27th Annual Poster Session
Thursday, April 16th 2015

The first fourteen posters are featured for the UNESCO International Year of Light.

1. Video Analysis of Reef Fishes and Live Bottom Seafloor Cover in the South Atlantic Bight

Luke Rein¹, Gorka Sancho¹, Rachel Bassett¹, Tracey Smart² and Dawn Glasgow²

1 Department of Biology, College of Charleston,
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South Carolina Department of Natural Resources’ Marine Resource Monitoring, Assessment and Prediction Program (MARMAP) collects and analyzes data concerning the South Atlantic Bight’s commercially important snapper-grouper fishery to determine catch limits and conserve the region’s fishery. In addition to conventional trap capture-based data, MARMAP increasingly employs video recordings to determine key metrics about the fish communities in this region. This study uses video analysis to compare the presence of live bottom seafloor cover to the abundance and diversity of four common species of the snapper-grouper complex (C. striata, P. pagrus, R. aurorubens, and B. capriscus). This analysis shows that live bottom seafloor cover may have a variable effect on the presence of fishes.

2. Correlating solubility parameters and Kamlet-Taft solvatochromic parameters with the self-assembly of poly(3-hexylthiophene) in mixtures of organic solvents

Madeline P. Gordon and David S. Boucher, Department of Chemistry and Biochemistry

Recent experimental endeavors have shown that well-ordered P3HT assemblies formed in solution can improve the crystallinity and morphological uniformity of thin films and composites, thereby providing a promising new route to more efficient polymeric optoelectronic
materials. We have studied the assembly and crystallinity of poly(3-hexylthiophene) (P3HT) in >100 binary solvent mixtures using UV-Vis absorption spectroscopy, and it is clear that the identity of the poor solvent used to drive aggregation has a significant impact on the structural order and crystallinity of the P3HT aggregates in solution. Here we report our findings using Hansen solubility parameters (HSPs), specifically the solubility distance vector, Ra, and the Kamlet-Taft solvatochromic parameters of the solvent mixtures to better understand the dominant solvent forces driving the self assembly of P3HT.

3. Direct imaging of concentration-induced fluctuations in nanocolloids

Lincoln Fraley, Department of Physics and Astronomy

Nanocolloids are ideal systems for investigating both spatial and temporal processes using optical methods since they have particle sizes larger than the characteristic size of atomic or molecular systems. We performed direct imaging experiments in order to investigate the concentration-driven non-equilibrium fluctuations. Our direct imaging experimental setup involved a glass cell filled with colloidal suspension and water with the concentration gradient oriented against the gravitational field and a superluminescent diode (SLD) as the light source. Nonequilibrium concentration-driven fluctuations in silver nanocolloidal suspensions with a range of particle sizes and at different concentrations were recorded using direct imaging technique. We used a dynamic structure factor algorithm for image processing in order to compute the structure factor and to find the power law exponents and the correlation time of these fluctuations. The investigation of time evolution of concentration induced fluctuations allowed us to evaluate the dynamics of critical wave number.

4. Palagonite Alteration of the Blue Dragon Flow, Craters of the Moon National Monument, Idaho

Garth Groshans Jr. and Robert Nusbaum, Department of Geology and Environmental Geosciences

The purpose of this research was to study surficial weathering and alteration products of the Blue Dragon lava flow located in Craters of the Moon National Park, Idaho. Of particular interest is the alteration of basaltic glass to palagonite in a terrestrial setting. Palagonitization of Blue Dragon Lava is observed as dark brown alteration product surrounding plagioclase and olivine phenocrysts within the basaltic glass. Lava samples were analyzed using polarized light microscopy and a Tescan MIRA-3 SBU scanning electron microscope (SEM) equipped with a backscattered electron detector and an energy-dispersive x-ray spectrometer (EDS). Backscatter SEM images suggest the palagonite is compositionally zoned distal from the phenocryst boundary. While glass values for elemental oxides are relatively constant, the same oxides may
vary by a factor of five in adjacent palagonite. With the exception of MgO, the results are consistent with initial development of amorphous “gel” palagonite described in the literature.

5. Toxicity of combinations of Naproxen and its Photodegradants

Luke Rein¹, Allison Welch¹ and Wendy Cory²

¹ Department of Biology
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Pharmaceutical compounds have been observed in natural waterways, due largely to their incomplete removal from wastewater. In the environment, ultraviolet radiation can degrade these pharmaceuticals into other biologically active compounds. However, continual input of common pharmaceuticals results in pseudopersistence, whereby enough new material is added that levels remain elevated in spite of their breakdown. We investigated the effects of UV photodegradation and pseudopersistence on the toxicity of naproxen, a common anti-inflammatory. Southern toad tadpoles were exposed to naproxen, its two UV degradants, and combinations of these three compounds in proportions that correspond to laboratory observations of naproxen photodegradation. Naproxen’s two degradants were significantly more toxic than naproxen itself, and combinations of naproxen and its photodegradants were particularly toxic. These data suggest that the ecological effects of pharmaceutical pollutants may be underestimated.

6. An Innovate System for 3D Clinical Photography

Hannah Wilson and Joseph Carson, Department of Physics and Astronomy

We and collaborators have developed a novel imaging technique that enables 3D imaging from a single digital snapshot, for the purposes of low-cost clinical photography in resource limited settings, such as rural regions in southeast Africa. The technique takes advantage of the emerging technology of light-field photography, which captures the information of multiple focus depths in a single digital snapshot. Our novel software approach reconstructs 3D shapes by evaluating how different parts of the image sharpen or blur at different focal depths. We combined our computational approach with a commercially available light-field camera, Lytro, and a medical hardware adaptor custom-developed by collaborators to ensure controlled and repeatable measurements. We have recently been working to expand our capabilities to enable endoscopic imaging with a miniaturized camera version as well as to improve the overall accuracy of our 3D rendering technique.
7. Pericyte Distribution in the Cerebral Cortex Revealed by High-Resolution Imaging of Transgenic Mice

Ian Grant, David Hartmann, Robert Underly, Ashley Watson, Volkhard Lindner, and Andy Shih, Department of Biology and Program in Neuroscience, College of Charleston, Department of Neurosciences, Medical University of South Carolina, and Center for Molecular Medicine, Maine Medical Center Research Institute

Pericytes are essential for normal brain function and play diverse roles in the brain, including maintenance of blood-brain barrier integrity, angiogenesis, and regulation of cerebral blood flow. Defects in pericyte function facilitate tissue injury in stroke and neurodegeneration by impairing cerebral microcirculation and vascular stability. Here, we utilized a transgenic mouse line that expresses Cre constitutively under the PDGRFβ promoter, providing highly specific and near complete labeling of pericytes along the entire cerebrovasculature. Optically cleared brain tissue from these animals allowed for collection of high-resolution image stacks over the entire depth of cortex using two-photon microscopy. Analysis of pericyte distribution in cleared tissue was assessed between layer I and layer II/III of the cortex, which revealed marked differences. Further characterization of pericyte density in other in vivo-accessible brain regions will provide insight to overarching pericyte distribution, and may lead to discoveries that implicate varying pericyte distribution in certain disease pathologies.

8. Relationship between Population Growth and Land-cover Change in the Charleston Area: A Landsat Remote Sensing Study from 1984-2014

Zak Bartholomew, Shelby Bowden, Eric Brown, Carolina Cardoso, David Derouen, Sam Fink, TJ Gladden, Elliot Harrington, Kristin Hughes, Robert Jones, Kori Ktona, Will Lorentzen, Savannah Norvell, Griffin Scott, Elizabeth Watkins, Hannah Yates, and John Chadwick, Department of Geology and Environmental Geosciences

The Charleston area is one of the fastest growing metropolitan areas in the eastern U.S., with Charleston, Berkeley, and Dorchester Counties increasing their total populations by 54.4% between 1980-2010. The relationship between population growth and changes in land cover (i.e. loss of natural vegetation and gain of human-modified cover like concrete and asphalt) can be monitored in the region using satellite remote sensing. Five student teams analyzed a total of 20 multispectral Landsat Thematic Mapper images collected between 1984 and 2014 using ENVI image processing software to quantify land cover changes. Image pixels were classified as vegetation, marsh, or urban development (other minor cover types were unclassified), based on their unique spectral reflectance properties. The results show that urban land cover increased by 117.5 km$^2$ (16.8%), vegetation decreased by 108 km$^2$ (8.7%), and marsh increased by 11.4 km$^2$ (5.1 %) over the 30-year time span.
9. Searching for Extrasolar Planets with the Subaru SEEDS Survey

Kellen Lawson, Nathan Gunzenhauser, Laura Stevens, Joe Carson, Department of Physics and Astronomy, and the multi-national SEEDS Science Team

We present a status report on the SEEDS subprogram to search for extrasolar planets (exoplanets) 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. It is an international project approved by National Astronomical Observatory of Japan (NAOJ) and led by PI M. Tamura. With first observations carried out in 2009, the high-mass star subprogram uses the Subaru 8-meter Telescope, an adaptive optics system (AO188), the HiCIAO near-infrared imaging science camera, and the angular differential imaging (ADI) technique, to search for heat signatures from young exoplanets. The survey is currently in its concluding stages. We describe the selection of our 42 targets, observing and data processing procedures, and recent progress and results.

10. Quantifying Coastal Changes of Cape Romain, SC using Google Earth from 1989 to 2014

Kristin Hughes, Kori Ktona and Leslie Sautter, Department of Geology and Environmental Sciences

Cape Romain is a prominent cuspate foreland on the South Carolina coast, located approximately 35 miles north of Charleston. A thorough study using Google Earth imagery was completed in order to determine the geomorphologic changes of the shoreline from 1989 to 2014. Major factors that have affected the shape of Cape Romain include storm surges and hurricanes. Qualitative data were analyzed from historical imagery, and quantitative analyses of shoreline changes were made using Google Earth measurement tools. This study is crucial for use in managing the National Wildlife Refuge located on Cape Romain, and for understanding the effects of the cuspate foreland's changing morphology on the nearby barrier islands.

11. Engineering a Photodegradation Protective Coating for Firefighter Turnout Gear

Isaac Gould, Yeon Kim, Shonali Nazare and Rick Daivs, National Institute of Standards and Technology

In a study done in 2011 it was found that firefighter suits, comprised of melamine polymer blend, are particular susceptible to mechanical degradation from to UV radiation. This degradation
severely limits the suit's potential lifetime use. To increase the suit's lifetime a thin photoprotective film of TiO2 nanoparticles was applied to the melamine fabric and then tested for its effectiveness in improving the fabric's mechanical performance after advanced UV exposure.

12. Exploring 3D data acquisition, modeling, and printing for geoscience applications

Kyle W. Bostick and Norman S. Levine, Department of Geology and Environmental Geosciences

Geoscience 3D visualization and modeling has become relevant with the advent of laser-scanning, drone and 3D printing technologies. This project explores several methods for 3D data acquisition: laser-scanning and "photo-stitching" (sample modeling) and eBee drone and LiDAR data (landscapes). Real-life objects (e.g., fossils, specimens) and terrains were imaged and converted into polygonal mesh composed of vertices, edges, and faces. These geometric data collectively define the shape of a polyhedral object; when coupled with 3D management software such as MeshMixer we can modify shape, size, fill, and textures. Using our "MakerBot 5.0" 3D-printer, we have produced several scale-models of geologic terrains as well as completed paleontological models including an ocular orbit for Xenorophid whale skull on display at the Mace Brown Museum of Natural History. There are numerous applications of these 3D imaging technologies which include the curations of specimens, illustrating data for visually impaired students, and the manufacture educational flood-models.

13. Art Installation Visualizing Rogue Wave Modeling

Victoria Shuler and Annalisa Calini, Department of Mathematics

Rogue waves are waves of extreme height that can appear out of nowhere, at times in a calm ocean, and have been known to cause many a shipwreck. Only recently, systematic measurements from oil platforms and from satellites have shown that rogue waves are far more common than expected. This artwork is a representative visitation for several concepts concerning a mathematical model of rogue wave formation in deep water. The model is based on the Nonlinear Schroedinger Equation, that admits rogue wave-like solutions, and that give rise to chaotic dynamics when physically realistic corrections are added. The underlying mathematical theory that this artwork denotes shows that a chaotic sea state enhances rogue wave generations, providing a possible explanation of why rogue waves are not such rare events.
14. The Design and Testing of a Raindrop Velocimeter

Derek R. Tuck and Michael L. Larsen, Department of Physics an Astronomy

Using affordable laser diodes and photodetecting transducers, a simple instrument was constructed. This instrument is designed to be capable of measuring raindrop arrival times at two locations with known vertical offset. Acquired data includes the fall speeds of large raindrops with the ultimate goal of identifying and analyzing drops falling slower than their terminal velocities. Here we present results from the early calibration and testing phases of the instrument prototyping process.

15. Bathymetric and Geomorphologic Characterization of the Mouth of Shannon, Ireland

Victoria Houston and Leslie Sautter, Department of Geology and Environmental Geosciences

The Shannon Estuary is located on the west coast of Ireland where Ireland’s longest river, the River Shannon enters the Atlantic Ocean. In July 2011, the Marine Institute of Ireland surveyed the 15 km wide estuary mouth between Loop Head and Kerry Head. Data were collected aboard the Institute’s R/V Celtic Voyager using a Kongsberg EM3002 multibeam echo sounder and were processed using CARIS HIPS & SIPS 8.1 to map the basin’s geomorphology. Marine development opportunities and sheltered deep-water add ecological and economical value to the Shannon Estuary. This study characterizes the seafloor of the southern portion of the estuary mouth, using bathymetric data and revealed a significantly large area potentially consisting of bedrock buried under soft mud extending to both edges of the mouth at approximately 20 meters. Creating a slope map, reveals steep edges, inferred as rocky outcrops.

16. A Role for the Extracellular Matrix Protease ADAMTS5 in Cardiovascular Development

Lockett Nelson¹, Sarah Thibaudeau² and Christine B. Kern²

1 Biology Department
2 Department of Regenerative Medicine and Cell Biology, Medical University of South Carolina
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17. Phase resetting of neural oscillators subject to multiple inputs

Kelsey Vollmer and Sorinel Oprisan, Department of Physics and Astronomy

External stimuli, such as presynaptic inputs, reset the phase of neural oscillators. The phase resetting curve (PRC) determines the advance or delay of an action potential based on the strength and timing of the presynaptic stimulus. Since neural oscillators are nonlinear systems, the neural response to a set of external stimuli is not the sum of responses to an individual stimulus. We developed a systematic and consistent mathematical approach to predicting the
phase resetting induced by multiple stimuli that arrive during the same activity cycle of a neural oscillator. Our approach is independent of oscillator’s biophysical details and generalizes the single-stimulus PRC.

