineralogy, and Geology (M3G)

Jesica Trucks¹, Justin Peers², and Caroline Smith²

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²Department of Geology and Environmental Geoscience

The NASA Space Mission Design Class this semester focused on developing feasible scientific goals and objectives for a mission to Mercury. M3G (Mercury's, Magnetosphere, Mineralogy, and Geology) is a collaborative effort between College of Charleston, University of Alabama at Huntsville, and ESTACA in Paris. M3G will determine the connection between the magnetosphere, exosphere, and surface geology of Mercury upon landing in a volatile rich basin. By cross examining spectral data of both surface rock and exosphere composition, M3G will determine the rate at which volatiles are released from Mercury’s surface into the exosphere.

60. Abnormal Heart Development in a Mouse Model of the LEOPARD / Noonan Syndrome

Gabriel C. Segarra¹, Boding Zhang², Jessica Lauriol³, Maria I. Kontaridis³, Kyu-Ho Lee²

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As our knowledge and understanding of genes and gene expression have increased, mutations of specific gene loci have been implicated as being causative of previously well-characterized congenital syndromes. In humans, mutant forms of the PTPN11 gene have been linked to congenital heart diseases, specifically the LEOPARD and Noonan syndromes. Mutation at the PTPN11 locus results in irregular forms of Shp2, a protein tyrosine phosphatase that is hypothesized to be involved in biochemical pathways which profoundly affect embryonic heart development. In order to examine the physical abnormalities that result from abnormal Shp2 and to test the hypothesis that mutant forms of Shp2 can cause LS/NS, we used cross-sectional photographs of PTPN11-mutant mouse embryos at various stages of development to create computerized 3D cardiac reconstructions. Embryos 12.5-14.5 days into development showed abnormalities similar to those seen in human LS and NS. Ongoing work will examine mutant heart development in more detail.

61. Synthesis of Key Intermediates for the Formation of Phthalazinones as an Anticancer Agent

Justin K. Wyatt, Stephen Brown, Shawn Ferguson, and Kristen Warren, Department of Chemistry and Biochemistry

Chemotherapy kills cancer cells in several ways including reducing tumor size and destroying microscopic metastases. Combretastatin (CA4) is a chemotherapy drug that binds to the colchicine binding-site of microtubulin to stop cell proliferation. Since combretastatin is not effective on all patients for numerous reasons, our group is involved in the development and synthesis of a class of anticancer compounds called phthalazinones. Phthalazinones are predicted to mimic the binding potential of CA4 based on a 2D-QSAR
(quantitative structure activity relationship) study developed in collaboration with Dr. Yuri Peterson at MUSC. To form phthalazinone as an anticancer agent, we had to synthesize two key intermediates. The first started with 3,4,5-trimethoxybenzoic acid to create 4,5,6-trimethoxyphthalide. The second was the nitration of 4-methoxybenzaldehyde to produce 4-methoxy-3-nitrobenzaldehyde. The synthesis of these materials will aid in future production of our phthalazinone anticancer agent and with further modifications possibly replace combretastatin as a chemotherapy drug.


Rachel Dorr¹ and Jennifer Hein²

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*Anguillicoloides crassus* is an invasive nematode which infects the swimbladder of the American eel, *Anguilla rostrata* whose population is in worrisome decline. The infection and health status of eels in South Carolina (SC) is unknown. Eels (n=101) were collected from the lower Pee Dee River in spring and fall 2011. Prevalence and intensity of infection, and splenosomatic and hepatosomatic indices were determined according to season and size of the eels. There was a significantly higher prevalence of infection during the spring (50%) compared to the fall (28%). Larger eels (≥300 mm) had a higher prevalence of infection (49%) compared to smaller eels (21%). Infected eels had a smaller hepatosomatic index than uninfected eels, which suggests that their health is negatively affected by this parasite. This research shows that this parasite is prevalent in SC waters and supports the idea that its occurrence may threaten the American eel population.

63. Modafinil reverses methamphetamine-induced memory deficits in an object-in-place task in rats: role of glutamate receptor expression

Meghin J. Gilstrap¹, Carmela M. Reichel², Lauren A. Ramsey¹, Jacqueline F. McGinty², and Ronald E. See²

¹Department of Psychology, College of Charleston
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Chronic methamphetamine (METH) exposure causes long term cognitive deficits. Here, we demonstrate in rats that chronic self-administered METH impairs memory on an object-in-place task (OIP) and evaluate whether modafinil (a cognitive enhancing drug) reversed this memory impairment. Rats either self-administered intravenous METH or saline, and were subsequently tested for OIP recognition memory. Saline-treated rats spent more time interacting with objects in changed locations, while METH-treated rats did not show object preference, indicating a memory deficit. A pre-injection of modafinil showed a reversal in this deficit in METH-treated rats. To evaluate neurobiological modifications, we evaluated glutamate NMDA2B receptors in memory-related brain areas. METH self-administration had no effect on receptor expression in the hippocampus but decreased expression in the perirhinal cortex. Further examination of NMDA2B receptor levels in the prefrontal cortex may reveal more about the mechanisms that underlie METH-induced OIP deficits and its subsequent alteration by modafinil.
64. Synthesis of a novel heterocyclic silane compound, 1,1,3,3-tetrafluoro-1,3-disilacyclopentane

Horace Dukes, Justin Wyatt and Gamil Guirgis, Department of Chemistry and Biochemistry

While extensive research has been reported regarding the synthesis, structure, and conformational analysis of various cyclopentanes and cyclopentane derivatives, much remains unknown regarding cyclic compounds with silicon atoms introduced as part of the ring. It is also reported in literature that the inclusion of a silicon or germanium atom in the ring drastically changes the conformation of the five-membered rings to which they are introduced. A greater understanding of the incurred molecular changes would be beneficial in regards to improving and creating new commercial applications of cyclosilanes, such as the silicon films currently used in solar cells and water-repellent coatings. This knowledge prompted us to prepare 1,3-disilacyclopentane, 1,3-disila-1,1,3,3-tetrachlorocyclopentane, and 1,3-disila-1,1,3,3-tetrafluorocyclopentane molecules, the last of which had never been synthesized before now, in order to study the conformational stability of the products.

65. Award of Merit: Dangling Amine: a strategic synthesis for a novel class of antibiotics

Christen Chaconas and Justin Wyatt, Department of Chemistry and Biochemistry

Antibiotic resistance is a global crisis and is capable of harming anyone, anywhere. Since the advent of antibiotics in the early 20th century only 13 new classes of antibiotics have been discovered. Synthesis of new antibiotics would not only provide patients with more treatment options but would also help control the spread of resistant microbes. In nature a variety of organisms have evolved their own defense against infectious agents. We are modeling our antibiotic after the naturally occurring Cytosporone E, a very weak, antibiotic that is a product of two different endophytic fungi, Cytospora and Diaporthe. Our overall goal is to transform Cytosporone E into a new class of potent antibiotics. Thus far, we have successfully synthesized the backbone of our derivative and are currently synthesizing a dangling amine that will be used as a handle to develop a series of different, yet potential, antibiotics.

66. Overexpression and Purification of a Functional Manganese Catalase

Andrew Lejman and Pamela Riggs-Gelasco, Department of Chemistry and Biochemistry

Catalases disproportionate H₂O₂ into O₂ and H₂O and, in conjunction with superoxide dismutase, are vital in preventing oxidative damage to cellular components by reactive oxygen species (ROS). Typically, catalases utilize a heme metallocofactor but a growing number of bacterial species such as Bacillus cereus, Lactobacillus plantarum and Bacillus anthracis express a “pseudocatalase”, containing a manganese cluster that catalyzes the same reaction. Previous attempts to overexpress and purify the L. plantarum manganese catalase (MnCat) have been plagued by insolubility issues. Here, we report the partial purification of a functional manganese catalase. Activity assays indicate catalase activity in the presence of high sodium azide concentrations that normally inhibit heme catalase, suggesting the presence of an active manganese catalase enzyme. Details of the expression, purification, and assays will be presented.
67. Powerful Winds from a Supermassive Black Hole

Matthew Marvin and George Chartas, Department of Physics and Astronomy

We present results from the spectral analysis of X-ray observations of the broad absorption line (BAL) quasar PG 1115+080 performed with NASA's Chandra X-ray Observatory. Our analysis shows two X-ray BALs with rest-frame energies of 6.82 and 11.40 keV. These lines are detected at > 99% confidence. We interpret this absorption as due to lines arising from highly blueshifted Fe XXV 1s–2p. The maximum blueshift of the lines imply an outflow velocity of ~0.5c. We calculated the column density of the outflowing X-ray absorber using a curve-of-growth analysis and used the variability of the absorber to constrain its location. By estimating the mass-outflow rate, efficiency of the outflow, and assuming that the outflow properties of PG 1115+080 are a common property of most quasars at similar redshifts, our results then imply that quasar winds are massive and energetic enough to influence significantly the formation of the host galaxy, provide significant metal enrichment to the interstellar medium and intergalactic medium, and are a viable mechanism for feedback at redshifts near the peak in the number density of galaxy mergers.

68. Possible Detection of Active Galactic Nuclei in Protogalaxies

Christopher Andrews and George Chartas, Department of Physics and Astronomy

The galaxy formation process is thought to be hierarchical with smaller dark matter haloes coalescing to form larger ones that eventually form protogalaxies. Protogalaxies may contain enough gas to fuel a possible central massive black hole. If this is the case we might expect to find a large fraction of protogalaxies with active nuclei. To test this scenario, we performed an exploratory search for X-ray emission associated with intervening Damped Lyman Alpha absorbers, presented in a survey of distant quasars. The X-ray observations of these quasars were made with NASA's Chandra X-ray Observatory. In four cases we discovered X-ray emission within 2 arcsec of the background quasar that is known to contain absorption from the intervening system. The X-ray luminosities of the detected sources are consistent with those of active galactic nuclei. One exciting possibility is that this X-ray emission originates from an active galactic nucleus near the center of a protogalaxy.

69. Ethanol Induced Regulation of Apoptotic Markers and Protection by Calpeptin in Ventral Spinal Cord Motor Neurons

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Alcoholism has devastating effects such as hepatic toxicity, impaired movement and coordination, and cognitive dysfunction. This study focused on the different pathways of neuronal cell death caused by exposure to the psychoactive-ethanol. Hybrid ventral spinal cord (VSC) motor neuron cells differentiated into motor neuronal phenotype were exposed to different concentrations of ethanol that correspond to the levels found in Blood Alcohol Concentrations (BAC) after social and binge drinking. Morphological assessment of VSC motor neurons via In Situ Wright staining showed significant cell death at ethanol concentrations >50 mM. Cell death was also found in prolonged exposure of ethanol at concentrations >12.5 mM. Increasing ethanol concentrations showed up-regulation of intrinsic and extrinsic apoptotic proteases such as caspase-3,
caspase-8, Annexin V, and elevated Bax/Bcl2 ratio. Calpain, a major protease upstream of the proteolytic cascade, was also up-regulated. Calpeptin, a major calpain inhibitor, induced resistance against the up-regulation of these proteases.

