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**Inclusive Education and Attitudes toward Diversity**

Kathryn Allenby and Cynthia May, Department of Psychology

Contact theory suggests that negative biases toward minority groups can be reduced when individuals experience direct, positive contact that allows for cooperative, collaborative interaction with minorities. Recently, researchers have also explored the indirect contact hypothesis, which suggests that the mere knowledge that an in-group member has a close relationship with an out-group member can lead to more positive intergroup attitudes. The present study assessed whether these two theories might apply in a real-world setting. Using the M-GUD Scale, we compared attitudes toward racial, gender, disability, and ethnic diversity in high school students who had either direct contact, indirect contact, or no contact with disabled peers. As expected, direct interaction with disabled peers resulted in the greatest acceptance of diversity, but even indirect contact with disabled peers was associated with more positive attitudes about diversity relative to no contact.

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"**Fingerprinting"** lithic samples from an archeological site in Göksu Valley, Turkey

Kalen McNabb and Vijay Vulava, Department of Geology and Environmental Geosciences

From 2004 to 2007, the multidisciplinary Göksu Archaeological Project (GAP) has been led annually to investigate the settlement patterns and land use of the Anatolian Plateau and Cilician Plain of Turkey. This study sought to analyze the geochemistry of recovered chert samples through the use of microwave assisted acid digestion and an Inductively Coupled Plasma Mass Spectrometer with the ultimate goal of obtaining a chemical fingerprint of the source rock. Elemental data regarding these samples were compared from other chert sources, and has shown unusual high concentrations of Mg within the GAP chert. In addition, rare earth elements (REE) were analyzed. Preliminary data shows the Göksu chert is dominated by lighter REE, indicating their formation in a shallow marine environment. "Fingerprinting" allows comparison between the chert recovered from GAP and from various parts of the region and the world and aids in geologically identifying the source of these rocks.
Frontal Cortex and Locus Coeruleus Modulation of Behavior in a Go/No-Go Task

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¹Medical University of South Carolina, Department of Neurosciences
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The purpose of this study was to investigate the role of locus coeruleus (LC) and orbitofrontal (OFC) and anterior cingulate cortices (ACC) in response inhibition, a subtype of impulsivity. Impulsivity is implicated in drug addiction and is a key diagnostic criterion of attention deficit/hyperactivity disorder, the most commonly-diagnosed childhood psychiatric disorder. In these studies, we collected electrophysiological recordings of rats performing a Go/No-Go task designed to measure ability to inhibit prepotent responses, a key component of response inhibition. Early results show: 1) rats reliably perform the Go/No-Go task, and 2) activity of neurons in the LC, OFC, and ACC are all modulated during the task. LC activity is modulated in both Go and No-Go conditions, suggesting a dual-role for LC in response activation and inhibition. Ongoing studies will elucidate more details of the involvement of LC, OFC, and ACC in impulsivity. Supported by NIH grant P50 MH62196 to GAJ.

Age-related changes in Locus Coeruleus T1-TSE signal

M. A. Mercer, N. I. Keren, P. S. Morgan, M. W. Hurd, and M. A. Eckert, Program in Neuroscience, Department of Psychology

The locus coeruleus (LC) is a brainstem structure consisting of noradrenergic neurons that regulate attentional states through widespread cortical connections. While age-related declines in LC neuron number have been observed in post-mortem studies, there has been limited research conducted on this structure because of its small size and the relatively poor resolution of conventional imaging techniques. More recently, high-resolution T1-weighted turbo spin echo (T1-TSE) magnetic resonance scanning methods have been used to image the LC. The focus of this investigation was to examine specific age-related changes in LC signal, in addition to other factors that could be attributed to changes in T1-TSE scans. T1-TSE scans were used to produce a probabilistic map that defined LC location across 44 adult participants. Non-linear changes in LC signal were observed and found to be dependent on the pontine tegmentum control region while LC signal decreased and became noisier in the older adult scans.

Synaptic Plasticity in Dysbindin Deficient Mice

Amanda Grigg¹, Bailey Glen², Antonieta Lavin²
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Schizophrenia is a severe brain disorder that affects approximately 1% of the population and results in
decreased cognition and memory function. Currently, there are no biological tests for schizophrenia. There have been strong links found between reduced expression of the gene, DTNBP1, and the clinical expression of schizophrenia. DTNBP1 encodes for the protein dysbindin. Dysbindin is expressed in neural tissue of the hippocampus and is involved in control and release of glutamate. Dysbindin alleles are thought to regulate synaptic glutamate receptor (NMDA receptors) expression and function. NMDA-dependent synaptic plasticity is thought to be the synaptic mechanism for learning and memory. Our hypothesis was that genetic loss of dysbindin would decrease NMDA receptor-dependent synaptic plasticity in the hippocampus. Field recordings in the hippocampus using a LTP stimulation protocol were completed using male wild-type and homozygous mutant littermate mice. The results showed a decrease in long term potentiation and NMDA receptor function.

Effectiveness of Supplemental Nutrition Products in Conjunction with a Caloric Restricted Diet and Resistance Training

Department of Health and Human Performance

The purpose of this study was to determine which supplement (whey protein; branched-chain amino acids; 4:1 carbohydrate:protein blend) in combination with a calorie restricted diet provided the best support for developing muscular strength and positive body composition changes (i.e. increasing lean body mass while decreasing fat mass) while performing a body building style resistance training workout four days per week for eight weeks. Subjects were male, aged 18-40 years, experienced weight lifters with no known injuries. Subjects were instructed to ingest one serving of their supplement before and one serving immediately after their workout. Pre and post testing included a 45-minute resting metabolic rate, total body water via bioelectrical impedance, skin folds and circumferences for muscle mass estimation, and hydrostatic weighing for body fat. Maximal strength (1RM) and maximal repetitions at 80% 1RM were measured on the squat and bench press exercises.

Risky Riding: Parenting Influences on Children's Bicycle Helmet Use

Margaret Kay Brinson, Lisa Thomson Ross, and Thomas P. Ross
Department of Psychology

Parents (N=121; 87% female; 97% Caucasian) completed surveys to assess parenting variables that influence children's helmet use. Parents who wear helmets reported stronger helmet rules and more strongly believe this shows good role modeling. Helmet rules also correlated with more parental monitoring and resistance to parental and children's peer pressure. This may be the first study examining parenting peer pressure (both in general and specifically regarding helmet rules).
Survey of Health & Human Performance Recent Graduates

Gabe Compton, Sara DuPont, Brooke Kotcella, Amber Mead, Sarah Peagler, Ashley Vickers, and William R. Barfield, Department of Health and Human Performance

Introduction: Health and Human Performance (HHP) graduate success is important to the mission of the College of Charleston (CofC) and HHP. In 2010 a survey addressing graduate success and the current HHP curriculum was developed. Methods: CofC alumni in athletic training, exercise science, health promotion and teacher education who graduated between 2005-09 were surveyed via email. Results: 65% of 110 responded. 72% of respondents were 22-25 years old. Post graduate work was necessary for 74% and 83% felt their HHP degree prepared them for their career goals. 18% are currently employed in physical or occupational therapy. 42% selected unemployed or other. Conclusions: HHP graduates are prepared for post-baccalaureate education. A question related to whether they were currently in graduate or professional school should have been asked. A significant percentage who indicated they were unemployed are in graduate training which affected our results. Follow-up surveys will address current study limitations.

Suspension Training Improves Muscular Endurance, Muscular Strength, Cardiovascular Fitness, and Body Composition in College-Aged Women

Brittany Heck, Carrie Luhn, Michelle Schecker, Georgia Walker, Trey Gore, Kendall Stevens, Jessica Ziker and Timothy Scheett
Department of Health and Human Performance

Suspension training is a relatively new mode of exercise that allows individuals to use their own body weight as resistance while performing various exercises in an interval fashion. Twenty college-aged women completed three 60 minute suspension training workouts per week for a period of six weeks. Training and control subjects (n=33) underwent pre and post testing for measures of muscular endurance, muscular strength, cardiovascular fitness, and body composition. The training program resulted in significant (p<0.05) increases in upper and lower body muscular endurance (37.7% and 84.6%, respectively), upper and lower body muscular strength (21.8% and 23.2%, respectively), cardiovascular fitness (8.5%), and lean body mass (4.0%); as well as significant (p<0.05) decreases in body fat (-11.6%) and fat mass (-10.6%). The suspension training program successfully provided both aerobic and resistance training improvements for college-aged women. Suspension training may be a superior alternative to traditional exercise programs commonly used by this population.

Analysis of Children's Toy Preferences

Samantha Denning, Rebecca Anderson, Katherine Fitzgerald, Caroline Gonya, Victor Imko, and Lisa Thomson Ross
The Honors College
We investigated whether preschool-aged children have stereotypical preferences for their toys and activities in the classroom. Toys/activities were pre-rated by college-aged students as being girl toys (e.g., arts/crafts, playing house), boy toys (e.g., blocks, cars) or neutral toys (e.g., games, books). A total of 87 observations were made over a two-week period from behind a one-way mirror. There were no interactions between age and sex for boy toys, however chi-square analyses revealed age by sex interactions for neutral and girl toys. Among the younger children, 43% of the girls boys compared to only 14% of the boys girls played with neutral toys, whereas this difference did not occur for older children. Finally, for girl toys, there was no significant relationship between play and sex among the younger children, however, among the older children 21% of the girls boys compared to 83% of the boys girls played with girl toys.

What Children Wear: Age and Sex Interaction

Hallye Meeks, Hannah Reed, Chris Cimorelli, Meredith Porter, Georgia Schrubbe, Alex Hennessey, and Lisa Thomson Ross
The Honors College

We investigated whether preschool-aged children dress according to fashion or color stereotypes. Observations (N=132) were made over a two-week period from behind a one-way mirror. There were no interactions between age and sex for the color of the childrens tops, however chi-square analyses revealed age by sex interactions for color of the bottoms (shorts, skirts, pants) and for whether or not there was an emblem on the shirt. Among the younger children, boys were more likely to have neutral colored (53%) or blue (43%) bottoms, whereas girls were more likely to have brighter colored bottoms (55%). Among older children, girls and boys were more similar with regards to blue or neutral bottoms, although girls still wore brighter colors more often than boys (45% versus 11%). Among younger children, more boys (56%) than girls (24%) had emblems on their tops this difference was not found among older preschoolers.

The Role of ADAMTS5 in the Developing Pulmonary Valves of the Cardiac Outlet

Alexandria C. Bahan¹, Jessica D. McGarity², and Christine B. Kern²
¹The Honors College
²Cardiovascular Developmental Biology Center, Medical University of South Carolina

During normal cardiac valve maturation the extracellular matrix (ECM) undergoes dramatic remodeling. We investigated a mouse model deficient in ADAMTS5, a metalloprotease that cleaves versican, an essential ECM component in early valve development. The pulmonary valves of Adamts5LacZ/LacZ mice were grossly enlarged at E17.5 compared to wild type littermates. Three-dimensional reconstructions of semilunar valves from Adamts5LacZ/LacZ and wild type mice revealed an average of 2.7 greater volume in the pulmonary valves and 1.4 increase in the aortic valves between the Adamts5LacZ/LacZ and wild type mice. There was reduced cleavage of versican, the primary substrate of ADAMTS5, in the pulmonary valves (E14.5 and E17.5) of Adamts5LacZ/LacZ compared to wild type as defined by both an increase in the intact form and a decrease in the N-terminal cleavage product. These data suggest a critical role for versican cleavage by ADAMTS5 during maturation of the semilunar valves of the mammalian heart.
Near Io Reconnaissance Orbiter (N.I.R.O)

Nathan Towles and Alex Greene, Department of Physics and Astronomy

Io, the closest moon to Jupiter, is the most volcanically active body in our solar system and perhaps one of the most intriguing planetary bodies ever observed. Careful study could reveal clues to the formation of our planet, as well as information on how close orbiting moons interact with their host planet. This poster demonstrates how utilizing spectroscopic, photographic, and thermal data from a mission devoted solely to the exploration of Io could answer many unknown questions. This information would give us insight into the early existence of Earth and enable us to accurately build a model of Ios changes. Presented is a detailed description of a mission to Io to achieve a preponderance of specific objectives, which were outlined in a formal NASA Announcement of Opportunity and given to a collaboration of students from the College of Charleston and University of Alabama Huntsville.

The Venus In-Situ Explorer Mission Study

Jordan Adams, Department of Geology and Geosciences
Michelle Anderson, Department of Physics and Astronomy

The Venus In-Situ Explorer project is an in-depth study on a proposed mission to Venus. The study was conducted by a group of two scientists at the College of Charleston and eight engineers at the University of Alabama at Huntsville. The Venus In-Situ Explorer is a spacecraft designed to fly to Venus and deploy an Orbiter platform around the planet and mid-altitude balloons into its atmosphere. The Orbiter will be responsible for mapping the surface of Venus in high detail, determining cloud motions, atmospheric composition, density, wind velocities, and temperature profiles of the upper atmosphere. The In-situ balloons will be focused on measuring atmospheric composition, density, and particle size; surface composition and texture; and temperature, pressure, and wind velocity profiles of mid and low altitudes. This mission would significantly advance our current understanding of the properties of Venus's surface and atmosphere.

