**Abstracts of the 75th Anniversary Meeting of the Florida Academy of Sciences**
**Florida Institute of Technology, Melbourne, Florida**
**11-12 March 2011**


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## PLENARY ADDRESS |return to top|

PLE-01 The *Deep Horizon* disaster: Lessons from the ghosts of oil spills past. T. SHIRLEY. Harte Research Institute, Texas A&M University-Corpus Christi, 6300 Ocean Drive, Unit 5869, Corpus Christi, TX 78412-5869. Approximately 760 million L of oil, 6.8 million L of dispersant, and 1.5 x $10^{10}$ moles of natural gas were released into the Gulf of Mexico by the 2010 BP *Deep Horizon* oil disaster. In comparison to other major oil spills, relatively little ecological damage was recorded, and most of the oil, methane, and dispersant was reported to have been degraded or removed from the ecosystem as of early 2011. The oil disaster, its cleanup, and research activities monitoring its aftermath, will be reviewed briefly. Long-term ecological consequences of the Exxon Valdez oil spill, and those of the less well studied *Ixtoc* oil spill, will be posed as examples of the kinds and duration of potential ecosystem effects from the *Deep Horizon* disaster.

## BANQUET ADDRESSES |return to top|

BNQ-01 The Florida Academy of Sciences: The history and highlights of the first 75 years. L.S. LIEBERMAN. Women's Research Center, University of Central Florida, P.O. Box 160955, Orlando, FL 32816-0955. The presentation with review the historical highlights of the Florida Academy of Sciences since its founding based on 'informal discussions' in January, 1936 (*Proceedings of the Florida Academy of Sciences*, Vol.1, p.1, 1936) through its present expansion into the

digital age of webpages and electronic submission of abstracts. What has been steadfast is a commitment to the inclusiveness of scientific disciplines from anthropology to zoology in annual meeting presentations for both the senior academy and Florida Junior Academy of Sciences, *Florida Scientist* publications, selection of medalists and plenary speakers. What has evolved is an international recognition of *Florida Scientist* as the foremost repository of scientific information concerning Florida and southeastern flora and fauna systematics and ecology, geology, hydrology and environmental chemistry. The ten published Academy Research Symposia have covered topics ranging from shark biology to solar energy with a special emphasis on the application of science to a range of water management issues. The presentation will note the contributions of many past and current members, the trends in meeting presentations and FAS participation in local, state and national activities. FAS is a member of the National Association of Academies of Science, an affiliate of the American Association for the Advancement of Science. (Leslie Sue Lieberman, Ph.D., Member since 1978, FAS President 1987-1988, FAS Medalist 1996, and President of the National Association of Academies of Science 2000-2001)

BNQ-02 Stellar archeology: What white dwarf stars tell us about the history of the galaxy. T.D. OSWALT. Physics and Space Sciences Department, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. The Universe 13.7 billion years old. We know this age with better than 95% certainty. It's pretty amazing that such an enormous age, spanning vastly more time than human beings have existed could even be measured. The Hubble Space Telescope was designed to specifically to determine that age of the Universe. As it turned out, ground-based telescopes and dim nearby stars in our solar backyard played a critical role in pinning down this number. In this talk, I will discuss how astronomers measure the ages of stars in general, and the role white dwarf stars have played in the search for the age of the Universe, determining the nature of dark matter, and the discovery of dark energy.

## AGR = AGRICULTURAL AND NATURAL RESOURCES |return to top|

AGR-01 Biological control of pestiferous urban insects. S.P. ARTHURS. Mid Florida Research and Education Center, University of Florida, 2725 Binion Rd, Apopka, FL 32703. Many insects occur as pests within the urban environment, which includes homes and landscapes such as gardens, yards, parks, cemeteries and roadside medians. Florida is also home to many invasive insect species that make this problem especially acute. In response to this threat, large quantities of pesticides are used by professional landscapers, golf course managers, parks departments and homeowners, amongst others. However such approaches are not always successful and may have negative environmental consequences. Scientists at the University of Florida are researching new ways to manage pests that rely on alternatives to traditional pesticides. One promising approach is biological control, *i.e.*, the use of naturally occurring predators, parasites or diseases to manage pests. I discuss examples of some recent advances in biological control of insect pests in the urban environment in Florida. For example, predators including ladybeetles, lacewings, mites and bugs and parasitic wasps can be harnessed to control many problem pests without any harmful residues. In addition several insect pathogens can be formulated as biological pesticides that can be applied against several pests.

AGR-02 Localization of the bacterium associated with citrus greening disease in various organs of its insect vector *Diaphorina citri* (Hemiptera, Psyllidae). E.-D. AMMAR, R.G. SHATTERS and D.G. HALL. Subtropical Insects Research Unit, USDA-ARS, USHRL, Fort Pierce, FL 34945. Subtropical Insects Research Unit, USDA-ARS, USHRL, Fort Pierce, FL 34945. *Candidatus Liberibacter asiaticus* (*Las*) bacterium has been strongly implicated as the causative agent of huanglongbing (HLB), or citrus greening, which is currently the most devastating citrus disease in Florida as well as in other areas of South America, Asia and Africa. HLB is transmitted in Florida by the Asian citrus psyllid *Diaphorina citri* in a persistent manner, but its interactions with the psyllid vector, particularly at the organ and cellular levels, are poorly understood. We used fluorescent in situ hybridization (FISH) and quantitative PCR (Q-PCR) for the localization of *Las* in *D. citri*. Several FISH protocols have been tested on hemolymph smears and dissected psyllid organs and on leaf sections from HLB-infected citrus plants as positive controls. *Las* was detected by FISH in the hemolymph, filter chamber, midgut and the salivary glands of *D. citri* collected from HLB-infected citrus trees, as well as in the phloem of infected citrus leaves. Additionally, Q-PCR detected *Las* in dissected organs of individual *D. citri* adults collected from HLB-infected citrus trees or infected in the laboratory. The proportion of infected (*Las*-positive) salivary glands (47-70 %) was significantly lower than that in other body parts (79-98 %). The relative titer of *Las*, compared to psyllid genomic DNA in each sample, was significantly higher in both the salivary gland and alimentary canal compared to that in the rest of the insect body. These results provide the first molecular confirmation of *Las* in the hemolymph, alimentary canal and salivary glands of *D. citri*.

They also strongly suggest that the salivary glands constitute a major transmission barrier to Las/HLB in the psyllid vector, and that *Las* may replicate or accumulate in both the alimentary canal and salivary glands of *D. citri*.

AGR-03 Challenges and opportunities for citrus cultivation arising from interactions between an invasive insect, plant pathogen, and alternative host. A.J. WALTER (1), D. HALL (1) and Y. DUAN (2). (1) USDA Agriculture Research Service, Horticultural Research Laboratory, Subtropical Insect Research Unit, 2001 S. Rock Road, Fort Pierce, FL 34945, and (2) USDA Agriculture Research Service, Horticultural Research Laboratory, Subtropical Plant Pathology Research Unit, 2001 S. Rock Road, Fort Pierce, FL 34945. The Asian citrus psyllid, *Diaphorina citri*, is an invasive insect that was first recorded in Florida in 1998. It vectors a bacterium, '*Candidatus Liberibacter asiaticus*' (*CLas*) to citrus trees. *CLas* causes huanglongbing, the most devastating disease of citrus worldwide. We have been studying the role played by orange jasmine, a common nursery plant and a close relative of citrus, in the dynamics of huanglongbing. Orange jasmine is an excellent host for the psyllid. We made repeated visits to eight jasmine plantings over the course of a year. We found that *CLas* was present at all sites, but fewer than two percent of the psyllids that developed on jasmine carried *CLas*. When we compared citrus and jasmine plants growing in the same field, the titer of the bacteria in the jasmine was about 27,000 times lower than the titer we found in citrus. We are now conducting transmission studies to determine how easily *CLas* can be acquired by the ACP from *CLas*-infected orange jasmine, and whether the low number of *CLas*-positive psyllids that develop on infected orange jasmine can transmit the disease to citrus.

AGR-04 Using RNA interference to reduce viral diseases. R.K. REDDY (1) and W.B. HUNTER (2). (1) Indian River State College, Virginia Avenue, Fort Pierce, FL 34945, (2) USDA, ARS, 2001 South Rock Road, Fort Pierce, FL 34945. RNA interference (RNAi) was used to reduce virus replication in cells. Cell lines Hunter-[HvWH2] established from glassy-winged sharpshooters (Hemiptera), were infected with the single-stranded, ssRNA virus, HovV-3. Double-stranded RNAs, dsRNA, were designed to the virus capsid gene and co-inoculated with virus onto healthy cells. RNAi significantly reduced virus replication, compared to control infected cells. The rate of cell propagation increased in RNAi treatments, supporting use of RNAi to reduce viral disease.

AGR-05 Persistence and infectivity of *Isaria fumosorosea* blastospores sprayed on citrus seedlings in the field for managing the Asian citrus psyllid, *Diaphorina citri*. D.A. PICK (1,2,3), P.B. AVERY (2), S.P. ARTHURS (3), D.G. HALL (4) and C.A. POWELL (2). (1) Wilkes Honors College, Florida Atlantic University, Jupiter, FL 33458, (2) Indian River Research and Education Center, University of Florida, Institute of Food and Agricultural Sciences, 2199 South Rock Road, Fort Pierce, FL 34945-3138, (3) Mid Florida Research and Education Center, University of Florida, 2725 S. Binion Road, Apopka, FL 32703-8504, (4) Subtropical Insect Research Unit, USDA-ARS, U.S. Horticultural Research Lab, 2001 South Rock Road Fort Pierce, FL 34945. This study was designed to test the persistence of Isaria fumosorosea (PFR 97™) as a bioinsecticide on citrus seedlings under field conditions in Fort Pierce, Florida. Leaf wash and Asian citrus psyllid mortality assays were used to quantify the spore viability and infectivity of PFR 97™ at 0, 7, 14, 21, 28, and 35 days post-spray. At 21 days post-spray, a 53% psyllid mortality rate, an average of 5.9 CFUs per replicate (n = 15), and a total of 88 CFUs were observed. Preliminary predictions are given for the interval on which PFR 97™ should be sprayed in citrus groves for efficient Asian citrus psyllid control and the impact of rain on spore retention.

AGR-06 Emerging psyllid genomics: Applications to reduce plant disease. W.B. HUNTER (1) and B.R. BEXTINE (2). (1) USDA, ARS, 2001 South Rock Road, Fort Pierce, FL 34945, (2) University of Texas at Tyler, Tyler, TX 75799. Current breakthroughs in genome sequencing, and computer science now allows in-depth analyses of multiple biological pathways. Genome applications of organisms also further supports the identification of the critical gene(s) in these pathways which when disrupted, or knocked out, can impart population suppression, as well as decreased or increased immune responses, thus providing advantageous management methods which are natural, and specific. The International psyllid genome consortium (being led by the authors) is pushing efforts to complete the genomes from two psyllids which are devastating crop pests, Asian citrus psyllid (*Diaphorina citri*) and the potato psyllid (*Bactericera cockerelli*), both of which transmit bacterial pathogens that destroy important food crops, potato, tomato, citrus, and others. Applications of genomic data, gene regulation, and the emergence and development of new plant- and viral- expression strategies are on the verge of producing 'next generation' strategies for the management and control of insects which transmit disease, aimed at the reduction of plant diseases. The importance of these developments are critical to the food security, safety, and sustainability for the USA, and future generations which will need to produce more food, in environmentally safe manners, to meet demands of an ever growing human population.

AGR-07 Can crop diversity regulate arthropod populations and marketable yields in organic squash? O.E. LIBURD and T.W. NYOIKE. Entomology and Nematology Department, Building 970, Natural Area Drive, University of Florida, Gainesville, FL 32611. Several species of aphids including melon aphid, *Aphis gossypi* Glover, cowpea aphid, *Aphis craccivora* Koch and green peach aphid, *Myzus persicae* Sulzer, as well as the silverleaf whitefly-B biotype, *Bemesia tabaci* Gennadius are key pests of organic squash in north-central Florida. Both aphids and whitefly vector viruses, and excrete honey dew that facilitates the development of sooty mold on squash plants. The presence of sooty mold interferes with photosynthesis resulting in reduce yield and a decrease in plant vigor. Additionally, the whitefly-B biotype causes a physiological disorder 'silver leaf' that also reduces the rate of photosynthesis. We evaluated diversified cropping treatments that included buckwheat, *Fagopyrum esculentum* Moench intercropped with organic squash and white clover, *Trifolium repens* L intercropped with organic squash. These treatments were compared to a grower standard, white mulch and an IPM recommendation, aluminized (reflective) mulch and a bare ground control. Aphid and whitefly populations decreased in diversified cropping systems as well as in treatments of aluminized mulch. Silverleaf disorders were also lower in diversified cropping systems. However, only treatments with white and reflective mulch and buckwheat had lower incidence of viruses compared with the control. Populations of natural enemies increased in diversified cropping system but overall marketable yields were lower in this system. Manipulating habitat design may increase the potential for increasing marketable yields while still achieving the benefits of pests' disease suppression and increasing natural enemy populations.

AGR-08 RNA expression for lignin content of potential hardwood tree species for bio-fuels in the southeast United States. A. FORDE and O. ONOKPISE. College of Engineering Sciences, Technology and Agriculture, Florida A&M University, Tallahassee, FL 32307. Corn is the substrate of choice for biofuels production. This agricultural technique is known to be associated with significant biodiversity loss, soil erosion and nutrient leaching. In addition, rapid growth in liquid biofuel production will make substantial demands on land availability, water resources and offset the carbon content of soils and carbon stocks in forests and peat lands. A high yielding crop is needed for the production of biofuel. Such crops are expected to be fast growing, easily accessible, requiring small amount of labor and possess a low level of lignin content. The use of non-crop plants is considered to be of greater value to the total biomass fractions. The production of ethanol is through fermentation thus plants with low lignin content are best suited for biochemical conversion. The objective of the study is to evaluate fast growing tree species such as sweetgum (*Liquidambar styraciflua*), eastern cottonwood (*Populus deltoides*) and eucalyptus (*Eucalyptus grandis*) as potential biofuels substrates in the Southeast. Coppices of these species were taken from the field and grown in the greenhouse. The young shoots were used to form callus. The callus, roots and shoots will be used to collect RNA expressions which will then be used to determine the lignin percentage of each species. RNA expressions will be collected using the Real Time PCR method. Preliminary results should show *E. grandis* as the most suitable hardwood tree species to be used as a biofuel alternative source.

AGR-09 Molecular identification of fungal pathogens for ectoparasitic mite (*Varroa destructor*) of the honey bee. C. EDDINGTON and L.H.B. KANGA. Entomology Program, College of Engineering Sciences, Technology and Agriculture, Florida A&M University, Tallahassee, FL 32307. This study will be carried out to determine if mortality of *Varroa* mites is due to fungal infections. Thus, cadavers of *Varroa* mites will be collected from an apiary located in Quincy, FL and brought to the laboratory in Tallahassee, FL. The infected cadavers will be surface-sterilized by immersing them in a sterilant disinfectant (Expor) for three minutes and rinsed with 95% ethanol for two minutes. The cadavers will then be plated onto Petri dishes containing Sabouraud maltose agar supplemented with 1% yeast extract and incubated at 27 ± 1°C, 85 % RH, and 13:11 (L:D) h photoperiod. The Petri dishes will be sealed with parafilm prior to incubation and dead mites will be observed daily for the presence of external fungal hyphae. Only mites that show fungal growth will be considered to have died of infection. The fungus will then be isolated and cultured on new Petri dishes for use in DNA fingerprinting techniques for identification.

AGR-10 Can we control Chilli thrips (*Scirtothrips dorsalis*, Thysanoptera: Thripidae) by natural enemies? M. DOGRAMACI (1), S.P. ARTHURS (1), J. CHEN (2) and L.S. OSBORNE (1). (1) University of Florida, Department of Entomology and Nematology, Mid-Florida Research and Education Center, Apopka, FL 32703, (2) University of Florida, Department of Environmental Horticulture, Mid-Florida Research and Education Center, Apopka, FL 32703. The Chilli thrip (*Scirtothrips dorsalis* Hood) recently established in southeast of the United States poses an important threat to agronomic and ornamental plants. It is a highly polyphagous pest and has been documented to attack more than 100 recorded hosts from at least 40 different families. We evaluated management of the thrips on five pepper cultivars that possessed certain morphological characters using two commercially available Chilli thrips' natural enemies: the Insidiosus flower bug (*Orius insidiosus* Say) and a predatory mite (*Amblyseius swirskii* Athias-Henriot). Pepper cultivars were: (1)'Brigadier

hybrid' susceptible with domatia, (2) 'Big red cherry' susceptible no domatia, (3)'Serrano' susceptible with trichomes, (4) 'Serrano del sol' resistant with trichomes, and (5) 'Trinidad perfume' resistant no trichomes. The study was conducted in a greenhouse on caged plants. Pepper plants were infested with 35 thrips per plant. One week after thrip infestation, *O. insidiosus* and *A. swirskii* were released at two initial release rates (10 *vs.* 20 per plant). At the higher initial release rate, both of the predators were highly effective in controlling thrips. At the lower initial release rate, the predators were effective controlling thrips, though the surviving thrips caused 15% foliar damage. There was tritrophic interaction among host plant, thrips and the predators. Susceptible cultivar 'Brigadier hybrid' was more compatible with predators controlling the thrips. Releasing the Insidiosus flower bug and the predatory mites together may enhance efficacy of the predators to reduce Chilli thrips' damage.

AGR-11 *In vitro* study of Southern Green Stink bug using various strains of *Beauveria bassiana* (Bals.) Vuill. K. BARR, A. SOMORIN, M. HASEEB and M.T.K. KAIRO. Center for Biological Control, College of Engineering Sciences, Technology and Agriculture, Florida A&M University, Tallahassee, FL32307. The Southern Green Stink bug, *Nezara viridula* L. (Hemiptera: Pentatomidae), is a polyphagous pest of economic importance. Various collections of the pest were made in summer 2009 from farmers' fields at different locations including Turkey Hill Farm, Crescent Moon Farm, and FAMU Community Garden in Tallahassee, Florida. A colony of this insect was successfully established on a diet of green beans, okra, peanuts, and young plants of beans (Blue lake bush) under the laboratory and the greenhouse. Aiming toward more environmentally sustainable control measure, five different Floridian isolates of *Beauveria bassiana*, a cosmopolitan potential entomopathogen, were cultured in the laboratory. Using spore suspension bioassays the susceptibility of adult green stink bug was assessed. Preliminary data from in vitro screening revealed varying degree of virulence, lethal and sub-lethal effects from the different isolates. Future work involve continuing to invigorate the insect culture with fresh field collections and screening further fungi strains to identify those that would be most effective in controlling the pest. The results indicate a potential for entomopathogenic fungi as an alternative control of *N. viridula*.

AGR-12 Verification of the expression of *CHS* gene for *in vitro* cell lines of North American native grapes. G.M. DAVIS, A.O. ANANGA, S. KRASTANOVA, S. SUTTON and V.M. COLOVA (TSOLOVA). CESTA, Center for Viticulture and Small Fruit Research, Florida A&M University, Tallahassee, FL 32317. *Muscadinia rotundifolia* is known to have the highest antioxidant levels among fruits. It contains flavonoid compounds that are important part of the animal and human diet. Flavonoids form various distinct groups of natural products, which include anthocynin, proanthocyanidin and phlobaphene pigments. There are several pertinent genes involved in critical steps of the flavonoid biosynthesis and differential expression of transcripts associated with *Muscadinia* berry ripening. Some of these genes have been identified and expressed. The aim of this study was to confirm the expression of chalcone synthese (CHS3) gene in *in vitro* cell lines of *M. rotundifolia* (Noble) and *Vitis aestivalis* (Cynthiana) by RT-PCR technique. Total RNA was extracted from the cell lines, and reverse transcriptase enzyme was used to convert mRNA to cDNA. RT-PCR primers specific to CHS3 was used to screen the cDNA to confirm its expression in 'Noble' and 'Cynthiana' cell lines. Our study indicates that CHS3, which is associated with flavonoid biosynthesis in *vinifera* grape is differentially expressed in both 'Noble' and 'Cynthiana' cell lines. This confirms the previous studies by emphasizing that regulatory steps of the flavonoid pathway are conserved among *M. rotundifolia* and *V. aestivalis.*

AGR-13 Estuarine clam *Rangia cuneata* population dynamics: A positive impact of an invasive species in Venezuela. F. MORALES, N. ESPINOZA, R. GUERRERO and H. BARRIOS. Biological Science Department, University of Zulia, Av. Universidad Edif. Grano de Oro, Bloque A1, Maracaibo, Venezuela. The estuarine clam *Rangia cuneata*, (Family Mactridae) is reported as original from the east coast of USA and Gulf of Mexico. *R. cuneata* has been found at the Maracaibo System (Venezuela) since the 1980's. *Rangia* exploitation has been reported at two different places, "*Gran Eneal*" northern area and "*Curarire*" southern area. Exploitation allows an artisan fisheries development, which provides clams for regional and national demand; an alternative fisheries exists among the populations of the *Rangia* clams, fishermen exploit one place, up to the point where capture effort becomes too low, then move to the other and *vice versa*. Population dynamics aspects of the bivalve *R. cuneata* at Curarire were also considered in this study. Clams were collected from January to December 2009 in Curarire beach, Zulia State, at three different points along the coast. Results showed a dominant group between 38 and 44 mm, showing a high growth rate. Density population showed fluctuations during the sampling period, with values from 40 to 400 ind/$m^2$. According to the observations of gonadal tissue, *R. cuneata* has a continuous reproductive cycle, showing mature individuals throughout the year. The sex ratio of population was 1.2:1 predominating females. Condition index (6.77 to 8.04%) obtained was much lower than those found in other commercial bivalves of similar size. An approach of local *Rangia* fishery and national distribution along 2009 was established with the

help of local fishermen and commercialists. Population-based assessment of these clams and high appreciation of this resource for regional and national consumers, allowed concluding that the *Rangia* exploitation in Venezuela could become a successful use of an invasive species at this location, so we recommend promoting design and management policies for the resource. (This research was financially supported in part by CONDES-LUZ)

AGR-14 Potential genetic differences between male and female *Mauritia flexuosa* palms endogenous to Amazon Basin. M. SALAY (1), C. MILLER (1) and I. DUFFY (1). (1) Department of Math and Science, Saint Leo University, PO BOX 6665, 33701 SR 52, Saint Leo, Fl, 33574. *Mauritia flexuosa*, also known as the moriche palm, is a dioecious species that grows abundantly in the Amazon Basin. This species of palm is an ecologically and economically dominant species of palm throughout the Amazon, and it is especially economically important in areas such as Peru. Moriche produces an important form of nourishment for the people of the Amazon by production of fruit and is also a source of oil. However, the only palms that produce this fruit are the mature females, and it is currently impossible to determine the sex of the palm before it is planted and conclusions can only be made once the plant has matured (up to 20 years). We propose to demonstrate potential genetic difference between male and female *M. flexuosa* by use of techniques such as RAPD PCR.

AGR-15 Food safety: Consumer demand and behavior. A. WHITTER-CUMMINGS, V. THOMAS and L. WALTERS. College of Engineering Sciences, Technology and Agriculture, Florida A&M University, Tallahassee, FL 32307. In 1999 an estimated 5,000 deaths, 325,000 hospitalizations, and 76 million disorders were caused by food borne illnesses in the United States. Food borne illnesses are caused by ingesting bacteria, fungi, parasites, viruses, toxins, or other harmful substances in contaminated food. When consumers perceive certain foods as unsafe, they may avoid purchasing them outright or choose safer alternatives. Even after the issue has been resolved, consumer perceptions about implicated food product and about the ability to produce safe food may be slow to change. Globalization of the food supply suggests that new food safety risks may be introduced into new areas or that previously controlled risks are reintroduced. Globalization has also allowed for contaminated food to be spread across greater geographic areas in relatively quick time frames. Food safety concerns may reduce demand for certain products, significantly change international food trade patterns, and limit market access. Using products that have been identified in recent food scares such as bovine spongiform encephalopathy, avian influenza, and swine flu, the broad objective of this study is to examine the relevant factors that affect consumer demand.

## AGR Posters

AGR-P01 Risk of wildfires in Volusia County. K.M. BRAGER and R. SNOW. Applied Aviation Sciences, Embry-Riddle Aeronautical University, 600 S. Clyde Morris Blvd, Daytona Beach, FL 32114. This project visually displays areas in Volusia County that are at risk for wildfires by examining wind speeds, temperature, recent precipitation, herb stage, and the Keetch-Byram Drought Index. By inputting values into the Fire Danger Calculator, provided by the Florida Division of Forestry, it is possible to calculate the fire danger in specific regions while simultaneously creating a log of the day by day fire dangers in order to see trends. Volusia County was selected due to its unique features of being located between wetlands, the Intracoastal Waterway, and rapidly developing subdivisions surrounded by forests. By using a Geographic Information System (GIS) to graphically display areas at risk, the public will be able to easily distinguish if their area is threatened and be able to take the necessary precautions.

AGR-P02 Bacterial and physical depuration of the clam *Polymesoda solida* at pilot scale. M. MONTIEL, Y. GARCÍA, H. SEVEREYN and F. MORALES. Biological Science Department, University of Zulia, Av. Universidad Edif. Grano de Oro, Bloque A1, Maracaibo, Venezuela. The consumption of shellfish has been associated with microbial infections even in cases where shellfish complied with the current regulation, which is based on bacterial analysis. Depuration processes try to eliminate microorganisms using seawater to allow living, filter-feeding shellfish to naturally purge themselves from agents they accumulated from the environment. In this study, depuration rates of potential indicators were estimated, during five days. Four experiments, with naturally-contaminated shellfish (*Polymesoda solida*), were performed. For evaluating the shellfish depuration process, total coliforms (TC), fecal coliforms (FC), fecal streptococcus (FS), enterococcus (EN) and mesophilic aerobic bacteria (MAB) were evaluated as bacterial indicators, using the most Probable Technique described by the American Public Health Association. Total inorganic content was used as physical indicator. Artificial prepared seawater of the depuration tank was disinfected by UV irradiation, during 24 h. Depuration removal rates of experiments running for 120 hours (five days) at 28°C, 5 psu, in 150 L tanks were effective (80%), and more

efficient during the first 72 hours, allowing an adequate bacterial and physical quality for consumption after this time, no matter the clams were collected in contaminated areas which do not complain with maximal allowable level. (Project supported in part by CONDES)

AGR-P03 Management of the Brown Citrus aphid, *Toxoptera citricidus*, using entomopathogen *Isaria fumosorosea* and aphid parasitoid, *Lysiphlebus testaceipes*. D.A. PICK (1,2,4), P.B. AVERY (2), W.B. HUNTER (3), C.A. POWELL (2), D.G. HALL (3) and S.P. ARTHURS (4). (1) Florida Atlantic University, Harriet L Wilkes Honors College, 5353 Parkside Drive, Jupiter, FL 33458, (2) University of Florida, Institute of Food and Agricultural Sciences, Indian River Research and Education Center, 2199 South Rock Road, Fort Pierce, FL 34945, (3) USDA, ARS, U.S. Horticultural Research Laboratory, Subtropical Insect Research Unit, 2001 South Rock Road, Ft. Pierce, FL 34945, (4) University of Florida, Institute of Food and Agricultural Sciences, Mid-Florida Research and Education Center, 2725 Binion Rd., Apopka, FL 32703. Widespread infestations of *Toxoptera citricidus* were common throughout the Florida citrus industry, from 1995-1998, today native natural enemies, such as *Lysiphlebus testaceipes*, are effectively managing this pest. Effects of Isaria fumosorosea on this trophic system of aphid, parasitoid, and aphid parasitism were evaluated. Our results are in agreement with similar studies, and recent literature presents some intriguing aspects of entomopathogens as tools for insect pest management.