70. Site-Directed Mutagenesis of Key Residues in the Protein Frataxin: Results from Chemistry 583L, a Research Methods Course in Biochemistry

Christine Chaconas, Whitney Gibbs, Matthew Knowe, Andrew Lejman, Corey Seacrist, Thomas Struble, and Pamela Riggs-Gelasco, Department of Chemistry and Biochemistry

Frataxin is a mitochondrial protein involved in iron homeostasis and regulation by serving as an iron chaperone for assembly of iron-sulfur (Fe-S) clusters on scaffold proteins such as Isu. Mutations in this gene causes Friedreich’s ataxia (FA), a neurodegenerative, fatal disease. Structural alignments of the gene coding for the protein show that sites for iron binding and residues involved in protein-protein interfaces are highly conserved. To elucidate the functional residues of Frataxin, we amplified the gene with a mismatched primer to introduce key amino acid substitutions. We attempted to make the following mutants of the Drosophila frataxin homologue: W133Y, R143Q, D86A, E89A, E90A, and E93A. These residues are either proposed Fe ligands or key residues in the interface of frataxin to the Fe scaffold protein Isu. Several mutations were introduced successfully and can now be expressed and purified as altered proteins for spectroscopic and mechanistic study.

71. Award of Merit: Applications of Computational Stochastic Geometry to the Determination of Cloud Structure

Clarissa Briner and Michael Larsen, Department of Physics and Astronomy

Stochastic geometry is the study of spatial point processes. Perfectly random spatial distributions of discrete entities, which are devoid of any statistical organization, are called Poisson distributions. Most systems in nature do not exhibit statistical perfect randomness, therefore well-constructed models of these natural systems should have some embedded mechanism for introducing deviations from perfect spatial randomness. One way of doing this is to introduce an explicit (positive or negative) correlation between particles based on their relative locations.

The internal structure of clouds is still subject to much debate in the atmospheric science community. Three-dimensional cloud structure is often extrapolated from one-dimensional data. We will attempt to demonstrate that this method leads to incorrect conclusions about cloud structure by analyzing various different distributions of particles in three dimensions, and comparing these analyses to one-dimensional “pencil beams” randomly selected from the initial data.

72. Relationship between Static Lower Extremity Alignment and Landing Mechanics in Adolescent Athletes

J.T. Rabe, A. Nguyen, L.J. DiStefano, B.D. Buckley, and M.C. Boling

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It is theorized that abnormal static lower extremity alignment (LEA) may contribute to dynamic malalignments known to increase the risk of knee injuries. Limited research has examined the relationship between static LEA and dynamic motion, particularly in the adolescent athlete where preventative measures may be beneficial. Therefore, the purpose of this study was to determine the influence of static LEA on knee joint angles during a double-leg jump landing (JL) in adolescent athletes. Assessment of 69 adolescent athletes revealed that in males, greater knee hyperextension (R²=0.143, P=.010) and greater Q-angle (R²change=0.102, P=.022) combined to predict greater knee valgus excursion explaining 24.5% of the variance (P=0.003). Greater pronation in males predicted less hip adduction at initial contact (R²=0.09, P=.045) but greater hip adduction excursion (R²=0.112, P=0.026). In females, less pelvic tilt predicted greater hip internal rotation excursion (R²=0.187, P=0.035).

73. Synthesis of a Novel Anticancer Agent Modeling Combretastatin A-4

Vincent Palmieri, Kimberly Klas and John Coward, Department of Chemistry and Biochemistry

The purpose of chemotherapy is to kill pathogenic cells. But unfortunately, resistant cancer cells are both constantly developing and challenging modern antitumor chemotherapies creating a need for new chemotherapy regiments. Our research group, along with collaborators at MUSC, performed a molecular modeling (QSAR) study on combretastatin A-4 (CA4) and its derivatives. CA4 is an antitumor compound that binds to the specific section of a cell’s microtubulin (protein) called the colchicine binding site, inhibiting mitosis. From this study, we designed a set of molecules known as phthalazinones that are potentially potent against tumors and have lower levels of cytotoxicity (to normal cells) than that of CA4. Once synthesized, these designed phthalazinones will be tested for their relative potency, cytotoxicity, and their degree of colchicine inhibition at the colchicine binding site. The results of this testing will give us insight into developing the next generation of potential anticancer drugs.

74. Impact of Perturbation Area on the Phase Resetting Curve of Type II Oscillators

Robert A. Raidt and Sorinel A. Oprisan, Department of Physics and Astronomy

We investigated the effect parameters defining a synaptic current perturbation, such as its duration and amplitude, had on the firing rate, of a model neuron. Previous data has shown that the relevant control parameter that modulates the firing rate of a neuron is the net electric charge, i.e., area of the synaptic current versus time. We found that, for relatively weak couplings, the area of the phase resetting curve (PRC), which measures the transient change in the firing rate, is linearly proportional to the net synaptic charge. For strong synaptic couplings we found that a substantial increase in perturbation area leads to quadratic increases in the areas of the advancing and delaying sections of the PRC. It was also determined that increases in synaptic current duration lead to a positive quadratic increase of advancing and delaying area, while increases in amplitude lead to negative quadratic increases.

75. Award of Merit: Tadpole responses to environmental stressors – pesticides and
salinity

Beverley E. Wood and Allison M. Welch, Department of Biology

As the environment becomes increasingly threatened, it is important to understand how populations respond to these changes. Wetlands are threatened by rising salinity levels caused by climate change and by pesticides from agricultural runoff and other sources. I tested the responses of southern toad tadpoles to combinations of salinity and three pesticides – carbaryl, glyphosate, and atrazine. These pesticides have been shown to inhibit tadpole growth and activity, as have higher salinity levels. I measured tadpole activity, mass, swimming speed, and days to metamorphosis. My results show that both pesticides and salinity reduce tadpole performance, and that when experienced together, salinity and carbaryl had an even greater combined effect. Pesticides also affected maximum swimming speed and distance traveled, which we expect to increase vulnerability to predation. Ultimately, both pesticides and salinity put amphibian populations at risk, and even more so when exposed to both stressors simultaneously.

76. Decontamination of Surfaces Using the ionator EXP™

Olivia Jamison and Susan Morrison, Department of Biology

This research examined the effectiveness of the ionator EXP™ as a tool for disinfecting hard surfaces. Six trials were performed and in these trials, the growth of known or unknown bacteria was tested both before and after spraying with the ionator. The results from these tests were inconsistent. In some cases, bacterial growth was lower after spraying a surface than before, but in other instances, bacterial growth was higher after spraying. There were also cases in which the growth before and after spraying were equivalent. Variations in testing and measurement could have led to the inconsistencies in the results. However, almost all of the tests indicated bacterial growth after spraying, bringing into question whether or not the ionator EXP is an effective bactericidal tool. Assuming variations in testing can be eliminated, the usefulness of the ionator EXP needs to be explored further.

77. Implementation of 3D Engineering Soils Mapping for Charleston, South Carolina

Daniel Sieger, Ryan Rembert, and Norman Levine, Department of Geology and Environmental Geosciences

In the Lowcountry of South Carolina much of the engineering of the region takes place on top of and within the soil horizons. Today’s modern soils data bases and GIS technology lend themselves to the development of detailed soil maps of a region at the 1:24000 scale. The databases that can be attached to the soil maps includes up to 225 unique properties ranging from taxonomic classifications to detailed horizon information. This study shows multiple methods for displaying and using the soil data within true 3 dimensional visualizations. Both incremental and horizon depth maps of the region are displayed. The soil databases permit users to better understand the nature of soil stability and flooding across the region.

78. Messages from Mercury: Landing in Crater Talaria

Daniel Sieger¹, James Goodrich¹, and Michelle Iannantuono²

  ¹Department of Geology and Environmental Sciences
After decades of exploring outer space, Mercury remains the most mysterious terrestrial planet in the solar system. Mission Talaria will be the first lander to visit Mercury, and will complement data obtained from the MESSENGER orbiter mission. Talaria was designed to address five core scientific questions: What are the details of the terrain? What is the geologic history and past volcanic activity? Does outgassing occur and what effect(s) could it have on the exosphere? What are the chemical, mineralogical and thermal properties of Mercury’s soil and rocks? Is there ice or organic material on Mercury? Not only could investigating these questions unlock the history and current state of Mercury, but the innovations required to achieve this mission could benefit future NASA endeavors.

79. Anxiotypic Behavior Following Acute Withdrawal from Extended Access Cocaine Self-Administration

Kyle Brown\textsuperscript{1}, Parrish Waters\textsuperscript{2}, Michael Ruscio\textsuperscript{1}, Ronald See\textsuperscript{2}
\textsuperscript{1}Department of Psychology and Program in Neuroscience, College of Charleston\textsuperscript{2}Department of Neurosciences, Medical University of South Carolina

In an effort validate a rodent model of drug relapse, we studied anxiotypic behavior following acute withdrawal from chronic cocaine self-administration in Sprague Dawley rats (n=16). The transition to chronic cocaine abuse was modeled using a 14-day extended-access cocaine self-administration regimen. Subjects exhibited an escalation in drug taking behavior as trials progressed. Following two days of abstinence, anxiotypic behavior was measured using the elevated plus maze (EPM) and defensive burying test (DBT). In rats undergoing cocaine withdrawal, we found a statistically significant increase in anxiety-like behavior on both the EPM ($t(6)=2.073, p<.05$) and the DBT ($t(10)=2.161, p<.05$) compared to control. Escalation in drug intake and withdrawal induced anxiety are characteristic of human substance abuse disorders and are believed to be mediated by allostatic deviation of the reward system and hypothalamic pituitary adrenal axis. This drug relapse regimen provides a pre-clinical model of the neural mechanisms of anxiety motivated relapse.