Preliminary Information on Size and Age at First Maturity for the Spot (Leiostomus xanthurus)

Benjamin Brown, Biology Department and SCDNR

The Spot (Leiostomus xanthurus), is found in the estuaries and near-shore waters along the United States Atlantic and Gulf of Mexico coasts. Although caught both recreationally and commercially north of Cape Hatteras, North Carolina; only recreational anglers target this species in South Carolina. Little is know
about the life history dynamics of this species along the southeast Atlantic coast; therefore, a preliminary study was conducted to establish both the size and age of maturity for Spot. These aspects were examined by observing the gonads and otoliths of the fish sacrificed. It is evident through this study that male Spot show mature gonad formation at a smaller body length than that of females. The study also shows that more males are showing maturity at age 1 than females. Less 2 year old Spot are present in the collection due to spawning migration out of the estuary. This study is critical in making meaningful management decisions about the sustained fishery for this species.

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An Investigation of Spincast Polymer Mirrors Produced on a Parabaloidal Substrate

Zachary Stroman and Terry Richardson, Department of Physics and Astronomy

Problems with thermal shrinkage of spincast polymer mirrors cured at 130°C have suggested a solution of casting the polymer on a preformed paraboloid or even a liquid surface formed into a paraboloid by the spinning process that forms the mirror surface. This work reports on tests done with two different substrates, a synthetic polymer pitch and a bismuth casting alloy. The bismuth alloy seemed the most workable but thermal expansion of the metal damaged the mirror figure. A solution to this problem is proposed.

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A New Species of Dolichomia (Pyralidae: Lepidoptera) from the Eastern United States

Tarah Hooks and Brian Scholtens, Department of Biology

A new species of Dolichomia (Pyralidae: Lepidoptera) has been collected over a period of many years from multiple locations in the Eastern United States. We describe the species here and compare it to three other species in the same genus. Differences in wing pattern, coloration, and genitalia distinguish this species easily from other Dolichomia. Little is known about the biology of the new species.

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TCR Mission: Trojan/Centaur Reconnaissance

David Weiss¹, Blake Hodges¹, and Caleb Gooch²
¹Department of Geology
²University of Alabama-Huntsville

The Trojan/Centaur Reconnaissance mission science objectives are to determine the physical properties of a Trojan and a Centaur. Using spectroscopy, visible light photography, and LIDAR; the mass, size, density, and geologic features, including mineralogical composition, will be determined. The color, albedo, and geology will be determined to better understand the history of the object. The Trojans are aggregated
about the L4 and L5 equilibrium points along Jupiters orbit. These objects are thought to be primitive remnants from early solar system formation, captured during giant planet formation. Centaur orbits are dynamically unstable, and these objects are thought to have originated as Kuiper Belt Objects. The TCR mission will flyby Trojan Philoctetes, which shares Jupiters orbit, followed by a flyby of Centaur Okyrhoe, which lies between the orbits of Jupiter and Saturn. The TCR mission is a joint project between the CofC science team and the University of Alabama, Hunstville engineering team.

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• Award of Merit Poster •

Modeling of Tilted Accretion Disks and Jets

William DuPre and P. Chris Fragile, Department of Physics and Astronomy

The Cosmos++ general relativistic magnetohydrodynamic code has been further developed to better model the accretion of a magnetically seeded disk onto a Kerr black hole and the resulting relativistic plasma jets. It is unknown what effects the spin of a black hole and the disk inclination relative to that spin axis have upon jet formation and orientation. Our current work is motivated by the goal of modeling a moderately tilted disk around black holes with a range of spins. Accurately resolving and stabilizing the magnetically dominated jets in such systems has required the implementation of several changes to Cosmos++, notably the use of a singularity-free spherical grid in place of a spherical-polar grid. The results of several test simulations and convergence studies with the new code are presented. Additionally, preliminary results from the ongoing tilted disk simulations are given.

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Preliminary assessment of slope failures along the Blue Ridge Parkway east of Asheville, NC

Mitchell Warnick, Alyson Bodendorf, and Robert Nusbaum
Department of Geology and Environmental Geosciences

Slope failures occur frequently along the Blue Ridge Parkway (BRP) in western North Carolina. The purpose of this research is to assess the effect of stratigraphy, proximity to drainages, and hill slope angle on the distribution of 69 known slope failures mapped by the North Carolina Geological Survey. Our study area along BRP encompassed eight counties east of Asheville, NC. Preliminary results indicate that 36 of the 70 slope failures are associated with drainages. Forty of 69 failures are associated with slopes greater than 30 degrees. Rock type appears to have played an important role with 63 of 69 slope failures occurring in Late Proterozoic metasedimentary schist and gneiss, mostly in Buncombe County. These preliminary results will be supplemented with field work conducted during the summer.

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Effect of Suspension Training on Flexibility and Balance in College-Aged Women
Jessica Ziker, Trey Gore, Kendall Stevens, Georgia Walker, Michelle Schecker, Carrie Luhn, Brittany Heck, and Timothy Scheett
Department of Health and Human Performance

This study evaluated the effects of a dynamic interval-based suspension training program on measures of flexibility, static and dynamic balance. Twenty college-aged women participated in 18 sixty minute training sessions during a six week training program while thirteen college-aged women served as free-range controls. Bilateral Hamstring 90-90, Sit and Reach, Balance Error Scoring System (BESS), and Star Excursion Balance Test (SEBT) were performed before and after the training period. The suspension training program resulted in significantly \((p<0.05)\) greater hamstring ROM and Sit and Reach flexibility. SEBT demonstrated significant increases within the training group for five out of eight directions for the left leg stance and in only one direction for the right leg stance. BESS showed significant increases within both groups but no difference between groups. Moderate improvements were observed in lower extremity flexibility and dynamic balance despite the suspension training program not being specifically designed to focus on flexibility and balance.

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Disentangling the effects of training history and primacy on resurgence in college students

Julia M. Hall and Adam H. Doughty, Department of Psychology

Resurgence refers to the recovery of a previously reinforced response when a more recently reinforced response is extinguished. Previous research has shown greater resurgence following lengthier training histories; however, those lengthier histories have been confounded with possible primacy effects (i.e., the power of first-learned conditions). The purpose of the present experiment was to measure resurgence as a function of training history while reducing the role of primacy effects. College students were exposed to a multiple schedule of arbitrary-matching-to-sample procedures wherein training history was manipulated across components. After these original discriminations were learned, they were extinguished in a second condition while new discriminations were reinforced. In a third condition, the latter discriminations were extinguished so that resurgence of the original discriminations could be measured. There was no evidence that a lengthier training history produced greater resurgence, suggesting that the results of earlier studies may have been determined largely through the effects of primacy.

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Three-Dimensional Kinematics of Acceleration in *Sceloporus woodi*

Kristen Johnson and Eric McElroy, Department of Biology

In animals that exhibit rapid bursts of movement, acceleration capacity is vital to organismal fitness. We explore the kinematic variables of the hindlimb which are predicted to impact acceleration performance in a small lizard species (*Sceloporus woodi*). We are particularly interested in angular kinematics which can be inferred to reflect underlying muscle function. To quantify acceleration performance and kinematics, we took high speed video recordings of individual lizards accelerating from rest over a 0.4 meter distance. We
used these videos to quantify the three-dimensional angular kinematics of the hip, knee, ankle, and MTP joints during steps 1, 2, and 3 from rest. Angular velocity is a stronger predictor of acceleration performance than other kinematic variables studied during steps 1 and 2. During step 1, slower femur retraction and faster knee extension result in increased acceleration. During step 2, only the angular velocity of the hip joint predicts acceleration performance. The function of the hip changes from step 1 to step 2, as faster femur retraction in step 2 correlates with increased acceleration. This was surprising as it implies that a single muscle can shift function across steps, suggesting that muscles can dynamically adjust during non-steady state locomotion.

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Effect of phosphate level on phytoplankton abundance

Nicholas J Collins, Laura B. Ferguson, Sarah A. Mandeville, and Gorka Sancho
Department of Biology

Phytoplankton are responsible for half of the world's primary production, and play an important role in estuarine ecosystems. These primary producers are often limited by nutrients such as nitrogen, phosphorus and other elements, since they are essential for photosynthesis and other biological processes. Our study sampled chlorophyll and phosphate concentration levels of three sites representative of different habitat types ecosystems (freshwater river, estuarine and oceanic beach) within the Charleston area over a period of five weeks. Precipitation was incorporated into the analysis to determine the influence of river discharge on phosphate and chlorophyll levels. We found elevated phosphate levels with high fluctuations in the river site when compared to the beach and estuary locations. Phosphates and chlorophyll were also more strongly influenced by rainfall at the river site than at the other two sites. This conforms to our expectations since rivers are a major source of phosphates into estuarine systems such as Charleston Harbor.

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Sediment Analysis and Mineral Composition across the South Carolina Continental Margin

Cody Donofrio and Leslie Sautter, Department of Geology and Environmental Geosciences

Leg 05 of College of Charleston's Transect Program was conducted in November 2009, during which sediment samples were collected across the continental shelf off Charleston, South Carolina. Sediments were collected using a Shipek Grab Sampler at 14 locations along two transect lines, one extending from Folly Island and the other from Capers Island. Using a particle size analyzer, grain size distributions were determined along two cross-shelf transects. A Scanning Electron Microscope and binocular microscope were used to determine mineral composition contained in coarse material at the 0.5 mm size fraction. Grain size distributions and mineral composition will be related to distance from shore and proximity to the Gulf Stream. Results indicate that the sediments collected do not follow the traditional model of sediment distributions along the continental shelf.
Which College of Charleston Building Would You Want to be in During an Earthquake?

Krystle S. Miner$^1$ and Steven C. Jaume$^2$

$^1$Department of Biology  
$^2$Department of Geology and Environmental Geosciences

Ambient seismic motion was recorded in five College of Charleston buildings: Randolph Hall, old and new Science Centers, 12 Bull Street (Historic Preservation) and 9 Greenway (Communications). Seismometers were placed on both the lowest and topmost floors of each building. The data was analyzed using Seismic Analysis Code (SAC) software in order to determine the frequency spectrum of the building motion. The spectra determined for the top floors were divided by those of the bottom floors in order to produce a spectral ratio (i.e., difference in motion). Peaks in the spectral ratios were assumed to correspond to the natural resonance frequency of each building. These results will be compared to the expected natural resonance frequency of soil ground motion in the College of Charleston area. Buildings for which the resonance frequency corresponds to the soil resonance frequency are expected to suffer more damage in the event of an earthquake.

Analysis of Projectin in Synchronous Lepidopteran Flight Muscles

Larchinee Turner, Department of Biology

To generate high wing beat, several insect orders have developed a novel muscle physiological system, resulting in multiple contractions per nerve impulse (asynchronous). Basal insects possess only synchronous muscles whereas asynchrony is specific to derived insects. It is expected that these two muscle types differ significantly in their protein composition, structure and abundance. One likely candidate is projectin, a large muscle protein composed of two repeated motifs, as well as unique sequences such as the PEVK domain, which is known to be an elastic region. We continue with our molecular analysis of projectin to include more diverse insect orders and correlate differences in projectin structure with muscle physiology. In this study we describe our progress for the silkworm, *Bombyx mori*, and another moth *Manduca sexta*. We assembled the sequence of the projectin gene in *B. mori* from genome data and obtained partial sequence in *M. sexta* using molecular cloning techniques.

Analysis Of Projectin PEVK Isoforms And Biomechanics Of Dragonfly Flight Muscles

Sean Bear, Department of Biology

Insect flight muscles are extraordinary in their diversity at the anatomical, physiological and molecular
levels; in particular muscle stiffness can be very different across insect orders. In derived insects a large part of the elasticity of flight muscles is attributed to the protein, projectin. The molecular characterization of projectin is available for several derived insects and reveals a highly conserved modular organization, including a variable elastic PEVK domain. If projectin is indeed responsible for a portion of the muscle stiffness, distinct PEVK isoforms and unique combinations of such isoforms could confer small differences in muscle mechanical properties. We explore whether such a correlation exists by obtaining molecular data for individual dragonfly, *L. pulchella*, where flight muscle biomechanics data are already available. Individual muscles were used for semi-quantitative RT-PCR reactions. We determine the ratio of the different projectin PEVK forms using capillary electrophoresis, fluorescence measurement of peak intensity and statistical analysis.