18. Effect of burning regimes on ants in a longleaf pine forest

Olivia LaRussa and Brian Scholtens, Department of Biology

In Francis Marion National Forest, fire regimes combat the invasion of loblolly pine and preserve the longleaf pine ecosystem. However, this treatment affects other organisms in the forest. Ants range in their ability to withstand hot, xeric conditions; therefore, forest fire management may influence which species can survive. Samples were taken at four different soil types in corresponding maintained and unmaintained plots of the forest. The arthropods collected were sorted to morphospecies and the ants identified to genus or species. The predominant species in both treatments was Nylanderia parvula. ANOVAs comparing the number of ants sampled or diversity indices between treatments showed no significant differences. However, collections were made using Winkler funnels for extraction and recent research has indicated that pitfall traps may be a more appropriate sampling technique in temperate areas. Further experimentation using this method may illustrate how fire adapted genera like Solenopsis are affected by fire maintenance.

19. Computational Studies of Hemodynamic Flows in Abdominal Aortic Aneurysms

Danielle Massé and Jason Howell, Department of Mathematics

Biomedical research has recently indicated that some specific dynamic characteristics, such as the blood wall shear stress and oscillatory shear index, of the blood flow inside arteries with aneurysms are risk factors for both the enlargement and rupture of the associated aneurysm. The primary objective of the project is to determine the influence that the geometry of an abdominal aortic aneurysm has on these specific characteristics.

20. Protein Disulfide Isomerase as a Novel Drug Target in ER+ Breast Cancer

Chelsea Snipes and Danyelle Townsend, College of Charleston Department of Biology and Medical University of South Carolina Department of Pharmaceutical and Biomedical Sciences

Protein disulfide isomerase (PDI) is a chaperone protein in the endoplasmic reticulum that facilitates folding and disulfide bond formation in its protein substrate. Estrogen receptor alpha (ERα), a steroid hormone receptor and transcription factor, directly interacts with PDI. The posttranslational modification, S-gluthathionylation, prompted by oxidative stress, inhibits PDI-ERα interaction suggesting that redox regulation of PDI mediates ERα stability. Using Kaplan-Meier Plotter, this introductory study examined the overall survival probability in silico of breast cancer patients expressing high and low levels of protein disulfide isomerase A1 (PDIA1) between disease subtypes and treatments. High levels of PDIA1 are shown to be a poor prognostic factor in estrogen receptor positive breast cancers and therefore a novel drug target with the potential to dually target estrogenic signaling and protein homeostasis.
21. Behavioral Evidence for Enhanced Intracellular Calcium Signaling in Cocaine Sensitization

Carrie Bailes, Bethany Pavlinchak, Arthur Riegel and William Buchta, College of Charleston Department of Biology and Program in Neuroscience and the Medical University of South Carolina Department of Neuroscience

Chronic cocaine use causes cellular adaptations in the prefrontal cortex (PFC) that contribute to addiction and relapse. A better understanding of these cellular adaptations will promote the development of effective relapse pharmacotherapies. Chronic cocaine disrupts multiple intracellular signaling cascades in the PFC, including calcium release from intracellular stores. However, the behavioral role for intracellular calcium signaling in addictive behaviors is unclear. Therefore, using cocaine sensitization to model aspects of addiction, we designed experiments to test the hypothesis that an elevated release of calcium from PFC stores contributes to cocaine sensitization. To establish behavioral sensitization, we administered daily cocaine (15mg/kg IP) to rats and assessed their locomotor responses. In sensitized animals, pharmacological manipulation of calcium release from intracellular stores augmented locomotor activity in sensitized animals but had no effect in non-sensitized animals. These findings demonstrate that adaptations in intracellular calcium signaling within the PFC contribute to the expression of cocaine sensitization.

22. Topsoil: An Open Source Visualization Tool for Geochronologists

Ben Wilson, Brandon Wagner, Cortney Mood, Tom Evans, Paul Kyser and Jordan Burrows, Computer Science Department

We are StackOverflow, a group of six Software Engineering Practicum students at the College of Charleston. Our semester long project has been to contribute to the open-source project, Topsoil. Topsoil is an open-source visualization tool for geochronologists. Topsoil has been developed by the CIRDLES undergraduate research lab, by principal investigator Dr. Jim Bowring. As Topsoil approaches a major release this summer, we have been aiding in the development of documentation and refactoring the existing code base in preparation for the upcoming version.

23. MuseScore: a free and open source way to create, play and print sheet music

Eugene Johnson, Trevor Kirkpatrick, Philip Rabe, Frank DuRant, Department of Computer Science

MuseScore takes the concept of open source and applies it to both the development of the software and to the sharing of products produced by the software. It includes a highly sophisticated social aspect integrated into the web platform, which enables MuseScore users to share sheet music files easily and efficiently. MuseScore is written primarily in C++ and is used to create, play and print sheet music, and is supported on Windows, OSX and several Linux operating systems. MuseScore can be used for a variety of purposes, including the writing of personal pieces to entire orchestral arrangements. MuseScore is released under the GNU General
24. Erroneous Drop Sizing by Impact Disdrometers: Possible Effects on Z-R Relationships

Kate O'Dell and Michael L. Larsen, Department of Physics and Astronomy

Erroneous drop sizing by impact disdrometers and its effect on the relationship between rain rate (R) and reflectivity factor of RADAR (Z) was investigated using data inferred from a two-dimensional video disdrometer. Six events were studied in detail. Comparison of drop size distributions for the inferred impact disdrometer data and the two dimensional video disdrometer data revealed substantial differences in drop sizing. However Z-R relationships produced using each set of data showed minimal effects of erroneous drop sizing.


Ally Olejar, Department of Physics and Astronomy

We use the state-of-the-art, astrophysics numerical code Cosmos++ to gain insight into black holes and black hole accretion disks. For this project, we investigated the black hole accretion disk systems which exceeded the Eddington Limit, the maximum luminosity an astronomical object can have while maintaining hydrostatic equilibrium. Astronomers have observed objects (particularly black hole systems) which exceed this luminosity, which suggests that the proposed Eddington Limit may not restrict nature at all. In order to accurately treat the radiation physics of these systems, we have included Compton cooling into Cosmos++ and have performed several tests to ensure the high performance of the code.

26. Age and Length Structure of Tomtate Haemulon aurolineatum in a Marine Protected Area

Zachary Brooker, Tracey Smart2, Rachel Bassett1 and Gorka Sancho1

1 College of Charleston
2 South Carolina Department of Natural Resources

This study aims to provide contemporary data for the age and length structures of tomtate (Haemulon aurolineatum). A total of 1,251 fish were sampled from May 2000 to September 2014 by the South Carolina Department of Natural Resources (SCDNR) near deep-water reefs in Marine Protected Areas (MPAs) along the coasts of North and South Carolina. Total (TL), standard (SL), and fork lengths (FL) were recorded for 1,249 fish to the nearest millimeter, and total fish weight (W) was recorded to the nearest gram. Ages were recorded for 737 of 1,251 samples. Samples were sexed using macroscopic observation in the lab on the research vessel. Growth curves, meristic conversions between lengths and weights, and age composition are essential data inputs to stock assessment models used most commonly in the southeastern United
States, and those from this specific study can potentially be used in a new management plan for the Tomtate fishery.

27. A Comparative Dietary Analysis of *Haemulon aurolineatum* and *Haemulon plumieri*

Mary Frances Babrowicz, Kevin Spanik, Rachel Bassett and Gorka Sancho, Department of Biology

A diet analysis can provide insight on competition for resources, food web dynamics, and transfer of energy through the ecosystem. Species population management is most effective when focusing on ecosystem based fisheries management. Studying groups of fishes rather than one species can be useful when completing a dietary analysis of the community. This study compared the diet of two species from the genus Haemulon: Tomtate, *Haemulon aurolineatum*, and White grunt, *Haemulon plumieri*. Both species had a widespread diet that included amphipods, bony fishes, bryozoans, crabs, decapods, echinoderms, gastropods, isopods, mollusks, ostracods, shrimp, sponges, stomatopods, tunicates and worms. White Grunt had a more diverse diet, feeding on a total of 52 varied prey items, while Tomtate fed on 21 different prey items. Competition between the two fish is unlikely because of the wide variety of prey items consumed.

28. Hello, Girl - Promoting Computer Science Through the Sugar Learning Platform

Joye Nettles, Alex Castelli, Sarah Mackey and Alex Housand, Department of Computer Science

A worldwide effort to provide every child with opportunities towards quality education, the Sugar Learning Platform is humanitarian free and open source software that promotes "collaborative learning" for users through a number of Sugar Activities. Adding to Sugar’s immense collection, Hello, Girl is an activity that encourages young girls to learn programming using fashion to create a customized girl. With this activity, users would simply drag and drop various clothes and accessories on the doll of their choice. As they do this, the users will also be able to learn how the python commands associated with the dolls appearance would be modified. Hello, Girl was developed in the Sugarizer development environment using Javascript and CSS. Moving forward, community participation is encouraged in future iterations of this activity. It is our hope that Hello, Girl will be another step towards breaking down the male-dominated stereotypes of the computer science field.

29. Slumps in a Proposed Marine Protected Area on Florida’s Atlantic Margin

Luke Rein and Leslie Sautter, Department of Geology and Environmental Geosciences

A proposed network of marine protected areas (MPAs) off the east coast of the United States has undergone multibeam sonar surveillance to determine the major seafloor features in the region. One particular site, located approximately 130 km east of Jacksonville, Florida on the shelf margin, possesses a number of slump features that may provide habitat for fishes in the snapper-grouper complex that the MPA is intended to protect. The slumps at this survey site were
analyzed to determine a relationship between slump width and slump relief, and it was found that in most cases, slumps exhibit greater relief as they increase in width.

30. Toxicological Effects of Oil Dispersants Finasol OSR 52 and Corexit 9500 on the Eastern Mud Snail, *Ilyanassa obsoleta*

Millie Thomas and Marie DeLorenzo, Biology Department

The explosion of the Deepwater Horizon offshore oil drilling rig in 2010 brought a discharge of oil into the ocean of a magnitude not previously seen. This necessitated the use of many different means of oil spill remediation, including oil dispersants such as Finasol OSR 52 and Corexit 9500. With little research previously done on these chemicals, it is of great importance that the effects of these dispersants are better understood as to more effectively and safely clean up oil spills. The Eastern Mud Snail, *Ilyanassa obsoleta*, is an ideal estuarine species to study the effects of these chemicals on as it lives and feeds benthically in estuaries from Canada to Northern Florida. This study determined the LC50 values of the two dispersants on larval and adult mud snails, and determined that larval and adult snails are more sensitive to Finasol than Corexit, with larval snails showing greater sensitivity than adults.

31. Chronic Intermittent Ethanol Exposure Alters Protein Expression in the Lateral Orbitofrontal Cortex

Julia Moss1,2, Natalie McGuier2, Joachim Uys3 and Patrick Mulholland2,4

1 Department of Biology and Program in Neuroscience
2 MUSC Department of Neuroscience
3 MUSC Department of Pharmacology
4 MUSC Department of Psychiatry and Behavioral Sciences

Alcohol use disorders (AUDs) are chronic, relapsing conditions characterized by excessive alcohol consumption and various behavioral deficits. Research in chronically drinking individuals shows functional deficits in the orbitofrontal cortex (OFC). A recent study from our lab demonstrated an increase in the density of long, thin dendritic spines in the lateral OFC (lOFC) following withdrawal from chronic intermittent ethanol (CIE) treatment. We hypothesized changes in synaptic protein expression would accompany this alteration and performed a proteomics analysis to compare expression in the post-synaptic density of neurons in the lOFC-treated mice versus unexposed controls. CIE treatment altered 29 proteins and immunoblotting confirmed changes in growth associated protein-43, elongation factor 1, synaptopodin, α actinin, and excitatory amino acid transporter-2. Protein-level changes affect morphological remodeling and glutamatergic signaling; together, these physiological processes may underlie OFC-dependent behavioral deficits observed in AUD patients.
32. You Can’t Monitor A Volcano If You Don’t Know What Time It Is

Carolina D. Cardoso and Steven C. Jaumé, Department of Geology and Environmental Sciences

Beginning on September 23, 2004, earthquake activity increased within Mount St. Helens, which culminated in an eruption on October 11. We acquired data from seismic stations close to Mt St Helens from the Incorporated Research Institutions for Seismology Data Management Center (IRIS DMC). We attempted to use this data to locate and track seismic sources within Mt St Helens in the lead up to the eruption. Unfortunately, after some analysis, we determined the data was corrupted. We expected P-waves to always arrive at station SEP before station YEL; we found, however, that for some events this was reversed. A detailed examination of data from SEP and YEL revealed time gaps and overlaps ranging from 0.086 to 0.899 seconds in the seismograms. This leads to mislocations of seismic events by up to 2 km. We are in the process of reporting this problem to the IRIS DMC.

33. Dynamic Modeling of Targeted and Non-Targeted Advertising Strategies

Chloe Fletcher and Jason Howell, Department of Mathematics

With the growing collection of data regarding the depth of detailed knowledge of consumer habits and trends, firms are gaining the capability to discern customers of other firms from the market of uncommitted consumers. Firms with this capability will be able to implement advertising campaigns where the advertising effort towards customers of competing firms differs from that towards uncommitted customers. We develop two mathematical models for the dynamic behavior of sales due to competitive advertising in a setting with a small number of competing firms. One model (non-targeted) assumes the advertising effort is the same for both categories of customers, and the other model (targeted) gives firms the capability to allocate advertising effort across the two categories differently. The models are mathematically analyzed and we formulate and answer several strategic questions that a firm may face when implementing a targeted policy.

34. CHRONI - An Android Application for geochronologists to access archived sample analyses from the NSF-funded GeoChron.org data repository

Joye Nettles and Jim Bowring, Department of Computer Science

Today, geochronologists are archiving their data and results to public cloud archives managed by the NSF-funded GeoChron database. The software application ET_Redux developed by Dr. Bowring at the College of Charleston provides seamless connectivity to GeoChron for geochronologists to automatically upload and retrieve their data. CHRONI is a mobile application for Android devices that provides easy access to this information. With CHRONI, geochronologists can view archived data and analyses downloaded from the Geochron database, or any other location, in a customizable format. CHRONI uses special documents called Report Settings to create the customized data display on a mobile device. In addition to providing geologists effortless mobile access to archived data and analyses, CHRONI allows users to manage their GeoChron credentials, download private and public files, and view specialized
graphics associated with particular files. Future versions of CHRONI will be developed to support iOS compatible (iPhone, iPad, and iPod) devices.