80. Pilot study to determine distance traveled and intensity of cardiovascular effort exerted by NCAA basketball officials

Kendra Gardner, Megan Roach, and Michelle Futrell, Department of Health and Human Performance

Literature is currently lacking regarding the physiological demands of basketball officials during a regulation basketball game. The purpose of this project is to begin to fill this void by conducting pilot work to determine the distance covered by NCAA basketball officials during a regulation basketball game and to determine the intensity at which they work. Body composition, heart rate, and distance traveled were assessed in 31 subjects over a period of 13 games. On average, officials covered a distance of $2.7\pm0.9$ miles and were working at a low to moderate level of intensity (51-72 ± 16 %) of their age predicted heart rate maximums per game. These results differ from those of previous studies. Future studies should be done with higher quality equipment and values should be compared.

81. Obsidian: Strategic Automation of Unit Test Generation
Software test engineers have recently gravitated to the use of the JUnit framework for the automated generation of unit tests for Java programs, due in part from the popularity of extreme programming and test-driven development. The Java-based unit test generating tools we’ve discovered all generate very simple test code bodies for each method and provide little additional assistance for the test engineer, who is then left to create test cases. We argue that this approach imposes unnecessary costs on test engineers by missing many opportunities to customize code. Our solution, Obsidian, which is a new unit-test-generating tool for Java programs built on the JUnit framework. Obsidian uses Java Reflection and a defined workflow informed by a set of principles and simple algorithms to automatically generate refined unit test methods that are ready-for-use by test engineers. Obsidian can generate unit tests from Java class files with or without the original code.

82. Cronus: Titan Lake Lander Mission

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Titan, Saturn’s largest satellite, is a fascinating place. It is the only moon with a significant atmosphere, and is considered to be the most Earth-like body in the solar system. Features commonly seen on earth, like mountain ranges, riverbeds, and large liquid lakes have all been identified on Titan’s surface. These features would not exist without the presence of Titan’s atmosphere. Just as on Earth, the atmosphere enables weather and climate to exist on Titan, and contributes to the dynamic evolution of Titan’s surface through weathering and erosion. While information of Titan has grossly increased the past few years due to the Cassini-Huygens mission, many questions remain. Therefore, Cronus has created a hypothetical lake-lander mission to specifically investigate the origin and evolution of Titan’s atmosphere in addition to its methane-driven weather cycle.

83. Comparative study of stimulus velocity encoding by the population of wind-sensitive interneurons in insect cercal sensory systems

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The wind-sensitive cercal sensory system is an ancestral structure of insects that has been modified within each species based on its role in generating behavior (i.e. terrestrial and/or aerial escape responses). This variation may result in natural species differences in sensory processing and encoding of wind stimulus properties. Using extracellular recordings, we measured wind-evoked neural responses from wind-sensitive neurons (WSIs) in three cockroach (Periplaneta americana, Gromphadorhina portentosa, and Blaberus sp.) and two non-cockroach species (mantis Tenodera aridifolia and cricket Acheta domesticus). Wind stimuli elicited more neural responses in species that exhibit strong wind-evoked escape responses (P. americana and A. domestica) than those that do not (G. portentosa and T. aridifolia). The weaker responses may contribute to wind not eliciting escape responses in these species. Surprisingly, wind elicited the most neural
responses in *Blaberus* sp., which has only a weak wind-evoked response.

### 84. Combined Effects of Social Stress and an Agricultural Pesticide on Tadpole Growth and Development

Jacob M. Oster and Allison M. Welch, Department of Biology

Environmental contamination in the form of pollutants and pesticides can negatively affect fitness in various species. Contaminants may produce even more severe outcomes when coupled with normal biotic stressors, such as intraspecific competition. We predicted that the stress of being an inferior competitor would increase an individual’s vulnerability to environmental toxins. We tested this idea by exposing size-structured groups of Southern toad tadpoles to a common insecticide or a no-pesticide control. Size-advantaged tadpoles generally metamorphosed earlier, although tadpoles that were initially smaller ultimately grew to larger sizes at metamorphosis. Food limitation intensified competition, leading to a greater delay in metamorphosis for small individuals. The pesticide inhibited growth for all size classes and affected the outcome of competition. Under food-limited conditions, the competitive suppression of smaller individuals was less pronounced when tadpoles were exposed to the pesticide, suggesting that larger individuals were less effective competitors in the presence of the pesticide.

### 85. Calpeptin Protects Against Ethanol Induced Toxicity in C6 Astrogial Cells

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Alcoholism is a disorder that impairs the CNS in a chronic progressive manner by altering the structural-functional integrity of diverse neural population. The present study investigated the potentially toxic effects of the psychoactive alcohol, ethanol on astrocytes. C6 rat glioma cells were differentiated into astrocytes and then exposed to ethanol (25-100mM) for either 6 hours (acute exposure) or 24 hours (chronic exposure). In order to provide insight into the mechanism of cell death, we assessed the effect of ethanol on the expression of cellular markers for intracellular and extracellular induced apoptosis. These results suggest a dose dependent upregulation of extrinsic and intrinsic pro-apoptotic proteases with ethanol. To probe the upstream regulators of ethanol-induced apoptosis, western blot analysis was performed on cells pretreated with calpeptin, a known blocker of calpain dependent cell death. The data demonstrates that pre-treatment with 100nM calpeptin rendered significant protection against 100mM ethanol.

### 86. Salinity Tolerance in Local Phytoplankton Populations

Marcus Henderson, Brandon Fessler, Peter Feltman, and Gorka Sancho, Department of Biology

Estuaries are challenging environments for phytoplankton communities and in these environments a certain level of salinity tolerance is likely present. This project tests for the salinity tolerance and viability of these phytoplankton communities living outside their normal salinity range. We found that saltwater communities can live with little to no difference in chlorophyll production in either freshwater or saltwater salinity ranges.
Freshwater communities grown in elevated salinity display lower chlorophyll levels after fifteen days of growth than was displayed in the freshwater control group. Diversity fell in all treatments. By varying the salinity levels, measuring the chlorophyll levels at set periods of time and measuring the overall phytoplankton species composition, the viability of these phytoplankton communities are tested.

87. Investigating Sensitization to the Discriminative Stimulus Properties of Methylphenidate

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Despite widespread use and abuse of psychostimulants, little is known about sensitization to the discriminative stimulus properties of these drugs. The current study investigated the development of sensitization to methylphenidate (MPH) using a mouse model. Mice were injected daily with either 8 mg/kg MPH (SENS) or with saline (CTL). Following this, mice were challenged with a low dose of MPH, and the SENS group was able to discriminate MPH more consistently, and showed greater locomotor activity. Finally, a separate group of mice were injected with guide cannulae aimed at the nucleus accumbens (NAc). Microinjections of selective reuptake blockers for norepinephrine and dopamine produced similar results as the discrimination procedure when mice were challenged with subthreshold doses of MPH. These data indicate that prior experience with MPH can sensitize the subject to the drug’s discriminative stimulus effects, and the importance of the NAc, norepinephrine and dopamine in processing the discriminative cue.

88. “All of the Above” Response Options Influence Later Memory

Lauren Lanzo and Anthony Bishara, Department of Psychology

Research has shown that testing enhances later memory, a phenomenon called the "testing effect." However, in multiple-choice type tests, certain question types prove to be better than others. We explored whether an “all of the above” question type has a beneficial effect on later memory. We predicted that an initial test with “all of the above” as the correct answer would lead to better later memory as compared to “all of the above” as an incorrect answer, a question without this response option, and a no-initial-test control condition. Participants read passages, took an initial multiple-choice test, and then a final cued recall test. Performance on the final memory test was significantly higher in the “all of the above” as the correct answer condition as compared to the other initial test conditions, suggesting that “all of the above” as a correct answer can be a more valuable question type.

89. Parsipating the Lateral Habenula-Ventral Tegmental Area-Rostromedial Tegmental Nucleus pathway using Optogenetics and Behavioral Assessment

Alexandra Koutsos\textsuperscript{1}, Margaret Gill\textsuperscript{2}, and Ronald See\textsuperscript{2}

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The Lateral habenula (LHb)-Rostromedial Regmental nucleus (RMTg)-ventral tegmental areapathway (VTA) has recently become a region of interest due to the discovery of the RMTg, found to be the intermediary between the lateral habenula and the ventral tegmental area. The RMTg has an inhibitory influence on midbrain dopamine neurons in the substantia nigraventral tegmental area in response to aversive cues, and an excitatory influence in response to reward based cues. This study utilized a more precise technique, optogenetics, to selectively control projections within this pathway from the LHb to the RMTg or VTA while testing subjects to probe the role of this pathway in behavioral rewarding and aversive tests behaviors. The rats were injected in the LHb with Adeno-associated virus containing ChR2 and NpHR proteins. Following viral incubation, LHb efferents were incubate for 2-3 weeks, then blue and yellow lasers were used to activate and inactivate the terminals containing the proteins. Results show successful manipulation of the LHb-RMTg-VTA pathway during open field locomotor testing. So far, our research has shown that the virus has been expressed as predicted.

90. Seasonal Effects on Sex Ratio and Gravidity in Anguillicoloides crassus, an invasive parasite of the American eel, Anguilla rostrata

Samantha Suriano and Isaure de Buron, Department of Biology

Anguillicoloides crassus, a parasitic nematode, infects the swimbladder of the American eel, Anguilla rostrata. It is an invasive species and a possible contributing factor to the decline of the eel population throughout the world. Its biology is not known in the USA. Seasonal effects on sex ratios and gravidity of females of A. crassus were studied to further our knowledge of the life cycle of this parasite in South Carolina. Adult worms (N=138) were collected from infected eels (N=66). Worm sex was determined using morphological criteria and gravid females carry eggs that harbor larval stage L2. Data were analyzed using a chi-square test to determine significance of seasonal effects on sex ratio and female's gravidity. Results show that there is no seasonal effect on the sex ratio of the worms or the gravidity of the females demonstrating that this parasite’s life cycle occurs throughout the year in South Carolina.