AGR-P04 Agriculture in a changing climate. M. SNOW and R. SNOW. Applied Aviation Sciences, Embry-Riddle Aeronautical University, 600 S. Clyde Morris Blvd, Daytona Beach, FL 32114. Global climate change is forecast to cause major shifts in the general circulation of the atmosphere, which will lead to variations in the length of the growing season and the alteration of precipitation patterns. These changes will, in turn, affect agricultural production. Some changes will be offsetting. An increased length of growing season may be offset by lower rainfall. Crop yields could be reduced, although the combined effects of climate and carbon dioxide will depend on the severity of climate change. In many regions of the United States, climate change could reduce corn, wheat, and soybean yields due to higher temperatures, which would cause considerable heat and water stress in the plants. In some northern areas, warmer temperatures and a longer growing season combined with rising carbon dioxide levels might possibly increase crop yields provided there is adequate irrigation. In any case, these projected agricultural shifts will affect not only the livelihood of farmers but the infrastructure and other support services as well. This research examines the impact of climate change on agriculture and suggests possible mitigation strategies.

AGR-P05 Identifying factors that determine the demand for goat meat in Florida. N.S. BROWN, G.L. QUEELEY and A. MCKENZIE-JAKES. Scholar Research Program, College of Engineering, Science, Technology and Agriculture, Florida Agricultural and Mechanical University, Tallahassee, FL 32301. Goat production has become one of the fastest growing livestock industries in the U.S. However, despite the increase in demand, U.S. producers are still unable to match production with demand. The demand for goat meat in the United States comes mostly from ethnic groups that include Asians, Africans, Latin Americans and the Caribbean. The purpose of this study was to identify factors that affect the demand for goat meat in the state of Florida. A marketing survey using 173 participants was used to collect data relevant to the study. The study focused primarily on the association of certain qualitative parameters such as cultural and religious practices, breeding programs, marketing age, weight and sex classes of animals, income categories, and the ethnic backgrounds of current and potential consumers with goat meat consumption. These parameters were chosen since previous research has shown that they were linked to the demand for goat meat. A chi square analysis was done to test the null hypothesis of no association between these parameters and goat meat consumption. The results indicated no significant association ($p < 0.05$) between ethnicity and goat meat consumption so this hypothesis could not be rejected. The results also indicated that Black Americans are the least likely consumers of goat meat, while people of African, Caribbean, European and Hispanic ancestry were the most likely consumers. This information could be useful in identifying marketing opportunities for small and limited resource goat farmers in the state of Florida.

AGR-P06 Determining optimal design of rain gardens to maximize their ecological and environmental benefits. J. EISELE and A.B. LORENZO. Landscape Design and Management Program, College of Engineering Sciences, Technology, and Agriculture, Florida A&M University, Tallahassee, FL 32307. The Environmental Protection Agency (EPA) has cited stormwater runoff as the number one water quality issue in Florida. Due to the potential negative impacts of stormwater runoff to the environment, and human health and well-being, studies are increasingly needed in determining the possibility for alternative mitigation systems. One prospect is the rain garden to act as a natural filter for stormwater runoff. Rain gardens rely on plant communities with a mix of groundcover, grasses, herbaceous shrubs, and trees arranged in natural configuration to stabilize the ponding area, increase infiltration, and promote uptake of pollutants. A survey of residential

rain gardens in Tallahassee, Florida built through grants from *Think About Personal Pollution* (TAPP) was conducted to gain knowledge on the commonly used plants and other garden variables including locations and physical dimensions. Survey results show a large majority of the rain gardens were located in front yards, areas ranged from 72 $ft^2$ to 1,500 $ft^2$, and mostly bean shaped. Although 50 different plant species were recorded, only five were found in at least 10% of the rain gardens surveyed. These survey findings are important to the development of rain garden research at Florida A&M University which goal is to determine the optimal design of rain gardens to maximize their ecological and environmental benefits.

AGR-P07 Utilization of cellulosic wastes by *Cytophaga hutchinsonii*. H. FASANYA (1), O. ONOKPISE (2), M. ABAZINGE (3), L. ALMEIDA (4) and C. LOUIME (2). (1) Florida A&M University, College of Arts and Sciences, Biology Department, Tallahassee, FL 32307, (2) Florida A&M University, College of Engineering Sciences, Technology and Agriculture, The FAMU BioEnergy Group, Tallahassee, FL 32307, (3) Florida A&M University, Environmental Sciences Institute, The FAMU BioEnergy Group, Tallahassee, FL 32307, (4) Universidade Federal de Viçosa, Campus Universitario, Departamento de Solos, Vicosa, MG, Brasil 36571. *Cytophaga hutchinsonii* is an abundant aerobic cellulolytic soil bacterium. An analysis of the recently published genome sequence showed a complete glycolysis pathway. Preliminary data from our research group however, revealed that *Cytophaga* does not utilize glucose as an energy source. Based on these findings, we hypothesized that *Cytophaga* may use an alternate pathway to attack its insoluble substrates. In the study presented here, a combination of genomics applications were used to gain insights into the molecular mechanism of cellulose hydrolysis by this organism. RNA-Seq data generated from growing *Cytophaga* on different carbon sources highlighted the unusual nature of this microorganism. Completely different sets of RNA were identified in the various sugars tested. These findings may facilitate increased usage of biomass resources by helping in the design of new and superior enzymes. More significantly, these investigations may help develop procedures aiming at increasing microbial utilization of cellulosic wastes. This will in turn address the present and immerging issue of National Energy Security and help protect and enhance the Nation's natural resource base and environment.

AGR-P08 Susceptibility of *Nezara viridula* (L.) to different isolates of *Beauveria bassiana* and *Metarhizium anisopliae* under laboratory conditions. J. WILLIAMSON, M.T.K. KAIRO, M. HASEEB and A. SOMORIN. Center for Biological Control, College of Engineering Sciences, Technology and Agriculture, Florida A&M University, Tallahassee, FL 32307-4100. The Southern green stinkbug (*Nezara viridula*) is known as a major pest of so many economically important crops. The most destructive stage of the pest are the adults, having been found to devour plant species in over 30 families with their proboscis-like mouthpart. Ecologically, the interest is to manage this pest and not eradicate it and also, because of problem of insecticides persistence, there is need for an environmentally friendly control measure for this species of stink bug. Mycopathogens such as *Beauveria bassiana* and *Metarhizium anisopliae* are two highly cosmopolitan entomopathogens that infect different kind of insects. Studies have shown varying degrees of pathogenicity of these fungi to stink bugs. There is therefore constant need for us to find better control measures that can be used solely or in conjunction with the present control efforts. This will provide the farmers cheaper and friendlier control measure for *N. viridula*. This is why the further evaluation the infectivity of different isolates of *Beauveria bassiana* and *Metarhizium anisopliae* on different stages of stink bug and also investigate the lethal and sub-lethal effects of the fungi on the stink bug.

## ANT = ANTHROPOLOGICAL SCIENCES |return to top|

### ANT Poster

ANT-P09 Florida's cattle culture: Ethos and enterprise in the Sunshine State. C.E. ZELLNER. Department of Anthropology, University of Central Florida, Howard Phillips Hall, 309, Orlando FL 32816-1361. Cattle ranching has been of major significance to Florida since the 16th century, however, few are aware of the historic, ecologic, economic and cultural influence of this industry. This study investigates the origins and impacts of the traditional customs and practices of Florida's cattle ranchers, who preserve and reinvent this rich heritage. Those involved in this way of life have close contact with the land and their animals, and due to the often uncertain nature of the business, must possess resourcefulness and initiative. The image of the stoic cowboy has long been associated with the American West, yet before longhorn cattle ever crossed the western plains, Florida frontiers were populated with herds of unique "cracker" cows, descendants of cattle left behind by early Spanish settlers. Like the West, Florida experienced conflicts between ranchers and other land claimants, issues that continue today. Modern ranchers contend with developers, environmental concerns, and increasing regulation, yet they persevere in passing on their cultural heritage. Agricultural lifestyles can be emotionally fulfilling, but stewardship of

land and animals can be stressful and expensive. Motivation to continue these customs may result from identification with cowboys of popular American media, enhanced by physical immersion in a similar setting. Optimal agricultural practices have been well-researched; however, ecological anthropology provides a different aspect in examining customs and practices of Florida's cattle ranchers. Anthropologists have long been concerned with the dynamic relationship between man's culture and his environment, examining how the physical landscape and ecological niches shape and are shaped by those who inhabit them. As globalized trade markets, technology and economies expand, impacting agricultural practices and destroying native habitats, diachronic studies of relationships between changing environments, economic and sociocultural influences in geographically bounded locales are needed to aid in understanding this process. Study participants are involved in Florida's beef cattle industry, ranging from family-owned, to large scale commercial operations.

## AOS = ATMOSPHERIC AND OCEANOGRAPHIC SCIENCES |return to top|

AOS-01 The distribution of *Pyrodinium bahamense* cysts in Old Tampa Bay sediments. D.J. KARLEN and M.A. MILLER. Environmental Protection Commission of Hillsborough County 3629 Queen Palm Drive Tampa, Florida 33619. Extensive blooms of the dinoflagellate *Pyrodinium bahamense* have occurred over the summers of 2008 and 2009 in Old Tampa Bay. This species forms resting cysts which remain dormant in the sediments until conditions are favorable for blooms to occur. This pilot study looked at the abundance and distribution of *P. bahamense* cysts in Old Tampa Bay sediments collected in May 2010 at the Environmental Protection Commission of Hillsborough County (EPCHC) monthly water quality monitoring stations. The purpose of this study was to 1) map the distribution of *P. bahamense* cysts in Old Tampa Bay to provide a baseline for predicting future bloom locations and 2) look at the water quality and sediment characteristics which correspond to the distribution of *P. bahamense* cysts in Old Tampa Bay. Additionally, we looked at the monthly population trends of *P. bahamense* in Old Tampa Bay from phytoplankton samples collected at the EPCHC water quality monitoring stations from January 2008 through August 2010. The phytoplankton data were compared with corresponding water quality data to look at possible correlations between *P. bahamense* blooms and surface hydrographic conditions and nutrient concentrations. The highest cyst densities occurred in the north and western areas of Old Tampa Bay and were correlated with areas of high silt/clay and organic content as well as reduced nitrogen isotopic signatures. These sites also corresponded to areas where past blooms had started. Cyst densities decreased towards the lower section of the bay, possibly due to stronger currents and shorter water residence time. Bloom events during 2008-2010 were tied to high water temperatures and decreasing surface salinities. Apparent optimal conditions for blooms had surface water temperature of 30°C and surface salinities around 25‰. Ortho-phosphate had a strong correlation with *P. bahamense* cell counts; however peak concentrations in Ortho-$PO_4$ occurred approximately one month after peak bloom events. (Funding provided by the Tampa Bay Estuary Program)

AOS-02 Tsunami total risk in the Caribbean and adjacent regions. G.A. MAUL (1), X.W. PROENZA (2) and C. VON HILLEBRANDT-ANDRADE (3). (1) Department of Marine and Environmental Systems, College of Engineering, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901, (2) National Weather Service, Fort Worth, TX 76102, (3) NOAA NWS Caribbean Tsunami Warning Program, Mayaguez, PR 00680. Total Risk is defined as hazard (frequency of occurrence of tsunami events) times measures of elements at risk (human exposure including property) times measures of vulnerability (community and government preparedness) in a given epoch (Nott, 2006). While the tsunami hazard in the Caribbean and adjacent regions (averaging 19 ± 22 years between deadly events) is lower than Pacific coastal areas, the total risk to life and property is at least as high as the USA West Coast, Hawaii, or Alaska, because of the higher elements at risk due to Caribbean population density and coastal living, and greater vulnerability due to beach tourism so attractive to more than 35 million visitors a year. Viewed in this light, the allocation of resources by governments, industry, and insurers needs to be adjusted for the better protection of life, for improved coastal engineering, and for infrastructure protection.

AOS-03 Temporal changes in abundances of surface metazooplankton of the Indian River Lagoon, Florida. H. KOLB and K.B. JOHNSON. Marine and Environmental Systems, Florida Institute of Technology, 150 W. University Blvd, Melbourne, Fl 32901. Zooplankton identities and abundances have been monitored in the Indian River Lagoon, near the outlet of Crane Creek (Melbourne, Florida), over seasons and through years. Each week from August through May a plankton tow is conducted mid-day from a pontoon boat with the use of a 153-µm mesh net towed for two-three minutes. Entire samples are subsampled using heavy and light aliquot methods and identities and abundances are scored via stereomicroscopy. The bulk of the sample is then place in a settlement tube in order to obtain a settled plankton volume,

representative of overall plankton abundance. Comparisons will be made between key events or times catalogued in the long term zooplankton database. Abundant organisms being monitored include bivalve veligers, gastropod veligers, polychaete larvae, barnacle nauplii, and decapod zoea. Analysis of samples and temporal comparisons reveal information about life cycles, seasonal abundance, and productivity.

AOS-04 2010 Wave climate of Brevard County, Florida: Spatial and temporal variability from post-nourishment monitoring, including the 2010 Atlantic hurricane season. C.A. CIMAGLIA and C.T. HUTCHERSON. TNC Oceanographic, 140 Tomahawk Dr., Unit 3, Indian Harbour Beach, FL 32937. For this expansive post beach nourishment monitoring project, wave data were collected at six sites with 15 independent wave gauges along the East Coast of Brevard County, FL from May 2010 to February 2011, including the 2010 Atlantic Hurricane Season. Wave data are being collected in support of Florida Tech Ph.D. candidate John Hearin's research on the impacts of beach nourishment on the surfing wave environment of Brevard County, Florida. Atypical instrument coverage of this breadth was possible with the use of newly developed, low-cost, pressure based wave gauges in concert with one acoustic Nortek Aquadopp instrument used for data validation. Dredge and beach fill operations were completed in Brevard County in spring 2010 for two nourishment projects; the North Reach (Cape Canaveral) and the South Reach (Indialantic and Melbourne Beach). Three monitoring sites were selected: two nourished sites [(1) Cherry Down Park in Cape Canaveral, and (2) Ocean Avenue Park in Melbourne Beach], and one non-nourished site [(3) Ponce De Leon Landing Park in South Brevard County]. Wave gauges were installed in the nearshore waters at two stations at each site at approximate depths of -10' and -30' MLLW. These sites will be monitored with a continual standard wave sampling scheme recorded twice per hour. Additional prototype directional wave gauge designs were also tested during this project based on the methods of Howell (1998), and Panniker and Borgman (1970). Directional instrument arrays were installed at Sites 1 and 3, -30' MLLW stations. The Nortek Aquadopp was installed at Site 3, -30' MLLW from June-August 2010 to compare directional sampling results. Preliminary data reviewed illustrates the spatial and temporal variability of the nearshore wave characteristics within the project area, multiple tropical storm event data sets (including two Category 4 storms), as well as depicting unique micro-events only detected through the extended instrument array used for this monitoring event.

## AOS Posters

AOS-P10 An examination of $\delta^{18}O$ values from the Mediterranean Sea and the Western Atlantic Ocean using different source organisms and verification of existing GISS model. N.L. LEDRA. Department of Marine Biology, Nova Southeastern University, 3301 College Ave, Fort Lauderdale, FL 33314. Recent environmental change threatens the existence and livelihood of many people around the world. Over the past twenty years, there has been much debate about how to measure environmental change. This paper employs one method currently in use through the measurement of ratios of light oxygen isotopes to heavy oxygen isotopes. It examines past environmental episodes with stable isotopes ratio analysis; in particular, the stable isotopes of oxygen ($\delta^{18}O$) obtained from different water sources. This study aims to provide a comparison of the $\delta^{18}O$ in water masses of two different geographic areas: the Mediterranean Sea and the western Atlantic Ocean. They are both areas of high similarity in terms of physical geography as they are semi-enclosed bodies of water that border on the Atlantic Ocean and thus have limited deep-water exchange with the Atlantic and are sandwiched between two large landmasses. The Mediterranean Sea and the Western Atlantic Ocean are also both commercially important and are therefore subject to a large amount of anthropogenic effects from various industries such as agriculture and petroleum. Finally, in recent years several studies have compared the effect of these anthropogenic effects on both bodies of water. The two areas of interest will be further subdivided in terms of physical and distinct geographic features as well as to make data analysis manageable. A statistically significant difference between $\delta^{18}O$ values was shown between many of the ten locations and between $\delta^{18}O$ values obtained from source materials such as: aragonite and ambient water. A generalized overall equation for prediction was found by significant multiple regression analysis where $\delta^{18}O$ was our dependent variable and the other variables we collected including depth and salinity were predictor variables. The values of this model will be tested against existing $\delta^{18}O$ models. This will give a clearer understanding of how to predict and generate future models of water masses in both the western Atlantic Ocean as well as the Mediterranean Sea regions.

AOS-P11 Long term survey of water quality and diatom community structure at a static immersion test site in the Indian River Lagoon, Florida. K. ZARGIEL (1), G. SWAIN (1) and J. MCDONALD (2). (1) Department of Marine and Environmental Systems, Florida Institute of Technology, 150 West University Blvd, Melbourne, FL 32901, (2) Yellow Springs Instruments, Inc., 1725 Brannum Lane, Yellow Springs, OH 45387. Water quality and diatom settlement have been monitored at a static immersion test site located several kilometers north of the Sebastian Inlet in the Indian River Lagoon

since August 2008. Water quality measurements included temperature, conductivity, salinity, pH, turbidity, dissolved oxygen, chlorophyll a, and blue green algae. These were taken every hour by a Yellow Springs Instrument (YSI) water quality sonde, model 6600V2-4. Large diurnal cycles of dissolved oxygen and pH were recorded and it is postulated that these reflect the high productivity of the lagoon. The changes in salinity and turbidity correlated with storm events. Water temperatures as low as 5°C were recorded for several days during the cold weather event of January 2010. Diatoms were collected every two weeks from biofilms that settled on PVC panels. These were analyzed for cell densities and taxonomic composition. Diatom communities were composed of taxa commonly reported in the biofouling literature, such as: *Achnanthes*, *Amphora*, *Bacillaria*, *Cocconeis*, *Cylindrotheca*, *Melosira*, *Navicula*, and *Nitzschia*. Data collected over two years show that diatom dominated biofilms due not reflect seasonality, but rather changes in environmental conditions, especially salinity and temperature.

## AOS-SS = SPECIAL SESSION IN MEMORY OF DR. BETH IRLANDI |return to top|

AOS-S01 Context-specific assessment and restoration of coastal marine populations: Collaborations with Dr. Beth Irlandi. W.S. ARNOLD (1), J.C. COBB (2), S.P. STEPHENSON (2) and S.P. GEIGER (2). (1) Southeast Regional Office, NOAA National Marine Fisheries Service, 263 13th Avenue South, St. Petersburg, FL 33701, (2) Florida FWC Fish and Wildlife Research Institute, 100 Eighth Avenue SE, St. Petersburg, FL 33701. Coastal marine resources throughout Florida are suffering stress from a variety of sources. The long-term sustainability of these resources requires that the impacts of stressors be quantified and that the resource be stabilized at a viable density. These requirements are complimentary. We discuss our collaborative research efforts with Beth Irlandi to evaluate impacts of beach nourishment on three beach taxa (coquina clams, [*Donax*], ghost crabs [*Ocypode*], mole crabs [*Emerita*]), focusing on comparisons between Florida east coast and west coast populations. Results provided a quantitative estimate of impacts and suggested that those impacts differ between coasts reflective of differences in population abundance, community structure, and beach physiography. We then discuss the second part of the equation, using as an example our work on enhancing hard clam (*Mercenaria* spp.) populations in the Indian River Lagoon utilizing novel techniques to enhance reproductive viability in the population. Although the methods we applied to the IRL hard clam population were not successful, they led to remarkable success with the rebuilding of bay scallop (*Argopecten irradians*) populations along the west Florida shelf. Such approaches achieve a necessary first step in progress towards sustainability by reestablishing a level of population abundance requisite to long-term viability. (These and ancillary projects were supported by funding from Florida Sea Grant, NOAA, the State of Florida, and various local governmental and non-governmental organizations)

AOS-S02 Ecological and recreational enhancements of Brevard County spoil island BC 47. M.T. VIRGILIO. Indian River Lagoon Aquatic Preserves Field Office, Office of Coastal and Aquatic Managed Areas, Florida Department of Environmental Protection, 3300 Lewis St., Ft. Pierce, FL 34981. The spoil islands of the Indian River Lagoon were created during the dredging of the Intracoastal Waterway throughout the mid 1900's. Since the creation of these spoil islands, they have been colonized by a mixture of native and exotic plant species. Presently, the islands provide habitat for several coastal bird species and recreational opportunities for boaters, kayakers, and fisherman. BC 47 was adopted in 2009 by the late Dr. Beth Irlandi on behalf Florida Institute of Technology's (FIT) Department of Marine and Environmental Systems (DMES). Since the adoption of BC 47, DMES has partnered with the Indian River Lagoon Aquatic Preserves Field Office (IRLAP) to complete several recreation and ecological enhancement projects. Through IRLAP's Spoil Island Project, volunteers and FIT students removed exotic plant species, added native plants, installed fire rings and an educational kiosk and signage. To document and facilitate communication, all vegetative enhancements have been tracked using a Trimble GeoXT GPS unit and subsequently converted into GIS shapefiles. Boy scouts, led by an Eagle Scout candidate, built and installed picnic tables on BC 47. FIT students also conducted monitoring and shoreline restoration projects as part of Dr. Beth Irlandi's Coastal Mitigation and Restoration class. Her students planted the saltmarsh grass *Spartina patens* and red mangroves (*Rhizophera mangle*) along an eroding portion of the shoreline, identified and mapped native and exotic plants on the island, and suggested methods for further ecological enhancement of BC 47. FIT students will also use the methodology developed by Saint Johns River Water Management District to monitor the seagrass beds on the south side of the island. Enhancement of BC 47 is expected to continue for many years through the strong partnership formed between FIT (*via* Dr. Beth Irlandi) and Florida Department of Environmental Protection's IRLAP Field Office.

AOS-S03 Vegetation mapping and planning of Island BC-47. J. CONSTANTINIDE. Alpha JC, Geospatial Services & Environmental Consulting, 2395 N. Courtenay Pkwy, Suite 102, Merritt Island, FL 32953. The conceptual and proposed

restoration plan of Island BC-47 will aim to remove non-native vegetation while minimizing soil loss and erosion and replace that non-native vegetation with native plants that will thrive and propagate on the island. The restoration plan will be carried out through a phase-by-phase process. Before, during, and after the restoration, geographic information systems (GIS) will be used to map non-native and native vegetation. Prior to and during plant removal, measures will be taken to minimally disturb wildlife and existing native vegetation. Non-native plant will be removed by mechanical (machinery and manual removal), physical (controlled fires), and limited chemical (herbicide) means. Potential soil erosion after the vegetation removal process will be mitigated with temporary structures. After removing non-native flora, native vegetation will be planted using methods to optimize plant health, propagation, and surrounding native species biodiversity. The planted native vegetation will reduce soil erosion, enhance the habitat for wildlife, and help maintain the integrity of the island's coastline. Following restoration, the success of the project depends on monitoring for goal attainment, proper funding, and public participation. Project monitoring will focus on native and non-native plant spatial coverage, using GIS, and BC-47's soil loss and erosion through soil profiles and topographical surveys. Soil loss and erosion will be monitored to distinguish project impacts from natural erosion. If funding permits, soil profiles will be tracked to assess if native vegetation effectively mitigates or eliminates erosion on normal weather days. As a necessary item for project success, funding sources are suggested to carry out the goals, objectives, and methods of suggested to carry out the goals, objectives, and methods of the plan. Along with funding, public participation by way of local citizen input, government agency involvement, and financial stakeholder inclusion will clearly communicate attainment of the restoration plan's progress and milestone successes.

AOS-S04 Indian River Lagoon Shoreline Restoration Project: Past, present and future direction. J.L. OWEN and L.W. HERREN. Indian River Lagoon Aquatic Preserves Field Office, Office of Coastal and Aquatic Managed Areas, Florida Department of Environmental Protection, 3300 Lewis St., Ft. Pierce, FL 34981. The Indian River Lagoon (IRL) Shoreline Restoration Project was established in 1995 to "*re-establish fringing mangrove habitat along the IRL while facilitating community involvement*." During the first ten years of the project 11,719 red mangroves were planted using the PVC encasement method, and 800 were planted between 2008-2010 using a three method(mature, multistem, and PVC-encased propagules), three elevation (1.5m increments from mean high water) experimental grid design. As of December 2010, 4.2% of the individuals planted using the PVC encasement method and 23.7% of those planted in experimental grid survived. In April 2010, the direction of the project shifted from planting mangroves along high-energy shorelines to planting saltmarsh vegetation that can quickly stabilize an area and naturally recruit mangrove propagules for long-term shoreline restoration. This change in direction was prompted by expert advice and a Florida Atlantic University experiment carried out on Hutchinson Island suggesting that planting saltmarsh species can encourage natural recruitment and succession. Mimicking this study one saltmarsh grass experiment and three saltmarsh grass sites were established along the IRL, using different combinations of three saltmarsh grass species; *Spartina alterniflora*, *S. patens* and *Paspalum vaginatum*. After four months of growth saltmarsh grass plugs planted along a shoreline in the U.S. Fish and Wildlife Service Archie Carr National Wildlife Refuge began growing together making it difficult to distinguish individual plants. In fall 2010, all three species were found seeding. Red mangrove propagules and black mangrove seeds have been planted at the saltmarsh grass sites and will be monitored for survival in comparison to natural recruits. The IRL Shoreline Restoration Projects' goal remains the same but the method with which restoration is carried out is evolving to examine the whole ecological system.

AOS-S05 ESTUARIES Program: Spring into action to educate tomorrow's leaders. C. MULLIGAN, M. OVARD and B. BENSON. Academy of Environmental Science, 12695 W. Fort Island Trail, Crystal River, FL 34429. The number of residents living in coastal areas around Florida has been increasing dramatically in recent years. This trend creates undue pressure on the local environment. Anthropogenic influences such as runoff, boat traffic, and other local land uses undoubtedly form the majority of this pressure. Educating the public about these issues has only recently become an increased priority. In the ESTUARIES Program at the Academy of Environmental Science students analyze relationships of water quality with biotic factors such as plankton diversity and seagrass growth and distribution through hands-on labs, field research, socioscientific debates, and community workshops. This not only teaches students critical marine science, chemistry, and environmental science concepts, it does so in a manner that is meaningful to their everyday lives through rigorous and relevant curriculum. These students can then contribute to the environmental literacy of the public through community workshops in which they step out of the role of student and into the role of teacher. Findings from this study have provided evidence that heavy anthropogenic runoff is having a negative impact on microscopic biota of the Crystal River.