35. Analyses of Marine Protected Areas on the North Carolina Continental Shelf

Lisa Diamond, Department of Biology and Leslie R. Sautter, Department of Geology and Environmental Geosciences

Along the southeastern coast of the United States, oceanic and conservation organizations have joined forces to enact Marine Protected Areas (MPAs) with varying geographic locations, sizes, and management types in order to benefit focal species and their critical habitats. Two MPAs in North Carolina, located off the coast of Frying Pan Shoals and Cape Lookout Shoals, were evaluated through the analysis of their seafloor features and biology. In June 2014, NOAA geoscientists collected multibeam sonar data from aboard NOAA Ship Nancy Foster. This bathymetric information provided insight to the seafloor features found at each MPA. Additionally, NOAA provided underwater images from a remotely operated vehicle (ROV) in these areas. Images showed presence/absence of the focal species near these protected and managed zones. Seafloor features and biota present were analyzed together to assess each MPA’s influence on the focal species’ abundances.

36. Behavioral Neuroscience in the Snapping Shrimp, Alpheus angulosus: An Autotomization Study

Patricia Cooney, Melissa Hughes and Chris Korey, Department of Biology

The snapping shrimp, Alpheus angulosus, exhibits a unique characteristic in its front claws. The snapper, used for defense and communication, and the pincer, used for feeding and habitat manipulation, differ radically in shape and size. When grabbed by the large snapper claw, the shrimp will generally drop, or autotomize, it in the interest of survival—just as a lizard might drop its tail. Upon autotomization, the shrimp can "switch hands" by regenerating a pincer from the previous snapper limb, and transforming the previous pincer into a functional snapper. While this transformation is standard among snapping shrimp, the specific autotomy behavior seems to differ within the species. To evaluate these differences and understand the role of nervous system control in this process, we have begun a large-scale behavioral analysis in which we compare drop latency of shrimp by sex and size initially, and by stage in claw transformation after initial autotomy.

37. Searching for Emission Episode Self Consistency in Gamma-Ray Burst Light Curves

Thomas Cannon and Jon Hakkila, Department of Physics and Astronomy

Using light curves of gamma-ray bursts (GRBs) detected by the Burst And Transient Source Experiment on NASA’s Compton Gamma Ray Observatory, we introduce a new method of self-consistent GRB categorization. We compile a table of similarity distances measuring the degree of correlation between any two GRB light curves. We then apply automated data mining tools
such as Self-Organizing Maps and decision trees to sort like-GRBs into groups according to their similarity distances. The results give us an additional method for classifying GRB light curves.

38. Role of Programmed Cell Death in Complement Mediated Killing of *Candida* Species

Beatrice Zaki\textsuperscript{1,2}, Mary Alice Cummings\textsuperscript{1,2}, Silvia Vaena de Avalos\textsuperscript{2} and Caroline Westwater\textsuperscript{2,3}

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

*Candida* species are the most common fungal pathogen of humans. Our laboratory has discovered that complement-derived peptides prompt potent antifungal activity against *Candida glabrata*. The goal of this study was to examine whether cells display classic markers of programmed cell death in response to complement peptide exposure. Phosphatidylserine is a phospholipid membrane component that is held on the cytosolic side of the cell membrane by the flippase enzyme. The triggering of cell death allows phosphatidylserine to flip to the extracellular side, becoming a signal to macrophages to engulf the cell. Cell death may also be triggered by DNA damage, and is accompanied by the production of excessive reactive oxygen species. Therefore, this study measured the appearance of programmed cell death markers in complement peptide treated cells by monitoring intracellular reactive oxygen species, the appearance of phosphatidylserine and annexin in the outer membrane, and the degradation of DNA.


M. Austin Sturkie, Department of Biology

The American eel, *Anguilla rostrata*, is a catadromous species found throughout the waters of eastern North America. A histological verification of gross gender assessment and reproductive development in the species provided a unique opportunity to compare findings in southern waters to previous studies, all of which so far have been performed in or north of Chesapeake Bay. All specimens studied were caught in inshore waters of South Carolina. A relationship was found between fish length and maximum oocyte size, while measurements of mean and extremes in oocyte size were found to be in disagreement to all past studies performed in more northerly waters, likely due to differences in environment sampled and the reproductive strategy of the animal itself.

40. Introduction of FT-IR and \textsuperscript{19}FNMR Protein Probes via S\textsubscript{8}Ar

Brenna Norton-Baker, Jessica Kapp, Carson Reed and Marcello Forconi, Department of Chemistry and Biochemistry

The electronic environment of proteins is highly idiosyncratic. IR and NMR spectroscopy are commonly used to reveal information about the properties of local environments. Proteins lack
nitrile groups and fluorine atoms, making these good candidates for selective probes. Taking advantage of the nucleophilicity of cysteine, we developed a facile, inexpensive way to modify this amino acid and introduce such probes via nucleophilic aromatic substitution (SNAr). We found that N- and O-protected cysteines react with a variety of fluoroaromatics, including 3,4,5-trifluorobenzonitrile (TFBN). FT-IR analyses showed that the nitrile stretching frequency of the cysteine-fluorobenzonitrile is dependent on the solvent electronic properties, lending to the proposal that it will indicate electronic properties of protein microenvironment. Protein modification trials were conducted using lysozyme, BSA, and hemoglobin. Analysis of the TFNB-treated proteins through Ellman’s reagent and mass spectrometry analysis suggests that solvent-exposed cysteine residues of these proteins were modified by TFBN.

41. Slope Failure Potentiality within the New England Seamount Chain: Analyzing Bathymetric Profiles for Potential Submarine Landslides

Garth Groshans and Leslie Sautter, Department of Geology and Environmental Geosciences

The New England Seamount Chain (NESC) is a deep sea volcanic chain comprised of over 30 volcanic peaks. These seamounts developed from the Great Meteor mantle-plume hotspot between 100 and 80 million years ago, and extend over 1200 kilometers in the northwest Atlantic Ocean. Seamounts of the NESC exemplify eminently steep terrain that could potentially have hazardous implications if submarine landslides were to result. The Gulf Stream current coinciding with steep topography can possibly expedite erosional processes. In addition, the entire NESC is capped with a thin layer of sediment on top of basaltic rock, which can contribute to further instability. At the utmost, severe slope failure could produce a cataclysmic tsunami event on the prone shores of Bermuda or New England. Cross-sectional profiles allow for quantifiable comparisons of seamounts based on calculations of slope and hydrostatic pressure. Seamounts exhibiting definitive guyot morphology posed the highest feasibility for slope failure.

42. Geomorphology of the Continental Margin off of the Dingle Peninsula, Ireland

Hannah Yates, Leslie Sautter and Erin Beutel, Department of Geology and Environmental Geosciences

From May to June 2009, the R/V Celtic Voyager collected multibeam bathymetric data off the southwest coast of County Kerry, Ireland for The Geological Survey of Ireland and Marine Institute. The system used for data collection was a Kongsberg EM3002 system. CARIS HIPS and SIPS 8.1 software was used to post-process the data and create 2D and 3D bathymetric surfaces. The area of study is located within Dingle Bay and immediately south of the Blasket Islands where the seafloor ranges from a depth of 20 to 100 m. The various features studied within Dingle Bay (outcrops, joint systems, and folds) show compressional forces acting both NW-SE and NE-SW, representing the Caledonian and Variscan Orogenies, respectively. The main deformational event that has shaped the geomorphology of Dingle Bay appears to be the Caledonian orogeny in the late Cambrian to mid-Devonian.
43. Convex Solubility Parameters for Polymers
Benjamin Stephens, Department of Chemistry and Biochemistry

Solubility parameters are certain measurable quantities that are observed to influence the ability of a solvent to fully dissolve a polymer. Current theory indicates that the dispersion energy, the dipole interaction, and the hydrogen bonding of the material are of critical importance, and each material has coordinates in a three-dimensional parameter space. The Hansen Solubility Parameters of a polymer are taken to be the center of the sphere of best fit of the coordinates of the good solvents in the parameter space. We propose a new method computing solubility parameters of a polymer that employs the convex hull of the good solvents in the parameter space and describe several alternatives for the computation of the convex solubility parameters of that polymer.

44. Histological analysis of adipose tissue in the tail of American alligators exposed to tributyltin in ovo
Nolan Barrett, Department of Biology

Tributyltin (TBT), a chemical used as an antifouling agent, gained attention after studies linked TBT-exposure to imposex in gastropods and obesogenic properties in mammals by stimulating the PPARγ-RXRα heterodimer signaling pathway. The developmental and obesogenic effects of TBT have not been investigated on Alligator mississippiensis (American alligator). At developmental stage-19, the collected eggs were given a single dose of 0.5 μl /g egg weight ethanol, 0.2 μg /g egg weight TBT, or 0.625 μg /g egg weight rosiglitazone. At one-week-old, the alligators were euthanized and necropsied. In a comparison between hatchlings' and one-week-olds' morphometric measurements, the regression of the tail girth index in the TBT-exposed group was significantly higher as compared to the control group. The tail adipose tissue was histologically analyzed to evaluate morphological alterations such as the number of adipocytes. The results showed that there were no significant changes in the number of adipocytes across the treatments.
45. **Investigation of Structural Plasticity Elicited by Cocaine within the Prefrontal Cortex of Rats**

Steven Lander¹, Ben M. Siemsen², Patrick Mulholland², Jonathan Koerber², Peter Kalivas² and Jacqueline F. McGinty²

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

Pre-clinical models of cocaine self-administration (SA) suggest dysregulation of the dorsomedial prefrontal cortex (dmPFC) to the nucleus-accumbens core (NAc) initiating relapse to drug-seeking. We have previously shown that cocaine SA decreases phospho-protein signaling in the dmPFC two hours after the final SA session, suggesting a reduction in synaptic transmission and shrinkage of dendritic spines. The present study investigated whether cocaine SA alters apical spine head diameter and density in the dmPFC during the two-hour timepoint. Rats self-administered cocaine for 14 days then were perfused two hours after the final session; brain slices containing the dmPFC were cut. Images of individual apical dendrites were then taken from layers V and II/III. Preliminary data indicates that cocaine SA decreases apical II/III spine density and decreases spine head diameters of layer V pyramidal neurons. We predict that this alteration plays a role in facilitating relapse due to decreases in synaptic activity during early withdrawal.

46. **Ranking Coaches To Help Predict March Madness**

Steve Gorman, Department of Mathematics

Despite there being many different types of predictive models to create brackets for March Madness, most don't take into consideration the value of a good coach. In order to take this into account, a simple method of evaluating and quantifying the strength of a coach was developed, called "Coach Ratings". This poster will discuss the creation of Coach Ratings in addition to it's effectiveness at picking out potential upset years and building a better March Madness bracket.

47. **Heme Analysis by Liquid Chromatography-Mass Spectrometry**

Nicholas J. Harris, Elizabeth H. Blankenship and Jennifer L. Fox, Department of Chemistry and Biochemistry

Heme is an essential cofactor required for function of the mitochondrial electron transport chain (ETC). The protein complexes of the mitochondrial ETC utilize heme cofactors with different functional group modifications of the porphyrin ring, designated heme A, B, and C. To analyze the heme content of mitochondria, we sought to develop a sensitive and reproducible method using liquid chromatography-mass spectrometry. Challenges included the need to avoid the use of trifluoroacetic acid, the low solubility of heme at low pH, and adapting literature heme extraction and liquid chromatography methods designed for use with visible absorbance detection to the mass spectrometer.
48. Analysis of Amino Acid Residues Essential for Function of Heme A Synthase

Nicholas G. Taylor, Nicholas J. Harris, Oleh Khalimonchuk and Jennifer L. Fox, Department of Chemistry and Biochemistry and University of Nebraska Department of Biochemistry

Heme A is an essential cofactor required for function of the mitochondrial electron transport chain. This cofactor enables electron transfer within cytochrome c oxidase to reduce molecular oxygen to water and to help establish the protonmotive force needed to drive ATP synthesis. The heme A cofactor is synthesized from heme B precursor by the successive actions of the heme O and heme A synthases, which respectively incorporate a farnesyl and aldehyde modification to the porphyrin ring. However, the enzymatic mechanisms of these biosynthetic processes remain debated, and recent discoveries suggest additional roles for the heme A synthase. We investigated this enzyme by expressing mutants in the eukaryotic model organism Saccharomyces cerevisiae and determined the effects of mutations on enzyme structure and function.

49. Lumican Emerges as a Potential Regulator of Cardiomyocyte Hypertrophy Using a Developmental Approach

Lorna Doucette, Loren Dupuis, Matthew Berger, Samuel Feldman, Shukti Chakravarti, Amy Bradshaw and Christine B. Kern, Biology Department

The maturation of cardiomyocytes and the extracellular matrix (ECM) occurs simultaneously in postnatal development. Collagen assembly is required to maintain a healthy mature heart but not all patients with collagen-related disorders have mutations in genes directly related to collagen. The role of the small leucine rich proteoglycan (SLRP), lumican that binds to collagen is investigated here. Lumican was immunolocalized in the cardiac ventricles beginning at E10.5. A significant number of mice homozygous for the lumican gene (C57BL/6) died at postnatal day 0 and had increased ventricular myocardium. There was no significant increase in proliferation at E17.5, E18.5 or P0. However the myocardial cell size at P0, 1 month, and 4 months was significantly increased in lumican null mice compared to wild type littermates, suggesting myocardial cell hypertrophy had occurred. These data propose that lumican may play a critical role in the maturation of ECM which controls eutrophic growth of cardiomyocytes.

50. Mopidy

Laura Barber, Cameron Beacham, Michael Blackburn and Ron Zielaznicki, Department of Computer Science

Music has slowly become more and more integrated into our lives as technology grows. Originally, music was static, meaning it only came from one source, but now, music can be from streaming services like Spotify, Pandora, Soundcloud, etc. or local files on whatever device is playing the music. This makes it much trickier to get access to all of your music at once. Mopidy solves this issue by separating the client from the backend controlling your music. This makes your music library extensible and allows you to aggregate all your music sources into one. Additionally, Mopidy uses MPD clients that take Mopidy’s content and delivers it to the device
you are using in the format you want. This poster will show our teams contributions to the Mopidy open source project.