91. Vasopressin-1b receptor distribution in the CeA and BNST during acute cocaine withdrawal

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Relapse, a major obstacle of cocaine addiction, is commonly triggered through increased anxiety, associated with abstinence from the drug. Vasopressin, a neuropeptide associated with anxiety, modifies primary neurotransmitters in the major stress pathway and consequently, contributes to stress levels. The central amygdala (CeA) and bed nucleus of the stria terminalis (BNST) may act as key regions of AVP-1b-induced modulation of the stress. Using a rat model of cocaine addiction, followed by acute withdrawal, and elevated plus maze (EPM) measures of anxiety, Avpr1b levels were measured using Western blot protein quantification. Results demonstrated heightened levels of anxiety in our cocaine-exposed animals, but revealed no statistically significant difference in AVP-1b receptor levels in the BNST and CeA between the cocaine animals and saline animals (t(8) = 0.0972, p=0.925, ns; t(8) = 0.2939, p=0.776, ns; respectively). These findings suggest that stress-related changes in Avpr1b levels may occur in alternative areas of the amygdala.
92. Oxygen Consumption of PANC-1 Cells Undergoing Low Level Laser Therapy (830nm)

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It has been shown that treating subjects with Low Level Laser Therapy (LLLT) can reduce inflammation, accelerate wound healing, and increase exercise performance. The mechanisms for these effects are not completely understood and both negative and positive responses have been documented. Proposed mechanisms involve an increase in ATP production. This is thought to be due to the absorbance of the light by Complex IV, Cytochrome C Oxidase. Complex IV is responsible for the reduction of molecular oxygen to water, an important step in the electron transport chain. In this project, the rate of oxygen consumption by Human Pancreatic Carcinoma (PANC-1) cells was measured using a Neofox fiber optic oxygen sensor. The results show no sustained (post treatment) increased cell metabolism. The results did show an increase in dissolved oxygen during treatment suggesting that the mitochondria may be releasing oxygen. Further experimentation will be performed to confirm this result.

93. Orexin Gene Transfer Blocked Cataplexy Attacks In Narcoleptic Orexin Knockout Mice

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Narcolepsy is a neurodegenerative sleep disorder, characterized by the loss of orexin neurons in the brain resulting in cataplexy, or flaccid paralysis. Orexin is produced by the lateral hypothalamus (LH) and innervates regions involved in arousal and muscle atonia, such as the pons. Cataplexy is an intrusion of REM sleep muscle atonia during waking, thus disruption of orexin in the pons may be responsible. Gene transfer uses a vector to express a gene in a cell. Gene transfer using recombinant adeno-associated virus (rAAV) expressing orexin and GFP was injected into the LH and pons of orexin knockout mice and behavior was monitored for 48hours. The animals were sacrificed, the brains were removed, sliced and immunostained to assess the expression of orexin. The rAAV-orexin vector has been shown to express orexin and reduce cataplexy. These results indicate that further research with gene transfer should be done using the LH and pons.

94. Modeling Cooling Rates of Martian Flood Basalt Columns

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Columnar jointing in large basalt flows can provide important clues about the emplacement conditions and cooling history of a basalt flow. The recent discovery of basalt columns on Mars provides an opportunity to infer conditions on early Mars when the basalt flows were emplaced. At the resolution provided by the orbiting HiRISE camera (0.9 m), the Martian columns resemble the Columbia River Basalt Group (CRBG) columns in eastern Washington, and so, subject to important caveats, inferences linking the morphologies of the CRBG columns to their thermal histories can be extended to the Martian columns. We describe our analysis of the HiRISE images of the Martian columns and what can be reasonably inferred about their thermal histories. We also report on a field expedition to the CRBG, during which we surveyed basalt column outcrops in order to ground-truth measurements and study the limitations inherent in remote-sensing data of such geological features.

95. Mapping Rover Routes and Hydrous Soil Locations on the Mars Desert Research Station

David Kutai Weiss¹, Bradley L. Wess¹, Norm S. Levine¹, Erin K. Beutel¹, Nicky De Munster², Leandro G. Barajas³, Karon Wynne⁴, and Cassandra Runyon¹

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Robotic exploration combined with human field work during a manned mission to Mars is important in resource acquisition; especially in locating water. Linking available rover routes with high-water-content soils is critically important given that the device which collects water from the Martian soils is likely to be a vehicle with travel limitations based on terrain topography and geology. We report on the closed two-week Mars Desert Research Station (MDRS) crew 109 simulation where satellite imagery and ground-based fieldwork conducted during Extra Vehicular Activities (EVAs) were combined to create a map of potential rover exploration routes and water acquisition locations for the area surrounding the MDRS habitat. Simulating data sets available for the Martian surface at MDRS will permit robotic and human exploration in Utah to be used as a model and test-bed for future soil studies on Mars.

96. Award of Merit: Modeling a New Brittle Extensional Crustal Delamination Facilitation Process

David Kutai Weiss, Erin K. Beutel, Department of Geology and Environmental Geosciences

Melt generation and continental uplift have been explained through delamination of an eclogitized orogenic root. Previous studies have proposed that the high density of a root compared to its overlying and underlying
layers may be enough to delaminate it. We suggest that prior to delamination, the high density of the root initiates foundering of the root and overlying lithosphere. The foundering of the root and lithosphere then generate extensional forces in the root which lead faulting, facilitating brittle delamination of the root in blocks. We utilize finite element analysis to determine the extent that extentional forces play in the delamination the eclogitized orogenic root.

97. Developing optogenetic techniques to probe the role of orexin/hypocretin in reward and addiction

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The orexins are a pair of neuropeptides expressed in the lateral hypothalamus and have roles in wakefulness, food-seeking, and drug-seeking reward behavior. We are developing ways to manipulate activity of LH orexin neurons in in vivo rat models using optogenetic techniques to understand the impact of orexin neuron activation on reward seeking behavior. Genes for light-activated cation channel channelrhodopsin-2 along with the mCherry reporter protein were packaged into lentiviral vectors. Immunohistochemical techniques were used to identify the co-expression of mCherry and orexin to verify ChR2 expression was selective to orexin neurons. Preliminary data show that orexin neurons in the injection area strongly express mCherry and ChR2. In addition, we observed a small subset of neurons outside the LH orexin region that exhibited weak mCherry expression. We are currently in the process of determining the source of this signal, and developing and applying additional immunohistochemical procedures to further investigate observed expression.

98. Bathymetric Analysis of Axial Seamount, Juan de Fuca Ridge

Ahmed Nayel, Willie Edwards, and Leslie Sautter, Department of Geology and Environmental Geosciences

Axial Seamount, an active undersea volcano on the Juan de Fuca Plate is currently being instrumented as a Regional Scale Nodes Cabled Observatory of the NSF Ocean Observatories Initiative, led by the University of Washington (UW). Multi-beam sonar data of Axial were collected in 2008, 2010 and 2011 onboard the UW research vessel \textit{R/V Thompson}. Seismic tomography has detected a significant magma reservoir beneath Axial’s caldera, indicating that eruptive activity at this location is forthcoming. The bathymetry of the region has been analyzed using CARIS HIPS 7.1 software in order to delineate the geological implications and processes associated with underwater volcanism. These studies will provide a basis for understanding the manners in which similar geologic settings behave, and provide a baseline for Axial that will be used throughout the life of the cabled observatory.

99. Comparison of Submarine Canyon Morphology off the U.S. East Coast

Megan R. Arnett, Veronica R. Holton, and Leslie R. Sautter, Department of Geology and Environmental Geosciences

Using multibeam sonar data collected in 2009 by the U.S. Geological Survey from the NOAA Ship Ronald
H. Brown, submarine canyon morphologies from several parts of the Mid-Atlantic and northern East coast of the United States have been studied and compared. Bathymetric data was processed using the software CARIS HIPS and SIPS 7.1. Canyons have been classified based on different characteristics, ranging from degree of sinuosity, relief, general shape, and orientation of the canyon. The amount of incision and depth of each canyon has been analyzed and could potentially be used to indicate the ages of the canyons relative to one another. These characteristics have been used to define different canyon morphologies, allowing them to be compared to each other as well as other canyons in the area that are not a part of the 2009 data.

100. Tephra Analysis of Novarupta Volcano

Megan Arnett and Robert Nusbaum, Department of Geology and Environmental Geosciences

Distal and proximal tephra samples from the 1912 eruption at Novarupta Volcano in southern Alaska were analyzed using reflectance spectroradiometer. Our objective was to identify spectral features that are dependent on compositions ranging from rhyolite to dacite. We identified three spectral absorption variations that appear to be dependent on composition within the spectral range of 400-2500 nm. Tephra particle size differences were also detected among rhyolite and dacite samples.

Continued research will allow this method to be applied to a larger number of samples from other locations while determining if the spectral absorption shifts are statistically significant. Typically compositional variation requires detailed geochemical analyses using electron microprobe analysis or ICP-MS. If this method proves to be noteworthy, determining distal tephra composition could be conducted more efficiently.

101. Temperature Tolerance and Sex Ratio in the Spotted Seatrout, Cynoscion nebulosus

Haley Ottinger¹, Katie Anweiler² and William A. Roumillat³

¹Department of Biology
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Spotted seatrout (Cynoscion nebulosus) is an important game fish in South Carolina. This study looked into sex-related mortality that a harsh winter might inflict on a small population. An initial gross assessment of sex for these age 0 fish that died due to lowering temperatures was confirmed through histological analysis. Although it was predicted that males would succumb to death first, statistics proved that there was no significant difference in time/temperature of death between male and female seatrout. However, additional histological assessment did find that all male and many female gonads showed signs of early maturation. All males showed signs of both primary and secondary spermatocytes. Many females showed signs of early vitellogenesis (sexual development). Maturation at this age and size has not been previously observed in spotted seatrout.

102. Bathymetric Analysis of Important Shelf-Edge Fish Habitats off the Coast of Charleston, South Carolin
Multibeam sonar analysis was used to map seafloor bathymetry of important fish habitats 60 miles east of Charleston, South Carolina. This area of the shelf edge is a rocky reef habitat where many species of fish live, feed, and spawn. The Gulf Stream runs over these rocky reef habitats bringing warm water and nutrients creating a habitat suitable for a diverse population of fish species, including grouper, triggerfish, and snapper. CARIS HIPS 7.1 was used to analyze multibeam sonar data acquired by the NOAA Ship Nancy Foster with a Kongsberg Simrad EM1002. The rocky reef surveyed extends over a depth range of 40 to 200m, and includes a variety of geologic structures that provide fish habitats. Seafloor morphology is compared to ROV dive videos provided by the SCDNR as part of their ongoing investigations of essential fish habitat seafloor sites to be considered for designation as Marine Protected Areas.

103. Multibeam Analysis of U.S. Atlantic Continental Margin Slump and Submarine Landslide Morphology

Nicholas C. Guzzardo, Gabrielle J. Byrd, Leslie R. Sautter, Department of Geology and Environmental Geosciences

Focusing on the U.S. Atlantic Continental margins of the Delmarva Peninsula, New Jersey, Rhode Island, and Georges Bank, analysis of slump characteristics and features was conducted in order to hypothesize potential slope-sourced triggers of submarine landslides and tsunamis. Using Reson multibeam sonar data collected by the U.S. Geological Survey aboard the NOAA Ship Ronald H. Brown in 2009, CARIS HIPS 7.1 was utilized to determine specific slump features such as existing slope gradient above the scarp, and depth of slump detachments. By generating profiles of the slump depths ranging from 200-3000 m, gradients and slope angles were calculated and used for determining which areas are more subject to failure. Feature types were compared to evaluate possible submarine landslide and tsunami trigger sites. This research may provide a characterization of slump features which will allow for improved accuracy to identify potential tsunami and submarine landslide sites.