AOS-S06 The ecology of stormwater ponds in Brevard County, Florida: A comparison among land usages. N.J.B. SLOAN and E.A. IRLANDI-HYATT. Department of Marine and Environmental Systems, Florida Institute of Technology,

150 W. University Blvd., Melbourne, Fl 32901. Florida's landscape has been altered greatly by the growing number of man-made habitats called stormwater ponds. These ponds are created to mitigate for the changes in hydrology created by an increase in impervious surfaces and to reduce pollutant loads from urban, agricultural and industrial development. Most prior studies have focused on the efficiency of stormwater ponds in treating runoff. The object of this research was to determine if there were differences in diversity, richness, and composition of zooplankton and benthic communities due to differences land use surrounding stormwater ponds, location within ponds and season. Stormwater ponds were chosen from different land use categories (agricultural, residential, highways), and three locations (inlet, middle outlet) within each pond were sampled to represent a potential gradient in pollutant loading. Benthic and zooplankton samples (n = 3) were collected quarterly over a two-year period. There were 86 species of zooplankton and 96 species of benthic macroinvertebrates identified. No significant difference in diversity was found in zooplankton by location or land use but there was a seasonal difference with diversity being higher in the fall. Benthic faunal diversity was significantly higher in highway ponds compared to residential ponds. There were no significant differences among locations within the ponds, and seasonally benthic diversity was higher in the fall. Species richness in zooplankton, however, was significantly higher in residential ponds and at the inlets of ponds, and zooplankton and benthic species richness were both significantly higher in the fall. Variations in diversity and richness are believed to be driven by differences in primary production associated with input of nutrients and seasonal changes in production and environmental conditions. Carlson Trophic State Indices indicated all ponds ranged from mesotrophic to hypertrophic, which was confirmed with the five most abundant benthic species being highly pollutant tolerant species.

AOS-S07 Reproductive biology of *Lysmata* shrimp. J. LIN. Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. The species of Caridean shrimp *Lysmata* has a unique reproductive system, protandric simultaneous hermaphrodite (PSH). The shrimp first matures as a male, may change to simultaneous hermaphrodite that can function as both a male (during inter-molt) and female (during post-molt). Some males never change to euhermaphrodite phase (EP). In many decapod crustacean species, the endopods of first two pairs of pleopods of males are modified, long assumed to serve as gonopods in insemination of females. However, in *Lysmata* shrimp, the modified pleopods 1 and 2 (cincinnuli and appendice masculinae) gradually disappear when males change to hermaphrodites and the shrimp can still function as males (even when they are fully pregnant!). The sexual phase ratio is largely determined by social environment (group size and sex ratio). *Lysmata* shrimp can be divided into two informal groups: peppermint shrimp (*e.g. L. wurdemanni*, *L. boggessi*, and *L. seticaudata*) live in aggregation and cleaner shrimp (*e.g.*, *L. amboinensis*, *L. grabhami*, and *L. debelius*) live in pairs or low density. *L. wurdemanni* males are much more active during mating and faster in transferring spermatophores than those of *L. amboinensis*. EP shrimp secrete both distance and contact pheromones to attract males (male-phase (MP) or EP shrimp serve as males) to mate during the critical short window of post-molt period when the shrimp can mate as females (the shrimp do not self-fertilize or store sperm). Males, on the other hand, can fertilize eggs successfully during inter-molt stage. The outer flagella of the antennules house the receptors (aesthetascs) of the distance pheromone, whereas both antennae and antennules can detect the contact pheromone. The number of aesthetascs of the group-living peppermint shrimps are greater than that of the pair-living shrimps.

AOS-S08 Sex pheromone detection and olfactory sensilla in *Lysmata* shrimp. J. ZHU and J. LIN. Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. In decapod crustaceans, mate recognition is regulated by numerous olfactory receptors located on the antennae and antennules. Aesthetascs are important olfactory sensilla, which have been found to be responsible for sex pheromone detection in many species. The number of aesthetascs varies greatly among species living in different environments. Species of caridean shrimp *Lysmata* provide an ideal model to study the relationship between social environments and sensory structures. Our study examined six *Lysmata* species representing different social groups: group-living peppermint shrimp (*L. wurdemanni* and *L. boggessi*), low-density/pair-living cleaner shrimp (*L. amboinensis* and *L. debelius*) and low-density peppermint shrimp (*L. pederseni* and *L. ankeri*). The number of aesthetascs of the six species was counted, and the ultrastructure of aesthetascs was examined using transmission electron microscopy. Generally, group-living species possessed higher number and density of aesthetascs than low-density/pair-living species did. Sexual dimorphism in the number and/or density of aesthetascs was present in *L. boggessi*, *L. wurdemanni* and *L. pederseni*, but not in *L. amboinensis*. Species or sexual phase within a species with higher number/density of aesthetascs were more sensitive to sex pheromones. Our study demonstrates that social environments and mating behavior are closely related to the number and density of sensory receptors.

AOS-S09 The never-ending seagrass stories from the Indian River Lagoon, Florida. L.M. MORRIS (1), L.A. HALL (2) and R.H. CHAMBERLAIN (1). (1) St. Johns River Water Management District, PO Box 1429, Palatka, FL 32178, (2)

St. Johns River Water Management District, 525 Community College Parkway SE, Palm Bay, FL 32909. Seagrass area in the Indian River Lagoon (IRL) system has been steadily increasing since 1996. This increase in area is the result of depth-limit expansion of seagrasses, which appears to be a response to modest increases in light availability (reduction in light attenuation, since 1997). The two seagrass monitoring methods used at St. Johns River Water Management District, mapping based on aerial photos and the 100 fixed seagrass transects, have provided the best technique for detecting changes in depth distribution, abundance, and species dominance over time. Over the past 16 years of monitoring, both methods show similar upward trends with regard to seagrass coverage, which has increased by over 2,800 ha, and average bed width (transect length), which has increased by 40 m. However, the paradox is, that despite an increase in the footprint of seagrass, some segments of the IRL are declining with respect to the overall density within the seagrass beds – some specific areas have declined as much as 50%. This decline is believed to be caused by persistently low salinities (below 20 ppt) and high residence times, primarily in the central reaches of the IRL following the slow recovery from the 2004 hurricanes and subsequent wet years through 2008.

AOS-S10 Setting seagrass density targets for the Indian River Lagoon, Florida. R.H. CHAMBERLAIN, L.J. MORRIS and J.S. STEWARD. St. Johns River Water Management District, PO Box 1429, Palatka, FL 32178. There are over 73,000 acres of seagrass lining the eastern and western shores of the Indian River Lagoon (IRL). However, not all seagrass beds are created equal. A sparse grassbed would not provide as much habitat, primary and fisheries productivity, nutrient buffering, and sediment stability as a dense grassbed. Therefore, in addition to the area and depth targets set in 2005, density targets are being considered to assure that the desired ecological services are being provided. The challenge is to set target densities that are historically based, attainable, and supports habitat functions characteristic of a seagrass ecosystem. Methods similar to those used to establish depth targets are being evaluated to set density targets. The densest part of seagrass beds (dense zone) was determined to be between the depths 0.4 and 0.8 m by calculating average percent coverage and coefficient of variation (CV) from 16 yrs of transect monitoring. Stable segments along the length of the IRL were analyzed to help determine upper density target ranges for each sublagoon portion. Frequency of occurrence (percentile range) for density in each non-reference segment is used to establish a minimum density reference for evaluating seagrass status and trend.

AOS-S11 Sediment organic content's effect on the settlement of the hard clam, *Mercenaria mercenaria*. J.T. RIDGE (1) and K.B. JOHNSON (2). (1) Institute of Marine Sciences, University of North Carolina at Chapel Hill, 3431 Arendell St., Morehead City, NC 28557, (2) Department of Marine and Environmental Systems, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. The hard clam, *Mercenaria mercenaria*, has exhibited infrequent population booms in the Indian River Lagoon (IRL), Florida. While once thriving throughout the lagoon, *M. mercenaria* only remains in abundance in certain regions. Potential explanations for their low populations include natural climatic events, degrading habitat quality, depensation effects, and overharvesting. In the past few decades, there has been an influx of high organic sediment into the IRL; this study examines the effect of degrading habitat quality on hard clam recruitment through the manipulation of the sediment organic content in both laboratory and field experiments. We created an algal powder from dried and blended *Gracilaria* spp. and added it to 'clean' sediment to create three treatments: clean, low organic (historical IRL sediment analog), and high organic sediments. *M. mercenaria* pediveligers were allowed to settle for 48 hours in both the lab and field before processing. Preliminary results indicate that while clams may be induced to settle more readily in suitable habitats of clean or low organic sediments ($F = 9.665$, $P = 0.002$), their ability to choose suitable habitat may be significantly hindered ($F = 12.072$, $P < 0.001$) in the presence of high organic sediment, as hard clam mortality was also significantly greater ($F = 35.953$, $P < 0.001$) in this treatment. These results have dire implications for IRL clam populations, considering the amount of high organic sediment has doubled in certain areas of the IRL in the past two decades.

AOS-S12 Planktonic larval supply and recruitment of hardfouling organisms to oyster shell substrata in the Indian River Lagoon, Florida. K. SOLTIS and K.B. JOHNSON. Department of Marine and Environmental Systems, Florida Institute of Technology, 150 W. University Blvd., Melbourne, FL 32901. During this month-long study we compared daily planktonic larval supplies in the water column of the Indian River Lagoon to benthic settlement in order to determine if larval supply is the primary predictor of recruitment. The system selected for study was benthic estuarine reefs of the oyster *Crassostrea virginica* and the hard fouling organisms associated with that community. Oyster mats and oyster bags, the two cultch structures used in oyster reef restoration initiatives in the Indian River Lagoon, were used as settlement substrata. This enabled us to determine if differences in recruitment of hardfouling organisms exist between the different types of reef restoration techniques. Recruitment to these mats and bags was determined every other day. In initial comparisons, peaks in planktonic larval supply of the two most commonly observed species occurred two to three days before peaks in recruitment

of those same species to the benthos. Preliminary comparisons of recruitment suggest that those same species recruited preferentially to oyster mats. Analyses of these data are ongoing and more details will become available. The results of this study will give insight into larval supplies and settlement patterns of animals associated with oyster reef communities; the relative appeal of different oyster cultch structures will also be evaluated.

AOS-S13 Substratum roughness and the development of marine biofilms. L.H. SWEAT and K.B. JOHNSON. Department of Marine and Environmental Systems, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Two of the most important considerations for fouling organisms during the settlement process are substratum roughness and the associated biofilm structure. Marine biofilm assemblages include a variety of benthic diatoms and other organisms, which may serve as important cues for larval settlement. We examined biofilm community structure in the Indian River Lagoon, Florida on a range of substratum roughnesses. Members of the biofilm community, without regard for treatment, included, but were not limited to: diatoms in the genera *Toxarium*, *Navicula*, *Melosira*, *Synedra*, and *Cylindrotheca*; peritrich ciliates; nematodes; and cyanobacteria. Contrary to most macrofouling organisms that are reported to recruit more readily to rough substrata, biofilms were more abundant in terms of species richness, diversity and organism density on smooth substrata. These results suggest increased ability to recruit and remain attached under different flow regimes and other surface properties likely promoted by reduced microtopography. This hypothesis is particularly applicable to benthic diatoms, which comprised the majority of biofilms in all treatments. Determining preference or choice of substratum in marine foulers, including biofilm organisms, has implications for encouraging colonization of desirable native fouling species, predicting the spread and establishment of invasive species, and reducing costly fouling of boat hulls and other submerged surfaces.

AOS-S14 The adhesion of diatoms to silicone fouling release antifouling coatings. K. ZARGIEL and G. SWAIN. Department of Marine and Environmental Systems, Florida Institute of Technology, 150 W University Blvd, Melbourne, FL, 32901. Silicone based fouling release coatings provide an environmentally friendly solution for the control of fouling on ship hulls. They are formulated to have surface and bulk properties which prevent organisms from developing strong adhesive bonds to the surface. This weak attachment reduces the development of fouling and facilitates removal by hydrodynamic forces or mechanical cleaning. Certain diatoms, however, have been shown to develop strong attachment to these surfaces (Finlay *et al*. 2002, Holland *et al*. 2004, Krishnan *et al*. 2006, Molino *et al*. 2008). This research investigated diatom settlement and adhesion to several fouling release coatings under static and dynamic conditions from a research platform at Port Canaveral, Florida. It was observed that the biofilms were composed of mixed diatom communities, often dominated by the following genera: *Athnanthes*, *Amphora*, *Cylindrotheca*, *Licmophora*, *Navicula*, and *Plagiotropis*. Furthermore the diatom community structure and adhesion strength was moderated by the hydrodynamic conditions (static or dynamic immersion).

AOS-S15 The ghost of fouling communities past: Evidence for carry-on effects on transplanted panels. E. RALSTON and G. SWAIN. Department of Marine and Environmental Systems, Florida Institute of Technology, 150 W. University Blvd, Melbourne, Fl 32901. Biofouling of boats and ships creates operational problems and has also been linked to the spread of invasive species. Previous research suggests that fouling community composition and quantity will be modified by prior fouling settlement and for ships and boats traveling between different ports this may have significant impact on the recruitment of organisms. This experiment was designed to determine how preconditioning affects the rate and composition of re-fouling after a transplant is performed. A series of 10.16 × 20.32 cm panels were placed at three locations in Florida (Ponce Inlet, Sebastian Inlet and Port of Miami) which were characterized by distinct fouling communities. Panels were immersed for four months and then cleaned and transplanted among the three sites. Fouling community composition and coverage was characterized at bimonthly intervals both before and after transplantation. The data showed that community structure at all three sites were affected by surface conditioning from different starting locations.

## AOS Special Session Poster

AOS-SP12 Remembering the scientific career of Dr. Elizabeth Irlandi (1963-2010). S. KREJCI, L. SWEAT, and K. ZARGIEL. Department of Marine and Environmental Systems, Florida Institute of Technology, 150 W University Blvd, Melbourne, FL, 32901. Dr. Elizabeth Irlandi received her Ph.D. from the University of North Carolina, Chapel Hill, and subsequently worked for over twenty years in the field of marine benthic ecology. Although, she was most commonly known for her work on seagrass ecosystems and their associated macrofauna, her research was broad, including topics such as: landscape ecology, linkages between terrestrial and aquatic environments, and the impacts of anthropogenic stresses on

the ecological functioning of coastal zone habitats. This wide range of work has been published in many peer-reviewed journals, including: *Florida Scientist*, *Marine Ecology Progress Series*, the *Journal of Experimental Marine Biology & Ecology*, *Aquatic Botany*, and the *Journal of Estuarine, Coastal & Shelf Science*. During Dr. Irlandi's academic career, she positively impacted her students and colleagues by actively serving as a mentor, committee member, and instructor for a variety of biological and environmental management courses. In addition to her service within the academic community, she provided educational outreach to middle and high school students by organizing an annual marine science summer camp designed to expose younger generations to both field and laboratory studies. Her continued dedication to exploring the dynamics of coastal marine ecosystems and disseminating knowledge to her peers greatly contributed to the field of marine ecology.

## BIO = BIOLOGICAL SCIENCES |return to top|

BIO-01 Evaluation of Y-STR diversity in Lingayat and Vokkaliga populations of Southern India. S. CHENNAKRISHNAIAH (1,2), T. GAYDEN (2,3), D. PEREZ (2,3) and R.J. HERRERA (2). (1) Department of Chemistry and Biochemistry, Florida International University, Miami, FL 33199 (2) Department of Molecular and Human Genetics, College of Medicine, Florida International University, Miami, FL 33199, (3) Department of Biological Sciences, Florida International University, Miami, FL 33199. India's unique geostrategic position in South Asia has served as a major corridor for the dispersal of modern humans out of Africa. The people of contemporary India represent a mosaic of ethnic, linguistic, cultural and genetic diversity. The vast majority of Indian populations belong to Hindu religion (80.5%) and they are socially stratified into castes on the basis of their occupations. Linguistically, Indo-European speakers are the largest group followed by Dravidians, Austro-Asiatic and Tibeto-Burman language families. Previous studies have failed to reach a consensus on the genetic origin(s) of Indian populations, particularly with respect to the contributions of Dravidian and Indo-European communities in shaping the genetic landscape of the present-day India. In the current study, 17 Y-chromosomal short tandem repeat (Y-STR) loci were typed to evaluate their forensic and population genetic applications in two Dravidian Kannada-speaking populations namely, Lingayat (101) and Vokkaligas (102) from Karnataka state in southern India. Lingayat (0.9917, 0.9981) exhibits higher haplotype diversity than Vokkaligas (0.9814, 0.9901) at both the minimal 9-loci and 17-loci Yfiler haplotypes, respectively. The overall haplotype diversity for both the Dravidian populations at 17 Y-STR loci is 0.9970 and the corresponding value for the minimal 9-loci haplotypes is 0.9915. A median-joining network based on 15 Y-STR loci showed no shared haplotypes between Lingayat and Vokkaliga populations, indicating absence of recent gene flow among them. Results from this study underscore the genetic uniqueness of our two Dravidian collections as well as the need for independent databases for forensic analysis and paternity testing.

BIO-02 Autosomal STR diversity in three traditional provinces of historical Tibet. T. GAYDEN (1,2), S. CHENNAKRISHNAIAH (2,3), A. BUKHARI (1,2) and R.J. HERRERA (2). (1) Department of Biological Sciences, Florida International University, Miami, FL, 33199, (2) Department of Molecular and Human Genetics, College of Medicine, Florida International University, Miami, FL, 33199, (3) Department of Chemistry and Biochemistry, Florida International University, Miami, FL, 33199. The Tibetan plateau is the highest and largest highland in the world. It is surrounded by Kunlun in the north, Karakoram in the west and the Himalayas in the south. The only break in the continuous mountainous landscape and deep river gorges is to the east of Tibet, providing a narrow east-west migratory route in and out of the plateau. These unique geographic features of the plateau may have kept Tibet relatively isolated throughout the history. In the present study, 15 autosomal STR loci were typed in 338 unrelated males from three different Tibetan provinces, namely Amdo (86), Kham (101) and U-Tsang (151). All the studied loci were consistent with Hardy-Weinberg equilibrium, except for the locus D19S433 in Kham province. FGA is the most polymorphic locus with the highest observed heterozygosity and gene diversity values across three Tibetan collections, whereas TH01 is the least variable marker displaying the lowest values for the same two parameters. U-Tsang exhibits the highest total numbers of alleles (139) followed by Kham (130) and Amdo (128) groups. Our results indicate that although these three Tibetan groups segregate within the cluster of the Himalayan populations in both Correspondence Analysis (CA) plot and Neighbor Joining (NJ) tree, they are genetically distinct from each other in congruent with their characteristic dialect, culture and tradition. The present study is the first of its kind to comprehensively analyze the Tibetan populations covering the three traditional provinces of historical Tibet, prior to Chinese invasion in 1959. Finally, STR profiles generated will be useful in creating national DNA databases for the Tibetan populations.

BIO-03 The potential role of endoglin growth factor β type III receptor in endothelial vascular tube formation. J. WATTERS (1), J. HAWKER (2) and I. DUFFY (1). (1) Dept. of Math and Sciences, Saint Leo University, PO BOX 6665, Saint Leo, FL 33574. (2) Department of Chemistry and Biochemistry, Florida State University, Tallahassee, FL 32306. Followed by cancer, heart disease is the leading cause of death in the United States. In contrast, heart disease is associated with the loss of blood flow to vital parts of the heart further diminishing heart function; while, cancerous tumors induce the formation of blood vessels increasing the risk of metastasizing to various parts of the body. Members of the transforming growth factor family and their receptors may augment angiogenesis. Endoglin is a type III receptor of the transforming growth factor beta (TGFβ) family predominately expressed in vascular development. Our goal is to identify whether endoglin is a major TGF-β binding glycoprotein in coronary venular endothelial cells (CVEC) by over expressing endoglin.

BIO-04 Are coastal populations of fire ants (*Solenopsis invicta*) impacting sea turtle nests? J.T. CLAYBORN, D. CASSILL and A. HOARE. Department of Environmental Science and Policy, University of South Florida, 140 Seventh Avenue South, Saint Petersburg, FL 33701. Humans have altered most coastal ecosystems in Florida, with potentially significant impacts on the success of sea turtle nesting and survival of hatchlings. A large number of studies have been conducted on the abundance and distribution of sea turtle nests during breeding season to determine the extent of damage caused by human encroachment into coastal habitats. These studies point to predators such as *Canis latrans*, *Procyon lotor*, and *Solenopsis invicta*. It is hypothesized that: (1) *S. invicta* abundance should be greater near the toe line and vegetative zones of the beach, because beach vegetation provides more protection than open sand; and (2) sea turtle nests near the toe line or within the vegetative zones will be more prone to underground predation by *S. invicta* than nests out in open sand. *S. invicta* were collected and counted using bait traps in transects along the beach from the wrack line to the vegetation zone. Hard-boiled peeled chicken eggs were planted underground in transects along the open sand to the vegetative zone to quantify *S. invicta* underground predation. Data on the fate of *Caretta caretta* nests from 2004-2008 were analyzed to deduce which predators were major threats to sea turtle nests. The experiments were performed independently of each other. The bait trap study showed a significantly greater number of *S. invicta* captured at the toe line and vegetative zones compared to open sand closer to shore. The underground egg study quantified *S. invicta* as a minimal direct threat to buried eggs; however, mammalian predation was a significant threat. Analysis of *C. caretta* nests showed *C. latrans* were the top predator of sea turtle nests, and fire ants had a minimal impact. Contrary to the hypotheses, these studies suggest a greater abundance of *S. invicta* does not necessarily result in greater predation on sea turtle nests. (Project supported in part by the STREAMS program, USFSP)

BIO-05 The effect of salinity within the immediate environment on the survival of fire ants (*Solenopsis invicta*) in coastal habitats. J.T. CLAYBORN, D. CASSILL and A. HOARE. Department of Environmental Science and Policy, University of South Florida, 140 Seventh Avenue South, Saint Petersburg, FL 33701. Fire ants (*Solenopsis invicta*) are invasive organisms inhabiting diverse ecosystems in Florida including coastal environments. *S. invicta* thrive in disturbed habitats such as flood zones along lakes, rivers and tidal zones along the coast. Little is known about the ability of *S. invicta* to cope with water of varying salinity. It is hypothesized that: (1) the ability of *S. invicta* to survive in sand is dependent on moisture rather than salinity; and (2) salinity is a factor for survival only when *S. invicta* ingests solutions of high salinities, meaning an increase in salinity will result in an increase in mortality. The sand experiment was designed to assess the ability of *S. invicta* to survive in sand moistened with solutions along a salinity gradient (0, 15, 30 ppt) and moisture gradient (0, .75, 1.25, 2.5, and 5 mL). Data from the sand experiment showed that ant mortality based on varying salinities was not a factor in the environment. Moisture content within the containers was significant in ant mortality. When ingesting water of varying salinities, mortality was greater at 30 ppt or higher. The results of the experiment suggest coastal areas are not high-risk habitats for *S. invicta* unless they ingest seawater. In extremely dry environments, colony density may be greater near saltwater sources in comparison to freshwater. (Project supported in part by the STREAMS program, USFSP)

BIO-06 *Solenopsis invicta* as a potential biocontrol for *Aedes aegypti*. T. HOSSAIN and J. CLAYBORN. Department of Environmental Science, Policy, and Geography, University of South Florida-St. Petersburg, 12527 Earnest Avenue, Orlando, FL 32837. *Solenopsis invicta*, more commonly known as the fire ant, is an omnipresent invasive species in Florida, and across much of the entire southern half of the United States. Control efforts throughout its history as an invasive pest have largely focused on pesticides, which not only are inefficient, but are also known to harm the environment. The most common of these chemicals is cypermethrin. It behaves as a fast-acting neurotoxin in insects. It is easily degraded on soil and plants but can be effective for weeks when applied to indoor inert surfaces. Cypermethrin is highly toxic to fish, bees and aquatic insects. Bioaccumulation refers to the accumulation of substances, such as pesticides, or other organic chemicals in an organism which occurs when an organism absorbs a toxic substance at a rate greater than that at which the

substance is lost. Thus, the longer the biological half-life of the substance the greater the risk of chronic poisoning, even if environmental levels of the toxin are not very high. Repeated exposure to very low levels of toxins in these environments can be lethal over time. In order to limit the potential for the abuse of chemicals, such as cypermethrin, which lead to these negative effects, this study probes implications from previous work which has shown that fire ants are capable of walking underwater and also that they prey on *Aedes aegypti* larvae, the adult mosquito of which is known for spreading yellow fever, dengue fever, and other diseases. The intent is to quantify the possibility that the fire ant is a potential biocontrol for mosquito populations. Building on a previous pilot study showing that fire ants are capable of aquatic predation behaviors, an experimental design was implemented in which mosquito larvae were placed in varying depths of water to serve as prey for a colony of fire ants. The results show that shallow depths of water do indeed induce the aquatic predation behaviors of fire ants. The conclusion drawn is that the fire ant could act as a cheap and effective biocontrol for mosquito populations and thus lower the need for the use of toxic chemicals in controlling the populations of fire ants, thereby saving both money and time spent on medical expenses treating chemical exposure. It is recommended that that further studies be pursued in regards to the aquatic predation behaviors of fire ants, particularly in that there is a potential for reduction in the use of another potentially harmful chemical, sumithrin, a synthetic pyrethroid used in mosquito control more commonly known as Anvil.

BIO-07 Teaching old snakes new tricks: Operant conditioning in wild Burmese pythons. S.A. EMER and M.S. GRACE. Department of Biology, Florida Institute of Technology, 150 West University Blvd, Melbourne, FL 32901. Large pythons and boas have biological requirements and functions that are extremely different from traditional mammalian, avian and other reptilian models often used in learning experiments. These massive snakes are highly efficient ambush predators of live homeothermic prey (mammals and birds), and because they are very large, they generally consume correspondingly large food items, on an infrequent schedule. We report here the effective conditioning of the Burmese python (*Python molurus bivitattus*) using pre-killed juvenile mice as positive reinforcers. We chose Burmese pythons as subjects because they are invasive to and readily available in the Florida Everglades. Additionally, Burmese pythons are known for their ability to consume large quantities of food, and recent evidence indicates that some ingest multiple small prey items. Gradual modifications of the natural python feeding biology were used to establish patterns of response to reinforcement that are similar to those in other animals. Over the course of ten months, the pythons transitioned from weekly sessions with a live free-roaming adult rat, to sessions every 72 hours in which access to each of six, pre-killed juvenile mice was contingent on contact with an illuminated pushbutton. Learning was demonstrated by decreased latencies over the course of training sessions, and by the fact that latencies in each training session decreased significantly between the first and final trial. Snakes maintained performance despite decreased motivation and the absence of trials during shedding cycles. Thus, snakes do not "*forget*" over the course of several days without training. The development of operant conditioning paradigms like this can be used in psychophysical tests of behavioral sensitivity to environmental stimuli, specifically olfactory, visual, and thermal stimuli that are used to effectively localize and acquire prey. Furthermore, because the Burmese python is an invasive exotic megapredator in the sensitive Florida Everglades ecosystem, it is particularly important to understand the ecological consequences of its learned behaviors.

BIO-08 How does intraspecific competition affect prey capture kinematics and behavior in Florida populations of bluegill sunfish, *Lepomis macrochirus*? J.A. PFEIFFENBERGER (1) and P.J. MOTTA (2). (1) Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901, (2) Department of Integrative Biology, University of South Florida, 4202 E. Fowler Avenue, Tampa, FL 33620. Prey capture kinematics and behavior in bony fishes are affected by a number of abiotic and biotic factors including environmental temperature and satiation level of foraging fish. The density of fish in a population has affected growth, behavior, prey selection, feeding, and physiology of fishes. This study investigated the effects of density-induced intraspecific competition for food on the prey capture kinematics of juvenile bluegill sunfish, *Lepomis macrochirus*. Five focal fish in a group of conspecifics at variable densities were filmed using high speed video while feeding on fish prey. We tested the following hypotheses: (1) the rate of movement of cranial elements involved in prey capture is faster in the high-density compared to the low-density regime; and (2) the mode of prey capture (suction- or ram-feeding) is different between fish feeding in the high-density compared to the low-density regime. Results revealed that fish feeding in the high-density regime exhibited more rapid jaw opening, shorter mouth closing times, and shorter gape cycles relative to conspecifics in the low-density regime. In addition, bluegill sunfish attacked its prey at a faster rate in the high-density regime compared to the low-density regime. There was no density-induced intraspecific variation in feeding mode. The number of conspecific fish in a feeding territory, a metric that may be used to indicate levels of intraspecific competition, does affect individual feeding performance, including prey capture kinematics.