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**Analysis Of Calcium ATPase Pump Across Insect Phylogeny**

Katherine Gumps, Department of Biology

Cytosolic calcium concentration is a key factor in the regulation of muscle contractions, and is very different between insects with synchronous and asynchronous (stretch-activation) physiologies. The Ca-ATPase gene codes for the calcium pump associated with the sarcoplasmic reticulum (SR) that regulates the amount of calcium being pumped back into the SR at the end of contraction. To further understand the importance of calcium for stretch-activation, we investigated the distribution of the SR and the SERCA protein in flight muscles of several insects. We also initiated a quantitative analysis of SERCA expression in different muscles of synchronous and asynchronous insects by quantitative RT-PCR.

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**Microhabitat heterogeneity and natural variation in Iberian populations of *Arabidopsis thaliana***

Laura B. Ferguson, Gorka Sancho, Matt T. Rutter, and Courtney J. Murren
Department of Biology

Genetic and environmental variation influence phenotypic expression of ecologically important traits. We characterized four natural Spanish populations of *Arabidopsis thaliana*. To identify genetic influence on aboveground phenotypic characters we planted field-collected seed in a common garden. Significant phenotypic variation within and among populations in the field and greenhouse indicate genetic variation for rosette diameter, height and reproductive output. Because soil characters are a key source of environmental variation, we manipulated soil nutrient and texture conditions. Field seed and accessions of Iberian origin from ARBC were planted in varying nutrient and soil conditions and measured. Other studies identify significant genotype by environment interactions across wide geographical areas; our study demonstrates similar patterns among populations encompassing a smaller area. Furthermore, we provide evidence of phenotypic variation among belowground traits in *A. thaliana*, an arena nearly untouched by researchers. Our data complement the numerous genetic studies on expression of ecologically important plant characters.
Evaluating the Use of the Nike+ System as a Motivational Tool for Beginning an Exercise Program

Austin L. Ruedrich, Deborah A. Miller, and Karen Smail, Department of Health and Human Performance

The purpose of this study was to investigate whether the Nike+ Sportband could increase exercise participation in sedentary women. Seventeen women, ages 18-22, were divided into a control group (CG), which exercised without the Nike+ Sportband, and an experimental group (EG), which exercised with it. The study duration was 4 weeks. Participants completed a log each time they exercised. They rated their motivation before, during, and after exercise using a 5-point Likert Scale, and described how they felt during exercise. They also filled out the Exercise Motivations Inventory-2 pre-and post-study. The EG exercised more often (M=2.143[1.260]) than the CG (M=1.875[1.260]) and also for longer durations (M=39.908[13.981]) than the CG (M=37.382[20.894]). The EG also showed significant (p<0.05) increases in the EMI-2 categories of Health Pressures, Weight Management, and Appearance, while the CG only showed a significant (p<0.05) increase in the EMI-2 category of Social Recognition. These results suggest that technology can be used to increase exercise participation among college-aged women.

Comet Surface Sample Return Mission: Sherlock

Jesse Snider¹, Kyle Clayton², Sherlock Engineering Team³
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²Department of Physics and Astronomy
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Comets are believed to be the remnants from the creation of the Solar System. Often described as "dirty snow balls", they are frozen objects that originate from the cold out skirts of the Solar System and eventually orbit around the Sun. Studying these leftovers of the Solar System can help us understand more about the processes of the early Solar System and how the planets differentiated into their current forms. With the help of University of Alabama Huntsvilles engineering team, the Sherlock Comet Surface Sample Return mission will help in the study of comets. If this mission is implemented and carried out successfully, it will return larger surface samples from the nucleus of the comet 17P/Holmes along with photographical and spectral data. This data is expected to provide us with a deeper understanding of comets in general as well as insight into why 17P/Holmes underwent a mysterious high magnitude outburst.

Assessment of Positive Behavioral Contrast between Male and Female Long Evans Rats
The purpose of this study was to determine if differences exist between male and female rats on assessments of positive behavioral contrast. In Phase 1, four male and four female rats were observed under identical conditions in standard operant chambers on a multi VI-30" VI-30" schedule for seven days. One VI-30" schedule was signaled by a house light, and one VI-30 schedule was signaled by a tone. In Phase 2, the tone schedule was placed under conditions of extinction. While there was a significant decrease in responding during the tone stimulus, there was no significant evidence of increased responding during the light stimulus once the tone was put under extinction. Also, no significant differences were found between males and females regarding overall response rate or tendency to show positive behavioral contrast. The data suggest that assessments of positive behavioral contrast are not sensitive to sex differences in rats.

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Effects of Atrazine on Chlorophyll a Production in Lab-Cultured and Natural Phytoplankton

Anna Bailey, Erin Freeman, Shannon Wright, and Gorka Sancho
Department of Biology

Atrazine is an herbicide in commercial products used to kill lawn weeds. Surface water runoff can cause Atrazine to be washed into larger water bodies, including coastal waters. Atrazine inhibits photosynthesis, and can potentially have negative impacts on marine ecosystems. The purpose of this study was to determine the effects of Atrazine on phytoplankton, specifically how different Atrazine concentrations affect the growth of a laboratory cultured dinoflagellate species (Amphidinium) and a sample of natural phytoplankton from Charleston Harbor. Atrazine concentrations of 0μg/L, 0.25μg/L, 0.50μg/L, and 1.00μg/L were added to both phytoplankton samples in a growth chamber. As the concentration of Atrazine was increased, the growth of phytoplankton (measured by monitoring chlorophyll a concentrations) decreased in both phytoplankton populations. Atrazine could have a negative impact on marine ecosystems by inhibiting photosynthesis in coastal phytoplankton populations.

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- Award of Merit Poster -

Thermal fluctuation exponents for two near critical fluid systems

Brittany Bayley¹, Ana Oprisan¹, Sorinel Oprisan¹, John J. Hegseth², Daniel Beysens³, and Yves Garrabos³
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Supercritical fluids have been great potential for industrial application being used as non-polluting solvent of organic materials and in material science. We eliminate the effect of sedimentation, compression, and
buoyancy phenomena by making use of sulfur hexafluoride (SF6) experimental data recorded in microgravity, and a binary mixture of methanol and partially deuterated cyclohexane (CC*-Me) on Earth. We obtain information regarding the molecular interactions near the critical point, by using direct imaging and bright field, dark field, and phase contrast optical microscopy. Statistical analysis of the power spectrum of scattered and transmitted light revealed long range spatial correlations between fluctuations. Spatial correlation of fluctuations follows a power law for fluids, indicating universality of fluctuation mechanisms near critical point and a universal power law for all critical systems regardless of their molecular structure. The correlation time determined with the dynamic light scattering method was used to determine the thermal diffusivity coefficient.

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Chronic Ethanol Up-Regulates Synaptic Expression of The Nuclear Translational Regulatory Protein AIDA-1d in Hippocampus

Devin D. Antonovich, Patrick J. Mulholland, Bryen A. Jordan, Nick T. Luong, and L. Judson Chandler
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Recent studies have identified synaptic proteins that undergo synapse to nucleus translocation in response to neuronal activity that modulate protein synthesis. One such translational regulatory protein of the post-synaptic density being AIDA-1. Activation of synaptic NMDA receptors induces cleavage of AIDA-1 and the N-terminus is then shuttled to nuclear Cajal bodies, where it plays a possible role in RNA splicing. Moreover, prolonged synaptic activity produces an AIDA-1 dependant increase in global protein synthesis. The current study tests the hypothesis that there would be a corresponding increase in synaptic AIDA-1 following ethanol treatment. As expected, AIDA-1 is highly enriched in dendritic spines co-stained with PSD-95, and acute NMDA treatment increased AIDA-1 co-localization with coilin, a marker of Cajal bodies. Chronic treatment with ethanol or NMDA receptor antagonist APV enhanced the cluster size and density of AIDA-1. These data demonstrate that AIDA-1 expression is sensitive to chronic ethanol exposure and to prolonged inhibition of NMDA receptor activity.

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The Affect of Weak Magma Bodies on the Distribution of Compressional Stress in Variable Strength Lithosphere

Karen Black, Evan Koelker and Erin Beutel,
Department of Geological and Environmental Geosciences

Compressional stress within the lithosphere is not distributed evenly due to differences in properties such as density and strength of material. Therefore, weak magma bodies located in stronger lithosphere will affect the way compressional stress travels through the lithosphere. Mt. Rainier contains a hot and weak magma body located in strong lithosphere. The Cascadian subduction zone located to the left of Mt. Rainier contributes compressional stress to the region. Two-dimensional finite element models were used to mimic Mt. Rainier and evaluate the distribution of compressional stress in lithosphere containing weak magma bodies. Models suggest that compressional stress is not fully transferred through the magma body and is displaced horizontally. Pipes and chains of smaller weak bodies oriented perpendicular to incoming
Changes in Compression Stress Vectors through Magma Chambers in Single Type Lithosphere

Evan Koelker, Karen Black, and Erin Beutel
Department of Geology and Environmental Geosciences

Magma chambers in the lithosphere of the earth are areas of different physical properties (density, stiffness etc.) than the rock in which they are contained. Naturally they have an affect on the way stress moves through and around them. Physical models constructed using the FEA program show that vectors and quantities of displacement and stress directly relate to the placement and shape of these weak bodies. Objects assigned with physical properties consistent with magma under extreme pressure in the crust concentrate compression perpendicular to the application of force and extension parallel to it. This creates predictable displacement caused by deformation of the magma chamber. Knowing where these areas of stress are located can point to likely locations of rock failure. In unstable regions, such as those that surround volcanoes like Mt. Rainier, areas that concentrate stress correspond to areas of increased seismic activity.

Fitness of *Arabidopsis thaliana* through Manipulation of the Jasmonic Biosynthesis Pathway

Katherine Hoffman and Matt Rutter, Department of Biology

Through the jasmonic biosynthesis pathway, we examined the fitness of *Arabidopsis thaliana*. The jasmonic acid (JA) pathway is involved in defense against herbivores and pathogens, and JA production sometimes leads to stunted growth when natural enemies are absent. We obtained 32 *A. thaliana* T-DNA insertion knockout lines, representing 17 genes involved in JA biosynthesis and an additional closely related gene. We planted 650 seeds from these lines, incorporated a wounding treatment, and measured several components of fitness, including germination, growth, and reproduction. Germination showed the biggest effect, where knockouts in most genes performed better than the control. Homozygous knockouts in later steps in the pathway had a lower chance of germination. However, we found no effect of gene identity or treatment on rosette size, fruiting or survival. It was unexpected that these would germinate better than the control, suggesting JA may have a larger influence on germination than previously described.

Bathymetric survey of lionfish habitat at a mid-shelf rocky ledge, Onslow Bay

Allison Stone and Leslie R. Sautter, Department of Geology and Environmental Geosciences
The problem of growing populations of the venomous lionfish along the Southeastern United States coast has become an increasingly pressing issue for the regional fisheries of Onslow Bay, off the coast of North Carolina. The lionfish, an invasive species, was introduced into the South Atlantic Bight within the last few years. This non-indigenous fish has few natural predators, allowing populations to reproduce rapidly and threaten indigenous populations. Beginning in 2005 researchers from the NOAA Center for Coastal Fisheries and Habitat Research (Beaufort, NC) began a multibeam sonar study of Onslow Bay in order to address management concerns. Multibeam sonar surveys of two mid-shelf sites (water depths ranging 32 to 45 m), Lobster North and Lobster South were conducted aboard the NOAA Ship NANCY FOSTER, and the bathymetric data have been processed using CARIS HIPS 7.0.

**Multibeam Sonar Analysis of Hard Bottom habitats for Invasive Lionfish in Onslow Bay, North Carolina**

Brett Haenn, Jason Enfinger, and Leslie Sautter
Department of Geology and Environmental Geosciences

Multibeam sonar analysis of Onslow Bay, North Carolina was conducted from July to August in 2007, April in 2008, and June to July in 2009, aboard the NOAA Ship NANCY FOSTER. Three areas were analyzed during the survey: The Woo, 210 Rock, and SW ledges. Sonar data were collected using a Simrad EM 1002 multibeam echo sounder system. The 07 data were previously analyzed using Caris HIPS 6.0 and the 08 and 09 data were analyzed using Caris HIPS and SIPS 7.0. The purpose of this survey was to attain very precise bathymetry of these areas and use these data to look at the eminence of the hard bottom benthic habitats of the newly invasive Lionfish. An overall analysis reveals numerous small crevices, rocky ledges, and shallow escarpments that are similar to the native Indo-Pacific environment of Lionfish.