51. Opening Apache Open Office

Logan Minnix, Erik Engstrom, Kenneth Startin, Patrick Lynn and Nicholas Bechtol, Department of Computer Science

Apache OpenOffice is an open source productivity suite. As a team, we have joined the community and have contributed to the project by fixing bugs, improving documentation, and adding features. This involved downloading and installing the source code for OpenOffice, getting it running, and also being able to run and debug the code in our Eclipse IDE. The first bug fixed dealt with differentiating between two shades of blue that had been misrepresented in the color palette. The second entailed removing links to older search engines that were no longer in use. The third bug was much more involved. The word count function in the Writer module was malfunctioning and needed to be fixed. In our fourth and final bug, we added a new feature to the Writer module. We added shortcut keys to quickly increase the font size of a selected text segment.

52. Using Confounder Correcting Orthogonal Projections to Latent Structures (ccO-PLS) to classify high-dimensional data sets with small sample sizes

David Moore and Paul Anderson, Department of Computer Science

Predicting biological phenotypes from next-generation high-throughput data sources is essential to bioinformatics. However, confounding variables such as gender, age, and habitat can skew the results of such data, leading to biased and inaccurate results. While work has already been done to create a confounder correcting method in Support Vector Machines by Li et. al, there is no such method available for a classification algorithm suited for high-dimensional data sets with small sample sizes (d >> n). We have extended Li et. al’s confounder correcting algorithm for Support Vector Machines (ccSVM) to allow Orthogonal Projections to Latent Structures (O-PLS) to account for confounding variables. We demonstrate that our novel method improves the accuracy of a non-confounder correcting O-PLS implementation, and that it is better suited to datasets that exhibit the d >> n pattern than the ccSVM.

53. The Effects of Cocaine on Cue-induced Drug Seeking Leading to Relapse

Mallory Mulvaney, Sade Spencer, Constanza Garcia-Keller, Doug Roberts-Wolfe and Peter Kalivas, College of Charleston Department of Psychology and Program in Neuroscience and the Medical University of South Carolina Department of Neurosciences

Chronic cocaine usage induces an increase in nucleus accumbens core (NAc) medium spiny neuron (MSN) spine head diameter. These changes, designated as transient synaptic potentiations (t-SP), occur at variable times during reinstatement. The longer latency in expected t-SP allowed us to hypothesize that cocaine-priming suppresses the initial t-SP. Rats were trained to self-administer cocaine paired with cues for 10 days. Following extinction, a modified
reinstatement schedule was imposed where the rat was exposed to 10 min of cues with no cocaine access followed by 45 min with access. Rats were sacrificed at various intervals to demonstrate that upon access, the increase seen in MSN spine head diameter is reversed. This reaffirms that cocaine promotes an increase in dopamine release in the NAc, thus removal of this access increases drug seeking behaviors. This research is pertinent to finding a treatment for addiction as the reinstatement schedule resembles the human phenomenon “relapse”.

54. Comparison of Salt Withdrawn Basins on the Louisiana Continental Shelf, Northern Gulf of Mexico

Megan Jackson and Leslie R. Sautter, Department of Geology and Environmental Geosciences

Multibeam sonar data of submarine basins were analyzed along the continental shelf in the Northern Gulf of Mexico, an area known for its numerous salt domes (diapirs). The sonar data were collected in 2014 using a Kongsberg EM302 aboard the NOAA Ship Okeanos Explorer. Three areas of the region off the Louisiana coast were studied and consist of diapirs and several small basins, referred to as salt withdrawn basins. Depths of these basins were measured along with each basin’s short and long axes. A comparison of the axis ratios to basin depths showed depth does not affect the basin shape. Several of the basins measured were nearly circular with varying depths. Backscatter intensity analysis was performed on three basins of varying depths and showed no relationship between basin bottom hardness and basin depth.

55. Geochemical Fate and Transport of Antidepressants in Natural Soils

William C. Vesely, Larissa R. Almeida, Ashleigh N. Kirker and Vijay M. Vulava, Department of Geology

Unintended exposure to antidepressant medications have become a worldwide concern due to increasing presence in water resources. They are discharged from wastewater treatment plants in trace levels resulting in soil, sediment, and groundwater contamination. Trace levels of three antidepressants: fluoxetine (Prozac), sertraline (Zoloft), and bupropion (Wellbutrin) have been reported in natural streams. The main objective of this study was to determine sorption and transport behavior of these antidepressants in natural soils. Sorption and transport experiments were conducted using two types of natural soils – organic rich A-horizon and clay-rich B-horizon soils. The antidepressants were measured using UV-Vis and HPLC techniques. Sorption isotherms were nonlinear and fit using Freundlich model. The data showed fluoxetine and sertraline sorbed more strongly to the B-horizon soil while bupropion sorbed more strongly to A-horizon soil. Fluoxetine and sertraline preferentially sorbed with negatively-charged clay minerals in B-horizon soils. Bupropion sorption behavior suggests partitioning into organic-rich A-horizon soils.

56. The impact of P3HT molecular weight and solvent composition on P3HT films processed from binary solvent mixtures

Lawson T. Lloyd, Madeline P. Gordon and David S. Boucher, Department of Chemistry and Biochemistry
Polymer assembly and organization into well-defined nanostructures is of great interest for organic photovoltaic applications. We have studied the assembly and crystallinity of two regio-regular poly(3-hexylthiophene) (P3HT) samples, Mn » 28 kDa and Mn » 65 kDa, in several different binary mixtures of organic solvents. We use an excitonic coupling analysis of the UV/Vis absorbance spectra to assess the impact that the solvent and the molecular weight of P3HT have on the relative structural order of the polymer assemblies. In addition, we investigate the influence that the solvent composition and the structural order of P3HT aggregates have on the assembly and organization of P3HT films. We use optical and atomic force microscopy techniques to study thin films of P3HT processed from different solvent mixtures. Our results show that relatively small variations to the P3HT solutions can produce significant changes in the morphology and macromolecular structures of the P3HT films.

Best of Physics and Astronomy 57. Diurnal Evolution of the Statistical Structure of Near Surface Wind

Alexis Payne and Mike Larsen, Department of Physics and Astronomy

Near surface wind’s power spectrum was studied with a focus on how it shifts through a diurnal cycle. Data were acquired using three sonic anemometers to gather wind speed and temperature. For each of the 26 days studied, the data were partitioned into four disjoint six hour intervals. It was apparent that wind’s power spectrum does go through a diurnal shift. However, the transition still preserves statistical structure. Nevertheless, small changes were evident in the power law exponents, for sunrise it was -1.64±0.06, for day it was -1.68±0.02, for sunset it was -1.47±0.15, and night’s was -1.33±0.07.

58. Wreck this Calculus Book

Kaitlyn Manley and Amy Langville, Department of Mathematics

Many students are frustrated by their Calculus textbooks, finding them to be dry, formulaic, and uninteresting. These students end up memorizing definitions for tests, without ever learning how to appreciate the conceptualizations behind the polished texts. These students will often ask, "Why do we need to learn Calculus?" or "How is this useful to me?" Professor Langville started writing her "Wreck this Calculus Book" series with the goal of instructing students in a way that they can understand the "traces of investigation" made by the discoverers of calculus. Using hands-on activities, challenge and conceptual problems, graphic novellas, pictures and diagrams,
and stories of the history of mathematics, the "Wreck this Calculus Book" series has flourished, with five potential works in progress, including two nearly-complete books covering Calculus 1 and Calculus 3. This poster will show examples of the types of activities and pages in her books, and explain why books like these are needed.

59. Bathymetric Analysis of Axial Seamount's Southeastern Flank, Juan De Fuca Ridge

Anna DeGeorge and Leslie Sautter, Department of Geology and Environmental Geosciences

Multibeam sonar data were acquired aboard the R/V Thomas G. Thompson. Axial’s southeastern flank exhibits a unique topography that is a direct result of the geological implications and processes associated with extrusive eruptions and seismic activity. Through this study, we found that the flank is characterized by terraced lava flows. The feature has layers that extend from the caldera to the base and all vary in depth ranging from ~1450 to 2500 meters. The second area studied was a cluster of small seamounts located at the base of the flank. The seamounts sit in a linear pattern and all have the same general morphology. These six seamounts range in depth from ~2400 to 2500 meters. Backscatter analysis showed that the shorter seamounts are primarily composed of hard rock, most likely basalt, and the taller seamounts are composed of soft substrate, most likely sand, mud, and silt deposited on the seafloor.

60. Extending deep neural networks to multi-way classification

Kellan Fluette and Paul Anderson, Department of Data Science

Deep learning models that capture high-level abstractions in data often outperform standard models for classification problems. On large datasets, significant gains in classification accuracy can be achieved by using computationally efficient non-linear transforms, such as using deep neural networks (DNNs) or stacked denoising autoencoders (SDAEs), to model higher-level abstractions in the data before using standard models for classification on the transformed dataset. Le et al. have developed Fastfood, a method for approximating kernel expansions in loglinear time; kernel expansions are performed in neural networks and must be calculated for every pair of training samples–this quickly becomes costly for large datasets, and is partially resolved by using Fastfood kernel expansions. As the existing paper describes using Fastfood optimized neural networks (FONNs) for binary classification problems, we extend the algorithm such that it can be applied to classification problems with more than two classes using a logistic classifier.
61. Galaxy Classification Using Deep Belief Networks

Alexander Jacobs and Paul Anderson, Department of Computer Science

The massive number of galaxies in the universe poses a central problem for astronomers and requires novel techniques to be used for classification. To cope with the vast amounts of data created by modern observations, past research organizations, specifically Galaxy Zoo (part of the citizen science project, Zooniverse), have crowd-sourced morphological classification techniques, inviting members of the public to log onto a website and classify the data. The technique has been effective, but we hypothesize that we should be able to apply machine learning techniques to classify the data as well as humans. We analyze the performance on this classification task for a deep learning neural network constructed by stacking restricted Boltzmann machines on top of one another, also referred to as a deep belief network.

62. The Roles of MMPs and nNOS in Animal Models of Heroin Reinstatement

Emily Berich, Alexander Smith and Peter Kalivas, Department of Psychology and Program in Neuroscience, College of Charleston, and Department of Neuroscience, Medical University of South Carolina

Proteins necessary for the neuronal plasticity that characterizes addiction include matrix metalloproteinases (MMPs) and neuronal nitric oxide synthase (nNOS). We explored the effect of pharmacologically inhibiting MMP-9 and nNOS in a brain region critical to addiction, the nucleus accumbens (NA), on reinstatement behavior and MMP activity. Following heroin self-administration, rats received intra-accumbens injections of either MMP or nNOS inhibitor prior to reinstatement, a quantifiable model of heroin relapse. Behavior analysis revealed that MMP-9 inhibitor attenuated reinstatement-associated lever pressing, \(p=0.2659\), suggesting MMP-9 is necessary for heroin relapse. Furthermore, in vivo zymography data suggested that microinjections of nNOS inhibitor, but not MMP-9 inhibitor, led to lower levels of MMP activity than contralateral microinjection of vehicle \(t_4=3.692, p=0.021\), indicating that nNOS is necessary for the MMP upregulation associated with heroin reinstatement. These data implicate an important role for MMP-9 and nNOS in neuronal plasticity related to heroin relapse.
63. Are You a MAHT Person? MAHT, a novel genomic approach to study the stability of human tRNAs.

Ariel McShane, Eveline Hok, Jensen Tomberlin and Renaud Geslain, Laboratory of tRNA Biology, Department of Biology

Genetic translation is the universal mechanism that allows the biosynthesis of cellular proteins; some of the most prominent actors in this process are transfer RNAs. Paradoxically, little is known about the stability of individual tRNA species because of the practical challenges that represent precise and systematic tRNA identification. This work describes a new technical and conceptual in vivo approach named MAHT (Microarray Analysis of Human tRNAs) designed to study the stability of human tRNA at the genomic level. The overall half-life for the entire pool of human tRNAs was estimated at 43 hours, suggesting that most tRNAs are passed down from parent to daughter cell during cell cycle. Interestingly, five tRNAs, specific to Leu, Gly, Glu, Pro and His amino acids were found to be significantly less stable. The role of posttranscriptional modifications on tRNA stability is currently under investigation.

64. How noise influences the interval timing clock

Derek Novo¹, Sorinel Oprisan¹ and Catalin Buhusi²

¹ Department of Physics and Astronomy
² Department of Psychology, Utah State

The ability to accurately and reliably estimate the passage of time in the supra-seconds range (interval timing), is critical for cognitive processes like decision making, rate calculation, and planning. A timed response in this temporal range typically follows a Gauss-like curve centered at the time being estimated (criterion time) and with a standard deviation proportional to the criterion time. We used a computational model that mimics the activity of some neurobiological structures known to be involved in interval timing. In our model, the output of the network is determined by the coincidence between the state of the network at the reinforcement time and the current activity. We found that small fluctuations of the network’s parameters have specific signatures that allow us to identify the source of noise.

65. Graphical User Interface for Beets

Derek Novo, Andrew Hanold, Jason Houston and Carter Wooten, Department of Computer Science

Beets is a free and open source music organizer that aims to give the user exceptional control over manipulating and accessing his or her music library by utilizing metadata. Beets catalogs the user’s music collection and improves its metadata upon continual use by exploiting the MusicBrainz database. Before this work, the user was required to evoke Beets’ functionality via command line operations. We are currently implementing a workable Graphical User Interface (GUI) for both novice users and an overall more intuitive experience. Here, we discuss the requirements analysis involved in developing this GUI. Specifically, we examine the
requirements analysis involved in designing the import function, which moves music to the user’s desired directory. Since this function can be customized with a tag suite on the command line, we aim to retain this flexibility in our GUI.

### 66. Blockade of Stress Related Neuropeptides Reduces Binge-Like Drinking in Male C57BL/6J Mice

Clark Phelps, Rachel Anderson, Marcelo Lopez and Howard Becker, College of Charleston Department of Biology, Charleston Alcohol Research Center, Department of Psychiatry and Behavioral Sciences-Medical University of South Carolina and Ralph H. Johnson Veterans Administration Medical Center

Alcohol abuse is one of the most preventable health problems facing society. Mouse models are useful for testing drugs that may reduce excessive alcohol consumption. In this experiment we examined the effects of two drugs that have been recently shown to play a large role in stress modulated drinking, a κ-opioid receptor (KOR) antagonist and a corticotropin releasing factor (CRF) antagonist on binge-like drinking using the drinking in the dark model (DID). In the DID model the mice were given access to alcohol for 2 hours for 3 consecutive days, followed by a 4th test day when we administered the drug prior to 4 hours of access to alcohol. We also tested both drugs with sucrose drinking and activity monitoring boxes to see if they were selective for alcohol. KOR antagonists appear to be a great candidate to treat excessive alcohol consumption, while CRF antagonists appear to have nonselective effects.