BIO-09 Temporal and spatial distributions of the ichthyoplankton of the middle St. Johns River, Florida: program overview and implications for watershed management. J.M. SHENKER, M. SCRIPTER and A. FARSON. Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne FL, USA 32901. The flood plains and marshes around most of the upper reaches of the St. Johns River along the east coast of Florida river have long been drained for agricultural use, but efforts by the St. Johns River Water Management District over the last few decades resulted in reconnection of many tens of thousands of acres back into marsh and recharge areas in the headwaters region. These efforts to restore the river potentially conflict with other human activities. Due to increased populations in central Florida, municipalities are requesting the ability to withdraw water from the river. An extensive series of studies has been commissioned by the District to determine the potential environmental impacts of such withdrawals. One major study examines fish spawning and larval drift over a 100 km section of the river. Our ichthyoplankton survey consisted of weekly or twice weekly sampling from February 2008 to September 2009 at four to six stations within each of 6 habitats, ranging from shallow lakes and rivers to deep channels. Samples were collected using paired 0.5 m mouth diameter, 505 micron mesh plankton nets mounted on weighted sleds that were towed from the bottom to the surface. Samples were generally collected during the daytime, with additional efforts to determine diel patterns in catches. Over 7,000 plankton samples were collected on over 250 sampling dates during the 18 month study. An exhaustive laboratory effort was undertaken to process the samples, and data are being analyzed to determine temporal and spatial patterns of larval fishes in the river, ecological interrelationships and associations with hydrographic conditions. These results will help guide the management district to make decisions about how to best maintain the quality of the river ecosystems and serve human populations.

BIO-10 Effects of flooding from Tropical Storm Fay on larval fish assemblages in the Middle St. Johns River, Florida. A. FARSON (1), J. SHENKER (1), M. SCRIPTER (1) and S.J. MILLER (2). (1) Department of Biological Sciences Florida Institute of Technology, Melbourne, FL 32901, (2) St. Johns River Water Management District, Palatka FL 32177. An intense larval fish survey was conducted along a 100 km section of the Middle St. Johns River, Florida from February, 2008, to September, 2009. Samples were collected once or twice each week from four to six stations within each of six habitats, ranging from shallow lakes and rivers to deep channels. Larvae were collected using a 0.5 m mouth diameter, 505 micron mesh plankton net mounted on a weighted sled that was towed equally along the bottom, at mid-depth and at the surface during each 10 minute tow. Tropical Storm Fay passed over central Florida in mid-August. This slow-moving storm produced rainfall exceeding 50 cm in many areas and dramatically changed the environmental conditions and water level of the river. In some locations, water rose above the river banks into vast flood plains. Dissolved oxygen decreased rapidly to near zero in many locations, causing some adult fish kills. Water conductivity decreased to very low levels, and pH dropped from its typical slightly basic state to neutral. Immediately prior to Tropical Storm Fay, numerous fish species were spawning in the river, including Centrarchidae, Gobiidae, *Notropis* spp. and *Dorosoma* spp. There was an almost complete cessation in the production of larval fishes in the aftermath of the storm, and this absence of larvae lasted for weeks to months in various habitats. The only species that ultimately increased in abundance was *Gambusia holbrooki*, which presumably thrived in the shallow flood plains habitats and then accumulated in the river channel as the water receded. Sampling later in the fall detected the resumption of spawning activity, and collections made during summer and early fall the following year illustrated the probable typical seasonal patterns of larval diversity and abundance that occur in the absence of such an extreme environmental event.

BIO-11 Development of an identification manual for the early life history stages of fishes of the Middle St. Johns River, Florida. M. SCRIPTER (1), J.M. SHENKER (1), A. FARSON (1) and S.J. MILLER (2). (1) Department of Biological Sciences Florida Institute of Technology, Melbourne FL, 32901. (2) St. Johns River Water Management District, Palatka, FL 32177. Research on the early life history (ELH) stages of fishes in fresh water, estuarine habitats, and marine systems provides critical information on the structure and function of ecosystems, the biology, ecology and populations of fishes, and management of vital resources. One of the key difficulties with ELH studies is the accurate identification of specimens from natural habitats. Ontogenetic changes in morphology, morphometric and meristic characteristics, pigmentation and many other characters, make identification a challenging effort, especially when larvae from many species may be present at the same time. Our intensive study of the ELH stages of fishes expected to reproduce in the St. Johns River required development of a comprehensive manual that enabled relatively untrained workers to rapidly identify larvae from thousands of ichthyoplankton samples. The effort began with the collation of widely dispersed literature that spanned decades of research and was of widely varying quality. These reports on the ELH of different species were used to compile quantitative and qualitative identification characteristics across ontogenetic development for families, and for species within families. As ichthyoplankton samples were processed, individual fishes were identified, measured, photographed and identified to species. Photographs were then marked with circles, arrows and other features to designate specific characters

(*e.g*. gut length, mouth, pigmentation, myomeres, *etc*.) that can help differentiate among species. Dichotomous keys were developed to help separate among closely-related species. As additional larvae were examined, their photographs, updated characteristics, and corrected morphometrics were progressively incorporated into the developing manual. Identification characteristics were used to develop a dichotomous key to families, and more precise guidance for separating closely-related taxa was provided. At present, our St. Johns River identification manual includes photographic and morphometric/meristic identification methods for 41 species within 21 families of fishes. Upon completion of this work in the near future, we anticipate publication of a comprehensive identification manual for these fishes that can be easily used by trained researchers and by students just entering the field.

BIO-12 The effects of structure *vs*. chemistry of adult *Balanus eburneus* (Ivory barnacle) skeletons on settlement induction of Indian River Lagoon fauna. J. ROBERTS, T. BRUNNER, R. JORDAN and K.B. JOHNSON. Florida Institute of Technology, Department of Marine and Environmental Systems, 150 W. University Blvd, Melbourne, FL 32901. Comparisons were done between panels containing skeletal remains of *Balanus eburneus* (n = 5) *vs*. clay skeletal molds (n = 5) on the recruitment of organisms to settlement panels in the Indian River Lagoon (Florida). Clay replicas were fashioned from fire hardened earthen clay to highlight the settlement effects due to structure and topography which are independent of the chemistry of the adult skeletons. Four distinct terrains (clay barnacle, clay plain, skeletal barnacle, and skeletal plain) were considered for possible settlement. An ANOVA statistical analysis ($\alpha = 0.05$) was used to compare settlement patterns between the five most abundant settled fauna. Those fauna were algal propagules, foraminiferans, mollusks, amphipods, and isopods. Significant differences were found between foraminiferans ($p < 0.01$) and mollusks ($p = 0.037$), however no significance was observed between algal propagules ($p = 0.132$), amphipods ($p = 0.078$), and isopods ($p = 0.384$). (Funding provided by Florida Institute of Technology)

BIO-13 Environmental correlates of ladyfish (*Elops saurus*) distribution in the Indian River Lagoon. J.R. BLANCHARD and R.G. TURINGAN. Department of Biological Sciences, Florida Institute of Technology, 150 West University Blvd, Melbourne, FL 32901. The ladyfish (*Elops saurus*) is one of the most valuable recreational fish species in Florida. The economic value of ladyfish has stimulated interest in enhancing wild stock through mariculture. However, the initiation of ladyfish aquaculture, as well as the aquaculture of all members of Superorder Elopamorpha, is hindered by the lack of understanding of the reproductive biology of the species and the biology of the elopamorph leptocephali. This study was designed to determine the environmental factors that influence the distribution of ladyfish in the Indian River Lagoon, with emphasis on the spatial and temporal distribution and abundance of leptocephali. To address this objective, data collected by the FWC-FMRI fisheries independent monitoring program, during the recent decade, were analyzed using multivariate and univariate statistics. Canonical Correspondence Analysis indicated that turbidity, temperature, and salinity contributed most of the variance that explains the spatial and temporal distribution of ladyfish leptocephalus larvae and adults. An analysis of variance revealed that, among all the environmental factors examined, only temperature showed to have a significant effect on the life-history-stage-specific distribution of the ladyfish population in the Indian River Lagoon. It is likely that environmental temperature is a key factor in the successful aquaculture of ladyfish. Successful aquaculture of ladyfish will provide a breakthrough in the stock-enhancement program for ladyfish.

BIO-14 Experimental augmentation of the endangered *Dicerandra christmanii* at the Lake Wales Ridge National Wildlife Refuge. B.J. POIRIER (1), S.J. HALLER (1), E.S. MENGES (1) and C. PETERSON (2). (1) Archbold Biological Station, PO Box 2057, Lake Placid, FL 33862, (2) Bok Tower Gardens, 1151 Tower Blvd, Lake Wales, FL 33853. Endemic to Highlands County, *Dicerandra christmanii* is a federally listed endangered mint which populates gaps in the oak-hickory matrix of yellow sand scrub. There are five known populations; only one of which occurs on protected land, on The Lake Wales Ridge National Wildlife Refuge. We have collected demographic data from a population in the Flamingo Villas tract since 1994, observing a steady decrease in population size. *D. christmanii* prefers open microhabitat conditions with reduced canopy cover and shrub height, but fire suppression has resulted in a decrease in gap sizes and an increase in woody vegetation. As a consequence, most plants are now restricted to the edges of fire lanes and sand roads. To reverse these trends, we initiated an experimental augmentation, adding *D. christmanii* to a burn unit with very few plants. The augmentation is designed to evaluate the efficacy of three types of plant material (seeds, greenhouse-grown seedlings, or greenhouse-grown stem cuttings) and identify favorable microsite conditions for *D. christmanii*. Plants were placed into recently burned or unburned gaps in three different microsites within each gap (north edge, south edge, or gap center). In August 2010, we transplanted 40 stem cuttings, 160 seedlings and sowed 4,000 seeds throughout 40 gaps. Transplants and seed arrays were caged (to prevent herbivory) and irrigated with a citrus style irrigation system connected to a 550 gallon tank. To date, there are75 germinants from introduced seeds with only one seedling death. Seedling transplants and stem

cuttings each have high six month survival (89% for seedlings and 95% for cuttings). Most cuttings flowered during the fall. We will compare vital rates between the introduced population and adjacent wild populations. Results from this experimental augmentation have the potential to provide science-based land management guidelines to strengthen and conserve natural populations.

BIO-15 Concurrent growth and differentiation of regenerating arms in brittlestars. H.M. CROCE and R.L. TURNER. Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd., Melbourne, FL 32901. Regeneration of body parts from sub-lethal predation and disturbance is common in ophiuroids. Because arms play a critical role in feeding, rapid functional recovery is critical. Some investigators suggest that the cost of arm regeneration results in a trade-off between functional recovery (differentiation) and regrowth of lost length. This study examined the hypothesis that growth and differentiation occur concurrently along a regenerating arm. Intact and regenerating arms of the ophiuroid *Ophiophragmus filograneus* were compared using scanning electron microscopy to test this hypothesis. Arms were examined with soft tissue present and with it removed by treatment with bleach. With soft tissue present, both intact and regenerating arms clearly displayed arm segments (demarcated by dorsal or ventral plates) that continuously increased in length from the arm tip (ocular or terminal ossicle) to the point of autotomy. Near the ocular, segments were difficult to distinguish with soft tissue present; but arm plates, vertebral ossicles, and sometimes the ocular were readily visible in bleached arms. Soft tissue can obscure differentiated skeletal elements towards the arm tip, but, once removed, the skeletal elements become clearly visible. This study found that growth and differentiation of the skeletal elements of regenerating arms do occur concurrently. No evidence was found of a trade-off resulting in growth without differentiation during arm regeneration.

BIO-16 Autotomy of rays of *Heliaster helianthus* (Asteroidea: Echinodermata). J.M. LAWRENCE (1) and C.F. GAYMER (2). (1) Department of Integrative Biology, University of South Florida, Tampa, FL 33620, (2) Departamento de Biología Marina and CEAZA, Universidad Católica del Norte, Coquimbo, Chile. In species of the family Heliasteridae, the ossicles of the proximal parts of the sides of each ray are joined by connective tissue to those of the adjacent rays to form interbrachial septa so a relatively small part of the ray is free. Autotomy of rays occurs in *Heliaster helianthus* in response to predatory attack by the asteroid *Meyenaster gelatinosus*. Autotomy of the ray does not occur at the base of the free part of the ray (arm) but near the base of the ray. In addition to the plane of autotomy at this location, a longitudinal plane of autotomy occurs in the connective tissue between the ossicles of the connected portion of adjacent rays. This indicates a plane of mutable collagenous tissue is present. Autotomy of the ray involves all these planes of autotomy and results in loss of most of the ray.

BIO-17 Population characteristics and biology of two populations of *Archaster angulatus* (Echinodermata: Asteroidea) in different habitats off the central-western Australian coast. J.M. LAWRENCE (1), J.K. KEESING (2) and T.R. IRVINE (2). (1) Department of Integrative Biology, University of South Florida, Tampa, FL 33260, (2) CSIRO Marine and Atmospheric Research, Wembley, WA, Australia. We examined populations at Whitford Rock (WR) and Port Beach (PB) in January 2009. The sediment was fine sand at WR and a mix of larger particles at PB. Individuals at PB were predominantly orange and more uniform in colour than those at WR, which were predominantly grey. Body size and pyloric caeca index of individuals at WR were greater than those of individuals at PB, indicating the nutritional condition was better at WR. This suggests the quantity or quality of food at WR was better. Despite the very small size of the gonads, some individuals were in the pseudocopulatory position, indicating this behavior occurs even when gametes are not present. In every case, the male of the pair was situated above the female. Given the abundance of this species in nearshore habitats, it is likely to be ecologically important.

BIO-18 Large-scale patterns of biodiversity in epiphytic foraminiferans. S.L. RICHARDSON. Florida Atlantic University, Wilkes Honors College, 5353 Parkside Dr., Jupiter, FL 33458. This study investigated the biodiversity of epiphytic foraminiferal communities living associated with the seagrass *Thalassia testudinum* at a number of different spatial scales, ranging from within a single sampling unit to between ecoregions of the Tropical Northwestern Atlantic Province. Epiphytic foraminiferal communities were censused in a diversity of habitats at 18 sites in Belize (Carrie Bow Cay, Twin Cays, Man O'War Cay, Pelican Cays), and nine sites in the Bocas del Toro Archipelago in Panama. Seagrass blades were haphazardly collected from each site and examined using a dissecting microscope. Live individuals of adherent epiphytic foraminiferans were identified to species. Diversity indices calculated for each site include: species richness (S), Shannon's H, evenness (E), density, Whittaker plots, and k-dominance plots. Large area species richness was higher in Belize (S = 56), compared to Panama (S = 25). Sample species richness was highest at the Twin Bays site in Belize (S = 35), and lowest at

Bocas del Drago, off Isla Colon (S = 2), and at Hospital Point, off Isla Solarte (S = 2) in Panama. Between-site similarity was analyzed using the Czekanowski Similarity Index. In Belize, the highest similarity indices were observed between mangrove sites located within the Main Channel at Twin Cays (86.2%), and between West Bay and Twin Bays at Twin Cays (70.4%). In Panama, the highest similarity indices were observed between mangrove sites located in Hospital Bight, off Isla Bastimentos, and Boca Torito (87.2%), and in Hospital Bight and the bay near the Smithsonian Bocas del Toro Research Station on Isla Colon (79.8%). The extremely high similarity index calculated for Bocas del Drago and Hospital Bight (95.4%) reflects the fact that both sites had a sparse epiphytic biota, with the same two species occurring at both sites. Similarity indices calculated for Belizean *vs*. Panamanian sites were generally low (< 20%), with the highest similarity observed between mangrove sites at Cuda Cut, Twin Cays, and off Isla Bastimentos, near Crawl Cay in Panama. Two species, *Planorbulina acervalis* and *Iridia diaphana*, were present at all sites sampled.

BIO-19 The effects of global climate change on marine benthic community structures in Antarctica. S.C. VOS and R.B. ARONSON. Department of Biology, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Global climate change is threatening marine benthic communities in shallow water habitats as far south as Western Antarctica. Increasing ocean temperatures are drawing down the cold-water barriers that have heretofore excluded fast-moving, durophagous predators from high southern latitudes. Reptant decapods have been recorded on the Antarctic continental slope. The arrival of skeleton-breaking predators in shelf habitats could completely restructure Antarctic benthic communities. Currently, shelf faunas are dominated by epifaunal suspension-feeders, and slow moving invertebrates are the top predators. The Antarctic bottom fauna is unique in that it resembles deep-sea and Paleozoic fauna. Range shifts of durophagous predators due to elevated temperatures could modernize the archaic benthos. To understand more fully the extent of predatory incursions into Antarctica, high-resolution videographic images were taken of the slopes and shelves of the Bellingshausen and Amundsen Seas during a research cruise in November 2010–January 2011. The results enable us to assess the degree to which predatory decapods are established at the study sites and whether their presence is affecting benthic communities. (This project is funded by the National Science Foundation)

BIO-20 Micromollusks as proxies for environmental disturbance on reefs of the tropical eastern Pacific. J.W. HOBBS (1), I.G. MACINTYRE (2) and R.B. ARONSON (1). (1) Department of Biology, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901, (2) Department of Paleobiology, Smithsonian Institution, Washington, D.C. 20560. Accelerating degradation of coral reefs has spurred investigations into the history of environmental disturbances affecting reef ecosystems. This study evaluated the utility of assemblages of micromollusks found in the soft sediments of coral reefs in the tropical eastern Pacific as proxies for environmental disturbance through time. We also evaluated whether sediment grain-size distribution affects the composition of micromolluscan assemblages. Assemblages of micromollusks were not affected by the temporal dynamics of disturbance or by sediment grain-size, but they varied from location to location, possibly depending on upwelling regime. Micromollusks may thus be good proxies for environmental differences between sites or regions.

BIO-21 Climatic control of coral reef development in the Galápagos Islands. K.J. HENDRICKSON, L.T. TOTH and R.B. ARONSON. Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. In the past three decades, disturbances related to the El Niño–Southern Oscillation (ENSO) have been shown to influence coral reef growth in the Eastern Pacific. In the Galápagos Islands, more than 95% of corals were killed after the severe 1982-1983 El Niño. However, the two predominant coral species found in the coral assemblages at Devil's Crown, *Psammocora stellata* and *Diaseris distorta*, survived this severe ENSO event. By analyzing three cores of the reef framework at Devil's Crown, this study assessed how the coral assemblage has changed during the Holocene epoch. The historical reconstructions were then related to existing records of Holocene ENSO variability in order to determine if changes in the relative abundance of coral species were related to ENSO activity. We observed high variability in the relative abundances of *P. stellata* and *D. distorta* in the cores, including an increase in the abundance of *D. distorta* 2,200 yBP. Increases in *D. distorta* during the late Holocene may indicate increased ENSO activity at this time as *D. distorta* is especially resistant to ENSO-related perturbations. Overall, the high variance in coral composition at Devil's Crown throughout the Holocene highlights the high frequency of disturbance in this region and the limitations imposed on coral reef development as a result of climatic phenomena such as ENSO.

BIO-22 Coral reef development along an upwelling gradient in the tropical Eastern Pacific. L.T. TOTH (1), R.B. ARONSON (1) and I.G. MACINTYRE (2). (1) Florida Institute of Technology, Deptartment of Biology, 150 W. University Blvd, Melbourne, FL 32901, (2) Smithsonian Institution, National Museum of Natural History, PO Box 37012, MRC 121,

Washington, DC 20013. Coral reefs worldwide are in decline, with many reefs exhibiting shifts in benthic assemblages to novel states. To put these modern transitions into context, it is important to look into the past and view coral reefs on geological time scales. In many areas of the world, degradation of coral reefs over the last three decades was unprecedented for at least several millennia. In contrast, paleontological records from the Tropical Eastern Pacific (TEP) show protracted periods of limited coral growth and suppressed vertical reef accretion during the middle to late Holocene. We extracted push-cores from coral reef frameworks in Pacific Panamá that currently experience intense, moderate, and no upwelling. Subfossil corals in the cores were analyzed to compare trends in reef accretion. By comparing the history of Holocene reef development among reefs with distinct upwelling regimes, we determined the role that upwelling played in structuring those reefs in the past. Understanding the controls on reef development in the TEP will give important insights the future of coral populations and reef accretion worldwide.

BIO-23 Responses of benthic coral reef organisms to no-fishing zones in the Florida Keys National Marine Sanctuary. M. CHIAPPONE (1,2), S.L. MILLER (2) and L.M. RUTTEN (2). (1) Miami Dade College, Homestead Campus, 500 College Terrace, Homestead, FL 33030, (2) Center for Marine Science, University of North Carolina-Wilmington, 515 Caribbean Drive, Key Largo, FL 33037. The Florida Keys National Marine Sanctuary was created in 1990 to help preserve and restore this unique ecosystem, while facilitating multiple uses. After six years of public comment, the Final Management Plan included 23 no-take zones (NTZs) from northern Key Largo to Key West that originally encompassed < 5% of the Sanctuary area. One of the scientific objectives for the zoning action plan is to track changes in benthic communities that may result from changes in trophic interactions due to no-take protection. Assessing spatial and temporal patterns at larger spatial scales is needed to place the performance of the NTZs into a regional context, given the relatively small sizes of most of the zones and the diversity of habitats and along-shelf positions. To assess and monitor the responses of benthic coral reef organisms to the zoning action plan, a stratified random sampling design was implemented that incorporates cross-shelf habitat type, along-shelf position, and management zones. In addition to typical measurements of coral species richness and cover, the program also evaluates cover, richness, densities, and sizes of other benthic organisms such as gorgonians, sponges, urchins, selected mollusks, and algae. Not including surveys in 2010, as well as those in the Tortugas region, a total of 1,053 sites were sampled during 1999-2009 to support this effort. Comparisons between NTZs and reference sites reveal a complex pattern dependent upon habitat type and benthic variable. Most habitats sampled have remained relatively stable for certain variables (*e.g.*, species richness of sponges and benthic cnidarians) or NTZs have become more similar to reference areas. Changes in the variables we measure over time are best explained by storm events, bleaching, and disease that reflect larger spatial-scale phenomena that presently over-ride any potential reserve effects that might result from no-take protection.

BIO-24 Age and growth of three mesopelagic fish species by incorporation of otolith marginal increment analysis. K. BOLOW and D.W. KERSTETTER. Nova Southeastern University Oceanographic Center, 8000 North Ocean Drive, Dania Beach, FL 33004. We apply whole and transverse-sectioned otolith ageing techniques to develop indices of somatic growth of four mesopelagic bycatch species in the commercial tuna and swordfish industries by using otolith growth increment widths. The objectives of this study are to: (1) develop otolith growth chronologies for escolar (*Lepidocybium flavobrunneum*), oilfish (*Ruvettus pretiosus*), and snake mackerel (*Gempylus serpens*); and (2) to integrate this information with the von Bertalanffy growth function to determine the rate of growth in length and weight, and (3) to create a methodological tool for other researchers aging deep-sea teleost species. From 2008 to 2010, these mesopelagic fishes were collected as bycatch from pelagic statistical areas in the Gulf of Mexico and the U.S. South Atlantic Bight from commercial pelagic longline vessels. Visual interpretation and UTHSCSA ImageTool measurement software is used in conjunction with a 12.2 megapixel digital camera to identify narrow and wide banding patterns of growth increments. Age assessments will be done via double blind marginal increment analysis. Presence of annual growth patterns was verified by measuring the width of the most distal ring of the sagittal otolith, plotting the width against the month of landing and visualizing the increased width of deposition as distance from the spawning month increases. The harvesting of these individuals has an unknown ecological impact and they currently fall under no protective regulations. Determining growth rates of these mesopelagic fishes give us baseline data for population analysis and future comparisons.

BIO-25 A rod-dominated visual system in leptocephalus larvae of elopomorph fishes (Elopomorpha: Teleostei). M.S. GRACE (1) and S.M. TAYLOR (2). (1) Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901, (2) School of Veterinary Medicine, St. Matthew's University, Grand Cayman KY1-1204, Cayman Islands. The early larval retinas of nearly all teleost fish species either contain only cone photoreceptors (no rods), or are highly cone-dominated; most rod photoreceptors develop sometime after the first feeding. Because photopic visual acuity increases as either cone density or lens diameter increases, the dense array of small cone photoreceptors in

larval teleosts should maximize daytime visual acuity in tiny larval fish eyes. Only two species have been described (based upon cellular morphology only) as having rod-first development. One is a deepwater (200-2000m) benthopelagic species (Order Gadiformes, Family Macrouridae: grenadiers/rattails), believed to be pure-rod throughout life. The other is the diadramous European eel, *Anguilla anguilla* (Superorder Elopomorpha). In order to confirm this latter case of rod-first developmental pattern and to assess its significance among elopomorph fishes generally, we examined the nature and distributions of photoreceptor cell types in the retinas of 16 species (three orders, eight families) of elopomorph leptocephalus larvae. Anti-opsin immunofluorescence, light microscopy and transmission electron microscopy (TEM) were used to assess opsin distribution across the retinas and to associate photoreceptor morphology and opsin content. Retinas of all species were immunoreactive with anti-rhodopsin throughout, while anti-cone immunoreactivity was generally restricted to a small region of the retina. Rod and cone photoreceptors were morphologically indistinguishable by light microscopy, but TEM revealed ultrastructurally distinct photoreceptor types in at least one elopomorph species (*Megalops atlanticus* Valenciennes). These results indicate that a rhodopsin/rod-dominated retina is common among leptocephalus larvae, in stark contrast to the cone-dominated retinas of nearly all other teleost fish species. That is, species with the leptocephalus larval form (Elopomorpha) share a pattern of retinal development that differs markedly from that of most non-elopomorph teleost larvae. This supports the hypothesis that the leptocephalus larval form is a strong synapomorphy aligning a monophyletic assemblage of relatively diverse elopomorph species, and has important implications for leptocephalus ecology.

BIO-26 Effects of feed enrichment on growth and survival of longsnout seahorse (*Hippocampus reidi*) fry. N.K. PHAM and J. LIN. Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. From their horse-like head, upright swimming posture, to male pregnancy, the seahorse bears unique biological characteristics not exhibited in any other fishes. Approximately 20 million wild seahorses are collected each year to supply the medicinal and aquarium market, therefore to manage this threat to wild populations, all seahorses (Genus *Hippocampus*) are listed under Appendix II of the Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES). The marine aquarium trade industry largely depends on wild collected specimens; therefore aquaculture is an alternative to alleviate pressure on wild populations. The longsnout seahorse, *Hippocampus reidi*, is popular in the marine ornamental trade, yet scientific information about its growth and culture is scarce. Contrasted to many other seahorses that have established culture protocols, *H. reidi* has an extended pelagic life stage. This is one of the major bottlenecks in *H. reidi* culture. The other major bottleneck, nutrition in the early fry phases, is also the crux of many aquaculture endeavors. The aim of this study was to evaluate the growth of newly released *H. reidi* fry fed under different nutritional protocols. Two diets were compared to test if a fortified enriched rotifer and *Artemia* diet would enhance the growth performance of *H. reidi* fry compared to an unenriched diet. The experiment was conducted in flow through 50L circular tanks with two aeration points designed to create continuous water current throughout the system. Wet mass (mg) and height (cm) were measured to analyze growth performance. At seven days post release (DPR), no difference in growth was observed in either wet mass or height. However at 14 DPR, fry raised on the fortified enriched diet fry had greater wet mass, height, and survivorship than those raised on the unenriched diet.