**Possible Submarine Landslide Locations Along the Continental Slope, East of Georges Bank**

Alex Nuechterlein, Daniel McCartha, and Leslie Sautter
Department of Geology and Environmental Geosciences

Georges Bank is geographically located near the edge of the continental shelf off the eastern coast of Massachusetts. In May 2009 scientists from the U.S. Geological Survey (USGS, Woods Hole, MA) collected multibeam sonar data from aboard the NOAA Ship RONALD H. BROWN, surveying the continental slope east of Georges Bank where water depths ranged from 200 to 3000 m. A Seabeam 2112 12KHz swath bathymetric sonar system was used to collect the bathymetric data, which was then processed using CARIS HIPS 7.0 software. The bathymetric image created makes it possible to view the seafloor morphology and depth relief of the continental slope area east of Georges Bank East. Numerous submarine canyons cut through the slope, and are conduits for submarine landslides. The USGS scientists will use the images produced to better understand areas of potential slumping for the purpose of investigating areas prone to tsunami generation.
Multibeam Sonar Analysis and Characterization of the Charleston Bump on the Blake Plateau off the coast of Charleston, SC

Kacey L. Johnson, M. Scott Harris, Leslie R. Sautter, and Robert L. Nusbaum
Department of Geology and Environmental Geosciences

Multibeam survey data, video, and surficial rock samples have been collected, analyzed, and interpreted from the Charleston Bump aboard multiple research vessels 200 km off the coast of Charleston, SC. The high-relief survey site is approximately 1300 km, with water depths ranging from 500 to 850 m. The Charleston Bump, located on the upper continental slope of the northern Blake Plateau, is covered with ferromanganese-phosphorite pavements that support the growth of deepwater corals. The pavement has partly eroded over time to form caves and overhangs, providing habitat for deep-dwelling, demersal fish. Moreover, the Charleston Bump deflects the Gulf Stream eastward, strengthening bottom currents while causing upwelling that supports the reproduction and nourishment of pelagic marine life. The purpose of this project is to create a high-resolution bathymetric map of the survey area and to characterize the deepwater rocky substrate so that fishery management plans can be initiated.

Seabed Characterization of the Transect Meanders using Multibeam Sonar, Backscatter, and Sedimentology

Christy Fandel and Leslie Sautter, Department of Geology and Environmental Geosciences

In 2004, College of Charleston Transect Program students identified a series of meandering channels in 22 m of water off the coast of Charleston, using Side Scan Sonar aboard the R/V Savannah. The area now known as Transect Meanders is recognized as an ancient coastline potentially dating to approximately 10,000 ybp when sea level was significantly lower than present. The site was reexamined in November, 2006 aboard the NOAA Ship NANCY FOSTER, where bathymetric and ground truth data were collected using multibeam sonar and sediment grab samples, respectively. The area exhibits exceptional hard ground features as well as vast areas of prominent sand features. Using Geocoder and CARIS HIPS 7.0 multibeam processing software, sediments within the region were compared to backscatter and bathymetric data to characterize the seabed. Fine sand deposits were found within incised channels, as well as on the leeward sides of hard-ground ridge-like features.

Education and Implementation of Nutrition and Sports Nutrition in College Students and Student-Athletes: A Pilot Study
Despite higher education, university students do not appear to have better knowledge or application of the USDA guidelines for proper nutrition than age-matched controls. The purpose of this study was to examine the nutritional knowledge and practice of university students and student-athletes, in particular, males versus females. A self-administered questionnaire was completed by 10 students (5 males/5 females) and 10 cross-country athletes (5 males/5 females). Mean scores for knowledge were poor (,,D‰) and no significant difference (p>0.05) was found among or within both groups. Interestingly, while female athletes had the lowest nutritional knowledge (33.3±20.8) they had the highest mean scores for implementation of nutrition. (68.9±19.9). This finding implies that female athletes understand there is a need to make healthier choices. Future research should explore the factors that influence the female athlete's eating habits as well as the effects that nutritional education can have.

Comparison of Contaminants in Urban and Suburban Retention Ponds

David Weiss and Brad Weiss, Department of Geology

Urban development causes extremely high runoff and reduces infiltration of water and negates the filtering affect of this process. We hypothesize that this causes pollutants to accumulate in urban retention ponds. We collected core samples from both an urban and suburban retention ponds which were then analyzed by the ICP-MS for trace element levels in the soil. Water samples were taken from both ponds and analyzed by the Ion Chromatograph to test for nitrates, sulfates, and phosphates. We found that the urban retention pond held more anthropogenic contaminants than its suburban counterpart. We then explored the possible causes and infiltration patterns for each trace element and compound in its respective environment.

The role of BDNF/TrkB signaling in acute amphetamine-induced locomotor activity and opioid peptide gene expression in the rat dorsal striatum

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Department of Psychology, Neuroscience Program, College of Charleston

Psychostimulants, such as amphetamine, are a category of abused drugs that have a high propensity for abuse potential due to their ability to induce feelings of euphoria. The major neural systems affected by AMPH are largely implicated in the brains reward pathway, including the striatum. After acute amphetamine exposure, brain chemicals including glutamate, dopamine, and brain derived neurotrophic factor are released in high concentrations. The release of these three neurochemicals in the rat striatum activates various signaling cascades that we believe contribute to an increase in local neuropeptide gene expression and locomotor behavioral effects. After a systemic injection of amphetamine and blocking the effects of brain derived neurotrophic factor, an important neuronal growth factor, total distance traveled decreased but vertical activity increased in rats. This data suggests that brain derived neurotrophic factor
plays an important role in amphetamine-induced locomotor activity. Assessment of neuropeptide gene expression is in progress.

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Relationships between Hip Strength and Joint Motion during a Single Leg Landing Activity

Athena DeAngelis\textsuperscript{1}, Michelle Glymph\textsuperscript{1}, Rachel Hulett\textsuperscript{1}, Michelle C. Boling\textsuperscript{2}, Susan Rozzi\textsuperscript{1}, Yum Nguyen\textsuperscript{1}
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Inward collapse of the hip and knee have been theorized as risk factors for anterior cruciate ligament (ACL) rupture and patellofemoral pain syndrome (PFPS), however, factors contributing to this inward collapse remain unknown. The hip musculature is thought to play a major role in controlling joint motion during dynamic tasks, however previous research has provided conflicting findings. The limitation with previous studies is that they only assessed the relationship between isometric strength and joint motion, and did not take into account the influence of concentric or eccentric strength on joint motion. Therefore, the purpose of our study is to determine if concentric and eccentric strength are related to hip and knee motions during a single leg landing in 40 college-age participants. Decreased concentric hip abduction strength was related to increased knee valgus motion (R=-0.40, P=.014) during a single leg landing. No other strength values were related to dynamic joint motion.

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Thermal Properties of Bismuth Powder Samples

Matthew Fitzgerald and Narayanan Kuthirummal, Department of Physics and Astronomy

Thermal diffusivities of powdered thermoelectric materials, Bi\textsubscript{2}O\textsubscript{3} and Bi\textsubscript{2}T\textsubscript{3}, were determined using photoacoustic spectroscopy (PAS). The characteristic frequencies, which mark the transition from a thermally thin to thermally thick state, were found through analysis of log plots of the PA spectra. Based on these values, the calculated values of thermal conductivities were 1.06 mm\textsuperscript{2}/s for Bi\textsubscript{2}O\textsubscript{3} and 0.89 mm\textsuperscript{2}/s for Bi\textsubscript{2}T\textsubscript{3}, assuming a pellet thickness of 0.15mm for both samples. The values match relatively well with those available in other literature. The results support the use of this technique, and we plan to attempt to characterize nano-powders this way in the future.

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Ground Reaction Forces during Bipedal and Quadrupedal Acceleration in Acanthodactylus boskianus, Sceloporus woodi, and Aspidoscelis sexlineatus

Anna Baur and Eric McElroy, Department of Biology
Little is known about why lizards demonstrate a shift in gait type (bipedal versus quadrupedal). In order to determine the differences in ground reaction forces of these gait types, three species of lizards were raced down a track. We examined how mediolateral, foreaft, and vertical forces varied between the two gait types and for each of the three species. Foreaft and mediolateral impulses had no significant interaction with gait type or step number for any of the species. Vertical impulse did have significant differences, primarily due to variations in step duration and maximum vertical impulse. In *A. boskianus*, all quadrupedal trials had higher vertical impulse than bipedal trials over all steps. Vertical impulse is proportional to energy expenditure, indicating that one advantage to bipedalism is possibly its lower energy consumption. For *A. boskianus*, this bipedal advantage could lead to bipedalism being a behavioral choice.

Comparison of Benthic Foraminifera Between two Cross-Shelf Transects off Charleston, SC

Vikki Bernotski and Leslie R. Sautter Department of Geology and Environmental Geosciences

During the Transect Program in November 2009, fourteen sediment samples were collected using a Shipek Grab Sampler along two South Carolina cross-shelf transects: the Primary Transect off Folly Beach and the Capers Transect off Capers Island. A 120 mL homogenized sub-sample was taken from each grab sample for the purpose of studying benthic foraminifera. Foraminifera specimens were picked from the > 500 μm size fraction and identified to the genus level. The most common foraminifera genera, >10% of total abundance, were compared between the two transects for the inner, middle, and outer continental shelf regions. All genera found are present in both transects, showing equal diversity. The major genera vary across the shelf and are similar between the two transects at the outer shelf, but vary greatly for the inner and mid-shelf regions.

Diel Vertical Migration and Cross-shelf Distribution of Ichthyoplankton off Charleston, SC

Jessica Miller and Gorka Sancho, Department of Biology

Evidence for diel vertical migration (DVM) of larval fishes through the water column has been documented in several studies. In order to describe possible DVM behaviors in the ichthyoplankton community, plankton tows were taken off of the R/V Savannah along two transects across the continental shelf off the coast of SC in November 2009 as part of the Transects Program. Surface water tows were made with a Neuston net, and the water column was sampled by a Multiple Opening/Closing Net Environmental Sensing System (MOCNESS), collecting three stratified plankton samples. By comparing the day and night samples, little evidence for diel vertical movements was found at the stations sampled. In a comparison between the Neuston and the MOCNESS, there were no significant differences in the average total length of fishes caught.
Seasonal variation in fish diversity and abundance in the South Atlantic Bight

Marisa Ponte and Gorka Sancho, Department of Biology

Many demersal fish studies in the Southeast United States have focused solely on large adult fish, due to the use of commercial trawl gears. The use of a beam trawl with finer mesh size allowed for the capture of small fishes and the examination of their distribution, diversity and abundance. Eight stations distributed throughout the inner, mid- and outer shelf areas were sampled with 1 and 2m beam trawls as part of the Transects Program at the College of Charleston. Sampling was done in May (2004, 2005) and November (2003, 2004, 2009) to characterize the fish assemblages over time. High seasonal abundance changes were observed. Abundance of fishes increased sharply in the spring in the inner and midshelf areas, particularly in the dominant species *Synodus foetens*, *Symphurus minor*, *Prionotus carolinus* and *Etropus cyclosquamus*. Species diversity was variable.

Resonant Ultrasound Spectroscopy in Thermoelectric Materials and Heavy Fermion Superconductors

Tim Faugl and Alem Teklu Department of Physics and Astronomy

Resonant Ultrasound Spectroscopy is a nondestructive method of material research that uses ultrasound waves to accurately determine the elastic constant of materials by observing the resonant frequencies of materials. To do this, crystals of Ce$_{0.75}$Fe$_3$CoSb$_{12}$ and YIn$_3$ were placed between two transducers which applied stress waves to these crystals. The transducers measured the resonant frequencies of the sample, and the collected data was analyzed. We found the elastic constants $C_{11}$, $C_{12}$, and $C_{44}$ of Ce$_{0.75}$Fe$_3$CoSb$_{12}$ to be 1.61, 0.48, and 0.57, respectively, with a root mean squared of 0.061. The elastic constants $C_{11}$, $C_{12}$, and $C_{44}$ of YIn$_3$ were found to be 0.774, 0.129, and 0.421 respectively, with a root mean squared of 0.330.

Batch and seasonal fecundity estimates in Sheepshead *Archosargus probatocephalus* (Teleostei: Sparidae) with correlation to life history traits

Marisa Ponte$^1$, Chris McDonough$^2$, and Steve A. Arnott$^2$

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Sheepshead (*Archosargus probatocephalus*) is a coastal Atlantic sparid with an important recreational fishery. Sheepshead are asynchronous batch spawners and estimating reproductive output requires estimates of batch fecundity and spawning frequency. Relationships between size, age and fecundity are poorly characterized. In this study, these parameters were defined from recreational anglers catches off the coast of South Carolina between 2001 and 2009. Otoliths and whole ovaries were extracted from female sheepshead (n=89) undergoing full oocyte maturation. Fecundity was determined using gravimetric techniques and ranged from 66,409 to 320,012 with a mean of 210,020 oocytes. Specimen ages ranged from 2-18 years,
and 320-612 mm total length. Mean fecundity estimates varied widely with age, although they did increase linearly ($R^2=0.95$). The relationship between fecundity and length and weight, while positive, were not strong due to the wide range of sizes after age 4, which indicate length and weight are poor predictors of batch fecundity.