104. Multibeam Sonar Analysis of Marine Habitats in the Dry Tortugas

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

The Dry Tortugas, a group of islands 70 miles west of Key West, Florida, is home to more than 450 species of fish, a diverse coral reef ecosystem, and a variety of endangered sea turtle species. The Dry Tortugas’ geomorphology, consisting of corals and carbonate sands, plays a major role in the habitat in which these fish and other species live. This study will focus on what effect the underlying bathymetry has on the ecosystem. Bathymetric data were collected in 2009 and 2011 by scientists from the NOAA Florida Keys National Marine Sanctuary with a Kongsberg EM1002 multibeam system from aboard the NOAA Ship Nancy Foster. Sonar data were analyzed using CARIS HIPS 7.1 software to create CUBE bathymetric surfaces and profiles. These maps will be used as the primary tool to help understand what impact the structure of the marine habitat’s seafloor has on organisms in the Dry Tortugas.

105. Bathymetric Analysis of *Pterios volitans* Shelf-Edge Habitats, Onslow Bay N.C.
Christian K. Hartmann, Ralph M. Morris, and Leslie R. Sautter, Department of Geology and Environmental Geosciences

Pterios volitans, commonly known as the lionfish has become one of the most detrimental invasive species on the southeastern Atlantic coast. Lionfish prefer hard bottom habitats with moderate to high relief. NOAA Center for Coastal Fisheries and Habitat Research, Beaufort, NC, has deemed their spread worrisome enough to gather bathymetric data to locate and identify Lionfish habitats. The area of Onslow Bay studied consists of five separate sites, four of which were on the mid-shelf with depths ranging from 35-47 m and one on the shelf edge ranging from 68-133 m. Bathymetric analysis on each site was conducted using CARIS HIPS 7.1 and BASE Editor software, with data collected by the NOAA Ship Nancy Foster’s Kongsberg EM1002 multibeam sonar system. The sites exhibited hard bottom features consistent with previously recognized lionfish habitats.

106. Progress Toward Alkene-containing Poly(epsilon-caprolactone) and Thiol-ene Functionalizations for Water Solubility

Marcus J. Henderson and Brooke A. Van Horn

1 Department of Biology
2 Department of Chemistry and Biochemistry

With the growing need for improved means to deliver and track drugs and chemotherapy with specificity, researchers are exploring and developing biocompatible, biodegradable nanoscale vessels for personalized medicine. Our research lab at College of Charleston is interested in the fundamental design, synthesis, and characterization of such nanoscale vessels. In Summer 2011 and the 2011-2012 academic year, the preparation of polyester chains of poly(epsilon-caprolactone) (PCL) with alkene units was reproduced by the incorporation of 7-allyl epsilon-caprolactone. Using these allyl units as reactive handles, radical thiol-ene "Click" chemistry was performed for the covalent attachment of thiols to the polymer chain. This poster presentation will describe on our synthetic efforts and our cumulative characterization of the novel materials by nuclear magnetic resonance (NMR) and infrared (IR) spectroscopies and gel permeation chromatography (GPC) and will highlight our plans to translate this chemistry to the formation of water-soluble nanoparticles for biomedical and imaging applications.

107. Phase Separation Dynamics of Sulphur Hexafluoride in Microgravity

Cathleen A. Wise, Ana Oprisan, Department of Physics and Astronomy

To study phase separation in the pure fluid sulfur hexafluoride (SF₆) near the liquid-gas critical point, a series of experiments were performed in microgravity using the Alice II instruments. Full view and microscopic view images were analyzed using IMTechnology’s iSolution software to determine the changes in the size distribution of droplets. We recorded data for two different thermal quenches of 3.6 mK and 0.3 mK, respectively. For the first time, we provided experimental evidences regarding the existence of dimple and nose coalescence mechanisms in pure supercritical fluids under microgravity conditions. Our results indicate that, during the late stage of phase separation, the number of the liquid clusters decreases due to the coalescence events. We estimated the power law growth of the clusters and fitted it to a universal curve.
108. Circadian Gene Expression in the Starlet Sea Anemone, *Nematostella vectensis*

William D. Hendricks, Christine A. Byrum, and Elizabeth Meyer-Bernstein, Department of Biology

An organism’s daily physiological and behavioral patterns are controlled by an endogenous circadian clock, which is synchronized to rhythmic environmental stimuli. We have been studying the Cnidarian *Nematostella vectensis*, the Starlet Sea Anemone, in an effort to elucidate the evolution of the circadian clock. We have localized the gene expression of two circadian clock components, cryptochrome 1a and clock in *N. vectensis* by use of in situ hybridization. We found expression of these genes restricted primarily to portions of the oral disk surrounding the mouth and the tips of the tentacles, areas that are neuron-dense and receive maximal sunlight. Based on this evidence, we believe the master clock is an organized structure within the nervous system of *N. vectensis*. By characterizing the temporal and spatial expression of these putative circadian genes, we can begin to provide insight into how the use of these genes has been modified throughout evolution.

109. Geochemical Assessment of Water from Wakendaw Lake, Mt. Pleasant, SC


The goal of this class project was to assess the water quality of Wakendaw Lake, a 17-acre storm water retention pond located in Mt. Pleasant, SC. Several water samples from various locations across the lake were collected and analyzed for the presence of trace metals and major ions for comparison with EPA water quality parameters. The purpose of this comparison was to determine if the lake ecosystem is being influenced by factors such as erosion, runoff, and local construction-related pollution. In the geochemistry lab, a variety of methods were employed to analyze the lake samples in order to ascertain what environmental factors are having an effect on the lake's water quality. The results generated will be beneficial in determining what course of action should be taken to help reduce possible negative effects on the lake and the surrounding community.

110. Progress Toward Iodine-Labeled Poly(epsilon-caprolactone) for X-ray Imaging Applications

Caroline C. Duncan\textsuperscript{1} and Brooke A. Van Horn\textsuperscript{2}

\textsuperscript{1}Department of Biology
\textsuperscript{2}Department of Chemistry and Biochemistry

With two of the most common processes for imaging in the human body being general X-ray radiography and computed tomography (CT) technologies, scientists are moving beyond traditional small molecule contrast agents and developing exciting new choices for imaging agents. A biocompatible, biodegradable polymeric macromolecule with engineered radio-opacity (X-ray and CT contrast) and reactive groups would have similar imaging utility as the traditional systems with additional means to covalently link directing groups for specific cellular targets and therapeutic agents for delivery. Our research lab at College of Charleston began efforts in Summer 2011 to prepare and fully characterize linear poly(epsilon-caprolactone)
chains with ketone functionalities for the acid-catalyzed ketoxime ether attachment of iodinated species, including the recently prepared O-(2-iodobenzyl)hydroxylamine, to impart tunable radio-opacity to the polymeric material. Our poster illustrates the current state of our project and outlines our plans to translate this chemistry to the formation of radio-opaque water-soluble nanoparticles.

111. Analysis of a Discontinuous RNA Enzyme

Matthew Knowe and Marcello Forconi, Department of Chemistry and Biochemistry

Ribozymes (enzymes made of RNA) were considered continuous nucleotides that adopt complex three-dimensional structures; however, recent work showed that ‘discontinuous’ ribozymes, in which two RNA regions recombine to form a ribozyme, also exist in Nature.

In this project, we began investigating a putative discontinuous group I intron. Introns are ribozymes that splice and excise themselves from surrounding RNA, and use exogenous guanosine to initiate this process. Our collaborators recently reported the existence of a minimal group I intron that lacks structural elements conserved in larger group I introns. This intron splices when flanking exons are long, but not when they are minimal. It is therefore possible that regions outside the intron assist the splicing process. If these preliminary data are confirmed, this intron will represent a novel class of discontinuous ribozymes. The goal of this project is to find the minimal length of the flanking regions that allows proper splicing.

112. Quicksilver: A Proposed Mission to Mercury

Alex Nuechterlein, Department of Geology, and Meagan Collins, Department of Physics and Astronomy

Following NASA’s Discovery/New Frontiers Academic AO the Quicksilver mission to Mercury will include a landing craft fitted with a 27kg science payload. After landing in the polar region the science instruments will be turned on and the initial multispectral data will begin collecting composition and topographic data. An SD2 drilling mechanism will collect three in situ samples from below the lander to be analyzed by the COSAC systems gas chromatograph and mass spectrometer. The harpoon component of the mission will launch three separate harpoons, each fitted with a mini-gas chromatograph and tethered to the craft into the floor of the Chao Meng-Fu crater to analyze samples. With the data collected from the multispectral cameras, the drilling mechanism, and the harpoon system, a wealth of knowledge will be gained about the composition and distribution of materials on Mercury; as well as aid in further understanding of our solar system.

113. Semantic Search +

Katie Cumbee, Trevonte Dixon, Judson Hall, Duncan McDuffie, Maximilian Mross, Department of Computer Science

Google search is one of the most widely used search engines in the world. Our plan is to leverage Google search with the Search+ prototype app. We would accomplish this by creating an application for Android phones that is a similar version to Apple’s product Siri, but vastly improve its search capabilities and have improved voice recognition. Our application would not only be able to search the Internet, but also the phone. This feature will allow the users to use the phone hands free. Our application would permit users to search
Google by voice, picture, and text. Another small feature we would like to incorporate is a (+) or (-) option. This would allow users the opportunity to rate their search results. Overall, our application will give users a unique and improved experience with Google search and be able to answer most of their inquiries.

114. Will Cell Phones Kill the Cable Provider?

Andrew Gerland, Ross Jones, Keely Laughlin, Matt Pruitt, and George Woolston, Department of Computer Science

In 2012, the world is more mobile than ever before, creating the desire to access videos and news from cellular phones. The current YouTube app is limited by its functionality. The lack of suggestion features and corrective spelling elements make finding videos on phones difficult. To simplify the process and provide users with more desirable content, this app prototype will focus on providing preference based suggestions to users. The app will recognize patterns in people’s video searches and recommend similar content. It will also include the options for users to opt in for notifications when certain videos are available.

115. Cougar Campus Navigator

Ben Schwertz, Anthony Stitt, Brittany Walker, Rachel Walley, and Amber Williams, Department of Computer Science

This project focuses on the use of improved geolocation to improve the college experience for new students. Location software can help new students find classrooms and other places on the College of Charleston campus as well as make appointments with their professors and informs users of upcoming campus events. The application we have envisioned primary function is to provide users with turn by turn navigation to the building and the actual classroom. The application could use API’s to extract information from Banner and OAKS and to provide information about professors’ office hours as well as class hours. The campus calendar will include information from Student Activities about upcoming events on campus.