BIO-27 Effect of dietary esterified astaxanthin concentration on dermal coloration and chromatophore physiology in spinecheek anemonefish, *Premnas biaculeatus*. A.L.F.C. HO and J. LIN. Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, Florida 32901. Coloration plays an important role in market price of ornamental fishes. Anemone fishes (Pomacentridae: Amphiprioninae) form a staple of the marine ornamental trade and dominate the marine ornamental aquaculture production. This study examined the effect of dietary astaxanthin concentration and duration on dermal coloration in *Premnas biaculeatus*, *i.e*., hue, saturation, and luminosity. In addition, chromatophore physiology was investigated. The parameters were drosopterinosomes (red pigment granules) density, drosopterinosome diameter, and drosopterinosome color (hue, saturation, and luminosity). Juveniles of 30 days-post-hatch (DPH) were fed gel-based diets consisting of 23, 214, or 2,350 ppm esterified astaxanthin for 115 days and the fish were sampled at 45, 120 and 145 DPH. Hue was significantly reduced with increasing time and esterified astaxanthin concentration. Saturation fluctuated primarily over time while luminosity only affected by time. Drosopterinosome (red pigment granule) density was statistically homogenous across the treatments, at ~ 0.3 granules/$\mu m^2$. Significant difference in drosopterinosome size was detected; with higher astaxanthin resulting in larger diameters. Drosopterinosomes showed significantly lower hues, higher saturation, and lower luminosity values for the higher astaxanthin concentration diets. This is indicative of higher concentration of carotenoids in the drosopterinosomes. In conclusion, diets explicitly imparted different coloration in *P. biaculeatus* and the manifested color differences in the fish are result of increased drosopterinosome size and increased drosopterinosome carotenoid concentration. On the economics end, results show that 214 ppm imparts adequate coloration for high market value while still maintaining cost effectiveness.

BIO-28 Population genetic structure coincides with geo-graphy, coloration, and morphometrics in yellowhead jawfish, *Opistognathus aurifrons* (Perciformes: Opistognathidae). A.L.F.C. HO, C.L. PRUETT and J. LIN. Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, Florida 32901. In this study, we investigated intraspecific variability in phenotype and population genetic structure of yellowhead jawfish, *Opistognathus aurifrons*, from four different locations in the Caribbean region: South Florida, Bimini, St. Thomas, and Aruba. Discriminant function analysis (DFA) of nine melanistic traits in the head region resulted in clear separation between Bimini and the other three populations. South Florida, St. Thomas, and Aruba slightly overlapped in patterning, with St. Thomas forming the transition between South Florida and Aruba. DFA of 17 morphometric characters elucidated a similar pattern in morphometrics as was observed for melanistic traits. Haplotype networks, population pairwise Fst, and Analysis of Molecular Variance (AMOVA) for both cytochrome c oxidase subunit one and mitochondrial control region sequences revealed distinct genetic structure in *O. aurifrons* across sampled populations. The Aruba population was estimated to have split from the ancestral population around 44-33 kiloannum ago, while the remaining populations likely diverged more recently. All sampled populations showed significant genetic differentiation. Based on melanistic, morphometric, and genetic differentiation the four populations studied are herein recognized as four evolutionarily significant units (ESUs).

BIO-29 Pattern and process of prey-resource adaptability in Florida fishes. R.G. TURINGAN. Department of Biological Sciences, Florida Institute of Technology, 150 West University Blvd, Melbourne, FL 32901. Widely distributed fishes along the coasts of Florida are likely to encounter different locally available prey resources. Evidence indicates that some fish species consume different prey in different habitats and this variation in food habits is correlated with variation in feeding functional morphology. This study investigated the: (1) intraspecific variation in food habits in Florida coastal fishes; (2) plastic response of fish to different prey types; and (3) consequences of this plastic response to feeding performance. Three species of Florida fishes fed on either hard (*e.g.*, barnacles and clams) or soft (*e.g.*, polychaetes and seagrass) prey depending on locations where fish were collected. Durophagous (hard-prey eating) fish had more robust (*i.e.*, more massive jaw bones and muscles) feeding apparatus than conspecifics feeding on soft prey. A laboratory rearing experiment showed that the development of a robust feeding apparatus is caused by a durophagous feeding habit. Results of a subsequent performance experiment revealed that fish with more robust feeding apparatus were able to feed more efficiently on hard clams relative to conspecifics that developed weaker feeding apparatus. It is conceivable that morphological and behavioral plasticity underlie the ability of Florida fish species to adapt to changing prey-resource availability, which may arise as a consequence of climate change and other drivers of environmental change.

BIO-30 Feeding versatility of the invasive pike killifish, *Belonesox belizanus* (Cyprinodontiformes: Poeciliidae) C. HARMS and R.G. TURINGAN. Department of Biological Sciences, Florida Institute of Technology, 150 West University Blvd, Melbourne, FL 32901. Evidence indicates that the most common traits shared by invasive fish species include the ability to adapt to the environmental conditions in the invaded territory and to feed on locally available prey resources. The pike killifish (*Belonesox belizanus*) has specialized, piscivorous food habit and feeding functional morphology that perhaps limit its ability to feed on the diverse prey types available in the invaded aquatic ecosystems in Florida. However, after the initial introduction of about 50 individuals in a ditch in south Florida in 1957, the range of distribution has expanded both westward and northward from the initial site of introduction, including the Everglades National Park (ENP). This study was designed to investigate the ability of pike killifish to modulate its feeding behavior and prey-capture kinematics, while utilizing a specialized feeding functional morphology, to feed on different prey types, other than fish. Pike killifish collected from the ENP were kept in experimental tanks and filmed using high speed video while feeding on live fish and shrimp prey. A prey-selectivity experiment was also conducted to determine if the invasive pike killifish prefers fish prey over shrimp prey. Results indicate that the invasive pike killifish: (1) eat both fish and shrimp prey; (2) prefers to eat fish prey over shrimp prey; and (3) key prey-capture kinematics vary between fish eating fish prey and fish eating shrimp prey. It is hypothesized that functional morphological specialization does not constrain the ability of non-native fish species to feed on different, locally available prey in the invaded ecosystem.

BIO-31 Variation in feeding ecomorphology between northern and southern Florida populations of the invasive Mayan cichlid (*Cichlasoma urophthalmus*). L.E. YOUNG and R.G. TURINGAN. Department of Biological Sciences, Florida Institute of Technology, 150 West University Boulevard, Melbourne, FL 32901. The ability of exotic fish species to adapt to local environmental conditions, such as variable temperature, salinity and prey-resource availability, determines the rate of spread and the range of distribution of invasive populations. An exotic population of the Mayan cichlid (*Cichlasoma urophthalmus*), which is native to Central American freshwaters, was first found in Florida Bay in 1983. Since then, this fish

species has become invasive and expanded its range of distribution from south Florida to north Florida. Invasive populations of *C. urophthalmus* have been found in freshwater canals, salt marshes, mangrove forests and estuaries in Florida, indicating that this species in highly tolerant of a wide range of environmental conditions. Previous studies also indicated that the Florida invasive population of *C. urophthalmus* has a generalist food habit. However, no study has directly compared the food habit and feeding functional morphology of *C. urophthalmus* collected from different locations within its invasive range of distribution in Florida. This study was designed to: (1) compare the feeding ecological morphology of *C. urophthalmus* collected from two extreme locations in Florida; (2) determine the prey-capture kinematics; and (3) prey-preference of *C. urophthalmus*. Results indicate that: (1) prey consumed by fish in south Florida is different from conspecifics collected in north Florida; (2) in general, prey-capture kinematics of fish while feeding on fish and shrimp prey are different; and (3) invasive *C. urophthalmus* feed on both fish and shrimp when available. This study indicates that *C. urophthalmus* possesses the traits of good invasive species including a wide tolerance of environmental conditions, voracious food habits, and an ability to adjust its prey-capture kinematics and feeding behavior according to the type of prey available in its invaded environment.

BIO-32 Recent invasion of a Florida estuarine system by the lionfish, *Pterois volitans* / *P. miles*. Z.R. JUD (1), C.A. LAYMAN (1), J.A. LEE (1) and D.A. ARRINGTON (2). (1) Florida International University, Department of Biological Sciences, Marine Sciences Program, 3000 NE 151st Street, North Miami, FL 33181, (2) Loxahatchee River District, 2500 Jupiter Park Drive, Jupiter, FL 33458. The invasion of lionfish (*Pterois volitans* / *P. miles*) in the western Atlantic and Caribbean is emerging as a serious ecological problem. While lionfish have been identified on coral reefs and other marine systems, additional ecosystems may be impacted as the invasion spreads. Here we identify the first estuarine intrusion of lionfish in their invasive range. Between August and November 2010, we captured 124 lionfish in the Loxahatchee River estuary (Florida), with some individuals located up to 4 km from the ocean. Ninety-five fish were harvested for stomach content, stable isotope, and otolith analyses. The remaining 29 fish were tagged and released to estimate growth rates and movement patterns. Lionfish exhibited very high site fidelity, with some individuals occupying the exact same location for more than three months. Multiple size classes were documented (24-174 mm SL) and small post-settlement juveniles (< ~40 mm) were collected throughout the sampling period, implying that recruitment was an ongoing process rather than a one-time chance event. All individuals were found in close association with anthropogenically created habitats (*e.g.*, docks, sea walls, debris), suggesting that human-driven changes in habitat availability may facilitate estuarine invasion. Since estuaries are already highly threatened, and provide critical habitat for numerous commercially, recreationally, and ecologically-important species, establishment of lionfish in these ecosystems is of particular concern.

## BIO Posters

BIO-P13 Testing a mathematical model of the MAPK pathway during oocyte maturation and fertilization using single starfish oocytes. C. CHATER (1), D. MCDONALD (1,2), C. MAZZONE (1), D. CARROLL (1), L. SHUHAIBAR (1), I. POLICEANU (2) and S. KOKSAL (2). (1) Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901, (2) Department of Mathematics, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Proteins in the mitogen-activated protein kinase (Mapk) pathway may play pivotal roles during oocyte maturation and after fertilization in the eggs of some animals. The starfish has emerged as a very interesting model system for the analysis of this pathway (Hara *et al.*, 2009, Development, 136, 1687). A series of ordinary differential equations (ODE) were developed to predict the behavior of Mos, Mek, and Mapk in the starfish oocyte during meiotic maturation and after fertilization. These systems were based upon a model initially developed to explain the all-or-none phosphorylation of MAPK during oocyte maturation in *Xenopus* oocytes (Ferrell and Machleder, 1998, Science, 280, 895). Using phosphorylation-state specific antibodies, changes in Mapk and Mek phosphorylation were analyzed during starfish oocyte maturation and following fertilization. To better understand how these proteins are regulated during these transitions, the phosphorylation changes in single starfish oocytes were compared to those observed in oocyte populations. Changes in both Mek and Mapk phosphorylation were more abrupt when visualized in single oocytes than when oocyte populations were assayed. There was variability in the response time between individual oocytes. The single cell system will allow examination of the variability of individual oocyte response to differing stimuli, which will enable refining of the ODE model. This is something that cannot be easily observed when working with samples prepared from populations of cells. It is hoped that this will allow novel mechanistic studies to understand the regulation of MAPK during oocyte maturation and at fertilization in much finer detail than has been possible. (This research was supported by NIH AREA Award R15 HD048712-01 and the NSF UBM Award 0734251)

BIO-P14 Historical reconstruction and current population status of *Diadema antillarum* in the Florida Keys. M. CHIAPPONE (1, 2), L.M. RUTTEN (2) and S.L. MILLER (2). (1) Miami Dade College, Homestead Campus, 500 College Terrace, Homestead, FL 33030, (2) Center for Marine Science, University of North Carolina-Wilmington, 515 Caribbean Drive, Key Largo, FL 33037. Abundance surveys of the once ubiquitous echinoid *Diadema antillarum* Philippi in the Florida Keys prior to the 1983-84 Caribbean-wide mass mortality are limited, but available data indicate that densities were as high as six individuals per sq. m in certain habitats. The mass mortality event began in the Florida Keys during June 1983 and led to a 90% reduction in population size. Surveys during the early 1990s suggest that the population was recovering, with densities on the shallow fore-reef approaching 1/10th of the pre-1983 level, and a size distribution dominated by larger (> 5 cm TD) individuals. A second mortality event that began in April 1991 again reduced the population to 1/100th of its pre-1983 level and surveys one year later indicated that that very low densities (< 0.1 per sq. m) and small test sizes (< 3 cm) in shallow fore-reef habitats characterized the population, a pattern that continued for the next decade. Over an 11-year period (1999-2010), we examined densities and test sizes of *D. antillarum* and other urchins at over 1,100 Florida Keys sites spanning ~350 km of the archipelago, encompassing multiple habitat types from inshore to the deeper fore-reef slope. Underwater visual surveys along belt transects were used to quantify numbers of individuals and test sizes in a stratified random sampling design. Although densities are still well below one individual per square meter and the maximum site-level density recorded during the 11-year period was only 0.33 individuals per sq. m, there has been an increase in the average and maximum size of *D. antillarum*. Regression analysis indicates that recovery of densities to pre-1983 levels could take decades, if not longer. The abundance patterns of algal functional groups in most habitats, despite reduced *D. antillarum*, suggest that fish grazing is critical for maintaining low algal standing crop.

BIO-P15 Investigating the aggregation of *Acrasis rosea*. M. COHEN, L. BERGEN-LOSEE and A.C. SHOR. Department of Mathematics and Sciences, Saint Leo University, 33701 State Road 52, Saint Leo, FL 33574. Slime molds are fungi-like organisms that are divided into two categories; the acrasids and the dictyostelids. *Acrasis rosea* is an acrasid slime mold belonging to the Phylum Acrasiomycota. *A. rosea* has a flat, cylindrical body and is a light pink-orange color. It is a fairly common slime mold, found growing in soil, dung, and decaying leaf litter or other organic matter. *A. rosea* feeds on bacteria, yeast, and other amoeba by phagocytosis and digest them intracellularly in vacuoles. When the food source in an area is exhausted the amoebae aggregate to form a sorocarp. The chemical signal(s) that trigger aggregation in *A. rosea* are currently unknown. There are known acrasins for other slime molds. *Polysphondylium violaceum* is a cellular slime mold that responds to the acrasin glorin. *Dictyostelium lacteum* responds to pterin, while *Dictyosteium discoideum* responds to cAMP. It is also known that folic acid acts as a chemo-attractant in a number of other slime molds. These research efforts will explore the isolation of *A. rosea*, and the affects of the chemo-attractants pterin, glorin, folic acid, lumazin, and cAMP on aggregation. Dose response and time course analyses of each positive acrasin will be completed. The genes involved in the aggregation of *A. rosea* will also be investigated.

BIO-P16 Type on prey-capture kinematics and behavior of the invasive Mayan cichlid (*Cichlasoma urophthalmus*). B. COMPTON and R.G. TURINGAN. Department of Biological Sciences, Florida Institute of Technology, 150 West University Blvd, Melbourne, FL 32901. The Mayan cichlid (*Cichlasoma urophthalmus*) is native to the Central American freshwaters, but, has become invasive to waters of Florida. The continuing expansion of the range of distribution of the Florida invasive population has been attributed to the tolerance of this species to a wide range of environmental conditions including temperature and salinity, as well as its voracious appetite for a wide range of prey organisms including small invertebrates and teleost fishes. Although the invasive *C. urophthalmus* has been characterized as an environmentally-tolerant species, our understanding of how this fish adapts to a wide range of environmental factors and prey resources is very limited. This study was designed to investigate how the prey-capture kinematics and behavior of *C. urophthalmus* responds different prey types. Fish were collected from the northern range of the distribution of the invasive population in Florida. Individual fish was filmed using high-speed video while feeding on two contrasting prey types: small fish *vs.* shrimp. Feeding kinematics and behavior were compared between prey types using Repeated Measures Analysis of Variance. Results revealed that the magnitude (*e.g.*, maximum gape) and timing (*e.g.*, time to reach maximum gape and duration of feeding) of key kinematics events differed between prey types. In general, the behavior of *C. urophthalmus* varied while feeding on fish prey and shrimp. It is highly likely that the ability of *C. urophthalmus* to adjust its prey-capture kinematics and feeding behavior to locally available prey-resources contributes to its ability to expand the range of its invasive population in Florida.

BIO-P17 Developing *in-vitro* methods for organogenesis and somatic embryogenesis in *Hippeastrum*. L. DE SOUZA (1), D.P. MAUL (1) and A.W. MEEROW (2). (1) School of Science, St. Thomas University, 16401 NW 37th

Avenue, Miami Gardens, FL 33054, (2) U.S. Department of Agriculture, ARS, SHRS, 13601 Old Cutler Road, Miami, FL 33158. *Hippeastrum* (Family Amaryllidaceae) is a genus of bulbous tropical plants that has been developed into an economically important and popular group of mostly tetraploid or triploid hybrids. Diploid hybrids with desirable characteristics are considered to be good sources for novel traits in tetraploid commercial cultivars. However, in order to overcome cross-fertilization barriers between ploidy types, as well as self-incompatibility at the diploid level, it is necessary to first induce tetraploidy in diploid *Hippeastrum* plants. One procedure to induce doubling of chromosomes consists in exposing *in vitro Hippeastrum* tissues to antimitotic agents, such as oryzalin. Tetraploid-induced cells can then be used to generate tetraploid plants through organogenesis or somatic embryogenesis. Few reliable organogenesis and no somatic embryogenesis procedures that produce large number of in-vitro plantlets are available. We have compared the response of leaf and bulblet explants of diploid *Hippeastrum* cultivars to the auxin 2,4-dichlorophenoxyacetic acid (2,4-D) for callus formation, a first step towards organogenesis or somatic embryogenesis. After incubation in the dark with either 1 or 2 mg/L 2,4-D for 0, 1, 3 or 5 weeks, explants were transferred to Murashige and Skoog media. Calli have been obtained in both proximal leaf- and bottom bulblet sections in most media combinations with bulblets showing a more rapid response. Calli evaluations for organogenesis or somatic embryogenesis responses 10 weeks after initial incubation with 2,4-D are reported.

BIO-P18 Evaluating the role of seagrass beds as a nursery habitat and food source in Port Everglades, Florida. C. GABRIEL and A.C. HIRONS. Nova Southeastern University, Oceanographic Center, 8000 North Ocean Dr., Dania Beach, FL, 33004. Seagrass beds are highly productive ecosystems providing a nursery area for commercial fishes as well as food source for a number of valuable marine organisms. Potentially damaging human activities such as dredging can negatively impact local seagrass populations. The US Army Corps of Engineers (contract no. DACW 17-99-d-0043) has submitted a proposal to dredge, fill, and modify the turning basins, Intracoastal Waterway, and the Dania cut-off canal of Port Everglades, Florida, which will directly impact the local seagrass beds. The following data are the result of an ongoing study to identify the trophic dynamics and refuge of the primary seagrass species and associated vertebrates and invertebrates inhabiting three seagrass sites in the anticipated area of impact. Seagrasses and their associated animal assemblages have been collected manually since July 2009 using minnow traps, purse seine nets and plankton nets. All flora and associated fauna are analyzed for carbon and nitrogen ($\delta^{13}C$ and $\delta^{15}N$) stable isotopes ratios to determine the trophic contribution of seagrass communities to the food web. The predominant seagrass species are *Halodule wrightii*, *Halophila decipiens*, and *Halophila johnsonii*. These species were senescent during the winter of 2009. Surveys and collections resumed in April 2010 when seagrass flowering was observed. The seagrasses reached maximum growth during the summer months at which time the greatest diversity of associated organisms occurred (July > Nov.). Surveys during November 2010 showed little seagrass cover and senescence in early December. The most abundant juvenile and adult animals recorded were *Sphoeroides testudineus* (checkered pufferfish), *Haemulon sciurus* (bluestriped grunt), *Lagodon rhomboides* (pinfish) and *Callinectes sapidus* (Atlantic blue crab). Many *Urobatis jamaicensis* (yellow stingray) were also observed during the months of July and August and were usually seen during the late afternoon hours. The greatest numbers and diversity of large transient fish species, while present at all three sites, were predominantly found at the deeper site (3 m) during the flood tides. Preliminary stable isotope analyses of the flora and fauna at these locations indicate that the seagrasses are not the primary food source, but traces are found in these organisms' diet.

BIO-P19 Developing a sensitive assay for the detection of avocado sunblotch viroid (ASBVd). M. JARAMILLO (1), V. SANCHEZ (1), D.P. MAUL (1), C. TONDO (2), D.N. KUHN (2) and R.J. SCHNELL (2). (1) School of Science, St. Thomas University, 16401 NW 37th Avenue, Miami Gardens, FL 33054, (2) U.S. Department of Agriculture, ARS, SHRS, 13601 Old Cutler Road, Miami, FL 33158. Avocado sunblotch viroid (ASBVd) is an infective single-stranded circular RNA molecule of 247 nucleotides that causes an important disease in *Persea americana* Mill., the common avocado. ASBVd-infected avocado trees show a decline in tree vigor with sunken yellow lesions on the fruit, rendering them unmarketable. Because infected trees can be asymptomatic for prolonged periods, a sensitive method for detection of the viroid is crucial to the maintenance of healthy avocado orchards and germplasm collections. An end-point reverse transcriptase-polymerase chain reaction (RT-PCR) assay with specific ASBVd primers has been developed to detect the viroid in partially purified RNA extracts from avocado leaves and flowers. However, ambiguous results were obtained when using this assay in the germplasm collection at the National Germplasm Repository at the Subtropical Horticulture Research Station (SHRS) in Miami, FL. Fourteen plants diagnosed as ASBVd-infected in a 2000 survey were found to be negative in a 2009 survey. We have developed a real time SYBR green RT-PCR assay specific for ASBVd that is at least 10 times more sensitive in ASBVd detection than previous assays. In addition, the new assay allows comparison of viroid titers among trees and among different tissues within a tree.

BIO-P20 Feeding of *Gratiana graminea* larvae on tropical soda apple and other selected solanaceous (Genus *Solanum*) plants. H. MATA (1), D. AMALIN (2), A. RODA (2) and C. MANNION (3). (1) School of Science, St. Thomas University, 16401 NW 37th Avenue, Miami Gardens, FL 33054, (2) USDA, APHIS, SHRS, 13601 Old Cutler Road, Miami, FL 33158, (3) TREC, IFAS, UF, 18905 SW 280 Street, Homestead, FL 33031. Biological control of pests is a method of controlling pests such as insects, mites, weeds and plant diseases using biological control agents. Tropical soda apple (TSA), *Solanum viarum*, is a persistent weed that was first discovered in Glades County, Florida in 1988 and is spreading throughout the USA. Long term control of TSA is the use of biological control agents. A potential biological control agent, which is being requested for release in Florida is the *Gratiana graminea*. This project aims to determine if *G. graminea* will feed on solanaceous (Genus *Solanum*) plants other than tropical soda apple. Plant-host specificity tests were conducted with first instar larvae of *G. graminea* on three solanaceous plants: *S. melangona* (eggplant), *S. torvum* (turkey berry), and *S. viarum* (TSA). First instar larvae of *G. graminea* were introduced in each of the above plants. The average rating and percent leaf consumption for each plant was calculated and recorded. Leaf consumption analysis was completed using an Image Processing software, Image-Pro® 5.1.0.20, Media Cybernetics, Inc. Results on matured plants show that eggplant and TSA are equally preferred by *G. graminae* adults in the no-choice test. TSA plants were highly preferred by *G. graminae* adults followed by eggplants in the choice test. Turkey berry plants were the least preferred in both tests. Seedlings show that all the test plants were equally preferred in the no-choice test. This study shows that *G. graminae* are not highly specific to the target plant, TSA, and cannot be released if they continue feeding on non-target plants, such as eggplants (an important crop in the U.S.).

BIO-P21 The role of L1.1 in axonal growth from adult zebrafish primary brainstem neurons over growth-inhibitory chondroitin sulfates. M. M'BOGE (1), E. BAJUELOS (1), F. SHABAZZ (1), A. TAPANES-CASTILLO (1), K. VAJN (2), M. OUDEGA (2) and J. PLUNKETT (1). (1) School of Science, Technology, and Engineering Management, St. Thomas University, 16401 NW 37th Avenue, Miami Gardens, FL 33054, (2) Center for Neuroscience, University of Pittsburgh School of Medicine, 200 Lothrop Street, Pittsburgh, PA 15213. Axon regeneration depends on the balance of growth-inhibiting and growth-promoting influences. Chondroitin sulfate proteoglycans (CSPGs) inhibit axonal regeneration in the injured mammalian spinal cord. However, zebrafish regenerate their axons beyond the injury site despite the presence of CSPGs. It has been shown that axon growth from zebrafish neurons depends on the presence of the growth-promoting L1cam homolog, neuronal adhesion molecule L1.1 (nadl1.1). Our goal is to understand how L1.1 affects the response of zebrafish neurons to CSPGs in vitro. We hypothesize that L1.1 over-expression will result in more neurons crossing into and growing in CSPG areas. Accordingly, reduced L1.1 expression is expected to reduce axon outgrowth and decrease the number of neurons crossing into and growing in CSPG areas. We have successfully delivered morpholino and GFP expressing constructs into our brainstem neurons using Gene Tool's Endoporter and Amaxa electroporation, respectively. We are currently optimizing procedures to increase the percentage of cells that are morpholino or GFP positive. Once optimized, we will determine how alteration of L1.1 levels within cultured adult brainstem neurons affect axon growth over CSPGs. (Funded by U.S. Dept. of Defense W81XWH-09-1-0403 to JP)

BIO-P22 DNA barcoding of sea turtle leeches (*Ozobranchus* spp.) in Florida coastal waters. A.E. MCGOWIN and T.M. TRUONG. Department of Chemistry, Wright State University, 3640 Colonel Glenn Hwy, Dayton, OH 45435. Florida sea turtles that forage in lagoons with poor water quality such as the Indian River Lagoon, Lake Worth, and Florida Bay have developed fibropapillomas on their skin and eyes impairing their ability to see, swim, and feed. Fibropapillomatosis (FP) has become a panzootic with disease outbreaks at similar sites in Hawaii, Brazil, Puerto Rico, Australia, and others. Fibropapilloma-associated turtle herpes virus (FPTHV) has been identified as the likely infectious agent yet many of the factors associated with disease etiology have not been discovered. It is often reported that leeches of the Genus *Ozobranchus* (Family Ozobranchidae) are found on turtles in areas where high disease rates are observed. High viral loads have been reported in sea turtle leeches taken from a green turtle yet the leech species was not identified. The small size and various life stages make identification of species using standard morphological methods difficult or impossible. We sequenced the COI mitochondrial gene of *Ozobranchus* spp. leeches collected from turtles in Florida from Daytona Beach to Key West and developed a DNA barcode method to unambiguously identify two distinct leech species, *O. branchiatus* and *O. margoi*, including various haplotypes. Sequences were deposited in the GenBank database. A loss of host specificity was also observed for *O. branchiatus* that could be responsible for the spread of FP from green turtles (*Chelonia mydas*) to other species of sea turtles. The method was also successful in identifying the leech species from previously hatched cocoon residue found on the carapace of a *C. mydas*. (Specimens were collected by personnel of the InWater Research Group, Inc. and at the Marine Science Center at Ponce Inlet, FL.)