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Potential of Using Photomosaic Pictures to Generate a Fish Census at Lucky Strike Hydrothermal Vent (37º17'-37º18'n; 32º16'-32º17'w)

Jessica Miller and Gorka Sancho Department of Biology

Lucky Strike is a hydrothermal vent field centered over 3718.5N, 3216.5W consisting of several major sulfide deposits and invertebrate fauna found to be significantly different from those of other nearby vent fields, TAG (26ºN) and Snake Pit (23ºN), as well as being notably more shallow. Some research has been done to classify the ichthyofauna of the Lucky Strike vent field specifically, but little has been done to quantify the species populations and distributions across the field. Using the black and white photographic mosaic data collected by the CNRS, an attempt was made to quantify and characterize the ichthyofauna populations associated with the Lucky Strike vents. Fishes appeared to avoid the area directly in the center of vent system, instead populating the surrounding areas. Prominent fish genera observed included *Hydrolagus sp.*, *Coelorhynchus sp.*, and *Synapobranchus sp.* Future work will include a comparison between color photomosaics and video as censusing methods.

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Habitat Characterization of Continental Shelf Seafloor off Charleston, SC

Stephen A. Long and Leslie R. Sautter, Department of Geology and Environmental Geosciences

Habitat characterization of seafloor sites on the continental shelf off Charleston was conducted using video and sediment samples collected as part of Project Oceanica's Transects Program. Samples were collected aboard the R/V Savannah in November 2009, using a Phantom 300 remotely operated vehicle (ROV) and a Shipek grab sampler. In addition to these samples, ROV video images from November 2003 were subsampled. Adjacent transects of the continental shelf were compared in terms of substrate and sediment. Habitats observed included soft to hard substrate with features such as mottled ripples and rock outcrops. Relief ranged from less than 0.5 m to greater than 1.5 m. Epifaunal density was found to be primarily sparse, however abundant in areas of the greatest relief. Sediment ranged from coarse silt to very coarse sand. These results can supplement additional research being conducted.

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Distribution and Diel Vertical Migration of Zooplankton in the South Atlantic Bight

Leianna Arnold and Gorka Sancho, Department of Biology
The vertical and horizontal distributions of zooplankton over the South Atlantic Bight were analyzed and correlated with chlorophyll distributions. Zooplankton samples were taken with a Multiple Opening/Closing Net and Environmental Sensing System (MOCNESS) and a Neuston net in November of 2009 in continental shelf waters off Charleston, SC along two transect lines perpendicular to the coastline. The abundance and diversity of different zooplankton taxa were analyzed from preserved samples using a compound scope in order to describe distributional patterns in relationship to oceanographic variables. To characterize possible diel vertical migration (DVM) behavior patterns within the zooplankton community, MOCNESS tows were taken at discrete depths during day and night times and compared. Total zooplankton biomass was higher closer to shore, suggesting a positive correlation between zooplankton and phytoplankton densities. Also zooplankton biomass was higher during night tows than day tows suggesting diel vertical migrations.

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Validity of the Star Excursion Balance Test and Single Leg Triple Hop Test as Functional Measures of Hip Strength

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The Star Excursion Balance Test (SEBT) and Single Leg Triple Hop Test (SLTH) are functional tasks that are commonly used in the sports medicine setting for rehabilitation of athletic injuries and as criteria for safe return to activity. It has been suggested that performance on these functional tasks are reflective of hip strength, however, these relationships have not been supported with evidence. Therefore, the purpose of this study was to determine if relationships exist between hip strength and performance (distance) on the SEBT and SLTH. Our hypothesis was that decreased hip strength would be related to decreased distance in the SEBT and the SLTH. Assessment of 40 college-age subjects revealed that hip external rotation (R=0.67-0.68, P<.001), extension (R=0.34-0.66, P<.031) and abduction (R=0.41-0.54, P<.009) isometric, concentric, and eccentric strength were related to increased SLTH distance. However, no relationships were noted between hip strength measures and performance on the SEBT (R=-0.03-0.22).

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Vancomycin-Resistant Enterococcus Analysis using Pulsed-Field Gel Electrophoresis

Siobhan Drumm, Department of Biology
Marie Castoldi, College of Medicine, Medical University of South Carolina

Nosocomial infections present a large problem to patients and hospitals throughout the United States. In this experiment we used pulsed-field gel electrophoresis (PFGE) to identify clonal variants among vancomycin-resistant enterococcus (VRE) samples acquired from the intensive care units (ICU) of three hospitals over a 12 month period. Samples were taken from six predetermined locations per room. Initial results showed 1-2 predominant variants per hospital. Since broad variability was not seen at each hospital, further investigation into the relationship between patient and environmental samples was conducted using one hospital as the investigation site. Initial analysis showed only 19% of patient samples correspond to one of the hospital
New Uintan (Middle Eocene) Omomyine Primate Species from Southern California

Kathryn J. McGrath and Dana A. Cope, Department of Sociology and Anthropology

Traditionally, the Uintan North American Land Mammal Age (46-38 million years ago) has been viewed as a time when primate diversity declined due to reduction in closed canopy forests at the end of the early Eocenes global warming maximum. Recent discoveries in the Uinta C Formation of Utah, the Devils Graveyard Formation of West Texas and the Laredo formation, Texas, makes it clear that diversity reduction has been overestimated. We examined over 150 specimens, mostly isolated teeth recovered through screenwashing, at the San Diego Museum of Natural History. All measurements were taken with a stereomicroscope with an ocular micrometer. In addition to the presence of Ourayia uintensis, found in all the areas above, this paper describes two new endemic primate omomyine species from the Uintan Friars, Santiago and Mission Hills Formations of Southern California. These results imply a complex local history for these areas that does not mirror macro-climatic trends.

Resonant Ultrasound Spectroscopy in Gamma Brass and Doped Cobalt Antimony

Alem Teklu and Joseph Niehaus, Department of Physics and Astronomy

Resonant Ultrasound Spectroscopy is a method of deriving elastic stiffness constants from crystals by examining standing waves within the crystal. The samples Gamma Brass and CeFe$_4$Sb$_{12}$ were placed between two transducers which propagated acoustic waves. Resonance in the crystal was measured and elastic constants were then calculated. The Bulk Modulii for Gamma Brass and CeFe$_4$Sb$_{12}$ are 1.049 and 8.450 respectively.

User Passwords Exhibit Zipfian Proportions

John Youngblood and Bill Manaris, Computer Science Department

A corpus of over 32 million passwords was stolen from the social networking software company, RockYou, in December 2009 by an unknown hacker. The corpus was briefly posted on the Web, and so it was downloaded and analyzed by scientists and security experts. Using a Python program, we counted and assigned statistical ranks to these passwords, in order to compute their rank-frequency distribution. We discovered that passwords exhibit the same statistical proportions as books taken from Project Gutenberg. In particular, books exhibit 1/f (power-law or harmonic) proportions. This is known as Zipf's law. The significance of this finding is that computer passwords can now be added to a long list of natural and human-made phenomena known to exhibit Zipfian proportions, including music, city sizes, peoples
incomes, subroutine calls, earthquake magnitudes, thickness of sediment depositions, extinctions of species, traffic jams, visits to websites, and opening chess moves.

Late Stage Phase Separation of Pure Fluids Near Critical Point

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³ESEME, Institut de Chimie de la Matiere Condense de Bordeaux, CNRS, Université de Bordeaux, France

In order to study fluctuations and phase separation processes near the critical point of pure fluids, without the influence of the Earth's gravity, a set of experiments were performed in the microgravity environment using Alice 2 instrumentation. Local density fluctuations were observed by illuminating a cylindrical cell filled with a pure fluid, sulfur hexafluoride, near its liquid-gas critical point and recorded using a microscope and a video recorder. The pure fluid is heated above the critical temperature then quenched slightly below the critical temperature such that gas and liquid domains form. Microscopic images were analyzed to determine the droplets formation and distribution with time. The coalescence-induced coalescence mechanism was examined to determine its effect on droplet formation. Power spectra from full view images were obtained to analyze the power laws at different stages of phase separation domains.

Snapping Shrimp's Reaction to a Mirror Test

John Capelle and Melissa Hughes, Department of Biology

The purpose of this study is to identify whether snapping shrimp can visually perceive themselves. A mirror-test was used to test for self-recognition as well as cognition by placing a bright red mark on the shrimp and placing them in front of the mirror. Such reactions such as the rotation and adjustment of the body or the prodding of the spot while viewing the mirror were recorded. After testing for several variables, it appears that snapping shrimp face an area less when there is a mirror in that direction. Also it appears that snapping shrimp do not come into contact with an area that has a mirror than in one that does. The findings suggest that the shrimp does not have self-perception, yet does recognize the image to be another organism to keep a distance from.

Evaluation of Petroleum Hydrocarbon Occurrences in Estuarine Sediment Using Remote Sensing and Geochemical Techniques

Kyle Gray, Vijay Vulava, Amer Smailbegovic, Virginia Murphey, Kacey Johnson, and Ross Holbrook
Department of Geology and Environmental Geosciences
Remote detection of petroleum hydrocarbons (PHs) using visible-near infrared and short-wave infrared spectroscopy has gained popularity over the last decade as a useful technique in monitoring sites of possible petroleum pollution. The introduction of PHs into the environment via runoff/spill of oil and oil distillates can cause damage to ecology and human health. Using spiked sediment samples as a spectral input it is possible to carry out spectral similarity algorithms to extract spectral matches within an airborne hyperspectral dataset and thus delineate areas of possible PH pollution. Preliminary analysis of imaging spectrometer data in the industrial/estuarine setting of North Charleston, SC and subsequent ground truthing suggests multiple locations of sediment contamination by PHs. However, chemistry techniques are required in order to verify contamination. Therefore, a method was developed and implemented for the extraction and quantitation of PHs within the polluted marsh sediment. This data will be presented at the conference.

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• Award of Merit Poster •

Bleaching of *Oculina varicosa*, a Temperate Zone Stony Coral off South Carolina

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

_Oculina varicosa_*, a temperate zone stony coral, was monitored for bleaching on the wreck of the Freddy Day off the coast of Charleston, SC. Observations by divers suggested that this species may bleach in summer but it lacked documentation. Sampling in July, September, and November 2009, revealed that *O. varicosa* contains a cold water clade of symbiotic zooxanthellae that bleach when water temperature approaches 27.7°C. Curiously, chlorophyll a per cell and zooxanthellae mitotic index both increased during bleaching and recovery for which we have no explanation. However, bleached colonies suffered partial mortality suggesting that bleaching is detrimental to their vitality. It is well known that thermal stress can trigger tropical coral bleaching, but little is known concerning the responses of temperate species. Thus, *O. varicosa* may be an early indicator of the effects of global climate change on temperate zone marine habitats.

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Expression of Myoregulatory Genes in the Sea Urchin *Lytechinus variegatus*

Erica Flores, Elizabeth Ahern, Travis O'Dell, and Christine Byrum
Department of Biology

In metazoans, muscle development is regulated by several transcription factors including SRF (serum response factor) and MEF2 (myocyte enhancing factor 2). Both SRF and MEF2 contain MADS-box domains, crucial to their DNA-binding specificity. In muscle development, SRF is known to act as a cofactor with myocardin family genes, a group of genes that activate transcription in smooth, skeletal, and cardiac muscles. MEF2 influences skeletal muscle differentiation by interacting with the transcription factor MyoD, and is also critical for cardiomyocyte differentiation. Homologues to these myoregulatory genes were PCR cloned in the sea urchin *Lytechinus variegatus* and reverse transcriptase PCR was performed at intervals throughout development to determine peak levels of gene expression. MEF2 levels were especially high at the end of gastrulation, a period during which the *L. variegatus* MyoD homologue, Sum-1 is also
known to be active. High levels were also detected at 28 and 32 hpf (embryo development at 23°C). Preliminary results indicated that SRF was present at the prism stage (21.5 hpf).

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Reliability and Validity of Digital Photographs in the Measurement of Lower Extremity Alignment

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Alignment of the lower extremity has been suggested as a risk factor for knee injuries. To identify risk factors, researchers need to perform large-scale multi-center prospective studies. This requires multiple testers in order to collect a large volume of data. Research has yet to identify a valid and reliable technique that may be utilized to evaluate static alignment in large-scale multi-center prospective investigations. Therefore, the purpose was to examine the test-retest and inter-tester reliability of a newly developed digital photograph technique. A secondary purpose was to determine the validity between the digital photograph technique and clinical measures for evaluating static alignment. Assessment of 15 college-age participants revealed moderate to excellent test-retest reliability (ICCs=0.48-0.98) and good to excellent inter-tester reliability (ICCs=0.71-0.99) with the use of the digital photograph technique. Furthermore, moderate to excellent agreement was observed between clinical and digital photograph measurements for the evaluation of static alignment (ICCs=0.60-0.99).