### 67. Comparison of Effectiveness of Convolutional Neural Networks

Daniel Hurlburt and Paul Anderson, Data Science/Computer Science Department

There has been a great push in recent years to allow computers to make sense of the vast amounts of data which exist around us. Tasks of allowing computers to make meaningful associations and classifications are becoming increasingly important, and great strides have been made in recognition tasks because of advancements in convolutional neural networks, which perform recognition by using overlapping input fields. The layers of the network provide continually higher-level features until a classification can be made. After studying these networks, the question of their strengths and weaknesses in evaluating different types of datasets became a question. To that end, we tested convolutional neural networks on a variety of image datasets to compare its relative effectiveness.

### 68. Post OP

Michael Andino, David Amick, Miller Fanning and Ryan Sprowles, Department of Computer Science

There are very few, if any, open source social media applications. This led to the development of a new project known as Post OP. Post OP is an open source social media grouping application. The application was designed to allow the user to post statuses, images, and view live feeds for all of their selected social media sites. The application runs on AppJS and uses a SQLite
Database, allowing the application to be multi-platform. The process begins by saving user login credentials into the database as a way to persist login data. After the user has successfully logged in, the application retrieves the specific API and uses node.js to post and receive requests from the respective social media site. The user has the ability to post to any and/or all social media sites at once through a single request. The results of this project have proven that open source social media integration is possible though very difficult.

69. Analysis of Terracing and Geomorphology of the Florida Escarpment

Sarah Chahin and Leslie Sautter, Department of Geology and Environmental Geosciences

Multibeam data were collected on the NOAA Ship Okeanos Explorer in 2011 and 2014 and post processed with CARIS HIPS to investigate the terracing features present in two study areas on the Florida Escarpment. Study area 1 showed that the terracing features have gradual relief descending down the platform, but has a higher relief with near-vertical drops (100-400m) at the region of the area where terraces are present. A second study area showed similar features, although the relief in this location was more exaggerated and terracing started at a shallower depth with drops between 500 and 900 m. Backscatter data shows that in the locations where terracing is present, there is hard rock exposed, which is likely limestone. The forces affecting the geomorphology of the terraced features are turbidity currents, slope failure, ground water sapping, exfoliation and undercutting, and biogenic methane seeps.

70. Noise and Distortion in Mental Imagery

Katie Lynam and Thomas Naselaris, Department of Biology and Program in Neuroscience, and the Medical University of South Carolina Department of Neuroscience

fMRI studies show that visual perception and mental imagery are related, but not identical. In this study we show that it is possible to model and compare these processes using a simple visual task. We also attempt to determine the causes of error in mental imagery, which we believe is a result of noise and distortion. Subjects were shown an image on a computer and asked to remember it. Then they were shown probes and asked to count how many objects the probe covered in their mental image. Afterwards, a perception trial was conducted in which the probes and image were presented simultaneously. We found that there are differences between imagery and perception, mainly due to distortion. In addition, we created unique pictures representing each subject’s mental image and perception. Understanding these two processes can help explain errors in memory and improve treatments for mental disorders associated with mental imagery.

71. Method Development for Metabolomic Analysis by LC-MS

Elizabeth H. Blankenship, Wendy C. Cory and Jennifer L. Fox, Department of Chemistry and Biochemistry

Specific metalation of metalloproteins is crucial for many biochemical functions and depends on well-regulated metal transport and intracellular storage processes, including mechanisms that are less than fully understood. To investigate metabolic differences experienced by cells in response
to varying metal ion availability, we developed methodology for metabolite extraction of *Saccharomyces cerevisiae* and analysis by ultra high-performance liquid chromatography-mass spectrometry. These methods and the reproducibility of results from independent biological samples are presented here.

### 72. Fungal and bacterial composition of sea turtle nest sand at Ostional, Costa Rica

Morgan Larimer, Kristina M. Hill-Spanik, Vanessa Bezy and Craig J. Plante, Department of Biology

Olive ridley sea turtle hatching success is lower at mass nesting beaches than at solitary nesting beaches, presumably due to the high microbial activity that results from decomposing eggs crushed by overlapped nesting. Higher microbial activity at these sites increases temperature and decreases oxygen availability, potentially interfering with embryonic development. To discount specific pathogens or fungal invasions as possible causes of embryo mortality, a comparison of microbial species composition and diversity in areas of high and low survival was conducted using PCR-DGGE. Preliminary results indicate no statistically significant difference between the fungal communities of the sample sites. The bacterial component of this research is ongoing. Additional analyses (i.e. band excision and DNA sequencing) are also planned.

### 73. Solvents, micelles, and random proteins: Are they different from computationally-designed Kemp eliminases?

Enis Sanchez and Marcello Forconi, Department of Chemistry and Biochemistry

De-novo computationally-designed enzymes can produce significant advancements in our ability to break down pollutants and cure diseases. The most promising enzymes are Kemp eliminases, which speed up the Kemp elimination reaction of 5-nitrobenzisoxazole by 10^{17}-fold using active site carboxylates as the general base. The factor of acceleration by the nonpolar solvent acetonitrile suggests that simply partitioning the substrate in this protein’s hydrophobic interior catalyzes the reaction. We used micelles and long-chain carboxylates or phosphates to simulate this protein’s core. These simple model systems accelerated the reaction by 10^{4}-fold. Linear-free energy relationships suggest that the rate acceleration is due to the loose positioning of the substrate’s reactive groups rather than specific interactions between the substrate and the micelle or enzyme. The natural enzyme ketosteroid isomerase (KSI) possesses an active site capable of accommodating 5-nitrobenzisoxazole and significantly accelerates Kemp elimination. We are currently using site-directed mutagenesis to investigate this enzyme’s mechanism of action.
74. Roles for the complement anaphylatoxins C3a and C5a in regulating tumor immunity following radiation therapy

Colleen Quaas\textsuperscript{1,5}, Merry Andersen\textsuperscript{1,5}, Andrea Whitfield\textsuperscript{2}, Andrew Ellis\textsuperscript{3}, Mario Fugal\textsuperscript{3}, Kenneth Vanek\textsuperscript{3}, Melissa Scheiber\textsuperscript{1,4,5} and Stephen Tomlinson\textsuperscript{1,3}

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The complement system, comprised of over 30 soluble and cell surface proteins, is a vital component of the both the innate and adaptive immune systems. Complement activation leads to the generation of pro-inflammatory anaphylatoxins, C3a and C5a. These pro-inflammatory mediators have been shown to promote tumor growth. Using a mouse model of subcutaneous lymphoma (EL4), localized radiation therapy (RT) was shown to significantly reduce the tumor growth rate and increase survival in C3aR/C5aR knockout (KO) mice compared to wild-type (WT) mice. Thirty-seven days post initial RT, 66.7\% of the KO that received RT had no detectable primary tumor. These six mice were re-challenged with EL4 cells. After an additional 37 days, 5 of the 6 re-challenged KO mice had no detectable primary tumor, suggesting an anti-tumor memory response. Further studies are needed in order to confirm and determine the mechanism(s) responsible for this anti-tumor immune response.

75. Using an Accumulation Contribution Fraction to Investigate Rainfall

Joshua B. Teves and Michael L. Larsen, Department of Physics and Astronomy

Using a dense optical rain gauge array near Charleston, SC, a novel measure of rain is used to categorize and analyze storm behavior. Using 14 non-overlapping raindrop diameter ranges, the fraction of each size category's contribution to overall accumulation is determined. This "accumulation contribution fraction," $f_a$, is calculated each minute over both a summer and winter storm. The diameter range with the largest $f_a$, $M_a$, was determined for each minute. Assuming a Marshall-Palmer distribution, the theoretical $M_a$ was determined. Both theoretically and observationally, $M_a$'s were determined. Strong agreement was found for the winter storm. In the summer storm, however, the theoretical $M_a$ largely underestimated the observed $M_a$. 
76. **AquaTerra ArcGIS Plugin**

Nico Buescher, Christina Carmack, Caleb Whitaker, Zach Campbell and Thomas Mims, Department of Computer Science

AquaTerra is a plug-in that interfaces with the ArcGIS geographical mapping software provided by Esri. The AquaTerra toolbox prototype was developed by James M.L. Newhard, Norman Levine, and Angelina Phebus. The purpose of AquaTerra is to map out Terrestrial and Marine Communication Routes between two points on a map given a GeoDatabase. Our team has adapted and refactored the prototype with the intention of providing the modified AquaTerra python toolbox to the public as free and open source software that can be further modified. As a result the newly refactored AquaTerra is on GitHub ready to be collaborated on by an interested community.

77. **Scanning Electron Microscopy Analysis of El Guapo Chimney**

William G. Dennis-King, M. Montgomery Taylor, Robert L. Nusbaum and Leslie R. Sautter, Department of Geology and Environmental Geosciences

El Guapo is an active hydrothermal vent located along the Juan de Fuca ridge ~300 miles off the western coast of Oregon. A small (1-m) inactive, parasite vent was collected from the base of El Guapo during the 2013 VISIONS’ 13 expedition led by University of Washington. Two cm-sized flat segments were prepared for imaging and elemental analysis using a Tescan Vega3 Scanning Electron Microscopy (SEM) equipped with an energy dispersive (EDS) system. SEM/EDS analysis revealed textural and compositional variation between the two samples: one from the (vent) center and the other closer, but not at, the vent edge. The “central vent” sample consisted of colloform mafic glass with intergrowths of 20 micron Zn-sulfide euhedra. The “closer to the edge” sample also exhibited colloform and amorphous masses of mafic glass along with disseminated 1-micrometer Zn-Fe sulfides. These observations may reflect temperature variation within this small vent when it was active.

78. **Open Source: Diving into Firebug & CodeCombat**

Adam Sugarman, Jose Gonzalez, Will McCaskey and Scott Hallman, Computer Science Department

Taking a step into the world of open source software can be overwhelming and hard to fathom for developers of any level. Four students dove into two different projects, Firebug and Code Combat. Firebug is a widely adopted extension to the popular Mozilla Firefox, allowing an extension to the built in web development tools to allow users to see any Javascript, HTML, Net requests, and CSS of any webpage live as they use it. Code Combat is a multiplayer strategy programming game aimed to teach users how to code through a interactive game played in any browser. While we experienced many failures in the Firebug project, we had much success contributing to Code Combat. Our poster will highlight our learning points from diving into the world of open source software and show our success in becoming contributors to projects used by millions.
79. Properties of the Coosawhatchie Clay of Jasper County South Carolina

Katie Faust and Robert Nusbaum, Department of Geology and Environmental Geosciences

Two specimens from stratigraphically adjacent beds of the Coosawhatchie Clay Member from the Hawthorn Formation were collected from Dawson’s Landing in Jasper County, South Carolina. The Hawthorn Formation is from the Miocene-Pliocene Epoch and displays prominent outcrops in Florida, Georgia and South Carolina. Using an ASD spectroradiometer and observation of expansion qualities, it was determined that the clays were montmorillonite-rich. Further investigations using a scanning electron microscope for textural and chemical analysis supported this claim and provided possible explanations for why the two samples behaved differently. The upper clay sample is rich with diatom fragments while the lower sample exhibits almost none. The results are consistent with a literary analysis that suggests a marine depositional environment for montmorillonite and the silica required for the abundance of diatoms. While no glass shards were observed as evidence of volcanic tephra, high silica and montmorillonite are consistent with a source of distal volcanism.

80. Hacking Brackets - Contributing to an Open Source Web Development Text Editor

Nora Grossman, Katherine Vaughan, Courtney Profera and Venessa Johansen-Barrera, Department of Computer Science

Brackets is an open source text editor meant to simplify and enhance the web development experience. Described as a “code editor for HTML, CSS, and Javascript that’s built in HTML, CSS, and Javascript”, Brackets supports a wide range of customization as well as live preview functionality for user interface development. Throughout the semester we have contributed to the project in a variety of ways, from fixing existing bugs and reporting new ones to extending the existing functionality to support syntax highlighting for additional programming languages and writing new visual themes. Although bug fixes are considered the de facto manner of contribution to an open source project, Brackets provided us with several different ways to support this vibrant development community, demonstrating that there are many different but equally valuable skill sets needed to create and maintain an open source project.

81. Phenotypic effects of multinutrient treatments on model plant system Arabidopsis thaliana

Elsa A. Cousins, Clare Kohler, Rebecca J. Balazs and Courtney J. Murren, Department of Biology

Root system architecture (RSA) and aboveground phenotypic components can be jointly and independently responsive to nutrient stress and can vary among populations. Ten worldwide natural accessions and five lines per six Iberian populations were grown in replicates under four nutrient treatments. We collected data on bolting date, rosette diameter and height. After harvest, additional aboveground data were collected and roots were scanned for RSA analyses. Phenotyping for this experiment is ongoing. Different nutrient levels result in distinct differences in RSA and aboveground traits. We
detected genetic variation among populations for above and belowground traits. Low nitrogen treatments inhibited root growth across the lines and produced smaller rosette diameters, but some populations experienced milder effects. Studying natural variation and understanding stress tolerance in Arabidopsis provides insights into environmental responses that can be applied across plant species, especially those of agricultural significance.

82. Gene Expression Analysis of Candida glabrata Following Exposure to Complement-Derived Antifungal Peptides

Mary Alice Cummings¹,², Silvia Vaena de Avalos² and Caroline Westwater²,³

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

Candida species are the most common fungal pathogen of humans. The goal of this study was to use a candidate approach to identify the intracellular events that are critical for complement peptide killing of Candida glabrata (Cg). We used the nanoString nCounter System, a technology that digitally measures target mRNAs, to identify processes that are altered in Cg cells treated with complement peptide. Cg was incubated in the presence or absence of sub-lethal complement peptide and isolated RNA was mixed with a custom-designed nanoString probe set. For each experiment, raw counts were adjusted for technical variability, and then normalized for total input RNA, using the geometric mean of robustly expressed genes. A number of Cg genes in the probe set were altered when the treated and untreated datasets were compared. Future studies will validate the gene expression data and evaluate mutants lacking the identified genes for susceptibility to complement peptides.