116. The Future of Google + 1 Mobile

Samantha Milbauer, Amanda Simko, Nicole Lubel, Jordan Marusky, MacKenzie Riordan, Department of Computer Science

Social media is a very important part of today’s society and is currently dominated by Facebook and Twitter. In this project we will explore options to increase Google’s usability to attract and sustain more users. Google’s current terminology is not user friendly and is a key reason why their amount of users is. By incorporating different mobile, Google +1 can be a place where people go to do many things from searching for apartments to ordering food. Since businesses are currently the primary users, Google needs to backtrack and reevaluate their target market before expanding. By having applications within the program, Google will be able to keep the businesses interested while also attracting other users who are interested in the new features the program has to offer.
117. Chrome OS Mobile Operator (COSMO)

Jillian Brown, Cameron Beacham, Byran Armstrong, Eric Scott, and Derek Petty, Department of Computer Science

Chrome OS Mobile Operator (COSMO) utilizes the latest voice recognition technology and revolutionizes the way you use your phone in your car. COSMO allows for a hands-free control of the application itself along with integration into your text messages, call center, and email. COSMO even controls the music played through your car speakers right from the app. With integration into other Android applications, you can now play music from applications like Pandora or even the music stored on your phone’s SD card. Lastly, COSMO connects with Google Maps application to allow for a voice-controlled navigation system. Welcome to the future.

118. Early activation of the NLRP3 inflammasome in rat urothelium after cyclophosphamide treatment; a possible activator of hemorrhagic cystitis during chemotherapy

Andrew Nimmich¹, F. Monty Hughes², Jr., and J. Todd Purves²

¹Department of Biology
²Department of Urology, Medical University of South Carolina

Severe bladder inflammation, or Hemorrhagic cystitis (HC), is significant in patients undergoing cyclophosphamide (CP) chemotherapy despite treatment with 2-mercaptoethane sulfonate (Mesna), which inactivates the cytotoxic metabolite, acrolein. HC potentially involves pro-inflammatory cytokines such as IL-1β which are activated by caspase-1. Caspase-1 in turn is activated by structures known as inflammasomes. This study explores the activation of caspase-1 in the bladder following CP treatment, and whether it is acrolein-dependent. Two waves of caspase-1 activity were observed; one peaking at 4 h and a second at 24 h. Pretreatment with Mesna had a negligible impact. Our results suggest that CP initiates an inflammatory response, independent of the metabolite acrolein, which is mediated in part by inflammasomes.

119. Identifying Lower Extremity Biomechanical Differences Between Footwear Conditions During A Waking Task: A Descriptive Study

Jennie Engel, Grace Groseclose, Jennings Moody, Melissa Murray, Allyson Townsend, Miriam Klous, and William R Barfield, Department of Health and Human Performance

The purpose of this study was to evaluate biomechanical differences in the lower extremity during the stance phase of gait between toning shoe (TS) and barefoot (BF) walking. Juried research in this area is limited. Our hypotheses were that significant differences would be found between TS and BF conditions due to the unstable TS base. Three-D lower extremity kinematics and kinetics for 13 healthy female volunteers were quantified using an electromagnetic motion analysis system and a force plate. Mean age, body mass, and height of participants was 20.85 ± 0.47 years; 60.70 ± 0.47 kg; 152.4 ± 0.47 cm respectively. Data reduction was based on a four segment vertical ground reaction force (vGRF) curve. Statistically significant differences (p<0.05) were observed in the changed positions for each phase. Initial unloading showed 8 of the 11 variables were significantly different. Further analysis will add to the body of knowledge in this area.
120. Working with Shotwell: An Exploration of Software Engineering

Bradley Woods, Casey Jackson, Joshua Moore, Scott Rosenbrook, and Trevor Mehard, Department of Computer Science

For the Software Engineering Practicum, teams chose a Free and Open Source Software (FOSS) project in which to contribute. Our group decided on the Yorba Foundation’s Shotwell project. Shotwell is a photo manager for Linux GNOME distributions, notably Ubuntu and Fedora. Over the course of the semester, we were introduced to the open-source community and gained experience by contributing to the project. Our work focused on fixing bugs, implementing new features, and submitting project proposals. Through interactions with the community, we learned how to submit patches to the source code. Shotwell is written in a language specifically written for GNOME called Vala. This provided us with an additional opportunity to expand our knowledge. Despite setbacks, the team contributed several patches to Shotwell 0.12.1.

121. Investigating Disorder in Photovoltaic Polymer Aggregates: Some Surprising Results

Christopher Toussaint and David Boucher, Department of Chemistry and Biochemistry

The morphology, or structure, of polymer-based solar cell materials is well-known to impact device performance by affecting the photocurrent efficiency of the device. Recently, the nature of metastable structures formed in solution has been shown to significantly impact the morphology of photoactive thin films and our research explores innovative ways to drive solution-phase assembly and organization of photovoltaic polymers in order to improve the efficiency of photovoltaic polymer materials. Our preliminary data reveal some surprising and previously unreported results regarding polymer disorder and the nature of energy redistribution in solution-phase polymer aggregates. The absorption and photoluminescence spectra of poly-3-hexylthiophene aggregates assembled via ultrasonic irradiation give contradictory information about the extent of polymer ordering. We also observe dramatic excitation wavelength-dependent changes in the photoluminescence spectral features of non-sonicated, solvent-induced P3HT aggregates that suggest the existence of complex and interesting energy redistribution pathways.

122. Dependence of Chemical Effects on Fluence in Molecular Dynamics Simulations of the Successive Bombardment of Si with C_{60} Projectiles

Clarissa Briner, Department of Physics and Astronomy, and Kristin Krantzman, Department of Chemistry and Biochemistry

We present results of the molecular dynamics simulations on a silicon solid with 20-keV C_{60} projectiles at normal incidence. The pairing of the C_{60} projectile with the silicon substrate is unique because covalent bonds can be formed between carbon atoms from the projectile and silicon atoms in the substrate that are stronger than the silicon-silicon atoms within the target material. Consequently, nearly all of the sixty carbon atoms are deposited into the substrate after bombardment and become incorporated into the silicon lattice. With successive bombardment, the percentage of carbon in the substrate increases. As a result, the contribution of carbon atoms to the total number of sputtered atoms increases with fluence. However, the
depth distribution of deposited carbon atoms is on the average deeper than the region from which the atoms are sputtered. Therefore, we predict that the carbon concentration will continue to increase with successive $C_60$ bombardment, leading to a buildup of carbon atoms in the substrate.

123. Factors Affecting Female Athletes' Decision to Seek Care for Concussive Injuries

Kristin West and Daniel Greenberg, Department of Psychology

Many adults and children suffer concussions during athletic activities. Some sports have developed concussion management guidelines, but other sports, specifically cheerleading, have not. In this study, we recruited cheerleaders from local programs, tested their cognitive abilities, obtained their history of head injuries, and interviewed them about their decision to seek medical care for those injuries. Approximately half of the participants had incurred a concussion. Although these participants were aware of concussion symptoms and the severity of their injury, fewer than half sought treatment. Participants failed to seek care for two main reasons: social pressure (the team needed the participant to practice) or deference to authority (a coach or parent told them that the injury was insignificant). These results suggest that attention needs to be focused on increasing awareness of concussion among coaches and parents rather than on educating the cheerleaders themselves.

124. Memory for Piano Melodies: Fixed versus Random-Order Practice

Branden F. Abushanab and Anthony J. Bishara, Department of Psychology

Consider two practice orders for learning a motor task: fixed-order practice, where a person practices a task repeatedly before switching to the next task (e.g., Task A, A, B, B); and random-order practice, where a person randomly alternates among two or more tasks (A, B, B, A). In our experiment, participants who had formal training in piano practiced melodies under fixed or random-order conditions, and then returned for a final test two days later. Initially, participants performed faster on melodies in fixed-order. However, on the final test two days later, participants were faster with melodies from the random-order condition. Participants’ judgments of learning (JOLs) were misaligned with this pattern, as JOLs and other subjective reports showed that they favored fixed-order practice. These results show that the benefits of random-order practice extend to the learning of a musical instrument; furthermore, even trained musicians are sometimes unaware of these benefits.

125. Interplay Between Candida glabrata and the Mammalian Innate Host Defense System

Christina Nguyen1,2, Silvia Vaena de Avalos2, Marcus Duvall2, David Schofield3, and Caroline Westwater2,3

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3Department of Microbiology and Immunology, Medical University of South Carolina

Found within our bodies at any given time, Candida glabrata is an opportunistic human pathogen capable of infecting both immunocompetent and immunocompromised individuals. Previous work in our laboratory has
shown that *C. glabrata* fails to evoke a granulocyte-dominated, inflammatory response in animals despite high tissue fungal burdens. This suggests that *C. glabrata* may possess immune evasion strategies that prevent or suppress an inflammatory response during infection. In this study, we explore the role of soluble immune factors in host anti-*Candida* immunity. We demonstrate that pathogenic *Candida* species are susceptible, in a dose-dependent manner, to specific complement activation products. Further research is being conducted to investigate the role of the outermost layer of the yeast cell wall in mediating the fungicidal action of the complement activation products.

126. Geology, Climate, and Vineyards: Yadkin Valley AVA, NC

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

Established in 2003, the Yadkin Valley American Viticulture Area (AVA) includes seven counties in the Piedmont of northwestern North Carolina. The growing presence of vineyards provided an opportunity to initiate research on the role of geology and climate as contributing factors to viticulture in the Yadkin Valley AVA. Our research objective was to develop a Geographic Information System (GIS) to map the distribution of 29 vineyards of the AVA within the spatial context of elevation, aspect, slope, soils, and climate. The vineyards were spatially correlated in the GIS with raster derivative maps (slope and aspect) derived from 20 m Lidar digital elevation models (DEM). Spatial features such as climate, soil surveys, and bedrock geology were added to compliment raster (topographic) data. Results will be presented at the poster session.

127. Growth Rate Comparison of the American Eel (*Anguilla rostrata*) in South Carolina Estuaries

Ian Kelmartin, Department of Biology, College of Charleston and Steve Arnott, Marine Resources Research Institute, SC Dept. of Natural Resources

The American Eel (*Anguilla rostrata*) is a catadromous fish found along much of the east coast of North America. Its complex life cycle is poorly understood. In this study, eels were collected from 4 sites with varying salinities. To age the eels, the sagittal otoliths were extracted, sectioned with a wafering saw, polished, and the number of annuli counted. The number of annuli was compared to the total length of the fish to obtain an average growth rate. The data was used to define a von Bertalanffy growth curve for each of the sites, which were then compared to determine if there is a statistically significant difference in the growth rates of the eels collected at the different sites.