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Diversity and Distribution of Pteropods Across the Continental Shelf of South Carolina

Kayla Spry and Gorka Sancho, Department of Biology

Pteropods were collected across the continental shelf of South Carolina using a Multiple Opening/Closing Net Environmental Sampling System (MOCNESS). This sampler had three nets with mesh sizes of 150μm that sampled three portions of the water column, from a depth of ~40m to the surface. The diversity of genera and their abundance across the shelf were explored through comparison of samples taken across the shelf. By examining organisms at the surface and at different depths, vertical stratification, diversity and distribution of pteropods across the continental shelf were analyzed. It was found that the genus Creseis was most abundant only at the station closest to shore, while Limacina spp. dominated the samples along the rest of the transect. The highest densities were found in mid-shelf habitats, and the waters closest to shore display a different community than in the rest of the shelf waters, and pteropods display diel vertical migration.
Gene knockouts in the biosynthesis pathways of triacylglycerol and glycine affect germination and growth in *Arabidopsis thaliana*

Laura Boduch and Matt Rutter, Department of Biology

We looked at two biosynthetic pathways within *A. thaliana*, the triacylglycerol biosynthesis pathway and the glycine biosynthesis pathway, in order to find the phenotypic effects of gene knockouts. We obtained 68 T-DNA insertion knockout lines representing 39 genes. We grew the knockout lines in the greenhouse and measured germination rate and growth for the knockout lines and a control. The knockout lines overall showed decreased germination for both pathways. Within each step of the two pathways variability was seen for germination, but not for growth rate. The position of the insertion site for the knockout lines also influenced patterns of germination and growth. The results suggest hypotheses about the functional roles of the genes within the pathway. The results also show the insertion site is an important factor in regards to fitness.

Fingerprinting the origin of Native American artifacts from Cape Fear, NC

Sam Kuzma, Heather Meyer, and T. Laffredo
Department of Geology and Environmental Geosciences

Researchers from NC are interested in determining the source of the chert that was used to make artifacts created by ancient Native Americans that were discovered in the area near Cape Fear, NC. The convention hypothesis is that the chert originated from Arkansas, even though there were offshore sources of chert that would have been available to the Native Americans over 5000 years ago. Nine arrowhead samples from the Cape Fear area were digested in strong acid solutions using a Microwave Accelerated Reaction System to determine the elemental composition of the artifacts. These concentrations were compared with elemental concentrations of chert samples obtained from Arkansas and a location just offshore from Cape Fear using Inductively Coupled Plasma Mass Spectrometry. The raw data shows a rough correlation between the samples and the chert sample from North Carolina. This is far from definitive and more rigorous statistics are currently being calculated.

A Genomic Analysis of Smooth Muscle Marker Proteins in the Sea Urchin *Lytechinus*
Variegatus

Travis Lee O'Dell, Department of Biology

Calponin is an important actin-binding protein known to be specific to smooth muscle in vertebrates. In addition, this molecule can also bind actin cofactors. Actin is a versatile protein in the cell, forming microfilaments in muscle and the cytoskeleton as well as playing important roles in endocytosis. In this project, we sought to identify known members of the Calponin family in the sea urchin *Strongylocentrotus purpuratus*. To do this we selected known members of the Calponin gene family from the well defined *Mus musculus* genome. Then, using the genome of the sea urchin *S. purpuratus*, we searched for similar genes. In addition, each family member was further characterized using domain analysis by searching for the presence of Calponin Homology Domains. This project provides a better understanding of which Calponin family genes are located in invertebrates and how the Calponin family proteins correlate between species.

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Modafinil reverses methamphetamine induced cognitive deficits in object to place task

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Methamphetamine (meth) causes cognitive deficits in humans and animals. We used modafinil to determine whether memory impairments could be reversed. Male rats received a neurotoxic meth (4x4 mg/kg, 2 hr intervals) or saline regimen. One week later rats were tested in the object to place task by familiarizing them to four different objects in a round field for five minutes. Immediately afterwards, rats received 100 mg/kg modafinil or vehicle. During the test, 90 minutes later, the locations of two objects were switched. Total time spent at each object, approaches, and motor activity was recorded for three minutes. Saline/vehicle and saline/modafinil rats spent more time interacting with objects in the changed locations. Meth/vehicle rats spent similar time at all objects, indicating a memory deficit. Meth/modafinil rats spent more time interacting with the objects in the changed locations. In summary, these findings demonstrate the reversal of meth-induced cognitive deficits with modafinil.

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Morphological and Genetic Identification of North West Atlantic Commercial Larval Fishes

Carolyn Tarpey, Gorka Sancho, and Erik Sotka
Department of Biology

The understanding the early life history of fishes is required for the protection and management of commercial stocks and accurate and explicit identification of the larval fish is necessary for their study. We compare the results of identification of suspected commercially important larval fishes using visual morphologic characteristics and genetic sequencing using CO1 genes. Larval fishes collected from surface
and subsurface tows off the South Carolina were identified to the lowest taxonomic level using visual morphology characteristics and genetic sequencing of the mitochondrial DNA gene cytochrome oxidase subunit 1 (CO1). When results of morphological identification and genetic sequencing were compared, it was found that the morphological identification was incorrect at the Family level more than 80% of the time. It was determined that morphological identification is hindered when larval fishes are at an ambiguous stage of development and have not developed their characteristic morphological traits, or if they have been maimed or poorly preserved.

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Binding of Naproxen and Ibuprofen in Organic- and Clay-Rich Soils

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Pharmaceuticals, several of which are known endocrine disruptors in mammals and aquatic life, are some of the most ubiquitous chemicals found in natural surface waters across the world. In this project, we studied sorption of two pharmaceutical chemicals, ibuprofen and naproxen, in several soils that have different physical and chemical properties (e.g., soil pH, organic content, particle size, etc. Clean soil samples were taken from two different locations within the Francis Marion National Forest near Charleston, SC. These soil samples were spiked with varying concentrations \(10^{-3}-10 \text{ mg/L}\) of ibuprofen and naproxen in aqueous suspensions. Using batch sorption studies, sorption isotherms were created for these chemicals in the soil samples. A sorption isotherm quantitatively describes sorption of chemicals onto surfaces resulting in compound-specific sorption parameters such. Our experiments concluded that both chemicals more readily sorbed to organic-rich soil and less to the lower organic, relatively clay-rich soil.

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Changes in Cross-Shelf Sand Size Distribution Off the Coast of Charleston, SC from 2003 to 2009

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

Temporal changes in cross-shelf sand size distribution have been studied by undergraduate students from the College of Charleston Transect Program using sediment samples collected at seven stations during three research cruises from November 2003 to November 2009. Variations in grain size demonstrate changes in wave energy, currents, and tides affecting how deposition occurs. In 2009, samples were collected along a cross-shelf transect off Folly Island, SC using a Shipek grab sampler. Ro-Tap sieve and statistical analyses were conducted, and compared to results from two previous cruises on sediment samples collected at the same stations to demonstrate temporal changes in cross-shelf grain size distribution. The mid-shelf has a higher level of variability, whereas the most of the inner and outer shelves remained constant. Variability may be due to a station's close proximity to rocky hard ground areas.
**Distribution of Decapod Crustaceans along the South Atlantic Bight off the coast of Folly Beach, SC**

Jennifer Kist and Gorka Sancho, Department of Biology

To characterize the distribution of benthic crustaceans of the Order Decapoda in the South Atlantic Bight, seafloor biota samples were collected using a 2 m beam trawl towed over a soft and sandy substrate for distances ranging from 213 to 771 m. Collections took place as part of the College of Charleston’s Transect Program Leg 05 in November 2009, along two parallel cross-shelf transects at 7 stations located in water depths from 17 to 100 m. Benthic crustaceans collected were preserved in 4% formaldehyde and later transferred to 95% ethanol. The abundance and diversity of decapods in inner, middle and outer shelf habitats were correlated to bottom sediment grain size and depth in order to establish the habitat preferences of specific crustacean species. It was found that Decapod Crustacean abundance and diversity decreased as depth increased and the most abundant and diverse station contained coarse sand.

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**A Cross-Shelf Examination of Benthic Foraminifera off the Charleston, SC Coast**

Emily Osborne and Leslie R. Sautter
Department of Geology and Environmental Geosciences

Benthic foraminifera are single celled, calcium carbonate Protists found in all marine environments. These chambered organisms have proven to be invaluable proxies for reconstructing paleo-environments. The College of Charleston Transect Program has conducted five oceanographic research cruises off the Charleston coast along cross-shelf transect lines. Using a Shipek Grab Sampler, sediment samples were collected in November 2009, and foraminifera (125-500μm) were extracted from each sample and identified to the genus level. Foraminifera were also classified by test texture, showing an overall dominance of Rotalids. Twenty genera were found across the continental shelf, seven of which were dominant. The genus *Cibicidoides* (a Rotalid) dominates across Charleston’s entire continental shelf. This distribution differs from Wylie Poags Generic Predominance Facies off the West Florida shelf, possibly the result of low bottom water temperature variance off Charleston, due to the influence of the Gulf Stream at the shelf edge.

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**Interannual marine phytoplankton community dynamics in continental shelf waters off Charleston, South Carolina**

Morgan A. Cawley¹, Andrew Shuler², Steve L. Morton², Gorka Sancho¹ \¹Department of Biology \²CCEHBR/NOAA, Hollings Marine Lab

This study offers an interannual comparison of continental shelf phytoplankton species composition and distribution in the fall of 2004 and 2009. Phytoplankton communities can change in accordance to surface water environmental parameters such as temperature, salinity, nutrient availability and weather events.
Phytoplankton is the base of pelagic food webs, and its species composition is important since not all species of phytoplankton are equal in relation to their nutritious value to grazers or predators. The abundance and distribution of the Domoic acid producing diatom species, *Pseudo-nitzschia*, is highlighted due to the potential role of this harmful alga in the mortality of marine mammals. An observed dominance of cyanobacteria spp. *Trichodesmium* in all 2009 samples is likely due to warmer waters and drift from hurricane Ida's passage. Dinoflagellates were less abundant than diatoms. Diatoms decreased with distance to shore whereas dinoflagellates had an overall increase.

Analyses of Trace Metal Contaminants in Soils of a Previously Contaminated Industrial Site

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Department of Geology and Environmental Geosciences

The Macalloy Corporation site is a former ferrochromium alloy manufacturing plant located at Shipyard Creek in North Charleston, where ferrochromium alloy was produced by smelting chromium ore in submerged electric arc furnaces from 1941 to 1998. The soil, sediment, and ground water at this site were contaminated with hexavalent chromium, as well as radiological debris, nickel, zinc, and arsenic. Even though this site was remediated from 1998 to 2006 to mitigate transport of these contaminants to Shipyard Creek, the general view was that this site was still contaminated. In this study, surface soil samples were collected from the borders of the site and were analyzed for trace metals using the ICP-MS. Our analysis show that the concentrations of these metals were above EPA recommended sediment safe-contaminant levels. It is not clear what the sources of these contaminants are, since this area is heavily industrialized.

Why Are There Thermal Springs in the Appalachians? A Case Study of Two Springs

Chris Looney and Erin Beutel
Department of Geology and Environmental Geoscience

The thermal springs of Warm Springs, GA, and Hot Springs, NC, are rare geologic features of the Appalachian Mountains. The topography, geology, and hydrology of these areas were analyzed to get a better understanding of how these two locations produce thermal springs. The main factors in the production of the thermal springs are the existence of a deep, confined source of water and an isolated pathway that draws the warm, deep water up quickly, allowing the water to retain its heat at the surface.

Bathymetric Analysis of Submarine Canyons to Assess Morphological Variations and their Possible Origins
Multibeam sonar data were collected by the U.S. Geological Survey (Marine Branch, Woods Hole) aboard the NOAA Ship RONALD BROWN along the continental slope from Cape Hatteras to Nova Scotia in May, 2009. ELAC SeaBeam 2112 was used to collect data; CARIS HIPS 7.0 was used for sonar data processing. Continental slope morphology was examined, revealing dramatic submarine canyons, scarps, and slumps. Submarine canyons are historically formed by underwater landslides. The area studied is located south of the Connecticut coast. High resolution mapping and profile analysis of McMaster Canyon, Hydrographers Canyon, and Veatch Canyon was used to qualitatively evaluate morphological differences and hypothesize their origin. Similar depths were examined to compare and contrast gradients along transects perpendicular to the canyons.

Bathymetric Analysis Of Coral Reef Habitat In The Florida Keys National Marine Sanctuary

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Department of Geology and Environmental Geosciences

In September 2009, multibeam sonar data were collected aboard the NOAA Ship NANCY FOSTER throughout the Florida Keys National Marine Sanctuary. The three sites surveyed during the September cruise are located southeast of Vacation Key, south of Key West, and west of Dry Tortugas. The focus of the investigation was to provide coastal managers with information concerning coral reef habitats, fish populations, and natural resource distribution in order to assist with NOAAs Marine Spatial Planning initiative. CARIS HIPS 7.0 software was used to process bathymetric data that were collected using a SIMRAD EM1002 multibeam sonar data acquisition system. Water depths range between 12 and 120 m with reef habitats located in waters shallower than 30 m at the Dry Tortugas site. Numerous scientific dives were conducted to assess fish populations and reef biodiversity. Ongoing explorations are necessary west of Dry Tortugas to monitor the effect of preservation on reef habitats.