83. Applying Principles of Physics and Meteorology to Sea Fog and Rip Current Forecasting

A. Clayton Caulder and B. Lee Lindner, Department of Physics and Astronomy, and Peter J. Mohlin, National Weather Service, Charleston

Coastal hazard prediction can provide a unique challenge for weather forecasters because it involves a wide range of atmospheric and oceanographic processes and potential interactions between them. I explore potential summer research projects using National Weather Service data pertaining to sea fog and rip currents. I will document events of dense sea fog for correlation with various oceanographic and atmospheric data including air temperature, ocean temperature, wind speed, and temperature inversions. For rip current prediction, I will correlate the significant wave height and dominant period of offshore wind waves with the height of breaking waves on the coastline.
84. Salinity Tolerance in Southern Toads

Emily Beam, Department of Biology

Anthropomorphic activities are altering natural environments all over the world with direct implications for organisms and their choice of habitat. The use of road salts to de-ice roads and agriculture have all introduced a higher level of salinity to surrounding areas than what would naturally be present. This presents a direct challenge, as it is known that amphibians have specific ranges of salinity tolerance and are poor osmoregulators. For the southern toad, Anaxyrus terrestris, a coastal organism, adults have been shown to have a range of tolerance for differing salinities while previous studies have provided evidence supporting a very limited tolerance of tadpoles. Obviously, salinity tolerance varies between life stages. This research seeks to understand how physiological and behavioral responses to salinity vary from tadpole, to metamorph, to adult life stages. This would work to better assist conservation as it is important to denote which specific life stages are most imperiled.

85. Body Condition of African Elephants

Emily Beam, Department of Biology

Body condition of individuals relates directly to foraging success and health, and therefore is an important tool for conservation. In this study, a body condition mixed model was used to assess free-ranging African elephant health and contributing factors in the Tarangire-Manyara Ecosystem in three protected areas. Seasonality was the largest factor—the average body condition score in the dry season was more poor than scores in the wet season. Another contributing factor was location. The highest body condition scores were found in Lake Manyara National Park, then Manyara Ranch, then Serengeti National Park, and lastly, Tarangire National Park. In the United States, captive elephants were also assessed based on body condition. Though the sample size was small, it was found that out of three locations, a sanctuary environment had higher mean body condition scores than zoo environments.

86. Geomorphology of Lighthouse and Turneffe Fore-Reefs: Exploration using Backscatter

Kristin Hughes and Leslie Sautter, Department of Geology and Environmental Sciences

Deep sea corals are known to form in areas with a topographically enhanced bottom composed of a hard substrate on which attachment is possible. Bathymetric data were acquired for areas of interest in search of deep sea corals from the deep-water eastern flank, or fore-reef of Lighthouse Reef Atoll and the southern fore-reef of Turneffe Reef: 2 of 3 atolls that lie on Belize’s continental margin. With depths reaching 4,000 meters, the atolls lie on submarine ridges just west of the Yucatan Basin. The deep waters of these escarpments have potential for being suitable habitats for deep-sea corals to thrive. Through this research, it is our hope to benefit future ROV exploration by mapping areas of interest in search of deep-sea coral habitats. Furthering research of these atolls is crucial for understanding the delicate, threatened ecosystems of deep-sea corals.
87. Spit Growth and Decay at Pawleys Inlet, South Carolina from 1994 to 2014

Dante Curcio, Mason Atkinson and Leslie Sautter, Department of Geology and Environmental Geosciences

Pawleys Inlet is located on the South Carolina coastline between Pawleys Island and Debidue Island. Having an ebb-tidal delta along with a strong northeast-southwest longshore current, this inlet migrates rapidly, primarily due to spit accretion on Pawleys Island. The spit can be breached by storm waves, relocating the inlet and causing accretion on Debidue Island’s north end. Google Earth historical images from 9 years between 1994 and 2014 were used to better understand how sediment fluctuates between the spit, ebb delta shoals, and the north end of Debidue Island. Following a breaching event between 1995 and 1999, Pawleys’ spit area decreased by 14,000 m$^2$, and continued to erode between 1999 and 2005, resulting in a total decrease of 39,365 m$^2$. Much of the sand migrated to Debidue Island during that time period, resulting in accretion of 22,000 m$^2$.

88. Geomorphology of Two Puerto Rico Protected Habitats

Evalynn Barbare and Leslie Sautter, Department of Geology and Environmental Geosciences

Seafloor geomorphology was examined for two distinct protected tropical habitats, located off the northeast coast of Puerto Rico within the Northeastern Grand Reserve Ecological Corridor, and off the southern coast of the nearby Isla De Vieques. These continental shelf and slope areas were surveyed in March 2013 covering depths between 25 and 1150 m. Approximately 866 species of coral reef fauna inhabit these protected areas, and concern has been raised as to their stability to withstand complications. Features of the Reserve and Vieques margins were characterized and compared, and include submarine canyons that plunge approximately 900 m, and fore-reef edges of coral reef habitat on the continental shelf. These bathymetric 2D and 3D surfaces will be useful as baseline surveys of the critical protected areas to estimate future continental shelf and slope changes.

89. Inlet Orientation Associated with Bar Bypassing and Deposition in a Barrier Inlet System: North Island, South Carolina

Nicholas C. Damm, Kristopher J. Enfinger, William L. Hefner and Leslie Sautter, Department of Geology and Environmental Geosciences

Google Earth Pro satellite imagery from 1994 to 2013 was used to examine the relationship between inlet migration and general morphology of the downdrift barrier island at North Inlet, South Carolina. Using a reference line to divide the inlet into throat and tail sections, the orientation of the deep water channel was documented for each study year. The downdrift island’s north end was divided into three equal quadrants to examine accretion and erosion trends. Orientation measurements display a southern trend from 1994 to 2010 shifting 16.91°. As the inlet movedsouthward, the Central quadrant showed an increased deposition of 31,722 m$^2$, whereas the North quadrant eroded. The South quadrant remained relatively stable until 2010 when a slight shift in tail orientation resulted in a bar bypassing event and subsequent shoal
attachment. Therefore, the inlet orientation drives the downdrift barrier island geomorphology and plays a critical role in bar bypassing processes.

90. Ebb-Delta Breaching and Swash Bar Migration at Breach Inlet, South Carolina, From 2001-2014

Cameron Troilo, Sonja Tyson, Sue Morrison and Leslie Sautter, Department of Geology and Environmental Geosciences

In South Carolina, mixed tidal and wave energy environments create an abundance of tidal inlets. Breach Inlet, located between Isle of Palms and Sullivan’s Island, influences the geomorphology of the flanking barrier islands because of channel direction and wave refraction, causing periodic shoal bypassing events due to ebb-tidal delta breaching events. Google Earth images from 2001 to 2014 were used to quantify measurements and descriptive statistics. Ebb-delta breaching and shoal migration affect erosion and accretion rates downdrift and updrift. The average total swash bar volume is 447,610 m$^3$ per year, with increased volumes occurring before breaching with shoal bypassing events in 2005 and 2010. Repeated bypassing events cause tombolo effects on Sullivan’s Island while Isle of Palms experiences accretion or erosion based on channel position. The high rate of swash bar migration causes erosion and accretion on short timescales, which inhibits full development of dune complexes on both islands.

91. Morphodynamics of Captain Sam's Inlet, SC from 1989 to 2014

Cara Lauria, Shelby Bowden and Leslie Sautter, Department of Geology and Environmental Geosciences

Captain Sam’s Inlet is a migrating ebb tidal inlet located along the central mesotidal South Carolina coast between Kiawah and Seabrook Islands. Evidence for the main inlet channel migration and pivoting is shown by accretion and erosion patterns of adjacent barrier islands. Migration of the channel southwestward was consistent throughout the study years 1989 to 2014, except for an engineered breaching in 1996. Kiawah Spit showed an average increase in area at a rate of 3.36 km$^2$/year prior to breaching and 18.49 km$^2$/year following the breaching. Accompanying the spit’s extension is a southwestern pivot of the main inlet channel at a rate of 1.91 m/year prior to breaching and 1.05 m/year following the breaching. Quantitative and qualitative measurements collected in this study reveal the morphology of a dynamic inlet downdrift of a recurved spit.

92. Synthesis and Computational Analysis of a Novel, Bis-Indenyl 'Batwing' Ligand

Carson W. Reed, Travis P. Varner and Richard A. Himes, Department of Chemistry and Biochemistry

During the synthesis and development of new carbon-carbon bonds in molecules, it is vital at times to utilize a catalyst that will exhibit some control over the reaction. The chemistry of indene derivatives bound to transition metals has proven fruitful in this area. More specifically, indenyl ansa-metalloocene complexes of titanium and zirconium have characteristic and unique
reactivities, especially for controlling the tacticity of polymer synthesis. Slight modifications of indenyl ligands have been shown to have potentially drastic effects on polymerization reactivity. Therefore, we have designed and synthesized a novel, polycyclic, bis-indenyl 'batwing' ligand through two separate synthetic routes. The steric and electronic consequences of this ligand will be explored and discussed through both experimental and DFT computational methods.


Kori Ktona and Leslie Sautter, Department of Geology and Environmental Geosciences

Multibeam sonar data of the eastern slope of Glover’s Reef atoll were collected by NOAA marine biologist Dr. Peter Etnoyer. Glover’s Reef is an atoll within the Mesoamerican Reef, located approximately 45 km east of the Belize mainland. This study of the geomorphology of the seafloor could potentially lead to a better understanding of the entire biological system of deep sea coral habitat. Sonar data were post-processed to generate bathymetric 2D and 3D images, and backscatter was used to determine the character of the seafloor, including probable locations for deep-sea corals. Results show various interesting features including canyons and depths over 2,800 meters below sea level. The seafloor characteristics that were defined using backscatter allowed for identification of potential hard-bottom locations of deep-sea coral habitats. Detecting these environments is crucial for the continuation NOAA’s work studying the deep-sea corals of this atoll.

94. Toward Developing an Expert System for Classifying Gamma-Ray Burst Pulses

Maly Taylor, Thomas Cannon, Stephen Lesage, Eric Hofesmann, Ethan Redel, Samantha Word, Jacob Epps and Jon Hakki, Department of Physics and Astronomy

Gamma-ray bursts consist of pulses that range from the simple to the complex. We can improve upon the empirical Norris pulse model by fitting the pulse residuals with the Hakkila fitting function. We apply this approach to the gamma-ray data collected by the Burst And Transient Source Experiment (BATSE). Via an expert system we determine which entries will be added to our BATSE gamma-ray burst pulse catalog. Through discussion and comparison, we identify adequate pulses for catalog inclusion; this is difficult given the low signal-to-noise of BATSE data coupled with an apparently large range of pulse characteristics.

95. The Fitting Process for Gamma Ray Burst Pulses

Stephen Lesage, Thomas Cannon, Maly Taylor, Eric Hofesmann, Jacob Epps, Samantha Word and Ethan Redel, Department of Physics and Astronomy

We present a process for modeling and fitting gamma-ray burst pulses. The bursts in this sample were observed by the Burst and Transient Source Experiment (BATSE) on NASA’s Compton Gamma-Ray Observatory. The Norris fitting function is the four-parameter model represented by two merged exponential functions. The model easily reproduces multichannel light curves of isolated pulses. However, when fitting many pulses, operator intervention is often required. In
many cases the operator must adjust the parameter settings and determine if the output the program has created a good fit, bad fit, or if the pulse structure is simply too uncertain to be fit by the model.

96. Proposed Mission to Europa

Stephen Lesage, Thomas Cannon, Ethan Schneider and Madysen Cheek, Department of Physics and Astronomy

Jupiter's satellite Europa has a liquid water ocean under its icy exterior that could harbor life. We have developed, in conjunction with UAH engineering students, a mission to Europa with the purpose of determining whether or not Europa's structure is conducive to the development of life. Upon arrival at Europa our mission will establish a polar orbit and deploy between nine and eighteen "temporary probes" as well as one large lander. The network of probes will gather seismic data for 30 days. The lander will study a previously discovered large plume of liquid water near the South Pole. The orbiter will map the surface at multiple wavelengths. Our observations will tell us about Europa's surface, interior, the chemicals on both the surface and interior, how these chemicals interact with one another, and the probability of life being able to develop and grow in a habitat such as this.

97. Analysis of Raindrop Time Series via a Size-Dependent Pair Correlation Function

Robert Lemasters and Michael L. Larsen, Department of Physics and Astronomy

There is empirical evidence that large raindrop arrival times are not perfectly random. Additionally, it has been observed that a substantial portion of smaller drops tend to be falling at superterminal velocities. The exact mechanism for these phenomena are not clear and it is uncertain whether they are related. In an effort to identify any correlation, the authors use a generalized notion of the temporal cross-correlation function for use with discrete data. This tool, which will be called the "size dependent pair correlation function" (SDPCF), is applied to data provided by a 2-dimensional video disdrometer.

98. Mycobacteriophage Pipsqueaks: The Complete Genome Annotation of a New Cluster N Phage

Heba Abdin, Victoria Edmund, Brianna Harmon, J'Neice Payne, Brandi Bell, Samaria Boyd, Samantha Bridges, Maya Dilligard, Taylor Gibson, TaMia Morris, Cherie Pitts, James Solomon and Christopher Korey, Department of Biology

HHMI SEA-PHAGES is a yearlong research-based course that allows undergraduate students to collaborate with faculty mentors and discover new scientific information. This program is run with first-year students in collaboration between the First Year Experience and the South Carolina Alliance for Minority Participation (SCAMP). In the fall semester, students isolated novel bacteriophage viruses from soil samples using a variety of laboratory tools and techniques. The bacteriophage Pipsqueaks was selected from the six phage identified in the first semester to be sequenced at the University of Pittsburgh. In the spring semester, students in the First Year
Experience Research Course explored basic annotation and bioinformatics. Pipsqueaks’ genome sequence was annotated from the 5’ to 3’ end using the DNA Master Genome Annotation Software. We identified the open reading frames based on the predicted coding potential using the annotation algorithm programs Glimmer and Gene Mark. Here we present the initial data from the annotation of this new cluster N phage.

99. Vagus Nerve Stimulation as a Treatment for Parkinson's Disease

Donna Davis¹, Ariana Farrand², Rebecca Gregory³, Kristi Helke³, Seth Hays⁴, Vanessa Hinson⁵ and Heather Boger⁶
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Vagus nerve stimulation (VNS), currently FDA approved for the treatment of drug-resistant depression and epilepsy, has been shown to induce various electrochemical changes in brainstem nuclei and their projections, including the increase of brain derived neurotrophic factor (BDNF) in locus coeruleus (LC) target regions. In Parkinson’s disease (PD), studies have shown that the LC noradrenergic (NE) neurons degenerate prior to the dopaminergic (DA) neurons in the substantia nigra (SN). Therefore, we hypothesize that noradrenergic degeneration regulates growth factor expression in a rat model of PD. To evaluate this hypothesis, a neurotoxic double-lesion model was used to mimic the effects of PD. Following two weeks of VNS, stimulated rats showed greater locomotor activity, as well as increased BDNF levels in the frontal cortex and striatum and an increase in dorsal striatum density compared to the non-stimulated rats. Taken together, these data indicate a potential beneficial use of VNS in the treatment of Parkinson's disease.