128. The molecular structure of methyldifluoroisocyanato silane: a combined microwave spectral and theoretical study

Gamil A. Guirgis¹, Jason S. Overby¹, Michael H. Palmer², Rebecca A. Peebles³, Sean A. Peebles³, and Brooks H. Pate⁴

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The microwave spectrum of the most abundant isotopomer of MeF2Si-NCO (2) yields the rotational constants: A=3827.347(7), B=1264.5067(14) and C=1240.6182(11) MHz. The 14N nuclear quadrupole coupling plus additional doubling due to internal rotation of the methyl group gave a complex spectrum, necessitating use of three microwave instruments. The spectrum has been analyzed in the I^r representation for C_s symmetry, with inclusion of the 3-fold rotor. A partial substitution structure was obtained for the C, Si, N, and O atoms. The analysis was assisted by calculations of the equilibrium structure, using a 6-311G++(3df, 3pd) basis set, with calculations at each of the B3LYP, MP2 and CCSD(T) levels. The calculated and experimental rotational constant values are only consistent with a trans-orientation at each of the HCSiN, CSiNC, and SiNCO centers; there is relatively close agreement between theory and experimental structures especially at the CCSD(T) level. Indeed, super-position of the experimental and CCSD(T) structures shows close agreement, implying that the internal bond lengths and angles are realistic. The observed low value for the 14N quadrupole coupling term ($\chi_{bb} - \chi_{cc}$) implies a wide SiNC angle, which is consistent with the calculated values: 165.3 (B3LYP), 157.6 (MP2) and 157.4 (CCSD(T)) degrees. The skeletal bending potential is discussed.

129. Microwave, Raman, and infrared spectra, r_0 structural parameters, conformational stability and ab initio calculations of cyclobutylisocyanate

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The microwave spectrum of cyclobutylisocyanate, c-C_4H_7NCO, has been investigated from 21,000 to 11,000 MHz and eleven transitions for the more stable equatorial-trans conformer were assigned. The rotational constants of the ground vibrational state have been determined and the molecule has been shown to be a symmetric prolate rotor (K=-0.99). The B and C rotational constants have been confidently determined to be B=1508.68(3) and C=1476.55(2) MHz, respectively, whereas the value for the infrared spectra (3500 to 400 cm\(^{-1}\)) of cyclobutylisocyanate dissolved in liquid xenon have been recorded and the infrared spectra of the gas and solid. Additionally, the Raman spectrum (3600 to 100 cm\(^{-1}\)) of the liquid has been investigated. These spectral data indicated the presence of three conformers in the fluid states which are equatorial-trans, equatorial-gauche and axial-trans forms. The second part of the conformational name refers to the relative position of the NCO moiety relative to the alpha hydrogen.

130. Observation of Radially Pulsating K-Type Giants Using Kepler

Mark Wells and James Neff, Department of Physics and Astronomy

The Kepler spacecraft is providing light curves of unprecedented quality on time scales that were impossible beforehand. A set of variable cool K giant stars that currently do not fall into existing classification schemes have been observed. These targets have similar power spectra and relatively stable light curves. These stars
do not appear to be binaries and are too cool to be in any of the known instability regions. For each of these stars only the fundamental frequency and a strong first overtone are observed. The photometric variability might arise from a bimodal radial pulsation between the fundamental frequency and the first overtone. We will determine which variable class these stars fall into or if they comprise a new type of variable.

131. Assessing the Effects of Double Knockouts on Arabidopsis Plants

Hanna Vann, Yana Wieckowski and Allan Strand, Department of Biology

Six T-DNA insert gene knockout lines (five confirmed homozygous) of Arabidopsis thaliana were chosen because their products catalyze several steps in the biosynthesis pathway of Jasmonic Acid. DNA from these plants was isolated and genotyped to confirm the presence of a T-DNA insert, a functional copy of the targeted gene, or both. Genotyping efforts resulted in all nine samples of the one unconfirmed knockout line grown lacking a T-DNA insert and showing the presence of the functional gene. All the samples of the confirmed lines lacked a functional gene copy and all but one showed the presence of a T-DNA insert. We then used plant crossing techniques to cross each of the six lines with one another, producing offspring ideally containing copies of each non-functional gene, that will be further crossed to produce confirmed homozygous double knockouts, allowing for future analysis of their role in the Jasmonic Acid pathway.

132. Effects of Elevated Oceanic CO₂ on Sperm Motility and Swimming Speed in Sea Urchins: Implications of Ocean Acidification for Fertilization Success

Diego A. Castro and Robert D. Podolsky, Department of Biology

Increases in atmospheric CO₂ are raising CO₂ levels in the ocean, driving a decrease in oceanic pH through a process known as ocean acidification. Because several key biological processes are sensitive to small changes in pH, there is increasing concern about continued production of CO₂ from the burning of fossil fuels. We focused on consequences for external fertilization in marine environments by analyzing the effect of CO₂-induced acidification on sperm activity in the sea urchin Arbacia punctulata. Increases of CO₂ to 2.5 times current levels, corresponding to 100 years in the future based on climate models, lead to significant declines in both sperm motility and swimming speed. Changes in these parameters are predicted by mathematical models of fertilization success to lead to decreases in successful fertilization under future conditions.

133. Digital Topographic and Geomorphic Mapping along the Tibesti Lineament in the Tibesti Massif, Northern Chad, Africa

Daniel Harper, Robert L. Nusbaum and Norman S. Levine, Department of Geology and Environmental Geosciences

Previous research has documented the NW-SE Tibesti Lineament, a 200-300 km wide fault swarm that extends 6000 km from Kenya to southwestern Algeria and is associated with volcanism in the Tibesti Massif. We utilized ASTER data in an attempt to better understand the relationship between volcanism and tectonism in the area. Forty-two 60 X 60 km ASTER DEMs were mosaicked and used to create a variety of derivative digital maps used for topographic profiles, knickpoint analysis, and fracture pattern trends which were plotted
on Rose Diagrams. ASTER short-wavelength infrared (SWIR) and thermal infrared (TIR) data were used to map lithologies where needed for geomorphic or structural interpretation. Based on our results, regional fracture trends and knickpoints correlate in direction and age with the Cretaceous collision of Africa and Eurasia. This collision could have resulted in enough regional doming to allow for decompression melting and magmatism.

134. **Award of Merit: A molecular assay for the cause of bleaching in the temperate Atlantic coral species *Oculina arbuscula***

Lauren Fuess, Andrew Shedlock, Drew Wham, and Phil Dustan, Department of Biology

The extent and causation of bleaching of the scleractinian coral, *Oculina arbuscula* off Charleston, South Carolina was investigated from June 2009 to June 2011. Temperature data from the site shows a positive correlation between increasing temperatures and bleaching, however the cause of bleaching was unknown. *Oculina patagonica* bleaches during high temperatures due to infection by *Vibrio shiloi*. We used PCR-based analysis in order to distinguish between thermal bleaching and bacterial infection. DNA samples were extracted from coral samples taken during periods of known bleaching. PCR primers specific to *V. shiloi* 16rDNA sequences were used to amplify any target pathogen DNA in mixed environmental samples. No conclusive results were found. Analysis of video transects of the reef collected during the sampling period suggests that bleaching causes permanent coral mortality. Additionally, increasing algal coverage indicates a phase shift may result from bleaching. This could permanently alter the ecosystem structure of the reef.

135. **Characterization and Calibration of the Self-Guiding Spectrograph at the CofC Observatory**

Ryan Wilkie, Department of Physics and Astronomy

The College of Charleston observatory spectrometer has not yet been characterized and calibrated. I am developing procedures to properly align and focus the instrument. I will analyze spectra to begin the process of "science verification" of the instrument. An essential product of this project will be a set of documentation with characterization information, calibration data, and operating instructions for reference by future users.

136. **The Subaru SEEDS High Mass Star Exoplanet Survey: the impact of atmospheric conditions and instrumental parameters on survey sensitivities**

Palmer Wong, Joe Carson, and Thea Kozakis, Department of Physics and Astronomy

We present an investigation carried out as part of the the Subaru SEEDS sub-program to search for extrasolar planets around high-mass stars. SEEDS, the Strategic Exploration 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. The high-mass star sub-program uses the Subaru 8-meter Telescope, a 188 actuator curvature Adaptive Optics system (AO188), and a near infrared imaging science camera (HiCIAO) to search for exoplanet signatures. We present results from our use of the LOCI data reduction pipeline, which combines multiple images while removing the overwhelming light from the parent star, in
order to enable the detection of a faint signal from an orbiting planet. As part of this study, we examine the effects of atmospheric conditions, telescope pointing, and instrumental parameters on the ability to detect the faintest extrasolar planets.

137. Magnetically Arrested Accretion in Slightly Rotating Flows

Anna Gillespie and P. Chris Fragile, Department of Physics and Astronomy

Continuing our study of how astrophysical jets are formed, we have recently begun to analyze slightly rotating flows accreting onto black holes. Based on two-dimensional simulations done by Daniel Proga, we have modeled this specific flow with our general relativistic magnetohydrodynamical (GRMHD) code, Cosmos ++. Our simulations showed a surprising result not present in Proga’s Newtonian version – the development of magnetically arrested accretion, which occurs when a build-up of magnetic flux near the black hole prevents further matter from accreting inward. Eventually the accreting matter overpowers the magnetic field and falls inward, repeating periodically. We explored the dependence of these magnetically-arrested episodes on the spin of the black hole, but found no strong relation. The period of these episodes increases quadratically with time in all our simulations.

138. Energy Dependent Shapes of BATSE Gamma-Ray Burst Pulses

James A. Greene and Jon Hakkila, Department of Physics and Astronomy

The BATSE (Burst And Transient Source Experiment) instrument released the largest catalog of Gamma Ray Bursts (GRBs) observed to date. Pulse extraction techniques show that this catalog comprises many single and multi-pulsed GRBs. A systematic extraction of GRB pulses has produced an extensive, yet partially unstudied, catalog of data on these pulses in the bursts. Using the BATSE 4-channel data, we examine whether pulse shape (asymmetry) is a determinate of other pulse characteristics as pulses cascade through the BATSE energy channels.