Bathymetric analysis of Lionfish habitats along the continental shelf edge off Onslow Bay, North Carolina

Greg Goldberg, Amber Onufer, and Leslie R. Sautter
Department of Geology and Environmental Geosciences

Bathymetric survey data were collected by NOAA along the shelf edge of Onslow Bay aboard the NOAA Ship NANCY FOSTER in April 2008 and June 2009. Two sites, "Big Fish" and "OS_05" (water depths ranging 39.75 to 133.72 m) were investigated using multibeam sonar, and processed using CARIS HIPS 7.0 software. Mapping the bathymetry of this rocky seafloor area aids in assessing the benthic habitat of the non-indigenous Lionfish (*Pterois volitans*), which has been seen to propagate in the waters off the southeast
U.S. coast since the early 1990's. The venomous Lionfish—native to the Indo-Pacific coral reefs thrives in warm waters up to depths of 200 m. This species is a danger to the commercial grouper fishing industry off the southeastern U.S. coast since it feeds on small fish and crustaceans, and has no known predators. Habitat mapping provides useful information for eradicating this invasive species.

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**Multibeam Sonar Analysis of Dry Tortugas National Park**

Kristen Hughes and Leslie R. Sautter  
Department of Geology and Environmental Geosciences

Dry Tortugas National Park was established in 1992 to maintain its unique and pristine marine habitat. Located ~112 km west of Key West, Florida, the Park spans over 64,700 acres, with 99% of its area under water. Unique coral communities with coral mounds and pinnacles, and staghorn and elkhorn corals thrive in this tropical shallow water substrate. Multibeam sonar data were collected on the NOAA Ship Nancy Foster in September 2009 by investigators from the NOAA Florida Keys National Marine Sanctuary Coral Disease and Condition project. Bathymetric data were then processed using CARIS HIPS 7.0. The reef platform is mainly composed of oolitic and coral sands, with some carbonate muds and large sand bodies. The living coral reefs are currently under threat of degradation due to vessel groundings and overuse. Multibeam analysis of Dry Tortugas provides a baseline to determine future efforts to preserve this National Park.

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**Water Quality of a Deforested Wetland and Comparison to an Old Growth Swamp**

Jonathan Watson, Department of Biology

The temperature, pH, and specific conductivity of water flowing through a freshwater coastal wetland was monitored before, during, and a decade after deforestation to evaluate the ecological role of wetlands as biological filters between the land and sea. Deforestation altered the chemical characteristics and behavior of runoff from rain events. Thus, wetlands and associated watersheds interact to mediate both the amplitude and the chemical composition of terrestrial runoff. A parallel study in Francis Beidler Forest, an old growth swamp, reveals a much more stable series of water quality parameters. The capacity of a wetland to improve stream water quality is largely dependent upon the stability of the neighboring terrestrial environment which contributes to its chemical properties and consequently the diversity of the wetland biota.

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**Systematic Analysis of the Marine Hatchetfish *Polyipnus triphanos* Species Complex (Sternoppychidae)**

Iris M. Kemp and Antony S. Harold, Grice Marine Laboratory
The species complex *Polyipnus triphanos* is the subject of the present systematic analysis. Observations on qualitative morphological features with emphasis on the body pigmentation and photophores, serially repeating features such as fin rays and light organs, and internal structure based on radiography were included. We compiled a set of landmark-based morphometric measurements for use in bivariate and multivariate statistical analyses. Sheared principal components analysis was used to assess and quantify size-free variation in body shape. A reference image library was created to assist in the description of meaningful features. This has particular import in its inclusion of information about the dorsally positioned pigment bar and saddle marking, which are distinguishing characteristics. Preliminary results indicate the presence of at least two distinct species within the *P. triphanos* complex. Further resolution of this hatchetfish group will provide a more accurate assessment of biodiversity in the Indo-Pacific.

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**Schooling Fish Densities Around Urban Piers**

Iris M. Kemp¹, Gorka Sancho¹, Kenneth W. Able², and Thomas M. Grothues²

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The Hudson River has been severely modified; results from studies on this area may be generalized to other estuarine habitats. Research indicates that under-pier habitats are unsuitable for juvenile fishes, due to the depression of light availability. However, pier-edge habitats may be utilized as refuges from predation and/or feeding oases. In this study, schooling fish density was measured to establish the value of structure as potential habitat. Data obtained from dual-frequency identification sonar (DIDSON) were used to quantify and qualify schools and density. The habitats considered were under-pier, pier-edge, open water, and relict pile field (pilings with no covered deck). Physical measurements were taken and incident light levels were recorded. Behavioral observation around piers will increase understanding of fish interactions with these potential habitats. As structure becomes more prevalent, its viability as potential habitat and its effects on fish mortality must be researched.

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**Biota Diversity of Hydrate Ridge Regional Scale Node Site on the Juan de Fuca Plate, Northeast Pacific Ocean**

Stephen A. Long and Leslie R. Sautter

Department of Geology and Environmental Geosciences

Multibeam sonar data from the Hydrate Ridge site of the Regional Scale Node of the Ocean Observatory Initiative were collected July 22–August 5, 2008 during the INSITE ’08 cruise on the University of Washington's research vessel, the R/V Thomas G. Thompson. Seafloor bathymetry maps were produced in 2009 by College of Charleston seafloor mapping students. The research cruise also yielded digital images used for ground-truthing. The digital seafloor images were examined for biota to create a web resource and obtain a better understanding of the benthic habitat within and around Hydrate Ridge. This resource can be used for future studies on the abundance and diversity of the Hydrate Ridge region.
Strategies to Isolate Soluble, Functional Protein from Inclusion Bodies

Matthew Keller, Christian Harding, and Pamela Riggs-Gelasco
Department of Chemistry and Biochemistry

Overexpression of non-native proteins in bacterial hosts such as *E. coli* sometimes results in the production of partially folded, nonfunctional proteins, which aggregate via hydrophobic interactions into inclusion bodies. This physical phenomenon can be exploited for a protein purification strategy, if the proper conditions for refolding can be determined. Here we describe our efforts to obtain functional protein from inclusion body purifications for the enzymes manganese catalase from *L. plantarum* and the protein NRDI, a protein that plays a role in cofactor maintenance in the ribonucleotide reductase enzyme from *C. ammoniagenes*.

Isoprenoids regulate γ-secretase and Amyloid-β processing in Alzheimer's disease

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Alzheimer's disease is characterized by accumulation of the amyloid-β protein (A-β) in neurons. A-β production depends upon cleavage of the amyloid precursor protein (APP) by β-secretase and Carboxy terminal fragment (CTF)-β, which γ-secretase cleaves to produce A-β 40 and 42. Another pathway, α-secretase, cleaves APP to CTF-α, yielding truncated A-β that does not accumulate. Studies suggest statins reduce A-β production. Isoprenoids, such as geranylgeranyl pyrophosphate (GGPP), are produced in the cholesterol pathway and increase levels of A-β. We studied the relationship between statins and isoprenoids and how altering their levels affect A-β accumulation. We carried out these experiments using geranylgeraniol (GGOH), a precursor of GGPP and Chinese hamster ovary cell expressing human APP (2B7) and we analyzed the changes by western blotting and ELISA. Results demonstrate GGPP changes APP processing in a dose-dependent manner, suggesting that we may be able to identify ideal levels of GGOH, optimizing γ-secretase function.

Random Stimulation of the Morris-Lecar Computational Model

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Ubiquitous in all stages of the sensorimotor loop, noise is an external variable that must be physiologically
tolerated to maintain the viability of our cells. We investigated how a Morris-Lecar (ML) model neuron responds to an externally injected noise current of different distributions. The magnitude of oscillation, defined by the standard deviation of the external noise, was manipulated to apply ranging intensities of noise to our system. ML model could be easily tuned to represent a type 1 (spiking) or type 2 (bursting) excitable cell. For a type 1 cell we found that the level of noise significantly changes the average firing rate in the model. Type 2 neurons act as resonators and they tonically respond only to certain frequencies present in the background noise. From a biological point of view, type 1 excitable cells seem to be more sensitive to noise level and are ideal candidates for information processing. Type 2 neurons are relatively resistant to noise, and are presumably responsible for biorhythms and pacemakers.

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Circadian Rhythms in the Starlet Sea Anemone, *Nematostella vectensis*

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Department of Biology and Program in Neuroscience

An organism's daily pattern in physiology and behavior is controlled by a circadian clock. However, there is a lack of research aimed at understanding how this is accomplished in marine invertebrates. We have begun to identify patterns of circadian activity in the starlet sea anemone, *Nematostella vectensis*. Behavioral data indicate a late afternoon activity peak as measured under a light:dark cycle. Additional experiments are currently underway to examine this behavior under various light and temperature conditions to get an idea as to the environmental regulation of circadian behavior in this species. Taking a bioinformatics approach toward this recently sequenced genome we are constructing primers of known circadian genes (cry1a, per1, bmal/cycle, clock). We plan to use in-situ hybridization techniques to characterize their expression. We believe this will lead to a greater understanding of how a marine invertebrate regulates its circadian rhythms.

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Relationship of Coarse-Grained Sediment Distribution and Composition with Echinoderm Species' Habitat Preferences

Delynn Woodman and Leslie R. Sautter
Department of Geology and Environmental Geosciences

Sediment and echinoderm samples were collected by the College of Charleston's Transect Program from seven stations across the continental shelf off Folly Island, SC in November 2004, May 2005 and November 2009. The purpose of this study was to characterize the habitat of benthic echinoderm species by examining their sediment environment. Echinoderm sample collection ranged on average from 17 to 120 m depth and sediment sample collection ranged on average from 18 to 108 m. Sediment in the larger grain size fractions of gravel (>2.00 mm) and very coarse sand (1.00 to 2.00 mm) were examined for median grain size, percent biogenic, percent echinoderm fragments in biogenic sediment and percent gravel distribution. Sediment characteristics were correlated with the distribution and abundance variations of echinoderm species across the continental shelf. Grain size may have an effect on echinoderm's chosen habitat, but other parameters showed little to no statistical significance.
Effect of insulin-like growth factor I on phospholipase Cβ4 translocation in NIH/3T3 fibroblasts

Stacey J. Sangtian and Elizabeth L. Meyer-Bernstein
Department of Biology and Program in Neuroscience

The presence of an internal timekeeper is a biological phenomenon conserved throughout evolution. While the central circadian clock is located in an organism's brain, there are also oscillators in peripheral tissues. By studying the clock in the mammalian liver, we have determined that a protein, phospholipase Cβ4 (PLCβ4), may play a role in metabolic and circadian processes through nuclear and intracellular cell signaling. In the present study, our aim is to begin to identify chemical agents that can regulate the nuclear entry of PLCβ4, which may lead to changes in cell growth and proliferation. We found that insulin-like growth factor I, known to induce nuclear translocation of PLCβ1, induces nuclear translocation of PLCβ4 in a fibroblast model system. These data suggest that similar to PLCβ1, PLCβ4 may contribute to nuclear signaling process, which in turn, may be linked to the circadian clock.

The Effectiveness of Implementing a Strength Training and Nutrition Education Program in a High School Self-Contained Special Education Class

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Department of Education, Health and Human Performance

Studies have shown that individuals with intellectual disabilities have significantly lower fitness levels compared to their peers, which may lead to cardiovascular disease, respiratory conditions, diabetes mellitus, unintentional injury and obesity. The purpose of this study was to investigate the impact a six week fitness training and nutrition education program had on a high school self-contained special education class. Thirteen students participated in a weekly structured exercise and nutrition education program each lasting sixty minutes. Data was collected using pre and post assessments on cardiovascular endurance, muscular strength, flexibility, and nutritional knowledge. Results from the fitness program indicated a statistically significant change, whereas the nutrition results were not statistically significant. The results from this study suggest that high school students with intellectual disabilities may benefit from a structured exercise program. However, a more intensive nutrition program is necessary.

Evidence for increased transport of aerosolized dust from Africa?

Lauren Holder and Vijay Vulava
Department of Geology and Environmental Geosciences

African dust has been tracked and captured in the United States and the Caribbean in aerosol form, and the
dust has also been deposited in these areas. Africa has been experiencing increasing desertification and the amount of dust that is being transported is increasing. We hypothesize that if lake-bottom sediments in Caribbean islands were to be sampled, elements found in African dust would be found at higher levels closer to the surface than in deeper lake-bottom sediment, mirroring increased dust transport. In this study, six lake-bottom sediment cores were extracted from two hypersaline lakes on the island of San Salvador, Bahamas. Trace metals were extracted from these soil core samples and analyzed. Both lakes followed the general trend of decreasing concentrations with depth, and elements that were reported to be present in African dust at high concentrations were also present at high concentrations in the shallow lake-bed sediments.