100. The Discovery and Isolation of Six New Mycobacteriophage from the Historic Soil in Charleston

Heba Abdin, Victoria Edmund, Brianna Harmon, J'Neice Payne, Brandi Bell, Samaria Boyd, Samantha Bridges, Maya Dilligard, Taylor Gibson, TaMia Morris, Cherie Pitts, James Solomon and Christopher Korey, Department of Biology

HHMI SEA-PHAGES is a yearlong research-based course that allows undergraduate students to collaborate with faculty mentors and and participate in the research process. This program is run with first-students in collaboration between the First Year Experience and the South Carolina Alliance for Minority Participation (SCAMP). In their fall semester, students used a variety of laboratory techniques to isolate novel bacteriophages that infect Mycobacterium smegmatis from soil samples. Using sterile techniques and plaque assays, we were able to isolate 6 new phages. We created a high titer lysate that contained a high amount of phage to isolate genomic DNA to be sequenced. At the conclusion of the fall semester, the phage Pipsqueaks was selected to be sequenced at the University of Pittsburg. These new phages will help in the broader
understanding of phage evolution and will contribute to a library of phage being developed as potential therapeutics against M. tuberculosis.

101. Influence of Neck Width on the Hemodynamics of Intracranial Cerebral Aneurysms

Allison Conger and Jason Howell, Department of Mathematics

Recent advances in medical imaging technologies have enabled the study of the hemodynamics of arterial aneurysms through computational fluid dynamics (CFD) simulations. Researchers in medicine and biomedical engineering have discovered that several measures of the blood flow near and inside aneurysms may lead to enlargement and/or rupture of the aneurysm. These measures include the fluid wall shear stress (WSS) along the interior aneurysm wall, as well as the Oscillatory Shear Index (OSI). This project seeks to investigate the effect that the width of the entry point of an intracranial aneurysm has on the WSS and OSI, and therefore its enlargement and rupture.

102. The Role, Expression and Connectivity of Neuronal Nitric Oxide Synthase: Implications for Cocaine Addiction

Melissa Lorang, Peter Kalivas and Alexander Smith, College of Charleston Department of Biology and Program in Neuroscience and the Medical University of South Carolina Department of Neuroscience

Chronic cocaine use induces plasticity within a projection from the prefrontal cortex to the nucleus accumbens core (NAc). The extracellular matrix modifies plasticity through matrix metalloproteinases (MMPs). Nitric oxide (NO) synthesized by neuronal nitric oxide synthase (nNOS) activates MMPs. Cocaine use amplifies nNOS production causing greater MMP activity. nNOS role in MMP activation was determined by site-specifically inhibiting nNOS prior to cue-induced reinstatement, then analyzing MMP activity. This study hypothesized and confirmed nNOS inhibition attenuates reinstatement of cocaine seeking, as well as the associated increase in MMP activity. The abundance and colocalization of nNOS interneurons were compared to parvalbumin and choline acetyltransferase interneurons, which demonstrated nNOS interneurons are a unique cell type within the NAc and do not colocalize with either GABAergic interneuron. Furthermore, the prelimbic cortex, dorsal raphe nucleus, and ventral tegmental area exhibit direct monosynaptic connections to nNOS cells.

103. Geomorphology of the Southwest Coast of County Cork, Ireland: A Look into the Rocks, Folds, and Glacial Scours

Shelby Bowden, Rachel Wireman, Erin Beutel and Leslie Sautter Department of Geology and Environmental Geosciences

Bathymetric data were collected off the southwest coast of County Cork and computer generated 2D and 3D bathymetric surfaces were used to examine some of the lithologic formations. Several large rock outcrops occur showing a vertical rise of nearly 20 m. These outcrops are oriented in a northeast-southwest direction, and exhibit significant bed folding and tilting, regional folding,
and cross joints. The folds studied are plunging chevron folds. These folds have a northeast-southwest fold axis orthogonal to the cross joints and are older relative to the jointing systems. The NE-SW joints are older than the NW-SE joints due to their correlation with drainage and erosion patterns. Regional folding is the youngest feature due to its superposition on the chevron folding and jointing systems. The interaction of cross jointing and folding is consistent with the geologic history of the area, and creates a unique bathymetry worthy of further study.

104. Optical Properties of Zinc Oxide Doped with Argon and Oxygen

Leisha Lopez¹, Narayanan Kuthirummal¹, Ramakrishna Podila² and Apparao Rao²

1 Department of Physics and Astronomy, College of Charleston
2 Department of Physics and Astronomy, Clemson University

We have investigated zinc oxide (ZnO) semiconducting nanoparticles (~80 nm) doped with Argon (Ar) and oxygen (O2) using photoacoustic spectroscopy (PAS). Although the bandgaps did not show notable changes upon increasing the concentration of impurities, the steepness and Urbach energy parameters revealed significant changes. The Urbach energy parameter increased from 0.1478 eV to 0.1870 eV for ZnO doped with Ar (0.1478 eV to 0.1865 eV for oxygen doped samples) revealing increased density of defect states and hence a wider conduction band tail. Upon further increasing the impurity concentration, the Urbach energy shows saturation behavior for both Ar and O2 doped ZnO samples.
Prediction of Catastrophic Eruptions of Volcán de Colima, Mexico Via Analysis of Long Term Trends in Lava Geochemistry

Haley Cabaniss¹, John Chadwick¹, Erin Beutel¹ and Nick Varley²

1 Department of Geology and Environmental Geosciences
2 Universidad de Colima, Facultad de Ciencias

Volcán de Colima, Mexico is one of the most active volcanoes in the world, erupting dozens of times in the past century. It is therefore an excellent laboratory for understanding temporal patterns of eruption activity and investigating how eruption magnitudes may relate to the varying chemistry of its erupted lavas over time. The chemistry (including volatiles) of volcanic systems are the most important drivers of volcanic eruptions; understanding their behavior before, during, and after an eruption may result in a better mechanism for predicting the particularly powerful and deadly eruptions that occur about once every century in Colima. X-ray fluorescence spectrometry and Electron microprobe analyses of melt inclusions within plagioclase phenocrysts was undertaken for rock samples from 1998-1999, 2004, and 2013-2014 andesitic lava flows; these data will become part of a larger project to observe the evolution of sulfur concentrations over one complete cycle of volcanism of Volcán de Colima.

Open-Source Contributions to Moodle

Don Cole, Jason Curry and Oddom Vong, Department of Computer Science

Moodle is a widely used, free and open source software (FOSS) learning platform that is, in many ways, similar to Oaks. It allows educators to create secure, personalized learning environments for their students. Because it is open source, it is highly flexible and allows individual modules and components to be added or removed by users. Its flexibility also allows it to organize online classes as well as blended learning. Moodle is written in PHP and backed by a MySQL database. Our team made a number of contributions to the project, with examples including fixing issues in SQL queries and data retrieval for HTML table generation.
107. Data Reduction Techniques for Circumstellar Disk Imaging with the Hubble DICE Survey

Benjamin Wilson, Zach Griggs, Clay Gardner and Joe Carson, Department of Physics and Astronomy

We present a status report on the effort to develop computational tools to improve the effective sensitivity of Hubble Space Telescope (HST) imaging observations of circumstellar disks around nearby stars. Specifically, we are implementing an algorithm that enables one to combine tens or hundreds of digital images in a manner that strips away the overwhelming light from the parent star, while leaving intact the faint light from the surrounding disk. Our implemented image processing components are described in the sections of RAM, Shizzle, RSS, LOCI, Outlier Pixel Rejection, and Boxcar Smoothing. The ultimate goal is to reveal disk substructures which can indicate the presence of planetary formation and evolution.

108. Human Genomic Variation in Functionally Polymorphic Genes

Andrea Nillas and Andrew Shedlock, Department of Biology

This project aimed to identify differential expression of functionally polymorphic genes between human populations. Six loci (APOH, AVPR1a, CYP2C9, HERC2, MC1R and VDR) were selected and buccal DNA was extracted from human subjects of differing ethnic backgrounds for analysis to determine if ancestral conditions affected modern evolution of these genes. Appropriate primers were designed and PCR conditions were optimized to amplify target DNA segments. Successful amplifications were identified by gel electrophoresis, cleaned and directly sequenced. Sequences were edited with FinchTV, aligned in MEGA and compared to the NCBI reference database with BLAST to detect polymorphism. When referencing the Human HapMap project, loci HERC2 and APOH exhibited diagnostic mutations suggesting possible differential selection. Based on these preliminary results we expect a more extensive haplotype survey of Indo-Pacific vs. European subpopulations could elucidate how shifts in ancient demographics and culture may have impacted the phenotypic expression of these genes.

109. Hypermutation of the Immunoglobulin Heavy Chain Genes in Zebrafish

Kaitlyn Ballotti, Joshua Shaffer and Anastasia Zimmerman, Department of Biology

The Zebrafish, *Danio rerio*, has become a popular model for comparative immunology and biomedical research. In humans, mutations at antibody (Ig) loci are critical for effective immune responses. Knowledge of DNA motifs that are targeted for mutation can be used for understanding antibody responses to various infections, B-cell cancers, and autoimmune diseases. It is our goal to determine which DNA bases are prone to mutation in Zebrafish immunoglobulin heavy chain genes (IgH). By aligning IgH mRNA transcripts to genomic sequences, biases in DNA mutations at specific base sequences, or AID hotspot motifs, can be discerned. We have obtained over 90 cDNA clones. In aligning these clones to the Zebrafish genome, we have found certain motifs that display high rates of mutation. Understanding how
mutations generate antibody diversity is important to establish *D. rerio* as an immunological model and provide insight for creating novel vaccines and immunotherapies.

110. Solar Photodegradation of Pharmaceuticals in the Aquatic Environment

Taylor Domenick, Lisa Kasprzok and Wendy Cory, Department of Chemistry and Biochemistry

Pharmaceuticals and their degradation products have been observed in the environment, where they pose potentially negative effects to humans and other organisms. Degradation products may be more environmentally persistent and more toxic than their parent compounds. To investigate the environmental fate of commonly prescribed antidepressants, we measured their solar photodegradation rate in samples simulating the natural aquatic environment. Aqueous drug samples were prepared in 5 mM phosphate buffer (pH=7.0), with and without the organic degradation product humic acid (HA). These samples were photoexposed in a solar simulator and aliquots were taken at relevant time points and analyzed using HPLC and LC-ESI-MS. The half-lives were calculated using pseudo-first order rate laws. We observed that for most concentrations HA acted as a photosensitizer, speeding up the photodegradation of the compounds. Photodegradation products of sertraline and fluoxetine were detected using LC-ESI-MS and structures proposed.

111. Effect of N-Acetylcysteine on Appetitive Processes and Preventing Relapse in Adult Smokers

Megan White, Neringa Stankeviciute, Patrick A. McConnell and Brett Froeliger

Nicotine interferes with glutamate transmission between the prefrontal cortex and nucleus accumbens, an integral pathway to reinstating drug seeking behaviors and mediating top-down cognitive control and is interrupted by addiction. In animal models, N-acetylcysteine (NAC) has restored corticostriatal glutamatergic transmission levels and decreased drug-seeking behaviors. The effects of NAC have yet to be demonstrated in humans addicted to nicotine. The present study examined the influence of NAC on withdrawal symptoms and self-administration in adult nicotine-dependent smokers. Participants were randomized to receive either NAC or matched placebo (PBO) over the course of 3 ½ days of monetary-incentivized smoking abstinence. Participants came to the lab on each abstinence day so that their smoking could be biochemically monitored. Data revealed that compared to the PBO group, smokers in the NAC group significantly reduced smoking, reported less craving and higher positive affect, suggesting that NAC may help prevent relapse via appetitive process restructuring.
112. Cu-Catalyzed Addition of Alkynyl Trifluoroborate Salts to Imines

Justin Dorris, Department of Chemistry and Biochemistry

Cu-catalyzed additions of potassium alkynylboron trifluoride (BF₃K) salts to imines are described. The propargylamine products are useful building blocks in organic synthesis. This addition reaction has also been shown to be amenable to the synthesis of racemic unnatural amino acids bearing an alkyne moiety. Unnatural amino acids bearing these alkyne moieties could be useful for inclusion in peptides.

113. Varying Forms of Gamma-Ray Bursts

Eric Hofesmann, Jon Hakkila, Thomas Cannon, Stephen Lesage, Corinne Maly Taylor, Jacob Epps, Ethan Redel and Samantha Word, Department of Physics and Astronomy

In the process of constructing a gamma-ray burst pulse catalog, we have found that there are some gamma-ray burst light curves that defy current modeling procedures. Many of the bursts that are unfittable share common characteristics. We have begun to group these bursts together based on their observed features. We have named three easily identifiable groups as "Doubles," "Triples," and "Crowns." Doubles and Triples consist of two or three overlapping emission episodes to the extent that the pulse-fitting program is able to differentiate between them. The Crowns are composed of single emission episodes having very jagged maxima composed of many peaks. However, some gamma ray bursts have light curves that are intermediate between these groupings: these apparently indicate a gradual shift in complexity that may help us understand these varying types of bursts.

114. Predicting March Madness Using Probabilities

Liana Valentino, Department of Mathematics

Numerous predictive models exist that are used to predict a bracket for the NCAA March Madness tournament. Basketball analysts have different opinions regarding which statistics are important to use and the weight of importance associated with each statistic; this discrepancy provides the option to use a variety of different models. Instead of focusing on one model, the current research discusses using several methods with different weights and using the probabilities of teams advancing to create a bracket. This allows a bracket to be created from a combination of many models, instead of using a sole method.

115. Beating the Odds - Massey March Madness

John Sussingham, Department of Mathematics

What is it about March Madness that draws the attention of millions each year? Is it the aimless stab at creating the perfect bracket? Or perhaps the upsets and unpredictability of it all? The following analysis will reveal which years were predictable vs. unpredictable and how to use this information to form a bracket for this year. One will also learn how to modify the Massey
Method of Ranking by implementing various weightings and inducements. Additionally, we will examine each round of the March Madness Tournament as its own separate entity. This will allow us to manipulate our bracket into six sections and apply those different methods to assess and predict each round. In a final analysis, a comparison shall be made between the predicted spreads of our methods to those of Vegas.