139. Simulations of Radiative Transfer in Strictly Absorbing Atmospheric Media

Philip Boehner and Michael L. Larsen, Department of Physics and Astronomy

As of now, transmission of light through clouds is poorly understood. Although radiative transmission through perfectly random (a.k.a. Poisson) media is well understood both theoretically and computationally, work over the last 15 years has revealed that cloud microstructure (the distribution of cloud droplets within a cloud) does not follow this "perfectly random" theoretical description. In an effort to identify the extent to which the Beer-Lambert-Bouguer (BLB) law of exponential attenuation in perfectly random media is violated in realistic cloud volumes, we have developed a first-principles numerical model that actually simulates and resolves the positions of every droplet within a cloud, as well as “ballistic photons” that interact with these droplets. We found that in the case of a Poisson cloud droplet distribution, our simulation results in the Beer-Lambert predicted behavior, but in more physically accurate models containing clustered areas of droplets, we found deviations from the BLB law.
140. Elastic Constants of Epoxy Using Resonant Ultrasound Spectroscopy

Stacy D. Varner and Alem Teklu, Department of Physics and Astronomy

Resonant Ultrasound Spectroscopy is a method that uses ultrasound frequencies to determine the elastic constant of materials by observing the resonant frequencies of materials. A carefully prepared sample of diethylaniline cured Bisphenol A epoxy resin was placed between two transducers. The first transducer applied mechanical stress to the sample at ultrasound frequencies. The second transducer measured the response of the material to the input frequency. Peaks were recorded at the resonant frequencies of the material. Using a Dynamic Resonance Systems application to analyze the recorded spectrum we calculated the stiffness constants $C_{11} = 2.4$ GPa and $C_{44} = 0.9$ GPa. From these the Young's and Bulk moduli were determined to be 2.16 GPa and 0.2 GPa respectively.

141. Metal Organic Frameworks Occluded with Organometallic Coordination Complexes: Synthesis and Reaction Kinetics

Neil Tonks, Thomas Novak, Kevin A. Djordjevic, and Corey Klein, Department of Chemistry and Biochemistry

Molecular organic frameworks (MOFs) make up an area of organometallic and coordination chemistry that has greatly expanded in recent years. These novel molecules have become prime research targets in reactions requiring high temperatures and pressures. They are ideal catalysts due to their notable stability and extremely high surface area and porosity. In addition, they have attracted considerable attention for their candidacy as hydrogen storage molecules in hydrogen production reactions such as the water gas shift (WGS). Our project screened a number of MOF’s for activity in the WGS reaction and aimed to optimize catalytic performance by occluding known WGS-active organometallic species into the frameworks. The species found to be active in the WGS were further analyzed in a kinetics study to determine the respective energies of activation.

142. Re-establishing Full-time Operations at the Etelman Observatory

John Bent and James Neff, Department of Physics and Astronomy

The College of Charleston belongs to a consortium that operates the 0.5 m telescope at the Etelman Observatory in St. Thomas, US Virgin Islands. Our goal is to make the telescope completely robotic. It can also be controlled remotely from Charleston. After we had the primary and secondary mirrors re-aluminized, we had to install and collimate them. The polar alignment of the telescope was examined by monitoring the amount of drift seen in tracking targets in subjective sections of the sky. To inspect pointing errors inherent in the telescope hardware, we imaged the entire sky in a "meshed grid". The images will be compared with WCS coordinates to create a pointing model that corrects for the pointing errors. The refurbishing of the telescope culminated with multicolor photometry observations of two stellar clusters, M44 and M67.

143. Retinyl ester accumulation in the retinal pigment epithelium in the absence of light
Retinyl esters are the substrates for generation of the visual chromophore, 11-cis-retinal. These esters are stored in the retinal pigment epithelium. In the light, 11-cis-retinal is isomerized and these esters are mobilized to replenish it. In mice lacking RPE65, the enzyme that catalyzes the formation of the 11-cis isomer, a build up of esters occurs. Wild-type mice (129/sv) were age matched and dark-adapted for various lengths of time over the course of one-month. Esters were extracted from whole eyecups and quantified using normal phase HPLC. Ester content was compared to that of 12-hr cyclic light raised wildtype mice and in RPE65 deficient mice. Quantities of retinyl esters in both groups of wildtype mice were much lower than in RPE65 deficient mice and stayed relatively stable over one month, suggesting that formation and storage of retinyl esters is highly regulated in the eye. A model to explain the results is presented.

144. rmetasim_gpu : A GPU-accelerated Individual-based Population Genetic Simulation Environment

Thomas Fussell and Allan Strand, Department of Biology and Discovery Informatics Program

'rmetasim_gpu' is a GPU-based implementation of the R package 'rmetasim', an agent-based simulation of genetics, landscape-level dynamics, population structures, and within-population demographies. Through the use of Nvidia's CUDA GPU programming language, optimized data structures, and advanced parallel algorithms, this system can potentially provide significant speed improvements in both large and small simulations as compared to the original serial implementation. This speed improvement will allow qualitatively different applications of agent-based genetic simulations, in particular approximate Bayes calculations (ABC). It is hoped that similar techniques can be applied to other agent-based models both within population ecology and in other domains.

145. Undergraduate Phenotyping of Arabidopsis Knockouts

Christa Caperton, Colleen Stanczykiewicz, Marcos Schönholz, Katie Cross, Anna Matthews, Tanya Hunt, Hanna Vann, Erin Dolan, Mike Wolyniak, Kelly O'Donnell, Hilary Callahan, Yana Wieckowski, Allan Strand, Courtney J. Murren, and Matt T. Rutter, Department of Biology

A comprehensive dataset of genes with loss-of-function mutant phenotypes in Arabidopsis thaliana is essential to the future of plant research. UnPAK is a multi-institutional team involved in the assessment of single knockout mutant lines in the model species Arabidopsis thaliana. We are growing 3,700 SALK knockout lines in varying environments at three institutions. Whole plant morphological traits are recorded through observation by undergraduate researchers and PIs. These data are then added to an interactive database suitable for investigation of A. thaliana ecological genotypes and phenotypes. We predict that the effect of redundancy within gene families, the phenotypic relation to the environment, and previously overlooked genes related to fitness will become evident. Collectively, these data will lead to a more complete understanding of the A. thaliana genome as well as provide information about the nature of large-scale, undergraduate collaborative research.
146. Development of Bird Song Along a Rural-to-Urban Gradient

Caitlin E. Black¹, Mathieu Giraudieu², Kevin J. McGraw², and Paul M. Nolan³

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Urban environments pose more challenges to wildlife than do rural areas, including extensive noise pollution. Young animals there also face the demands of developing traits, such as songs, used later when attracting mates. We tested the previously unstudied hypothesis that house finch (Carpodacus mexicanus) song development is influenced by environmental factors that vary along an urban-to-rural gradient, and predicted a shift in the fundamental frequency and length of their songs. We recorded 6+ songs from each of 9+ birds at each of six sites in the Phoenix, Arizona area, ranging from urban downtown Phoenix to a rural desert park. We used ANOVAs and post-hoc t-tests to identify differences in song characteristics between the sites. Similar to the patterns seen in adults, juveniles shifted the low frequencies of their songs to be higher than the surrounding background noise. Our data show a complex pattern of differences between adult and juvenile song at each site. We conclude that previously observed differences in adult song along this gradient develop early in the bird’s life and are not genetically based.

147. Potential Enhancement of ACT Regimens with the Combination of IL-12 and Non-specific anti-CD3 Stimulation

Bennett R. May¹, Christopher Bryce Johnson², Mark P. Rubinstein², and Allan Strand¹

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Adoptive cell therapy (ACT) is the most effective treatment for metastatic melanoma. It consists of culturing tumor-reactive T-cells ex-vivo and then infusing them into the patient after lymphodepletion. We recently demonstrated in a T-cell receptor (TCR) transgenic murine model that adding the cytokine IL-12 to ex-vivo activation results in enhanced anti-tumor efficacy of transferred T-cells, possibly due to up-regulation of the IL-2 receptor CD25. Since current clinical strategies use non-specific TCR stimulation via anti-CD3 initially, we wanted to evaluate whether T-cell stimulation with anti-CD3 and IL-12 would also result in a programmatic change of T-cell function. Thus we stimulated splenocytes from a non-transgenic mouse with anti-CD3, +/- IL-12 and IL-2. We show that CD8 T-cells have the highest expression of CD25 in the presence of IL-12 and IL-2. Consequently, we conclude that the addition of IL-12 in combination with non-specific anti-CD3 stimulation may enhance ACT regimens.

148. The Effects of Size and Color on the Selective Predation on Family Cardiidae by Family Naticidae

Jennifer K. Kist and Phil Dustan, Department of Biology

Family Naticidae, commonly known as the moon snail, is the top predator of family Cardiidae. The amount of moon snail predation on Cardiidae by Naticidae can be determined by observing the amount of Cardiidae shells that contain the characteristic drill hole created by Naticidae. Cockle shells were collected in three
batches from the North end of Folly Beach in South Carolina. These batches were divided into three groups by color. The amount of predation by moon snails was tested by counting the number of cockle shells with drill holes as compared to without. Cockle shells were also measured to determine the amount of predation based on size. Shells were divided into five size classes and then the amount of shells with drill holes were compared to the amount without. The shell type displaying the highest likelihood of predation based on color and shell size was then determined.

149. Oceanus's Titan Lake Lander Mission: An Analysis of the Chemical Compositions of the Atmosphere and Ontario Lacus

Caroline Smith¹, Samantha Kuzma¹, and Palmer Wong²

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Titan, the largest satellite of Saturn, is unique in the solar system; it is the only moon with a significant atmosphere that contains quantities of carbon, nitrogen, and oxygen. Its dense atmosphere has led many to speculate of its ability to sustain life. Granted the ability to understand how these chemicals were formed and how they relate to one another can aid in having a better grasp on how Titan formed chemically. Understanding the formation of Titan will allow Oceanus to make more comparisons to Earth’s formation. Thus, the Oceanus’s lake lander mission aims to gain insight on Titan’s chemical composition to understand how Titan functions as a system. Thus, an extensive analysis will build knowledge on the relationship between the atmosphere and lake chemical structures and distinguish similarities and differences between Earth and other solar system bodies.

150. Improving Student Retention Rates Through Analysis of Student Survey Data

Ewan Oglethorpe and Tracy Burkett, Department of Sociology

Currently, the College of Charleston graduates fewer of its students in five years than other state and peer institutions. Low retention rates impact the institution negatively in terms of institutional reputation, social cohesion and economic bottom-line. For this applied project, the researcher created a dynamic and novel database application to link data from multiple longitudinal student surveys to institutional student data. The data was then analyzed using data mining techniques with the objective of identifying trends among students who did not complete their education at the College of Charleston.