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GILT Upregulates Costimulatory Molecules and Enhances HLA Class II Presentation in Human Melanoma Cells

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Melanoma is a deadly skin cancer that is prevalent in the world today. Previous studies have shown that melanoma cells differentially process and present antigens, hindering T cell recognition. Optimum presentation of HLA class II proteins is essential for activation of CD4\textsuperscript{+} T cells. Our laboratory has shown that melanoma cells express low to undetectable levels of gamma-interferon inducible lysosomal thiol-reductase (GILT), the absence of which perturbs HLA class II antigen processing and presentation in melanoma cells. A main focus of CD4 \textsuperscript{+} T cell interaction is the secondary signal received by costimulatory molecules. Melanoma cells transfected with or without GILT were tested for costimulatory molecule expression and functional HLA class II presentation. Our study shows that GILT upregulates protein expression and cell surface expression of costimulatory molecules CD80 and CD86. GILT expression in melanoma cells was seen to enhance HLA class II presentation and CD4 \textsuperscript{+} T cell activation.

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The Optical Stimulation of Drug-Seeking in Rodents

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Our purpose was to determine if the "stop" pathway for drug-seeking and the "go" pathway for drug addiction can simultaneously be innervated, and which would elicit the strongest response. We used rat models and isolated the pre-limbic cortex and basal lateral amygdala through microinjections of PEPA, DAMGO, and dopamine. The reinstatement model of drug relapse in rodents trained to self-administer cocaine demonstrates the transition from executive prefrontal cortical regulation of relapse to cortico-striatal habit circuitry. To simulate prefrontal regulation of cocaine-seeking reinstatement, the animals undergo extinction, thus engaging cortical circuitry. Animals forced into abstinence do not completely engage their
Prefrontal cortex when returned to cocaine drug-seeking environment. Reinstatement is larger in animals placed in abstinence versus undergoing extinction training; reinstatement escalates with the continuation of forced abstinence. Our findings show that the "go" pathway triggers a stronger response, which will be described as follows.

Investigating Quaternary Sediments Using Ground Penetrating Radar, Cape Fear Arch, Southeastern USA

Kristen Hughes and Scott Harris
Department of Geology and Environmental Geosciences

The Coastal Plain of South Carolina retains the remnants of a dynamic environment in which barrier island complexes were constructed due to the transgressions and regressions of global sea levels. This study investigated a single chain of barrier islands from the Cape Fear Arch of North Carolina to Charleston, South Carolina. It is uncertain whether the elevation and overall morphology of these ancient barrier islands has been shaped by cyclic transgressions and regressions alone, or if tectonic forces have played a role in shaping this landscape. Ground penetrating radar and existing LiDAR data were used to estimate elevations of these ancient barriers at high-stands of sea level. The elevation of relict shoreline deposits interpreted during the analysis of radar facies, revealed prominent overwash deposits representing sea level maxima. Using this combination of topography and GPR data, lateral trends with elevations along this barrier ridge from the Cape Fear Arch, to Charleston, SC is revealed.

Enlargement of Aortic Valves in Mouse Models Due to the Absence of ADAMTS5

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ADAMTS5 is an extracellular matrix protease that cleaves the proteoglycan versican. We have shown that ADAMTS5 is expressed in developing and adult valves of the mammalian heart. Embryonic and adult Adamts5-/- mice displayed significantly enlarged leaflets of the pulmonary valves. Embryonic Adamts5-/- mice also showed minor aortic valve abnormalities. Here we investigated whether the aortic valves recover or if the defects become more severe during late fetal development and into adulthood. We found that 100% (n=10) of adult Adamts5-/- had significantly larger aortic valves than adult wild type mice. Adamts5-/- aortic valves are significantly enlarged at the hinge region (p=4.03 x 10^-6) and the free edge (p=3.02 x 10^-14). This suggests, ADAMTS5 is not compensated by other cardiac expressed ADAMTS proteases and that developmental defects contribute to the myxomatous valves in Adamts5-/- adult mice. Mouse models of ADAMTS5 deficiency may be useful to study myxomatous valve degeneration and to test potential therapeutics.
Sediment Quality in the Cooper River in Relation to the Goose Creek Coal Power Plant

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Combustion of coal in coal burning plants produces toxic contaminants (Hg, As, etc.), which could potentially have harmful effects on the local ecosystems. It is expected that the sediments collected downstream of the Goose Creek Coal Plant would have higher concentrations of contaminants than the sediments collected upstream. Sediment samples were collected from the banks of the Cooper River at four separate sites upstream and four sites downstream of the plant. Several trace elements were extracted from the samples and analyzed using the ICP-MS and the results showed that pollutants were present both upstream and downstream from the plant. Surprisingly, contaminants were more abundant in the samples derived upstream of the plant. Higher concentrations upstream could be due to other pollution sources upstream or dredging operations in downstream stretches.

Is the steepness of the Appalachian Trail based on underlying rock type and characteristics?

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By observing certain characteristics of the underlying rock, it is possible to make correlations to determine if there is a relationship between those characteristics and the steepness of the Appalachian Trail in the Lemon Gap 7.5 minute quadrangle. The characteristics that were observed include rock classification, grain size, foliation, angle of foliation relative to the trail, and silica composition. Three of the five observed rock characteristics show strong enough trends to correlate them with the steepness of the Appalachian Trail. All consistently steep rocks were meta-igneous and no meta-sedimentary rocks displayed a steep slope. Foliated rocks also tend to be steep and no nonfoliated rocks are steep. Coarse grained rocks are predominantly steep and there are no steep rocks that are fine grained.

An Exploration of Market Efficiency and the Marginal Trader Hypothesis

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This research explores one possible explanation for market efficiency, the Marginal Trader Hypothesis (MTH), as well as market efficiency amidst partial information; the MTH holds that a small group of active and well-informed traders are responsible for steering market price to efficient levels. We test the appropriateness of the MTH by conducting a series of experimental asset markets, in which participants trade securities in a double-oral auction. Information as to the true price of the artificial securities was introduced to the markets in varying degrees so as to evaluate the impact of insider information on market
efficiency and the role of the "insider" in steering market price. Three markets comprised of six to twelve student participants were operated in this study using computerized asset markets. The results indicate that traders were able to conform to the expected value, but were unable to adjust based on the partial information introduced.

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Evaluation of Zinc Contamination at Local Charleston Marinas

Ralph Morris and Catherine Mills, Department of Geology and Environmental Geosciences

Zinc contamination contributes to adverse effects on growth, survival, and reproduction in aquatic biota. The goal was to determine the amount of zinc contamination that could be attributed to zinscs applied to boats to prevent corrosion. Zinc concentrations are expected to be lower from Morris Island and Sunset Cay sites due to absence of bridge runoff and lower degree of human activity. Three samples were collected from off Morris Island, the Bristol and Sunset Cay Marina to evaluate zinc concentrations. Samples we acquired via SCUBA at depths of approximately 20-25. Sediment was obtained in core casings and samples were sealed into plastic bags until brought back to the geochemistry lab for analysis and run through ICP-MS. Results showed lowered amounts of zinc at Sunset Cay, but higher amounts than expected at Morris Island. As hypothesized, Bristol showed the highest amounts of contamination.

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Species Limits In The Genus Celastrina (Lepidoptera:Lycaenidae) in South Carolina

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Identifying butterfly species based solely on morphological traits can be difficult. Sometimes too much attention can be put on small, highly variable traits, such as color and emergence date. With the recent increase in the study of the genus Celastrina, several new species have been proposed. The most controversial is a new species described by Wright and Pavulaan (1999), called idella. This new species is supposedly similar to ladon and neglecta with changes in flight period and some scale features. 64 specimens from the Celastrina genus were captured in South Carolina from March to September, to determine if idella extends into South Carolina. We believe that there is no idella species and that Wright and Pavulaan simply studied late flying ladon. The phenotypes were examined and compared between the three species and statistical tests were used to determine if there was a significant difference.

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Effect of Alcohol on GLT-1 Expression in the Nucleus Accumbens

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Chronic alcoholism is a disease that alters brain structure and function. However, the mechanisms through which chronic alcohol intake affects the brain are not fully understood. There is strong evidence that the nucleus accumbens, a brain area associated with reward and addiction, is linked to alcohol use and abuse. The current project administered alcohol to rats over a period of 6 weeks, followed by an abstinence period of 3 weeks. Control rats were not administered alcohol. Following withdrawal rats were euthanized and the nucleus accumbens was dissected. The expression of GLT-1 (a major glutamate transporter) in the nucleus accumbens was analyzed using a western blot. It was hypothesized that expression would decrease, therefore increasing the amount of glutamate in the synapse. While there was a decrease in the amount of GLT-1 expression for the rats that consumed alcohol, the change was not statistically significant.

**Azoles: Pyrazoles, Isoxazoles and Related Heterocyclic Compounds**

Spencer W. Todd, Shabree L. Knick, Sarah K. Gilreath, Sarah M. Williams, Amanda M. Acevedo Jake, Ellyn A. Smith, Thomas M. C. McFadden, Clyde R. Metz, and Charles F. Beam

Department of Chemistry and Biochemistry

For the past 28 years the strong base multiple anion synthesis of three broad classes of heterocyclic systems, azoles, pyrans/pyranones, and six membered ring nitrogen heterocycles has been an ongoing activity at this College. Because of continuous documentation, and presentation, the azole program is achieving acknowledgement as a major new synthetic method for an unequivocal synthon for two types of azoles, isoxazoles and pyrazoles. This research activity gives rise to numerous individual identity projects that are continuously ongoing at every stage of development. This gives us an opportunity to be involved in every part of the research program, including laboratory procedures, spectral characterization, preparing for and making presentations, publication of results, submitting new chemical compounds for biological testing, and working with collaborator Clyde Metz on X-ray single crystal analysis, when needed. The focus of this poster presentation for azoles is illustrated in the graphical abstract.

**Pyran/Pyranones: Strong Base Preparation of a Variety of Pyranones and bensopyranones**

Shabree L. Knick, Spencer W. Todd, Sarah K. Gilreath, Sarah M. Williams, Amanda M. Acevedo-Jake, Ellyn A. Smith, Thomas M. C. McFadden, Clyde R. Metz, and Charles F. Beam

Department of Chemistry and Biochemistry

The strong base multiple anion synthesis of three broad classes of heterocyclic systems: azoles, pyrans/pyranones, and six membered ring nitrogen heterocycles. These have been an ongoing activity at this College for the past 28 years. This research activity gives rise to numerous stand alone projects continuously ongoing at every stage of development. Shabree will have had some involvement in the preparation of select pyrans: pyranones and isocoumarins, a pyrazole project, and a project in the six-membered ring nitrogen heterocycle series, isoquinolinones. This gives Shabree an opportunity to be involved in every part of the research program, including laboratory procedures, spectral characterization, preparing for and making presentations, publication of results, submitting new chemical compounds for biological testing, and working with collaborator Clyde Metz on X-ray single crystal analysis, when needed. The focus of this
Conformational Study and Computational Calculations of Cyclotrisiloxane and its Hexamethyl and Hexachloro Derivatives

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The structural parameters have been determined from quantum mechanics calculations (HF, MP2, B3LYP) using different basis sets up to 6-311++G(2df,2pd). These theoretical parameters were compared to the experimental x-ray structure for the solid. 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.

NASA Space Mission Design Project: Mars Sample Return

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As part of NASA's outreach program, we were given the opportunity to design a robotic Sample Return Mission for the purposes of determining the internal structure, climate history, current atmospheric composition, and the past hydrologic cycles of Mars. In cooperation with three engineering teams at the University of Alabama-Huntsville, we have come up with three mission scenarios involving the extraction of an ice core from the Martian South Pole, collection of regolith and rock samples from Mawrth Valles and the Martian Highlands, and meteorological measurements at the surface and in the atmosphere.

Diversity and Distribution of Pteropods Across the Continental Shelf of South Carolina

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Pteropods were collected across the continental shelf of South Carolina using a Multiple Opening/Closing Net Environmental Sampling System (MOCNESS). This sampler had three nets with mesh sizes of 150μm that sampled three portions of the water column, from a depth of ~40m to the surface. The diversity of genera and their abundance across the shelf were explored through comparison of samples taken across the shelf. By examining organisms at the surface and at different depths, vertical stratification, diversity and
distribution of pteropods across the continental shelf were analyzed. It was found that the genus *Creseis* was most abundant only at the station closest to shore, while *Limacina spp.* dominated the samples along the rest of the transect. The highest densities were found in mid-shelf habitats, and the waters closest to shore display a different community than in the rest of the shelf waters, and pteropods display diel vertical migration.