BIO-P23 Spawning of snapper species (Lutjanidae) along Florida's east-central and northeast coast, with comparisons to conspecific spawning populations in the western Atlantic. M.S.T. MEADOWS (1), K.C. LINDEMAN (2) and J.M. SHENKER (1). (1) Department of Biology, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901, (2) Department of Marine and Environmental Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Information on the spawning of snapper species (Family Lutjanidae) is limited for east central and northeast Florida. Data regarding spawning sites and metrics are necessary for the sustainable management of these economically and ecologically important reef fish. Scientists and managers in the southeast U.S. have recently used fishers' ecological knowledge to gain important biological information on fish stocks that could not be obtained elsewhere; including identifying numerous current, declining, and historical spawning sites. In this study, snapper spawning localities in east-central through northeast Florida are being elucidated from detailed surveys with local fishers and a systematic analysis of existing scientific data and literature. Patriarch and matriarch recreational and commercial fishers from the Jupiter Inlet north to the Florida/Georgia border are being surveyed to identify current and historical spawning sites of the northern red snapper (*Lutjanus campechanus*), vermilion snapper (*Rhomboplites aurorubens*), gray snapper (*L. griseus*), mutton snapper (*L. analis*), cubera snapper (*L. cyanopterus*), yellowtail snapper (*Ocyurus chrysurus*), and lane snapper (*L. synagris*). Biological and physical metrics of spawning are being compared for current and historical east Florida lutjanid spawning populations, and compared to conspecific populations throughout the western Atlantic and the Gulf of Mexico. This research will be directly employed by federal and state management agencies in the development of new fishery regulations. These findings will also establish a baseline for snapper spawning research off Florida's east coast and assist understanding of snapper spawning throughout the western Atlantic. (This research is made possible through NOAA's Dr. Nancy Foster Scholarship Grant Award # NA10SEC4810004 and the International Women's Fishing Association 2010 Scholarship)

BIO-P24 Analysis of Bamboo rat (*Dactylomys dactylinus*) vocalization from the Sumaco region of Ecuador. D.J. POPE-REYES and E.N. VANDERHOFF. Department of Biology and Marine Science, Jacksonville University, 2800 University Blvd. N., Jacksonville, FL 32211. Amazon bamboo rats (*Dactylomys dactylinus*) are medium sized arboreal rodents inhabiting the rainforest of much of Amazonia. Bamboo rats are nocturnal and their most conspicuous feature is their loud, pulsing vocalizations consisting of several loud deep grunts followed by softer grunts. We recorded 20 calls from three bamboo patches during July 2010 at Wildsumaco Wildlife Sanctuary in Ecuador. We analyzed the following with Raven Bioacoustics software: duration, intercall interval, maximum frequency, minimum frequency, and number of call elements. Future investigations will explore the ultimate and proximate reasons for these vocalizations, including territoriality and within group social cohesion.

BIO-P25 Response of corals of the *Montastrea annularis* complex to hurricane disturbance in the Florida Keys National Marine Sanctuary. J.E. REYNOLDS, L.T. TOTH and R.B. ARONSON. Department of Biology, Florida Institute of Technology, Melbourne, FL 32901. Live coral cover has declined significantly on Caribbean coral reefs over the past several decades. In the Florida Keys, recent declines in coral cover were driven primarily by the mortality of the dominant reef-building coral in the region, the *Montastraea annularis* species complex. Although there are many causes of coral mortality, hurricane damage is a significant cause of coral loss on small spatial and temporal scales. By analyzing changes in the size-frequency distribution of *M. annularis* species complex on Eastern Sambo Reef, off Key West, in relation to hurricane activity in the region, this study will determine the effects of hurricane damage on the population structure of the *M. annularis* species complex. Preliminary results suggest a radical change in the population structure between 2004 and 2005, an interval characterized by high tropical storm activity. Using these results, a mathematical model was developed to predict the future population structure and the impact of future disturbances on Eastern Sambo Reef.

BIO-P26 Detecting macrozoobenthic biodiversity in the Indian River Lagoon: a contrast between two common methodologies. A.C. RHODES, J.C. HALL and B.G. TUNBERG. Smithsonian Marine Station, 701 Seaway Drive, Fort Pierce, FL 34949. Differences in abundance and diversity of benthic invertebrates were measured at three sites in the Indian River Lagoon using two different sampling methods. Three sampling sites were chosen in relation to the St. Lucie Estuary: near the mouth, in the middle of the lagoon, and at Peck's Lake near the inlet. These sites are part of the Comprehensive Everglades Restoration Plan (CERP) quarterly monitoring program, funded by the Army Corps of Engineers and South Florida Water Management District. Three grabs using a petite Ponar (232 $cm^2$) and eight cores using an Ogeechee core device (17.9 $cm^2$) were taken at each site in summer 2010. Petite Ponar grabs were sieved in the field through a 500 micron metal mesh screen (1810 $cm^2$) and preserved in 5% formalin stained with Rose Bengal. Core samples from 0-2 cm were also taken, preserved and stained. Upon return to the lab, core samples were passed through a 500 micron Nitex™ mesh screen (71.6 $cm^2$) and sorted. In the cores 2,713 specimens were sorted into 18 taxonomic groups. The Ponar grabs contained 4,543

specimens in 19 taxonomic groups. Fifteen groups were shared by both methods. Two biotic diversity indices were calculated: Shannon-Weiner (H') and AMBI. While all sites were ranked as "*slightly disturbed*" by AMBI, the estimates from the core data were significantly higher, and hence, more disturbed than the estimates for the Ponar data for the mid-Lagoon and Peck's Lake sites ($p < 0.05$). Conversely, the Shannon-Weiner index indicated a significantly higher (and healthier) value for the Peck's Lake site ($p < 0.05$) and no differences among sites when the core data were used. A multivariate analysis was performed using PRIMER v6.0 software (Plymouth, UK). Groups were clustered in the MDS according to site and sampling type. Therefore, both methods were useful for describing differences in diversity and abundance among the three sites chosen, but differed significantly in estimations of biodiversity for two of three sites.

BIO-P27 Assessing inherited markers of bone and soft-tissue sarcomas. D. SALAHUDDIN and A.C. SHOR. Department of Mathematics and Sciences, Saint Leo University, 33701 State Road 52, Saint Leo, FL 33574. Sarcomas are a rare and diverse form of cancers that originate from mesenchymal tissues, better known as connective tissues. There are two principal types of sarcoma: bone sarcoma and soft tissue sarcoma. Bone sarcomas are malignancies that develop in the bone, whereas soft tissue sarcomas develop from tissues resembling fat, muscles, nerves, fibrous tissues, blood vessels, or deep skin tissues. With the completion of the Human Genome Project in 2003, there is an abundance of information regarding genes and their functions which has led to the development of a field known as functional genomics. Functional genomics seeks to draw a connection between an organism's genotype and phenotype. It may be utilized through the use of web-based tools in which it is possible to determine the region(s) of chromosome(s) influencing a phenotypic trait. A list of candidate genes that could potentially be associated with the bone and soft-tissue sarcoma phenotype was derived from microarray analyses of untreated sarcoma cell lines and biopsies. This study will attempt to trace the genetic factors implicated in sarcomas through the use of web-based bioinformatics resources. More specifically, expression quantitative trait locus (eQTL) analysis will be used to determine the locus of genes thought to be a factor in both sarcoma development and survival. Correlations from the eQTL analysis will be determined using data obtained from sarcoma cell lines, as well as sarcomas biopsied from patients.

BIO-P28 Connexin 43 response to catecholamine and p38MapK activity in vascular cells. J. SANTIAGO, A. CHAVARRIAGA, J. BEYER and L.K. MOORE. Department of Biology, Florida Institute of Technology, 150 W. Univ. Blvd, Melbourne, FL 32901. Sustained elevated catecholamine levels cause significant cardiac compromise and this syndrome has been termed stress cardiomyopathy. The direct cause of these symptoms is unknown but it is thought they are induced by microvascular spasm. Gap junctions are specialized ion channels that play a role in modulating vascular tone and maintaining cardiac synchronicity. We have shown that substantial modulation of the expression of the two key cardiovascular gap junction proteins occurs when exposed to adrenaline and its metabolites at high concentrations. Alteration of the expression of one or both of the connexin (Cx) proteins has been demonstrated to result in aberrant vascular and cardiac function. Vascular smooth muscle cells expressing Cx40 and Cx43 were treated with the catecholamine adrenalin or the metabolites adrenochrome and adrenolutin and evaluated for changes in the expression of Cx protein. Mitogen-activated protein kinase (p38 MapK) activity and the effect of an inhibitor of p38 MapK, (SB203580) on Cx expression was also assessed using several techniques including immunoblotting, immunohistochemistry and dye tracer scrape-load studies with Lucifer Yellow. Our preliminary results indicate that the signaling molecule, p38 MapK may play a role in modulating the response of connexins to the catecholamine in vascular cells.

BIO-P29 Primary neuronal brainstem culture from adult zebrafish: Interactions with an inhibitory chondroitin sulfate proteoglycan-rich environment. A. TAPANES-CASTILLO (1), F. SHABAZZ (1), K. VAJN (2), M. OUDEGA (2) and J. PLUNKETT (1). (1) School of Science, Technology, and Engineering Management, St. Thomas University, 16401 NW 37th Avenue, Miami Gardens, FL 33054, (2) Center for Neuroscience, University of Pittsburgh School of Medicine, 200 Lothrop Street, Pittsburgh, PA 15213. In contrast to mammals, adult zebrafish (*Danio rerio*) recover functionally from a complete spinal cord injury. After trauma to the zebrafish spinal cord, chondroitin sulfate proteoglycans (CSPGs) are expressed at the injury site. It has been well documented that CSPGs inhibit axonal regeneration in the injured mammalian spinal cord, which contributes to the lack of endogenous functional restoration. Previous work in our laboratory has demonstrated that brainstem neurons in the adult zebrafish can regenerate their axon beyond a spinal cord lesion despite the presence of these inhibitory molecules. This ability is not characteristic for all brainstem neurons; different populations exhibit distinct regenerative responses, including failure to regenerate beyond the lesion site. To investigate the axonal growth response of zebrafish brainstem neurons to CSPGs, we developed a primary neuronal culture system using adult brainstem cells from wild-type zebrafish. We hypothesized that our culture would contain different neuronal populations that would respond distinctively to CSPGs presented under controlled culture conditions. Our results supported this hypothesis revealing three different populations of brainstem neurons with regard to their response to CSPGs *in vitro*. One population outside of CSPG-

rich areas extends neurites that are repelled upon contact with CSPGs. Another population outside of CSPG-rich areas extends neurites that grow into and across the CSPG environment. The third population remains exclusively within CSPG-rich areas and extends neurites across CSPG-rich areas. Our results suggest that the ability to grow across and beyond a CSPG-rich area is intrinsic to the neuron. This ability or disability to grow across CSPGs likely involves unique sets of axon growth-related genes. (Funded by U.S. Dept. of Defense W81XWH-09-1-0403 to JP)

BIO-P30 The effects of a new bridge on manatee (*Trichechus manatus latirostris*) use of the FPL discharge canal at Port Everglades, Florida. B.C. VIRAGH, E.O. KEITH, A.C. HIRONS and T.P. QUINN. Nova Southeastern University Oceanographic Center, 8000 North Ocean Drive, Dania Beach, FL 33004. The Florida manatee (*Trichechus manatus latirostris*) is an endangered species which migrates to warm water refuges such as natural springs or power plant effluents during the winter months to maintain endothermic body temperature. Construction and subsequent use of a new bridge near the Florida Power and Light (FPL) effluent in Port Everglades may have an effect on manatee abundance. Previous data, including age class and cow/calf pairing, from pre-bridge winters (pre-2010) have been compiled and will be compared with data from winter 2010, during bridge construction and winter 2011, post bridge construction. No manatees were present at the FPL survey site during winter until surface water temperatures were below 22°C. Although monthly mean surface water temperatures were not drastically different between winter 2009 and winter 2010 (21.9° ± 0.4°C and 21.8° ± 1.8°C), manatee abundance varied greatly. The 2009 winter season had higher mean numbers of manatees per survey from December through March (mean = 29.7, 27.3, 48.1, 2, respectively) than the 2010 winter season for the same months (mean = 0, 30, 10.7, 5, respectively). While we cannot decisively state that the bridge construction in Port Everglades reduced the number of overwintering manatees during 2010, it seems there is a potential for correlation. Observations will continue during winter 2011 to analyze post-construction/bridge manatee usage.

BIO-P31 Adaptive significance of snake skin microarchitecture: The roles of body mass and life history. S. VISSER and M.S. GRACE. Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. The epidermal surface of skin in most snake species exhibits complex microarchitecture that varies tremendously across taxa and may vary across different regions of an individual snake's body. Despite this amazing complexity, almost nothing is known about the adaptive significance of the microornamentation of snake skin. In fact, some authors have argued that these microscopic patterns have no adaptive significance but still may serve as phylogenetic markers. The goal of the work described here is to compare the epidermal microarchitecture among species that vary widely in mass, ecology and phylogeny, with the goal of identifying the functional significance of different epidermal surface patterns. Here we report a scanning electron microscopic analysis of epidermal microarchitecture in two snake species: the massive, terrestrial Burmese python (*Python molurus*), and the extraordinarily small and fossorial Brahminy blind snake (*Ramphotyphlops brahminus*). The ocular spectacle, epidermis of the pit organs, and inter-scale epidermis of *P. molurus* all exhibit regular arrays of nanopits that we hypothesize to function as diffraction gratings, altering the spectral properties of incident electromagnetic radiation for vision, infrared imaging and heat absorption, respectively. Infrared microspectroscopy of shed skins supports this conclusion. Elsewhere on the surface of *P. molurus*, the epidermal surface is covered by parallel rows of parallel, flattened, finger-like projections that may serve to reduce frictionalal coefficients of the epidermis. The epidermal surface of *R. brahminus*, however, is radically different. This completely fossorial micro-vertebrate exhibits none of the specializations observed in *P. molurus*. *R. brahminus* epidermal surfaces exhibit no structural specializations at all. As a fossorial snake, it does not thermoregulate by absorption of solar radiation, and as a blind snake, it lacks functional surface eyes. In addition, its small body mass may not require friction in order to move efficiently. These results support the conclusion that epidermal surface microarchitecture has adaptive significance, perhaps modulating optical and frictional characteristics of the epidermis.

BIO-P32 Passive acoustics as a monitoring tool for evaluating oyster reef restoration. H.P. ZENIL (1), V.G. ENCOMIO (1) and R.G. GILMORE (2). (1) Florida Oceanographic Society, 890 NE Ocean Blvd, Stuart, FL 34996, (2) ECOS Inc., 590 1st Street, Vero Beach, FL 32968. Passive acoustics uses naturally occurring sounds produced by marine organisms to study their behavior, biology, and location. Ambient marine sounds are known to vary from place to place, and these sounds can be used to detect differences in habitats. Oyster toadfish, naked goby, mud crabs, and snapping shrimps inhabit oyster reefs, and they are known to produce sounds. In an oyster reef, the combination of sounds produced by organisms' communication, feeding, or moving, may produce a unique acoustic signature. Therefore, individual acoustic signatures of oyster reefs may convey information about the habitat quality and the organisms that inhabit them. Three sites along the Saint Lucie Estuary, Florida were acoustically monitored. Restored and natural reefs were recorded for five minutes using a hydrophone. Acoustic signatures were compared using spectra (frequency (Hz) *vs*. intensity (dB)) overlays.

Preliminary results showed that shortly after restoration, acoustic signatures from the natural and restored reefs differed. As time progresses, the acoustic signature of a fully restored reef may resemble that of the natural reef, representing a convergence of restored and natural habitats. Passive acoustics has the potential to provide a new methodology to rapidly monitor oyster reefs and other ecosystems, such as coral reefs and rocky reefs.

## CMS = COMPUTER/MATHEMATICAL SCIENCES |return to top|

CMS-01 Contrasting the *Waltz of Pi*, *Music of Pi* and *Music of the Golden Number Phi*. D. PICK (1,2). (1) Indian River State College, 3209 Virginia Ave, Fort Pierce, FL 34981, (2) Olivet Private School, 568 SE Port St. Lucie Blvd, Port St. Lucie, Fl 34984. The goal of this project was to contrast six original compositions based on the irrational numbers pi and Phi and to determine which composition (or number) was more audibly pleasing to the listener. The project further investigated the complex relationship between mathematics and music. The hypothesis tested was that the Music of the Golden Number Phi would be more audibly pleasing than either the *Waltz of Pi* or the *Music of Pi*, because the number Phi represents the golden ratio which the eye perceives as beautiful. The researcher believed this beauty would transfer to the musical score. The numbers pi and Phi were converted to three musical scores: (1) *Waltz of Pi*; (2) *Music of Pi*; and (3) *Music of the Golden Number Phi*, using an algorithm that assigned digits to note names and rhythm values. After analyzing the scores, dissonance was discovered in five out of nine of the notes/numbers from the algorithm. The percentage of dissonance calculated in *Waltz of Pi*, Music of Pi, and *Music of the Golden Number Phi* was 62%, 51%, and 45%, respectively. To eliminate dissonance, algorithm 1 was modified, making the bass clef an octave and a 3rd lower than the treble (imperfect consonance). Algorithm 2 was used to create the *Music of Pi* Algorithm 2, *Waltz of Pi* Algorithm 2 and *Music of the Golden Number Phi* Algorithm 2. A comparison sheet was created contrasting all seven compositions (*Waltz of Pi* 2009 included). The *Music of the Golden Number Phi* Algorithm 2 was most audibly pleasing.

### CMS Poster

CMS-P33 A survey of WiMAX security. N. WU and Y. DU. Depart-ment of Electrical and Computer Engineering, Florida International University, 10555 West Flagler Street, Miami, Florida 33174. WiMAX (Worldwide Interoperability for Microwave Access) is a promising broadband wireless technology. It has many advantages such as high data rates, quality of service, scalability, security, and mobility. With the growing popularity of WiMAX, the security risks have increased. In order for WiMAX to achieve a maturity level and become a successful technology, research on security threats and solutions need to be conducted. This survey gives an overview of the WiMAX security architecture and the vulnerabilities in both physical and MAC layers. The current solutions to these vulnerabilities are discussed along with new suggested solutions.

## ENG = ENGINEERING SCIENCES |return to top|

ENG-01 A predictive method for uncoupled vessel roll prediction in an irregular seaway. J.T. HUNSUCKER. Department of Marine and Environmental Systems, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. The prediction of roll for a vessel in an irregular seaway is a difficult problem, but one that naval architects should be able to answer. In this paper, the author uses strip theory in conjunction with semi-empirical formulas to solve for the damping and added mass and thus an analytical solution for the response amplitude operators (RAO's). The linear superposition technique is then used for calculating the ship response in an irregular seaway. The Pierson-Moskowitz or International Towing Tank Conference (I.T.T.C.) sea spectrum is plotted against encounter frequency of the vessel then combined with the roll amplitude spectrum to statistically determine the significant, average one-tenth, and average one-hundredth largest roll amplitudes. In an effort to validate the method, the results obtained are analyzed against data from the RV Serpent. (Research funded by Ocean Motions Company, Micco, FL 32976)

ENG-02 Investigation of a five-head rotating grooming brush system for ship hull coating maintenance. M. TRIBOU and G. SWAIN. Department of Marine and Environmental Systems, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Ship hull grooming has been proposed as a proactive, in-water, mechanical method to maintain anti-fouling marine coatings in a "*fouling-free*" condition. Grooming may be defined as the gentle cleaning of an immersed surface at a frequency sufficient to prevent the permanent attachment and growth of fouling. After some investigation of various types of grooming tools, a five-head rotating brush grooming tool was selected for static immersion

field testing at Port Canaveral, Florida. Three US. Navy approved anti-fouling coatings were subjected to static immersion. One set of coatings was groomed weekly and the other set was not groomed and used as a control. The grooming tool was mounted to a cart designed to run underwater on a gantry capable of mounting the coated surfaces. The fouling was characterized prior to and after each grooming test by visual assessment. Grooming tool performance was evaluated in terms of the fouling and physical condition to both the test surface and grooming tool after each grooming event, and after six months of testing. The results from this testing will be presented. (Funded by the Office of Naval Research Grant # N00014-02-1-0217)

## ENG Poster

ENG-P34 A new scenario for the receiver of MIMO OFDM systems. Y. DU, K.K. YEN and N. WU. Department of Electrical and Computer Engineering, Florida International University, 10555 West Flagler Street, Room 3860, Miami, FL 33174. The techniques of MIMO (Multiple Input and Multiple Output) OFDM (Orthogonal Frequency Division Multiplexing) systems show many significant applications in wireless communication. A common method to recover transmitting signals at the receiver of a MIMO OFDM system is MMSE (Minimum Mean Square Error) scenario. This scenario is able to reduce the total interference and noise power of wireless transmission channels, but sometimes it cannot meet users' requirements about bit error ratio (BER) performance. Blind signal recovery (BSR) is a new method to enhance wireless system performance. The objective of this research is to propose a BSR-aided receiver scenario for MIMO OFDM systems to guarantee better BER performance. The simulation results show that the proposed method has better BER performance than common MMSE scenario.

ENG-P35 Reproduction of sound field using a virtual loudspeaker array system. T.-C. FU and T.-C. WANG. Department of Aeronautics and Astronautics, National Cheng-Kung University, No. 1, University Road, Tainan 70101, R.O.C. Traditional sound field reconstruction establishes a three-dimensional sound field around listeners by using two or more loudspeakers. Products such as Dolby Digital or DTS surround are two of such technologies. However, both Dolby Digital and DTS have requirements on the optimal placement of multi-channel loudspeakers and specific angle between loudspeakers and listeners. Therefore when the environment is such that loudspeakers cannot be placed at the desired location, the resulting listening experience will not be optimal. This paper aims at solving the placement issue by means of using virtual loudspeakers. Kirchhoff-Helmholtz integration is employed as the principle tool of wavefront synthesis for synthesizing virtual loudspeakers. Different from existing methods that use real loudspeakers to synthesize wave field directly, virtual loudspeakers can relieve loudspeakers from the restriction of specific placement and angle and solve the placement issue resulted from unsuitable environment. These virtual loudspeakers are synthesized by using real loudspeakers. Using this idea, virtual loudspeakers can then be placed at the optimal location for reproducing the surround sound using multichannel signal sources. Several examples with a verification tool for detecting the location of sound sources are used to demonstrate the benefits of the proposed method.

## ENV = ENVIRONMENTAL CHEMISTRY AND CHEMICAL SCIENCES |return to top|

ENV-01 Suwannee River humic acid-mediated silver nanoparticle formation under environmentally relevant conditions. N. AKAIGHE, V.K. SHARMA and M. SOHN. Florida Institute of Technology, Department of Chemistry, 150 W. University Blvd, Melbourne, FL 32901. The formation of silver nanoparticles (AgNPs) via reduction of silver ions ($Ag^+$) in the presence of Suwannee River humic acid (SUW) under various environmentally relevant conditions is described. SUW was obtained from the International Humic Substances Society. The time required to form AgNPs varied depending upon the concentration of humic acid as well as temperature. SUW reduced $Ag^+$ to form AgNPs at 22°C. The appearance of the characteristic surface plasmon resonance (SPR) of AgNPs was observed by ultraviolet-visible spectroscopy in as few as two to four days at 22°C. An elevated temperature of 90°C resulted in the accelerated appearance of the SPR within 90 minutes. Transmission electron microscopy and atomic force microscopy images showed that the AgNPs formed were typically spherical and had a broad size distribution. Dynamic light scattering also revealed polydisperse particle size distributions. SUW appeared to colloidally stabilize AgNPs based on a lack of significant change in the spectral characteristics over a period of two months. The results suggest the potential for direct formation of AgNPs under environmental conditions from $Ag^+$ sources, implying that not all AgNPs observed in natural waters today may be of anthropogenic origin.

ENV-02 Chemistry in the air. N. NESNAS, P.J. COHEN and R. MENSCH. Department of Chemistry, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. In the recent past, we have studied organic reactions in the air using Direct analysis in real time (DART) mass spectrometry. The DART ion stream could potentially provide the activation energy for the products to form prior to detection. In order to demonstrate that the reactions occur in the gas phase, and without the influence of an ion stream, a static headspace with three temperature zones was used. Diels-Alder reactions taking place in static headspace have been demonstrated to form prior to mass spectrometry detection using gas chromatographic separation before reaching the ion source. Furthermore, application of DART for plant volatile analysis will be discussed, including the scent of night blooming jasmine (*Cestrum nocturnum*). Future potential applications could include other scent analysis or plant volatile chemical communication studies.

ENV-03 Remediation of emerging contaminants in water. M. COVIN (1), C.J. CLARK (2), S. HOLLINGS-WORTH (2) and A.T. COOPER (2). (1) Center for Water Quality, College of Engineering Sciences, Technology and Agriculture, Florida A&M University, Tallahassee, FL 32307, (2) Civil and Environmental Engineering, Florida A&M University, Tallahassee, FL 32307. Advances in analytical methods have led to improved detection and reporting of low level concentrations of previously unidentified contaminants in water and soil. It may be years before we know to any scientific certainty the true impact of low-level exposure of many of these emerging contaminants. However, there is mounting evidence that indicates detrimental effects from at least some of these components. Changes in the endocrine systems of reptiles, increasing antibiotic resistance of microorganisms, and increased asthmatic rates amount are some indicators of the negative impacts of the presence of these chemicals in water and air. The photocatalyst titanium dioxide ($TiO_2$) has been effectively used for oxidative treatment of low levels of organic pollutants in water. In our lab we are evaluating the use of various forms of $TiO_2$ for the treatment of a variety of emerging contaminants.

ENV-04 Studies on the removal of Lissamine Green B (LGB) from soil in comparison with contemporary approaches. N. NABAR and D.F. MARTIN. Department of Chemistry, University of South Florida, 4202 E. Fowler Avenue, Tampa, FL 33620. Vast amounts of chemical dyes (around 106 tons) are made annually worldwide. Dye effluents can make their way into runoff and wastewater, eventually settling in the soil. These dyes can have adverse effects on the environment and ecosystems they pollute. Previous extraction methods have had limited success in removal from soil, and a recent approach involved the use of Fenton's reagent with electrochemistry (Rosales *et al*., J. Environ Sci. Hlth. 2009, 44, 1104-1111). We examined the efficacy of dye removal using a kaolin-clay model for soil and Lissamine Green B (LGB) dye. The removal of LGB from a LGB/kaolin mixture was recorded after a 24- and 48- hour extraction with hot water using a Soxhlet apparatus. Previously, aqueous Lissamine B removal was achieved using column chromatography with commercially available Octolig®, a polyethyldiamine molecule attached to a high surface area silica gel (Chang *et al*., Tech. Innov, 2010, 12 71-1277). The results appeared to be complete removal of LGB from kaolin using successive 24-hour Soxhlet extractions. Previously, we had demonstrated a 99.9% removal of LBG when run through a chromatography column packed with Octolig® [Technol. Inov. 2009, 12, 71-77]. Removal of dyes using hot water and/or chromatography with Octolig® could provide a potential safe, large-scale solution to treating soils contaminated with dyes or some other organics with suitable functional groups.

ENV-05 Polycyclic aromatic hydrocarbon levels in Tampa Bay, Florida. N.C. GOC, L. TALALAJ, K.M. CARVALHO-KNIGHTON and H.A. ALEGRIA. Environmental Science, University of South Florida, 140 7th Ave South DAV 258, St. Petersburg, FL 33701. Polycyclic aromatic hydrocarbons are SVOCs that are produced during the combustion of fossil fuels. The chief concern associated with them is the adverse effects they have on human health, including the increased probability of getting cancer. Due to the heavy urbanization, Tampa Bay is an ideal location to examine PAHs. This study will evaluate the levels of PAHs in the Tampa Bay region.