116. Synthetic modeling and spectral analysis to determine the surface properties of stars

Annie Steele and James Neff, Department of Physics and Astronomy

While the surface of the sun is easily resolved, distant stars can only appear as points of light, therefore determining the total starspot area must be accomplished using a circulatory approach. Titanium oxide (TiO) presents itself as a capable indicator of starspots because it maintains its structure in cooler regions in the stellar surface. Synthetic spectra were created using the SPECTRUM program and MARCS models. The average flux value was taken both before and after the band heads at 7055Å and 8860Å. The flux ratios taken from hot stars are indicative of active stellar surface regions while cool star ratios are used to indicate starspot regions. These TiO ratios are used to estimate starspot temperature and total starspot coverage by both observed and synthetic spectra.

117. The Photodegradation of Diphenhydramine in Simulated Natural Water

Aliya Dumas and Wendy Cory, Department of Chemistry and Biochemistry

Pharmaceuticals can re-enter the sewerage system either by human excretions or improper disposal, leading to detection of low concentrations of pharmaceuticals in the water supply. Active compounds in the water can be exposed to UV light which can facilitate degradation. Thus studies to understand the effects of these compounds, and their degradants on human, aquatic life, and the environment are warranted. Diphenhydramine, the active ingredient in Benadryl is a commonly used drug. We were able to determine the half–lives of 500 ppb diphenhydramine solutions with varying amounts of humic acid using High Performance Liquid Chromatography. Possible degradation products were determined using Ultra High Performance Liquid Chromatography-Electron Spray Ionization-Mass Spectroscopy. Structures of these degradation products will be confirmed in the future with MS/MS.

118. Characterizing a New Method of Harvesting Energy from the Natural Environment and Exploring the Physics of the Triboelectric Effect

Ryan Michael Sullivan and Alem Teklu, Department of Physics and Astronomy

A prototype DC triboelectric generator (DC-TEG) is presently undergoing a proof of concept investigation in order to determine its feasibility as a new system for harvesting energy from the natural environment. The DC-TEG converts rotational motion into electrical energy through the utilization of the triboelectric effect between Nylon fabric and Polytetrafluoroethylene (PTFE) tape. Preliminary results have demonstrated that DC current is generated with the magnitude dependent on angular frequency, surface-contact area, and properties of the triboelectric
materials. Measurements using angular frequencies between 0 and 10 revolutions per second (RPS) have yielded DC currents and voltages with orders of magnitude of $10^{-9}$ and $10^{-3}$, respectively. However, recent modifications have advanced the performance of the open-circuit voltage by a factor of roughly 2 for angular frequencies between 10 and 15 RPS. Future work will be to explore different circuits with the DC-TEG and to model its behavior conceptually and mathematically.

119. Exploring the Bathymetry, Geomorphology, and Seafloor Substrate off the Western Flank Turneffe Atoll, Belize

Rebekah Gossett and Leslie Sautter, Department of Geology and Environmental Geosciences

Turneffe Reef is a carbonate platform and atoll within the Belize MesoAmerican Reef. The reef flank extends to depths of over 1000 meters and may provide habitat for critical deep coral species. Using multibeam sonar data collected by NOAA scientist Peter Etnoyer aboard the Ocean Exploration Trust’s E/V "Nautilus", variations in bathymetry, seafloor substrate, and geomorphology on the northwest flank of Turneffe Reef were examined in order to hypothesize the identity of rounded structures found along the reef margin at depths ranging from 500 to 900 m. CARIS HIPS and SIPS 8.1 was used for post-processing bathymetry and backscatter data, to determine variations in seafloor hardness and identify potential deep coral sites. Characteristics of the geologic structures surrounding Turneffe Reef provide insight as to how deep coral is supported, and to identify sites to investigate on future ROV missions.

120. Investigation of microbial carbonates of the western shoreline of Storr’s Lake, San Salvador, Bahamas

Kyle W. Bostick, Mitchell Colgan and James Carew, Department of Geology and Environmental Geosciences

Extremophilic life continues to push the environmental bounds of what we consider habitable for life. Microbialites are organosedimentary deposits formed in the presence of microbial biofilms/mats and benthic metazoan communities; these biofilms often thrive in extreme environments where microbial-grazers are absent. Microbialites form as the result of 1) trapping/binding sediment with extracellular polymeric substances and 2) the process of organomineralization. This project has focused upon modern microbialites present in hypersaline Storr’s Lake located in San Salvador, Bahamas. Microscopy investigation has highlighted meso- and microscale petrographic diversity of both Dichothrix and Scytonema microbialites from the western shoreline of Storr’s Lake. We have hypothesized that variations in morphology are dependent upon the dominant genus of cyanobacteria, depth of formation, and geographic location. Through observation and literature review, we have concluded that Dichothrix microbialites form through trapping and cementation of surrounding sediments while Scytonema microbialites depend on organomineralization of High-Mg calcite.
121. Quantifying the Difference Between Imagery and Perception in the Human Brain

Andrew O’Laughlin and Thomas Naselaris Naselaris, College of Charleston Department of Biology and Program in Neuroscience, and Medical University of South Carolina, Department of Neurosciences

When imagining a scene, the images in your head do not precisely reflect the state of objects in the actual scene. Some parts of the brain are not as engaged when forming a mental image, leading to discrepancies from perceiving an image. One long-standing question in neuroscience is what parts of the brain are involved in forming a mental image. To investigate, we quantitatively determine the difference in brain activity when imagining something versus physically perceiving that thing with your eyes. An experiment with two separate fMRI scans quantifies the difference between imagery and perception. In the first scan, subjects are shown five different works of art and in a second scan they are told to imagine those same works. Analysis on the fMRI data reveals which parts of the brain are active when visually perceiving the art versus what parts are active when imagining the art.

122. Effects of Beach Renourishment on Benthic Microalgal Communities and Biological Sediment Armoring

Aubrey Butcher, Kristina M. Hill-Spanik and Craig Plante, Department of Biology

One method of preserving beaches against the effects of erosion and sea level rise is beach renourishment. The town of Folly Beach completed a beach renourishment project from January 2014 to June 2014, which involved pipelining sediment from an offshore borrow site directly onto the beach face. Unlike many other studies that look at the effects of beach renourishment on macro-fauna, this study aims to monitor the effects of beach renourishment on benthic microalgae (BMA) microscopic, photosynthetic organisms present in coastal sediments. The main objectives of this study were to determine how BMA biomass, community composition, sediment granulometry, and sediment erodibility were altered by renourishment. Results to date indicate that biomass and composition of benthic microalgal communities were altered by renourishment, biomass recovery occurring between 88-164 days. Sediment erodibility was initially higher in renourished areas, with recovery occurring in 2-4 months, depending on beach height.

123. Diabetes, Health Literacy and Mobile Technologies

Katie Kirchoff, Department of Computer Science

As health research continues to develop new technologies for patients to better care for health concerns from home, a serious challenge for healthcare professionals is the health literacy of patients. Health literacy is defined by The Patient Protection and Affordable Care Act of 2010, Title V, as the degree to which an individual has the capacity to obtain, communicate, process, and understand basic health information and services to make appropriate health decisions. Through my experience as a research assistant on a project studying health literacy in African American patients within eight counties of South Carolina at MUSC, I have learned a significant
amount about diabetes, health literacy and health care education. From my work on the grant and additional research, I have developed the framework for a new type of mobile application that takes into account health literacy to better manage diabetes.

124. *Haemulon aurolineatum*, A reproductive analysis of sex ratios in Tomtate

Taylor Avery, Department of Marine Biology

A reproductive study on spawning capable Tomtate, *Haemulon aurolineatum*, was conducted to determine if their sex ratios differ from 1:1 at different points throughout their reproductive cycle and characterize their spawning season off the coasts of South Carolina (USA). Analysis of 1,250 individuals collected from 2000-2014 over an eleven month period (January-November) demonstrated a significantly higher proportion of males in the population regardless of their stage in the reproductive cycle. These data also confirmed that Tomtate are multiple batch spawners with the main spawning season occurring from March to July.

125. Substellar Candidate Search using *Spitzer's Enhanced Imaging Products* (SEIP)

Christina Mueller, Department of Physics and Astronomy

For about 20 years, research into distant, faint objects, such as exoplanets, has increased. Many systems of interest are challenging to observe due to the presence of image-obscuring interstellar dust. Dusty regions can now be viewed at longer wavelengths in the infrared at 3.6 um and 4.5 um, which are nearly free of deleterious influences of dust. Images at those wavelengths for seven nebulae were chosen at random from available imagery. Images were analyzed using the *Spitzer Enhanced Imaging Product's* source list search powered by *Gator*, which provides visual and spectral data. The relative flux for 45,000 sources was compared, and 140 sources with $\text{flux}_{4.5} > \text{flux}_{3.6}$ are deemed candidates for further investigation. This selection criterion is a common indicator of substellar objects.

126. NASA Space Mission to Europa

Christopher Andrews, Elise Krall, Sam Fink, and Jeremy Jones, Department of Physics and Astronomy

Europa, a moon of Jupiter, has potential to increase our knowledge of icy satellites, but also of Earth. This moon, according to fly-by surveys made by the Galileo and Voyager missions, may have a possible sub-surface ocean. Due to the existence of this potential ocean, Europa could have a high probability of being habitable. We propose three main scientific goals to determine Europa’s habitability: identifying conditions necessary for surface formations by comparing old and new features, understanding the relationship between Europa’s chemical composition and possible life, and constraining the ice sheet thickness and characteristics of the subsurface environment. Our proposed mission will utilize an orbiter to gather data across the electromagnetic spectrum and a lander that will provide additional planetary surface data. Our proposed mission aims to add significantly to our knowledge of Europa while also providing a foundation for future explorations.
127. Jovian Interplanetary Mission to Europa (JIME)

Naomi Hillegass¹, Zach Sturman², Annie Steele³ and Nathan Gunzenhauser³
1 Department of Mathematics
2 Department of Political Science
3 Department of Physics and Astronomy

Europa, Jupiter’s smallest Galilean satellite, is an icy body known to have an ice surface several kilometers thick and an all encompassing ocean beneath. The presence of liquid water and the tidally caused internal energy makes Europa an enticing opportunity to look for extraterrestrial life. We propose a reconnaissance mission to study the habitability through surface evolution, internal structures, and Jovian system interactions. JIME requires both a radiation-endurant orbiter and lander working in conjunction to one another. The mission will observe the transfer of energies, identify surface and subsurface compounds, and map the intricacies of Europa’s structure. Critical instruments to this mission includes radar, laser altimeters, and high resolution cameras over multiple wavelengths. JIME will lay the groundwork for future subsurface missions to Europa in NASA’s continued search for life in our solar system.

128. Air pollution monitoring utilizing a low cost CubeSat

Winslow DiBona¹, Jenna Snow², Leisha Lopez³, Sarenna Nath⁴ and Courtney Lawrence⁵
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As global temperatures rise due to increased industrialization around the world, monitoring air pollution has become a pertinent issue as people attempt to resolve the damage caused to the atmosphere. This presents a need for accessible monitoring in regions that contain factories and production plants. This paper proposes a cost-efficient approach to gathering this data utilizing a CubeSat, smartphone, and a low altitude balloon. The CubeSat along with its payload will be launched in Decatur, Alabama and Huntsville, Alabama to study the presence of carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone, and particulate matter. This data will be used to make a statistical analysis of the composition of the atmosphere above both cities, and to determine the compositional changes compared to previous studies in the regions.

129. The Ontogeny and Dentition of the Naked Goby

Tasneem Dossaji, Department of Biology

A recent study shows that there is an abrupt shift from microscopic to macroscopic organisms in the dietary composition of the naked goby Gobiosoma bosc. This study’s primary focus is to correlate the shift in diet to the possible shift in the physical dental characteristics of the sample size collected (n=30). A method of clearing and staining was used in order to observe the ontogeny and dentition of the samples. The number and size of teeth relative to body size was
observed. The observations show that there is a positive correlation between body size (measured in standard length) and premaxilary tooth number ($R^2 = 0.60$). There was also slight positive correlation between the standard length and dentary tooth number count, but not nearly as strong ($R^2 = 0.34$). It can be seen that there is a discrepancy between the development in premaxilary and dentary teeth and that there is more significant change in comparison to body size in the premaxilla compared to the dentary.

130. (Intentionally Blank)

Nicolas E. Alcala, Joshua J. Mifflin, Loren E. Dupuis, Sarah Thibaudeau and Christine B. Kern. Department of Regenerative Medicine and Cell Biology, Medical University of South Carolina

131. Investigating the Invasive History of *Gracilaria vermiculophylla* using molecular markers

Sarah J. Shainker, Stacy A. Krueger-Hadfield and Erik E. Sotka, Department of Biology

The seaweed *Gracilaria vermiculophylla* spread from its native region, the northwest Pacific Ocean, to Europe and North America. A single nucleotide polymorphism (SNP) was used to investigate the invasion’s source and pathways of spread. A SNP is a variant at a single nucleotide of DNA. The SNP of interest exhibited either cytosine (C) or thymine (T). Preliminary data suggested that the SNP could differentiate between populations based on their geographic origin. The SNP was isolated with a restriction enzyme that cut the DNA only when the nucleotide of interest was T. Resulting DNA fragments, visualized using gel electrophoresis, indicated the nucleotide present. Most individuals from the species’ native range exhibited C’s, except for individuals from northern Japan, which exhibited T’s. Most individuals in the non-native range also exhibited T’s. These results suggest that the regions of northern Japan and the Sea of Japan are the source of the species’ spread.

132. Believe it or not: not all Six-Membered Ring Molecules are not in Chair Conformation.

Colin Cotter, Gamil A. Guirgis and Clyde R. Metz, Department of Chemistry and Biochemistry

The structural parameters for [Si(CH3)2O]3 have been determined from quantum mechanics calculations (I-IF, MP2, B3LYP) using different basis sets up to 6-311++G(2d,2pd). These theoretical parameters were compared to the experimental x-ray structure for the solid of [Si(CH3)2O]3. The short internuclear distances are consistent with delocalization in the ring. Natural Bond Orbital (NBO) results confirm the contribution of significant delocalization of the oxygen lone pair electrons. Semi-empirical calculations which do not include d-orbitals also reveal a planar structure. For the hexamethyl and possibly the hexachloro derivatives, all conformations other than the planar structure lead to severe steric interactions between substituents. Interestingly, when the oxygen atom is replaced by NH group in 1,3,5-cyclotrisilazane, the conformation changed to the twisted boat conformation which is contrary to the fact that the boat conformer is a transition state as in the case of the carbon analogue.
Thank you for attending the American Diabetes Association’s 77th Scientific Sessions. We would especially like to thank our speakers, abstract presenters, session chairs, moderated poster discussion moderators, and abstract reviewers whose participation made the meeting a great success.