ENV-06 Polychlorinated biphenyl and polybrominated diphenyl ether levels in Tampa Bay, Florida. L. TALALAJ, K.M. CARVALHO-KNIGHTON and H.A. ALEGRIA. Environmental Science, University of South Florida, 140 7th Ave South DAV 258, St. Petersburg, FL 33701. Polybrominated diphenyl ethers (PBDEs) are a group of widely used brominated flame retardants. Due to their extensive use, increasing levels of PBDEs have been found in humans, fish, birds, marine mammals, sediments, house dust, air, and supermarket foods. Tampa Bay is an interesting location for air and sediment analysis due to its urban and agricultural signatures. Atmospheric deposition, local leaching and discharge introduce these contaminants to a highly sensitive ecosystem. This study focuses on defining concentrations of select PBDE and PCB congeners in Tampa Bay sediments as well as total load of these pollutants in air. These levels would aid in defining distribution patterns between different non point source signatures as well as phases.

ENV-07 Biopiracy and the environmental costs of GMO use. K. MOYER and K.M. CARVALHO-KNIGHTON. Environmental Science, University of South Florida, 140 7th Ave South DAV 258, St. Petersburg, FL 33701. The primary application of biotechnology and genetically modified organisms (GMOs) is agricultural crops, the potential environmental implications of which are extensive and include: (1) creating new or more vigorous pests and pathogens; (2) exacerbating the effects of existing pests through hybridization with related transgenic organisms; (3) harm to nontarget species, such as soil organisms, non-pest insects, birds, and other animals; (4) disruption of biotic communities, including agro-ecosystems; and (5) irreparable loss or changes in species diversity or genetic diversity within species. Through the practices of biopiracy and patenting genetic material, agricultural corporations have gained ownership and control over all of the world's GMO crops. The research focuses on identifying the dangers of genetic modification of cultivated organisms, and to illustrate that the privatization and globalization of the world's agriculture threatens food security, environmental stability, and human rights.

ENV-08 Measurement of Brevard County On-Site Treatment and Disposal System (OSTD) and Wastewater Treatment Plant (POTW) and Removal Efficiencies for selected Organic Wastewater Contaminants (OWCs). T.V. BELANGER and T. PIPLAI. Department of Marine and Environmental Sciences. Florida Institute of Technology, 150 West University Blvd, Melbourne, FL 32901. Organic wastewater contaminants (OWCs) are substances such as pharmaceuticals (triclosan and sulfamethoxazole),hormones (17-beta estradiol) and stimulants (caffeine) that are dangerous for our nation's water bodies. Research suggests that these drugs cause ecological harm. The EPA is committed in investigating these contaminants and is developing strategies to help protect the health of both the environment and the public. The calculated concentrations of these products indicate their presence in water and the environment for as long as humans have been using them. This is because the drugs that we take are not entirely absorbed by our bodies and are excreted and passed into wastewater and surface water. With advances in technology that improved the ability to detect and quantify these chemicals, we can now begin to measure the concentration and identify what effects these chemicals have on human health and the environment using a new and a cost-effective technique called the ELISA technique instead of the gas-liquid chromatography method that has been used so far. This research is concerned with the measurement and removal efficiencies of the four mentioned organic wastewater contaminants (OWCs) at selected Brevard County Wastewater Treatment plants and On-Site Treatment and Disposal System (OSTDs). The samples were collected from July 2010 to November 2010. The samples were detected with high concentration of triclosan and caffeine. In addition to estimating their removal efficiencies, we also evaluated the use of triclosan and caffeine as chemical indicators of human fecal contamination. These chemicals are emerging as environmental contaminants are causing great concern because of their ubiquitous occurrence in urban wastewater and their potential effect on humans as well as biota.

ENV-09 Evaluation of the removal of aqueous halides by Octolig®. C.H. MCCANE and D.F. MARTIN. Institute for Environmental Studies, Department of Chemistry, University of South Florida, 4202 East Fowler Avenue, Tampa, FL 33620. Good and cogent reasons exist for the removal of halides from natural water systems. This study was concerned with evaluating the ease or possibility of removing fluoride, chloride, and bromide ions from water by column chromatography with Octolig®, a commercially available, polyethyleneimine covalently attached to a high-surface-area silica gel (CAS Registry No. 404899-06-5). Previous research suggested a mechanism, for removal of certain anions [ J. Environ. Sci. Hlth., 44A: 1545-1550] and subsequent research indicated the efficacy for removal of fluoride ion [J. Environ. Sci. Hlth. 45A:1144-1149] and still other research [unpublished results] indicated that bromide was not removed under similar conditions. Plotting percent removal as a function of charge/ion volume ratio suggested that perhaps 20% removal might be anticipated for chloride ion.

ENV-10 Evaluation of the removal capacities of Octolig® a supported polyethylimine, for selected anions. D.M. FRANZ and D.F. MARTIN. Institute for Environmental Studies, Department of Chemistry, University of South Florida, 4202 East Fowler Avenue, Tampa, FL 33620. Mixtures of sodium salts of phosphate, nitrate, and fluoride were used in chromatography experiments to compare the capacity of two immobilized ligands (IMLIG's) to remove these anions: Octolig® and its copper (II)-based metallolig, Cuprilig. These materials have been shown to remove phosphate, nitrate, perchlorate and other contaminants by means of encapsulation [J. Environ. Sci. Hlth., 44: 1545-1550; 45: 1144-1149]. It has also been shown that the rate at which the contaminant-containing effluent is passed over the IMLIG does not adversely affect the removal capacity for the material. The focus of this study was to find out which material, Octolig® or Cuprilig, if any, would remove these anions most effectively. In addition, we developed two methods for evaluation of the anion-removal capacity of these materials, which have potential for use in water purification systems. The method also permits evaluation of efficacy of synthesis of Octolig®.

ENV-11 Removal of aqueous ammonium ion by chromatography with cobaltilig. A. CHAVEZ and D.F. MARTIN. Institute for Environmental Studies, Department of Chemistry, University of South Florida, 4202 East Fowler Ave, Tampa, FL 33620. A convenient method for removal of ammonia from water seems desirable, and the possibility of using cobaltilig seemed appropriate. This material is a composite of aqueous cobalt chloride and Octolig®, a commercially available, polyethyleneimine covalently attached to a high-surface-area silica gel (CAS Registry No. 404899-06-5) [J. Environ.. Sci. Hlth 2008, 43, 1296]. Presumably under the conditions of synthesis, the product was converted to the cobalt(III) state. Samples of the composite in a chromatography column [1.9 cm (id) x 30 cm], were treated with dilute aqueous sodium hydroxide to convert the material to the hydroxide form, washed with water, then subjected to chromatography with a 6 ppm ammonium ion (as ammonium chloride). Best results to date indicate 94% removal, based on HACH kit analyses. Implications will be considered.

ENV-12 Ferrate (VI) oxidation of trimethoprim: A kinetics study. G. ANQUANDAH and V.K. SHARMA. Florida Institute of Technology, Department of Chemistry, 150 W. University Blvd., Melbourne, FL 32901. Antibiotics such as trimethoprim (TMP) and sulfamethoxazole (SMX) have been detected in drinking water at concentrations of ng/L, which may cause drug-bacterial resistance. Ferrate (VI) as an oxidant has shown potential to oxidize pharmaceuticals in wastewater. The kinetics of Ferrate (VI) with TMP as a function of pH will be presented. The analysis of the results using a kinetic model to determine species-specific rate constants will be given. The overall reactions rates were second-order with respect to the concentrations of Fe (VI) and SMX and the second-order rate constant at pH 7 was determined as $1.23 \times 102$ $M^{-1}$ $s^{-1}$. The removal of TMP by ferrate (VI) under environmental conditions is thus feasible.

ENV-13 Ferrate (VI) oxidation of glycine derivatives in alkaline media: A kinetics study. R.E. GILMAN, B. PATEL, V.K. SHARMA and J.C. BAUM. Florida Institute of Technology, Department of Chemistry, 150 W. University Blvd, Melbourne, FL 32901. Glycine is the simplest amino acid often utilized as a model for more complex amino acids, such as aminopolycarboxylates (APCs). Emerging micropollutants, such as APCs and pharmaceuticals, are found in surface and drinking waters worldwide. Increased levels of micropollutants may lead to long term effects of aquatic life as well as human health, and must be eliminated to maintain fresh water. Common treatment methods for water and wastewater, such as chlorination, produce harmful by-products which are hazardous to the environment. In chlorine-treated waters, glycine is known to be an important precursor for the formation of cyanogen chloride (CNCl). Nitrosamines are also produced by the chlorination of nitrogen-containing compounds. An alternate oxidant is potassium ferrate (VI) ($K_2FeO_4$), a salt of the iron (VI) derivative, which is an environmentally friendly and powerful oxidizing agent used for disinfection. The kinetics of the ferrate (VI) oxidation of glycine derivatives, N-acetyl glycine, glycine anhydride, and glycylglycine as a function of pH (7.0-11.0) will be presented. The trend in the rate constant versus pH will be modeled using species-specific rate constants. The influence of the molecular structures of glycine derivatives on the rate constants will be briefly discussed.

ENV-14 Initial investigations on the pigments and pigment-based chemotaxonomy of microbial mats of hypersaline lagoons on the island of Eleuthera, Bahamas. J.W. LOUDA. Department of Chemistry and Biochemistry and the Environmental Sciences Program, Florida Atlantic University, 777 Glades Road, Boca Raton, FL 33431. Hypersaline lagoons are one of the so-called 'extreme environments' on Earth. As such, consumer populations are extremely low to absent. In these environments bacterial and algal mats can form relatively undisturbed except for physical disturbances such as wind induced turbulence. The island of Eleuthera, as with many in the Bahamas, hosts a variety of hypersaline lagoons with seawater being added either by wash over, percolation through the carbonate substrates, or both. Anoxia and sulfate reduction usually reaches the water/sediment interface when mats are prevalent. During a preliminary (at this writing, Dec. 2010) pigment analysis of a mat (~ 4-6 mm) growing in a hypersaline lagoon on the southernmost tip of Eleuthera ('Lighthouse Point') allowed pigment-based chemotaxonomy to be forwarded here. This lagoon had a salinity of 'only' 55 psu due to recent heavy rains. Cyanobacteria were indicated by pigments (chlorophyll-a, myxoxanthophylls, zeaxanthin) characteristic of filamentous forms growing in moderate to high light conditions (scytonemin). Purple-sulfur (bacteriochlorophyll-a) and green-sulfur (six pseudohomologs of chlorophylls-c) bacteria were shown by their characteristic pigments, as indicated. Presently, the mat community biomass is concluded as being cyanobacteria > purple-S bacteria ≈ Green-S bacteria based on literature values for chlorophyll(s) to protein ratios in these taxa. Additional work is underway to ascertain the depth related zonation. Intuitively, from the water/sediment surface down-core, this would be cyanobacteria (sufide tolerant), purple-S bacteria and then green-S bacteria. This mat, though thin, is quite cohesive and exopolymeric substances (EPS) will form another aspect of continued study.

ENV-15 Pigment-based chemotaxonomy-implications on phytoplankton biomass relationships. C.S. GRANT and J.W. LOUDA. Department of Chemistry and Biochemistry, Florida Atlantic University, 777 Glades Road, Boca Raton, FL 33431. The ecological significance of phytoplankton (algae) lies in the fact that they trap almost all of the energy used in the pelagic ecosystem. This study examines the relationships of chlorophyll-a (CHL*a*) to taxonomically significant pigments, protein, two forms of carbohydrate and organic carbon in relation to cell numbers and biovolume as potential methods by which to better estimate 'true' biomass in the context of food chains and energy flow in aquatic ecosystems. Many parameters affect these relationships and we are therefore using nutrient replete conditions and examining only the influence of light (photon flux density). We hypothesize that correlations will exist between CHL*a* and these components and thereby allow extension of chemotaxonomy beyond cell number and biovolume relationships. Lab grown algal cultures belonging to the algal divisions Chlorophyta, Dinophyta, Cyanophyta, Haptophyta, and Rhodophyta are being investigated. We are currently assuming that positive correlations exist between algal biomass and algal colloidal and storage carbohydrate fractions, as these have all been shown to be produced from light dependent processes. Ongoing data shows a positive correlation between CHL*a* and colloidal carbohydrates, for the species belonging to the haptophyta and dinophyta alga divisions, while more random correlations were found for the remaining divisions for either storage or colloidal fractions. Inter-species variation was seen for the protein to CHL*a* relationships in the two chlorophytes used in the study: the correlations were positive, but not similar. The relationships between CHL*a* and these components were used to create a database and hence a regression equation for expressing them as functions of CHL*a*, with the possibility of applications to field samples. This hopefully will provide directions to the possible use of pigment-based chemotaxonomy to estimate to algal organic carbon, protein and carbohydrates not only for actual field samples but with extension to remote sensing such as satellite telemeters systems (SeaWIFFS, *etc*.)

ENV-16 Potential sunscreen protection from a novel cyanobacterial pigment. C.S. GRANT and J.W. LOUDA. Department of Chemistry and Biochemistry, Florida Atlantic University, 777 Glades Road, Boca Raton, FL 33431. A novel pigment has been isolated from: (a) samples collected in areas of the Florida Everglades; (b) lab grown cultures of *Scytonema hoffmanii*; and (c) *Scytonema* sp. collected from stromatolitic mats in Eleuthera, Bahamas, which were all subject to or grown at high light intensities, respectively. This pigment is believed to be related in structure to the pigment scytonemin. Scytonemin is a known ultraviolet-screening, photostable sheath pigment found in cyanobacterial mats, and is believed to play a role in the survival mechanism of some species of cyanobacteria against UV damage. This new pigment has absorption maxima in the visible regions of the electromagnetic spectrum (440, 562 nm) and we speculate that it may be protecting cytochrome and chlorophyll-a absorption bands from photodamage. Treatment of the pigment with the mild reducing agent sodium borohydride ($NaBH_4$) yields a derivative with absorption maxima (352, 502 nm) hypsochromically shifted to an extent to suggest the presence of at least two conjugated carbonyl (ketone, aldehyde) moieties. MALDI-TOF mass spectroscopy was used as an initial screening tool for the presence of scytonemin as well as this new pigment. LC-MS was then used to identify and compare the fragmentation patterns of these two pigments. The IR, UV-Vis and NMR spectra of the two pigments are reported and comparisons made to further elucidate the structure of the new pigment.

ENV-17 Characterization of humic acids by fluorescence spectroscopy. M. ERHAYEM, V.K. SHARMA and M. SOHN. Chemistry Department, Florida Institute of Technology, 150 West University Boulevard, Melbourne, FL 32901-6975. The purpose of this study is to characterize humic acids from different sources by using synchronous scan fluorescence spectroscopy. Seven humic acids extracted from soil and sediments were used in this study. The concentrations of humic acid samples were 15 mg/L in 0.1 M $Na_2HPO_3$ and 0.1 M NaCl buffer solution. The relative intensities of synchronous scan fluorescence peaks for soil and sedimentary humic acids were compared. Soil humic acids show higher intensity in the red region than do sedimentary humic acids. On the other hand, sedimentary humic acids show higher intensity in the blue region than do soil humic acids. The ratio of fluorescence intensities can be used to distinguish between soil and sedimentary humic acids. This ability to differentiate organic matter source is especially important in management of water quality.

ENV-18 Biofuel production from cellulosic materials in ionic liquids via halotolerant organisms. A. SCHMUDLACH, P. COHEN and N. NESNAS. Department of Chemistry, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Sugar bagasse, cellulosic material, is a major waste product of one of the largest agricultural industries in Florida. Ionic liquids are salts in the liquid state, some of which are capable of dissolving cellulose. Many halotolerant organisms show promise of cellulosic biofuel production by breaking down cellulose into sugars and further fermentation products. Halotolerant organisms have been identified in the literature having both cellulolytic and halotolerant properties. We propose to develop a system where cellulosic material will be dissolved in ionic liquids and

subsequently converted into biofuels via cellulolytic halotolerant organisms. A library of ionic liquids will be developed for cellulosic dissolution. Organisms will be screened for compatibility in the potential ionic liquids. Tunable culture parameters such as temperature and concentrations will be optimized for productivity and separation of end products. The quality and quantity of the products will be analyzed using NMR and Mass Spectrometry methods.

ENV-19 Synthetic approaches to hydrogen bonded heterocyclophane sensors. D.P. VORISEK, E.A. HERNBERG and A.B. BROWN. Department of Chemistry, Florida Institute of Technology, 150 W. University Blvd, Melbourne, Fl 32901. Currently hydrazine is detected by irreversible methods that are costly to industry. A carbazolopyridinophane was synthesized to detect hydrazine emissions in real-time, reversible, and low concentration. However, this molecule's threshold for detection was above the needed limit due to background fluorescence present. This is suspected to be due to a weak internal hydrogen bond, causing partial quenching of the fluorescence overall. Increasing the basicity by substituting the pyridine para to the ring nitrogen involved in the hydrogen bond should strengthen the bond, and therefore diminish the background fluorescence. Carbazolopyridinophanes will be tested, wherein the pyridine bears an electron-donating group (4-methoxy, 4-ethoxy, 4-amino) or an electron-withdrawing group (4-nitro). Changing the quencher from pyridine to acridine, as well as changing the emitter from carbazole to diphenylamine, will also be explored.

ENV-20 Oxidation of alginic acid, benzoic acid and related humic acids by ferrate (VI). T. HOANG, M. SOHN and V.K. SHARMA. Florida Institute of Technology, Department of Chemistry, 150 W. University Blvd, Melbourne, FL 32901. This research project examined the use of potassium ferrate (VI) for the oxidation of alginic acid and benzoic acid as potential models for humic acid. The kinetics of the oxidative degradation of these substrates was evaluated by using stopped-flow and UV-Vis spectrophotometry. Rates of reaction were compared to increase the understanding of the reactivity of Fe(VI), an environmentally friendly water treatment oxidant, with different natural substrates. This research also included a pH dependant study of the oxidation of alginic acid and benzoic acid by Fe (VI).

ENV-21 Magnesium/Ethanol system for the reduction of polycyclic aromatic hydrocarbons (PAHs) in the environment. M. ELIE. Chemistry Department, University of Central Florida, 4000 Central Florida Blvd, Orlando, FL 32816. Polycyclic aromatic hydrocarbons (PAHs), often found in oil spills and in soils nearby petrochemical plants, are one of the first classes of compounds identified as carcinogens. As a result, these organic compounds are labeled by environmental regulatory agencies as priority pollutants. PAHs, relatively nonbiodegradable, are a main component of crude oil and can also be produced during incomplete combustion (burning) of wood or carbon-based fuels (whether fossil fuel or biomass) and as such are prevalent in the aquatic, terrestrial and atmospheric media of our environment. Thus, efficient technologies for detoxification or removal of PAHs, in contaminated sites, have to be uncovered urgently. Treatment plants are now faced with the challenge of developing new techniques to remove these contaminants from effluents streams as new information on their transport and fate is released. Many advanced treatment options are available and chemical reduction is seen as a convenient technology, due to the fact that PAHs can be transformed into less harmful products. This presentation is an experimental assessment of the application of activated magnesium metal (Mg) in ethanol, for the reduction of polycyclic aromatic hydrocarbons in the environment. This technique has been shown to be effective at degrading some other polluting compounds, such as possible carcinogenic polychlorinated biphenyls (PCBs) compounds. The current limitations and future research needs associated with this treatment technology will also be discussed with regard to the contaminant of interest.

ENV-22 Kinetics of the oxidation of tryptophan by ferrate (VI) in alkaline media. E. CASBEER, V.K. SHARMA and J.C. BAUM. Florida Institute of Technology, Department of Chemistry, 150 W. University Blvd, Melbourne, FL 32901. The aromatic amino acid, tryptophan is an important molecule in both environmental and biological systems. Ferrate (VI) ($FeO_4^{2-}$) is a strong, but selective oxidant that has potential as an alternative oxidant in wastewater treatment because it is considered to be non-toxic. It has been shown to form no disinfection by-products that have been found with commonly used oxidants such as chlorine and ozone. This report will present the kinetics of the reaction between tryptophan and ferrate (VI) in the pH range 7.0-12.4 at 25°C. Generally, the rate of the reaction increases with decrease in pH. The interpretation of the trend in the rate constants (k, $M^{-1}s^{-1}$) *vs.* pH using species-specific reactions will be presented. An assessment of the effectiveness of ferrate (VI) as an oxidant to learn the fate of amino acids and proteinaceous matter in water and wastewater upon ferrate (VI) treatment will be discussed.

ENV-23 Oxidation of L-proline and hydroxyproline by ferrate (VI). M. STROUSE and V.K. SHARMA. Florida Institute of Technology, Department of Chemistry, 150 W. University Blvd, Melbourne, FL 32901. Amino acids are nitrogen-containing compounds which may form harmful byproducts during the disinfection process of chlorination. They are introduced into the environment through natural occurrence in organisms and through the pharmaceuticals that contain them. Oxidation and therefore removal of amino acids from the environment by use of ferrate (VI), an environmentally friendly oxidant, was examined by studying the oxidation of L-proline, a secondary amino acid, and its derivative, hydroxyproline, as a function of pH. The kinetics of the reaction as a function of pH in acidic and basic medium will be presented.

ENV-24 Concentrations of iodinated-disinfection byproducts in water. A. GARBOU and V.K. SHARMA. Florida Institute of Technology, Department of Chemistry, 150 W. University Blvd, Melbourne, FL 32901. Five iodoacids (bromoiodoacetic acid, (Z)-3-bromo-3- iodo-propenoic acid, (E)-3-bromo-3-iodo-propenoic acid, and (E)- 2-iodo-3-methylbutenedioic acid) were measured in drinking water treated with chloramination. Two iodo-trihalomethanes, (dichloroiodomethane and bromochloroiodomethane) were also assessed for comparison. The effect of free chlorine contact time on their formation was also examined in chloraminated and chlorinated drinking waters from 23 cities in the United States and Canada. Gas chromatography (GC) with high- resolution electron ionization (EI)-mass spectrometry (MS) with isotope dilution has been used to evaluate iodo-THMs DBPs. A gas chromatography (GC)/negative chemical ionization mass spectrometry (MS) technique was established to analyze these iodo-acids. The iodoacids and iodo-THMs were found in waters from most plants, at maximum levels of 1.7 μg/L (iodoacetic acid), 1.4 μg/L (bromoiodoacetic acid), 0.50 μg/L ((Z)-3-bromo-3- iodopropenoic acid), 0.28 μg/L ((E)-3-bromo-3-iodopropenoic acid), 0.58 μg/L ((E)-2-iodo-3-methylbutenedioic acid), 10.2 μg/L (bromochloroiodomethane), and 7.9 μg/L (dichloroiodomethane). Plants used the chloramination with the longest free chlorine contact times (> 45 min) resulted in lower levels of iodo-DBPs, whereas chloramination with short free chlorine contact times (< 1 min) led to the highest levels of iodo-DBPs.

**ENV Posters**

ENV-P36 Synthesis of potential new medicines based on the structure of resveratrol. J. CARRINGTON, K. PARKER and J. LEY. Miami-Dade College, Homestead Campus, 500 College Terrace, Homestead, FL 33030. Resveratrol, a chemical found in abundance in red grapes and red wine, has become increasingly popular in recent years due to its antioxidant, anti-inflammatory, anti-cancer and anti-aging therapeutic effects (Markus and Morris, 2008). However, exactly how resveratrol, a polyphenol, functions in the body is not entirely known. The purpose of this study is to prepare novel compounds, based on the chemical structure of the resveratrol molecule, by modifying the substituents on the stilbene nucleus. Thus far we have synthesized a previously unreported molecule by means of the McMurry Coupling of 3',4',5'-trimethoxyacetophenone. This product served as the precursor to cis- and trans-resveratrol analogues. These compounds will allow investigations of the effects of cis- and trans-isomerism on the chemical and biological activity of analogues of resveratrol.

ENV-P37 Development of photolabile caged neural transmitters. Y. OUEDRAOGO, R.L. COMITZ, B. SILVER and N. NESNAS. Department of Chemistry, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Understanding the specific malfunctions of the brain is necessary to develop cures for diseases and disorders such as Alzheimer's and epilepsy. We are developing caged glutamate molecules which can be delivered to specific neuron sites in an inactive form. The cage can then be removed with a pin pointed laser (hv) releasing the active glutamate to attach to the specific site of study, leading to insight on how the brain network is affected. This will facilitate the understanding of neural diseases and potentially lead to the development of treatments.

ENV-P38 Selecting surface water sites for monitoring of pathogenic microorganisms. S. DUNHAM, P. GILLIS and D. PACKERT. Allied Health Professions Program, Barry University, 11300 NE 2nd Avenue, Miami Shores, FL 33161. Proper site selection is fundamental when monitoring the concentrations of pathogenic microorganisms found in surface water on lands with and without grazing. To assess the impact of grazing on pathogenic microorganisms in surface water, the project initially set out to monitor six grazing sites with cattle present year-round, and two sites, with no cattle present, and therefore no discernible grazing. At the outset, we approached a number of governmental organizations including the USDA, the EPA and the South Florida Water Management District to gain access to possible sampling sites. In addition, we carried out independent investigations using Google Earth and various county property appraisers' websites. This was followed by physical inspection of potential sites and contacting the properties' owners for access. These independent investigations were

essential in identifying new, potential sites and proved to be the most successful means of acquiring sites. After 10-15 possible sites were gathered, each was analyzed to determine its level of relevance for our study. We considered such variables as types of livestock present, size of sites, position relative to other sites, and ease of access when determining the eight sites to be chosen. After careful deliberation, five sites in SW Broward County, two sites in NW Miami-Dade County, and one site in the Everglades along the Miami-Dade and Collier County border were chosen to be used in the study.

ENV-P39 Synthesis of novel conjugated 2,2'-bipyridyl ligands for homogeneous catalytic hydrolysis on a gold nanoparticle platform. O. KARÁCSONY (1), S.A. TRAMMELL (2), E.L. CHANG (2), R. NITA (1) and D.A. KNIGHT (1). (1) Florida Institute of Technology, Chemistry Department, 150 West University Blvd., Melbourne, FL 32901, (2) Naval Research Laboratory, Center for Bio/Molecular Science and Engineering, Washington, DC 20375. Homogeneous catalytic reactions involving hydrolysis have potential applications for WMD countermeasures. We are interested in enhancing metal-based homogeneous or heterogenized catalysts and catalytic reactions that can be directed to either chemical agents neutralization and/or bacterial/viral decontamination. Homogenous catalysts can be finely tuned, both sterically and electronically, through a careful selection of ligands, neutral molecules, or ions bound either covalently or electrostatically to the catalytically active metal ion center. Our goal is to further enhance hydrolysis using a novel approach that combines electronically-modulated catalysis - via molecular wires attached to gold nanoparticle (NP) surfaces - with additional desolvation effects, as well as decreased conformational freedom, and cooperative effects of multi-metallic catalytic centers at gold NP surfaces. We will describe our efforts towards the synthesis of novel conjugated 2,2'-bipyridyl (bipy) ligands and subsequent coordination to copper for the enhanced hydrolysis of phosphodiester bonds. Our ligand preparations involve the well known Kröhnke synthesis, Horner-Emmons-Wadsworth (H.E.W.) and palladium catalyzed Heck reactions. (This project received support from the Defense Threat Reduction Agency-Joint Science and Technology Office for Chemical and Biological Defense [MIPR #B102405M]; we also thank Jeff Deschamps for X-ray crystallography)

ENV-P40 A two-step stereoselective synthesis of a fish pheromone from cortexolone. N. NESNAS (1), Y.P. OUEDRAOGO (1), L. HUANG (1), M.D. PLAZAZ-MAYORCA (1), G. PRONI (2), E. CHADWICK (2) and R.J. WEHMSCHULTE (1). (1) Department of Chemistry, Florida Institute of Technology, 150 West University Blvd, Melbourne, FL 32901, (2) Science Department, John Jay College of Criminal Justice, 445 West 59th Street, New York, NY 10019. We hereby report a two-step enantioselective synthesis of 17α,20β-dihydroxy-4-pregnen-3-one, a fish pheromone of the species *Carassius auratus*, from the readily available cortexolone. The pheromone is released by the female, causing an increased sperm production in males. Moreover, the 20α epimer was also synthesized in just three steps using a rather novel type of reducing agent (HAlO). The reported work earns its urgency and significance in the simple methods employed to obtain exclusive enantioselectivity, and in our ability to explain such outcome via DFT computations. Furthermore, a microscale chiroptical technique was used to confirm the stereochemical outcomes.

ENV-P41 Citrus waste characterization. C.M. NEAL, S.J. HOLLINGSWORTH, J. ARIAS and A.T. COOPER. College of Engineering Sciences, Technology and Agriculture, Florida A&M University, Tallahassee, FL 32307. More than 90 percent of Florida's citrus crop is used for processing. Fifty percent of this weight is considered unusable and thrown away, contributing greatly to industrial waste after processing. This waste, referred to as orange bagasse, holds an enzyme called pectinase, often used to alleviate problems encountered during juice processing. Peroxidase activity has also been identified in a variety of citrus tissues and determined to be a factor in respiration, lignifications, degradation and treatment of industrial waste-waters. In this research we seek to isolate and identify activity from enzymes of interest. Proximate composition has been applied in order to distinguish the components of orange bagasse. Some properties of enzymatic constituents have been explored giving approximate result. Herein we report on the development of methods specific to the analysis of Florida's citrus waste for determination of elemental composition with an eye toward sustainability by potential waste reuse.

ENV-P42 Development of a cost efficient rich culture medium for the cellulosic bacteria *Cytophaga hutchinsonii*. J. WILLIAMS (1), O. ONOKPISE (2), M. ABAZINGE (3), L. ALMEIDA (4) and C. LOUIME (1,2). (1) Florida A&M University, College of Architecture, Tallahassee, FL 32307, (2) Florida A&M University, College of Engineering Sciences, Technology and Agriculture, The FAMU BioEnergy Group, Tallahassee, FL 32307, (3) Florida A&M University, Environmental Sciences Institute, The FAMU BioEnergy Group, Tallahassee, FL 32307, (4) Universidade Federal de Viçosa, Campus Universitario, Departamento de Solos, Vicosa, MG, Brasil 36571. There is a global understanding that, in the face of dwindling fossil fuels supplies and climate change, modern society has to look for alternative energy sources to secure its

future. These alternatives should be sustainable and renewable. Among these new energy sources, biomass seems to have the highest potential of immediately impacting our energy supply, as it is constantly being replenished by photosynthesis. The problem however, is that the technology to process biomass into usable products has not reached a point where it is economically comparable to fossil fuels. Amongst these technologies, bioconversion, which is a natural process, can be easily manipulated to propel us a bit closer to our goal of 25 by 25 (Vision that biomass will replace 25% of our energy supplies by 2025). The goal of this study was therefore to develop some of the technologies that will facilitate the transition to a greener economy. Specifically, we are developing cost effective growth media for bioconversion processes. Some of the nutrients composing these growth media were isolated from agricultural and industrial wastes, such as sugarcane bagasse. When scaled to industrial levels, this process should provide economic returns in par with fossil fuels.

ENV-P53 Universal solvent: Is it safe for us? L. ACOSTA-MARTÍNEZ . Department of Applied Aviation Sciences, Embry-Riddle Aeronautical University, Daytona Beach Campus, 600 S. Clyde Morris Blvd, Daytona Beach, FL 32114. Our world was given clean and healthy. The world as we know it is suffering a continuous abuse by the smartest living animal: the human. The rapid evolution of countries and their industrialization made huge changes around the world, including the Unites States and Puerto Rico, by polluting our water bodies. Making efforts to keep good water quality, governments are taking the responsibility to return it to a cleaner state. Governments are adopting safer practices to protect our water bodies. Among these practices are: regulations and community behavior. Is everyone helping to save this valuable liquid? To accomplish this duty is important that people recognize the real value of clean water.

## GHS = GEOLOGICAL/HYDROLOGICAL SCIENCES |return to top|

GHS-01 A report on the positive effect of geodiversity on biodiversity in Florida. B. BOOTH. University of South Florida, Department of Geography, NES 221, 4202 East Fowler Ave, Tampa, FL 33620. This is an investigation to confirm previous findings that the geodiversity of a landscape promotes greater biodiversity. Based upon prima facie evidence, the concept that geodiversity promotes biodiversity would be valid in the State of Florida. Geodiversity is a term used to describe the vast variations of morphological, lithological, and hydrological features possible in various landscapes. Biodiversity, the diversity of life, is driven by adaptive radiation, which is caused when species are forced to adapt to geographical separations, climate variations, niche availability, and different hydrological regimes. Florida has many instances of diverse terrains. Therefore, it is logical to assume that a geodiverse terrain in Florida would promote a greater diversity of life than a homogenous landscape. Sinkholes, circular subsidences in the landscape caused by the movement of groundwater removing subsurface materials, are common features in the autogenic karst that is present in much of Florida. This study examines how the presence of sinkholes in various ecosystems relates to the diversity of plants in Florida. The study was conducted in west-central Florida, in Pinellas and Hillsborough counties, along the Gulf of Mexico coast. Plant diversity was measured by transect-line survey within the confines of the sinkholes' influence, and then in the area outside the geomorphic influence of the sinks. Data was collected and analyzed using standard statistical methods. There followed an analysis of the effects of local hydraulic conductivity, urban environmental factors, and geodiverse-feature clustering on the study's results. The final results of the investigation indicate that there is an overall positive effect of 5% on the biodiversity of terrains in Florida in or near sinkholes. This is in agreement with other studies, and supports the hypothesis that geodiversity promotes biodiversity. The results of this study can validly be added and applied to ecological population-location models to optimize the selection of sites intended for biodiversity preserves. Locally, this supports the need for 'Geosite' preserves in Florida, which will act not only to preserve geologically unique and important landscape features, but which also serve as unique niches and habitats for the endangered life of Florida.

GHS-02 Analysis of bathymetry profile evolution of selected beaches in Brevard County after nourishment in 2010. J.M. HEARIN. Department of Marine and Environmental Systems, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL, 32901. Dredge and fill operations were performed in the North and South Reaches of Brevard County between January and April of 2010. The current U.S. Army Corps of Engineers requirement for annual surveys of beach nourishment projects is not necessarily sufficient to capture the response of beaches as they transition from the fill template back to a natural equilibrium profile. Instrumentation developed to measure the littoral wave environment and perform near-shore bathymetric surveys, at significantly lower costs than traditional methods, was utilized to analyze the evolution of the nearshore bathymetry and wave climate of selected beaches within and outside the nourishment projects. A new class of inexpensive wave gages, developed by TNC Oceanographic, was installed offshore of the test sites to record the near-shore wave conditions. Beach and near-shore bathymetric surveys were performed monthly (or as weather allowed) to document

the evolution of the beach and littoral environment before and after nourishment. The bathymetric surveys were performed using a Sonar/GPS system modified to be mounted on a sea kayak. The kayak system enabled surveys to be launched from the beach to record depths in the surf zone which are too shallow for traditional survey vessels at virtually no cost to the researchers. Results from these surveys will be presented along with an analysis of the beach evolution process. The results of these surveys will provide valuable insight into the coastal response of beach nourishment projects and provide a new data set for use by other coastal researchers.

GHS-03 Discrete modeling of a residential stormwater management system modified for irrigation. D. JONES. Civil Engineering, University of North Florida, 1 UNF Drive, Jacksonville, FL 32224. This report creates a model to analyze the potential runoff reduction over a twenty-seven lot subdivision by modifying an existing pond to create storage for an irrigation system. It is an extension of the Rate-Efficiency-Volume method proposed by Wanielista and recommended by the St. Johns River Water Management District. In the aforementioned simulation, a number of assumptions have been made to ease calculations, such as constant reuse rate and long-term average rainfall. The model focuses on residential applications by using accepted technology-based methods. Realistic site runoff is found using historical rainfall data, tracking antecedent moisture condition, evaporation, turf grass demand, and degrees of consumer participation. Sidebank seepage, drawdown, and overflow can be calculated from these values with the remaining transient volume available for non-potable residential use. Salt accumulation is minimized with an orifice to discharge the treatment volume approximately every three weeks and irrigation scheduling incorporates current seasonal variation of local water restrictions. Under proposed nutrient discharge restrictions, wet detention pond size for Medium Density Residential developments may increase by 160%. The model illustrates a 30-year average runoff decrease of 40%, reducing the quantity of nutrients leaving the site and the acreage needed for treatment. It has the potential to save home owners $600 per year per dwelling unit and reduce potable irrigation demand by up to 70% with minimal infrastructure improvements.

GHS-04 Development of a preliminary pipeline transportation network for carbon sequestration sites in Florida. B. POIENCOT and C.J. BROWN. School of Engineering, University of North Florida, 1 UNF Drive, Jacksonville, FL 32224. Representatives from the United States Department of Energy, and engineers, geologists, and scientists from all over the world have investigated the potential for reducing atmospheric carbon emissions through carbon sequestration. Numerous reports exist analyzing the potential for sequestering carbon dioxide at various sites around the globe, but none have identified the potential for a statewide geologic sequestration system in Florida, USA. In addition, only limited research has been completed on the feasibility of a Florida-wide carbon dioxide pipeline network, linking potential underground repositories with primary emission sources. This paper describes ongoing research regarding development of an optimal carbon dioxide pipeline network for Florida using linear programming optimization network theory.

GHS-05 A study of paleogroundwater levels within the Floridan Aquifer System in Florida. M. GANDEE and C.J. BROWN. Department of Biology and School of Engineering, University of North Florida, 1 UNF Drive, Jacksonville, FL 32224. The Floridan Aquifer System (FAS) in Florida is laced with numerous springs throughout the state. These springs have provided a critical source of freshwater to both humans and wildlife throughout their history. Spring flows and water levels also provide a proxy for groundwater conditions throughout the FAS as well as an indirect window on climatic changes in Florida over time. Ongoing research into these linkages indicates that it is feasible to estimate paleogroundwater levels in the FAS at select Florida springs by evaluating anthropological artifact ages and groundwater model results. This paper describes the research in progress for this effort and outlines the overall technical methodology along with preliminary results.

## MED = MEDICAL SCIENCES |return to top|

MED-01 Carbohydrate expression of pulmonary neoplasms as detected with periodic acid Schiff (PAS) reaction. J. ERVIL (1), A. COSTE (1) and A.T. MARIASSY (2). (1) College of Health Sciences, Graduate Biomedical Sciences, Barry University, 11300 NE 2nd Ave, Miami Shores, FL 33161, and (2) NOVA Southeastern University, College of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328. Neoplastic cells are known to alter their surface carbohydrates reflecting their altered neoplastic transformation. In the present study we examined ten lung tumors for the expression for neutral hexoses as engendered by periodic acid Schiff, or PAS reaction. PAS is a method of staining used originally to detect the presence of glycogen by selectively oxidizing glucose residues using the periodic acid to create aldehydes, which then react with the Schiff reagent to generate a magenta color at the detected carbohydrate residues in the tissue. Tumors

examined in this study were diagnosed as adenocarcinomas. We hypothesized that these may be further defined according to their carbohydrate expression. We present here the examination results of the resected pulmonary neoplasms stained with PAS. Five forms of neoplastic patterns are commonly recognized by their morphological characteristics (Green, F.L *et al.*: AJCC Cancer Staging Manual 6th Ed). Hisotpathological variants include papillary, solid, acinar, mixed, and broncho-alveolar. We used the PAS method to differentiate the variants based on their carbohydrate content. The most intense staining was detected in the solid neoplasms and the least in the mixed neoplasms. The intensity of the staining was rated based on the density of the magenta-staining using a scale of 0 to 4. The most densely staining tumor variants were solid, lesser staining was present in the papillary and broncho-alveolar tumor types. We used PAS staining to define carbohydrate expression of these tumor variants. The graded expression of the examined pulmonary adenocarcinomas exhibits a variable pattern which can be identified by the PAS histochemistry. (Supported by NSU Faculty Research Grant)

MED-02 The use of lectins as molecular probes for detection of the cell surface carbohydrates in lung tumors. J. DONOSO (1), L. ALBASSAM (1), A. BÖŐR (2) and A.T. MARIASSY (3). (1) College of Health Sciences, Graduate Biomedical Sciences, Barry University, 11300 NE 2nd Ave, Miami Shores, FL 33161, (2) UPJS, Ústav Patológie, Košice, Slovakia, 04001, and (3) Nova Southeastern University, College of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328. Lung tumors are one of the leading causes of death. The transformation of healthy tissue into tumors is known to involve carbohydrate alteration of their glycocalyx. The surfaces of cells express carbohydrates that are known to act as receptors. Developing and using markers of neoplastic transformation allows the clinical pathologist to ascertain and improve the diagnosis and thus positively affect the clinical management of the disease. Glycosilation is often the final post translational modifying process of cell structures and their products. Molecules with a glycosyl modification often acquire new physical, chemical, biological and functional properties. We hypothesize that the lung adenocarcinomas express modified carbohydrates on their surfaces. We present here the assessment of 8 adenocarcinoma cases with biotinylated lectins with acronyms (abbreviations) and binding carbohydrates: *Arachis hypogea* (PNA) β-gal-(1®3)D-galNAc; *Dolichos biflorus* (DBA); α-D-galNAc; *Griffonia simplicifolia* I.B4 (GSA) α-D-Gal; *Ulex europeus* I. (UEA), α-L-fuc; *Maackia amurensis* II (MAL), α-sialyl and *Galantus nivalis* (GNL), α-(1®3) man. Carbohydrate location in serial histological sections was detected by ABC Vector Kit®, and HRP/ DAB visualization. Deletion and non-biotinylated lectins were used as controls. Engendered brown precipitate tumor surface binding ranged 0.57 with GNL to 2.13 with PNA, with MAL II at 1.43, UEA I at1.13 and GSA and DBA at 0.88 in contrast to normal cell surface staining which ranged from 0.57with GNL to 1.50 with PNA, normal tissue having lesser stained cell surface ($P < 0.05$) GNL, DBA and deletion controls did not show lectin binding differences The results indicate considerable alteration of glycocalyx carbohydrate expression when neoplastic cells are compared to the adjacent unaffected tissue. (Supported by NSU Faculty Research Grant)

MED-03 Histopathological assessment of the flax-seed oil (FSO) and probiotics supplementation on the *E. coli* challenged small intestine of the gnotobiotic piglets (gp). S.E. DUNHAM (1), D. PACKERT (1), R. NEMCOVA (2) and A.T. MARIASSY (3). (1) Allied Health Professions Program, Barry University, 11300 NE 2nd Avenue, Miami Shores, FL 33161, (2) University of Vet. Med., Kosice, Slovak Republic and (3) Nova-Southeastern University, College of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328. The GI tract of gp (germ-free piglets) allows a defined microfloral manipulation venue for exploration of the intestinal response of the probiotic, *L. plantarum* (Lcb. LP96) fed milk culture L(7), supplemented with FSO, LMK(7) *E. coli* challenged, positive (+) K1(3) and negative (-) control/K0(3) gp. We examined the microanatomy and histopathology of the fixed, paraffin embedded duodenal, jejunal and ileal H&E stained sections of the gp mucosa, and its response to the nutritional supplementation and *E.coli* challenge. Control piglets revealed a steep increase in the abundance of goblet cells from duodenum to ileum, where their sheer number obscured the neighboring enterocytes. Submucosa contained extensive mucous glands in the duodenum, became meager in the jejunum and in the ileum formed a massive portion of the gut wall, making the ileum the most massive segment of small intestine. Mucous goblet cells number, sub-epithelial volume, mononuclear infiltrate, villas size and intestinal crypt characteristics were the most variable histological features among treatment groups when compared to each other. The (-) gp K0 controls had longest villi, most numerous goblet cells and lacked sub-epithelial infiltrate. While other treatment groups showed contrasting expression of the histopathological features, the variation of these, among them, was less distinct. Taken together, the results suggest morphologic and presumably functional alterations of the small intestine result from the employed treatment protocols. Further research utilizing lectin histochemistry has been made to explore the details of the responses to the employed treatment protocols. (Supported by the project SK0021, co-financing through the EEA and Norwegian financial mechanism, the State Budget of the Slovak Republic and NSU Faculty Research Grant)

MED-04 The effect of supplementation of flax-seed oil and *Lactobacillus plantarum* – Biocenol™ LP96 probiotic on the expression of intestinal carbohydrates in gnotobiotic piglets. T. ESPINAL (1), R. NEMCOVA (2) L.B. DRIBIN (1) and A.T. MARIASSY (1). (1) Nova-Southeastern University, College of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328, (2) University of Vet. Med. and Pharm. Kosice, 04001, Slovakia. The intestinal glycoconjugates and mucosal carbohydrates are altered in response to numerous conditions. Carbohydrate residues are known to be ligands for microorganism attachment as well as defensive protective masking against colonization of the intestinal cells. We hypothesized that the gnobiotic piglets would have a specific carbohydrate characteristics that will be modified with known probiotoics, flax-seed oil and experimental *E.coli* infection. We examined the lectin detectable carbohydrates in the duodenal, jejunal and ileal sections of germ-free piglets, fed with either a pro-biotic culture, Biocenol™ added to milk B (7), experimental, positive C (3) and negative N (3), *E. coli* control, experimental, (7) and control piglets (3) fed with milk only. Paraffin embedded serial sections were reacted with *Dolichos biflorus* (DBA); α-D-galNAc; *Griffonia simplicifolia* I.B4 (GSA) α-D-Gal; *Ulex europeus* I. (UEA), α-L-fuc. Lectins and the localized carbohydrates were detected with Vector ABC kit® and the engendered DAB precipitate. The lectin binding patterns of the intestinal mucosal carbohydrate were assessed as staining density on a scale of 0 to 4. The gp treatment groups had an increasing goblet cell population towards the distal GI. A majority of the goblet cell population was negative for the used lectins. Epithelial carbohydrate reactivity ranged from 0 to 4, stained only with GSA, UEA while PNA DBA only detected occasional epithelial cells. These alterations may affect the expression of carbohydrate receptors, and increase the secreted mucus barrier carbohydrates thus preventing the attachment of pathogenic micro flora to the glycocalyx of the intestinal epithelium. (Supported by the project SK0021, co-financing through the EEA and Norwegian financial mechanism, the State Budget of the Slovak Republic and by NSU Faculty Research Grant)

MED-05 Asthma public health study: Who is at risk Broward and Miami Dade Counties? L. AJAYI (1), R. LEE (1) and A.T. MARIASSY (2). (1) College of Health Sciences, Graduate Biomedical Sciences, Barry University, 11300 NE 2nd Ave, Miami Shores, FL 33161, (3) Nova Southeastern University, College of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328. Asthma is a chronic, controllable inflammatory disease that currently affects over 17.5 million Americans and has contributed to 3,447 deaths nationwide. Plainly, it has been identified as an important public health concern. Temporal and geographic variations have a considerable impact on the asthmatics and their quality of life. The influence of demographic and socioeconomic status bares no less important influence on the severity and consequences to the sufferers of this disease. To understand and interpret the demographic and socioeconomic variables related to asthma, we examined the public health data from the Florida Charts, of the Florida Department of Public Health to access the morbidity, mortality and demographic information concerning asthma in Miami-Dade and Broward Counties. Inasmuch as the prevalence of asthma continues to increase we need to assess the health-related economic, social and the quality of life issues in the asthmatic population. Public health policies focusing on asthma awareness, education and management should be implemented in areas with greatest needs. To this end we charted out the public health data on asthma to establish specific areas of the focus on the most needy and critically neglected populations. (Supported by NSU Faculty Research Grant)

MED-06 How far weather variability influences seasonal asthma episodes: Three years of correlations in Miami Dade, Florida. D. QUESADA. School of Science, Technology and Engineering Management, St. Thomas University, Miami Gardens Fl 33054. Climatic and environmental changes occurring since the middle of the 20th Century as well as the aggravating pollution levels in megacities are exacerbating asthma episodes and the number of hospitalizations due to this disease. Since 1999, in Miami Dade County the hospitalization rates were doubling the Healthy People 2010 objectives in every age group. Motivated by this situation, the Weather Laboratory at School of Science, Technology and Engineering Management in St. Thomas University started gathering weather and health information. In partnership with AWS Convergence Technologies (WeatherBug) a weather tracking station has been operating in campus 24/7 year round for six years. As a result, a comprehensive weather database including outdoor temperature (T), humidity (H), barometric pressure (P), wind direction ($\theta_w$) and speed ($v_w$) as well as the values of maximum and minimum and the range of all these variables has been created. Despite of the lack of detailed health (asthma) information time-series from large hospitals a sample for the present study was obtained from one of the medical groups operating in Miami Dade. The statistical validation of the recorded health data (total number of cases of asthma visits every fifteen days) was verified and plotted in standard deviations (z-variable) units. As a result, a seasonal pattern emerged, with a maximum appearing around the middle of December and a minimum around the middle of March every year for the three years of analysis. Despite of the differences in temporal resolution between the weather and health time series, correlations and anti-correlations appear clearly. Weather variables were averaged over periods of 15 days in order to keep the consistency with the health (asthma) time series. Even though, the temperature range $\Delta T = T_{max} - T_{min}$ as well as $T_{max}$ appeared as the best predictors in a preliminary analysis, the rate of

change (f[t+1] – f[t]) over a day of both correlates even better, showing areas of strong variations during the months where the increase in the number of cases were observed. It is worthwhile to notice that seasonal patterns of asthma were observed over many places in United States, where the position of the peak depends on the geographical area of analysis (climatic zone). Even though pollens are well recognized as environmental triggers of asthma, they rather seem to affect the mean values of the number of cases than the seasonal pattern of the disease. Furthermore, a minimal biophysical model that includes the gas exchange in lungs and the dynamics of respiration is discussed in order to understand the above results.

MED-07 Biosensor for rapid detection of pathogens. M. THOMAS and J. DAVIS. Biological and Agricultural Systems Engineering Program, Florida Agricultural and Mechanical University, Tallahassee, FL 32307. The ability to rapidly identify pathogenic bacterial species and evaluate their antibiotic susceptibility has become a critical need in the health-care industry. The massive increase in the number of reported cases of infections due to drug-resistant bacterial strains over the last 35 years represents an alarming trend. Here we present work on the development of a miniature and portable microfluidic-based biosensor that provides real-time detection of pathogenic bacterial species along with evaluation of bacterial species antibiotic susceptibility. The biosensor will utilize surface bound antibodies against various pathogens in a microfluidic device. The antibodies will be immobilized in such a way as to preserve its biological functionalities (*i.e.*, not block it active sites). We tested the device using *Escherichia coli* (*E. coli*) as a model pathogenic species. The microfluidic device was fabricated from the soft polymer, poly (dimethyl siloxane: PDMS) with the surface of device made from glass. Detection and immobilization of *E. coli* was performed to demonstrate proof of principle. The *E. coli* cells needed less than five minutes to equilibrate in the channel prior to detection. Cells were first imaged and then counted using a microscope with a 40× magnification objective. Results from each experiment were available within 10 minutes from the start of the experiment. The device demonstrated high selectivity with *E. coli* preferentially elected from a group of five bacterial species with greater than 95% selectivity. The detection limit for the device was in the range $5\times10^{0} – 5\times10^{3}$ cells, spanning three orders of magnitude. The development of this biosensor could potentially serve as a model for rapid bacterial species detection and identification in the areas of food science, agriculture quality control and medicine.

MED-08 Expression of hexoses in the pulmonary adenocarcinomas as detected by PAS. J. HEARD (1) H. MEKONNEN (1) A. BÖOR (2) and A.T. MARIASSY (3). (1) College of Health Sciences, Graduate Biomedical Sciences, Barry University, 11300 NE 2nd Avenue, Miami Shores, FL 33161. (2) UPJS, Ústav Patológie, Kosice, Slovakia, 04001, (3) Nova-Southeastern University, College of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328. Tumor metastasis is known to be involved in carbohydrate interaction with others cells and vasculature. We hypothesize that PAS detectable hexoses are differentially expressed in the tumors of the lung. We examined sixteen cases using PAS staining technique. The PAS is based on detection of hexoses by converting their adjacent hydroxyl groups to aldehydes and these reacting with a Schiff's reagent. Engendering a magenta color structure that stain are then PAS positive. Common designation of pulmonary adenocarcinoma subtypes include: acinar, papillary, broncho-alveolar, mixed, and solid. The results indicate differential staining of these tumor subtypes. Of the sixteen samples, the predominant subtypes were papillary then solid, acinar and mixed. Of the papillary and solid subtypes the connective tissue exhibited the most intensive staining. The acinar subtype showed an equal amount of stained secretion and connective tissue. Lastly in the mixed subtype only showed secretion stained. The highly differentiated tumors stained intensely with PAS. Differentiation was positively correlated with the staining; the higher the differentiation, the more intense the staining. The pleomorphic, neoplastic cells had minimal PAS staining, indicating a low secretory activity, reflecting the functional status of these cells. The results indicate that the PAS stain is a convenient means for assessing the neoplastic state of the tumor cells. Taken together, carbohydrate expression of the neoplastic cells helps differentiate the aggressiveness/functional status of the tumor cells. (Supported by the NSU Faculty Research Grant)

MED-09 Tracheal vasculature expression of the lectin detectable carbohydrates in allergic sheep. R. LEE (1), L. AJAYI (1) and A.T. MARIASSY (2). (1) College of Health Sciences, Graduate Biomedical Sciences, Barry University, 11300 NE 2nd Ave., Miami Shores, FL 33161, (2) Nova-Southeastern University, College of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328. We have previously described expression of carbohydrates in the tracheal mucosa in response to inhaled antigen (Mariassy *et al.*, (1994). J. Allergy and Clin. Im. 93(3):585-593). A considerable shift of sugar residues was detected. We hypothesize that since pulmonary vasculature is intimately involved in the immunological response, there would be alterations in the expression of carbohydrates in the endothelium and smooth muscle of the vessels as well. We examined the pulmonary arteries and thin walled vessels in three *Ascaris suum* antigen challenged sheep and compare them to three controls. Complete tracheal sections were processed with biotinylated lectins to identify carbohydrate alterations in response to the antigen challenge. Controls consisted of non-biotinylated lectins and carbohydrate pre-

incubation. The detected binding sites to the specific carbohydrates were visualized with Vector ABC kit and the HRP engendered reaction product, a brown deposit in the histological sections. These sites on the vasculature were assessed by grading of the deposit density on scale of 0 to 4. Vascular wall remodeling showed significant alterations of the examined carbohydrates. Preliminary data indicate that a larger percentage of the vessel endothelium and greater area of the smooth muscle contained altered carbohydrates in allergic sheep. Arteries and thin walled vessels were different in the antigen exposed as compared to the control sheep. Assessed reaction product ranged from 0.5 to 3.0., declining in some carbohydrates while increasing in others. These findings indicate a shift in carbohydrate composition of endothelium which may be responsible for the altered function of the consequent inflammatory response. The changes in the smooth muscle and BM, may reflect changes of the storage of inflammatory factors for endothelial repair and vascular as well as airway remodeling in severe asthma. The significance of these changes remains to be further examined. (Supported by NSU Faculty Grant)

MED-10 Lectin histochemical analysis of carbohydrate ligands in lung vasculature of the asthmatics. C.R. LITCHFIELD, (1) C.E. HOMISTEK (1) and A.T. MARIASSY (2). (1) College of Health Sciences, Graduate Biomedical Sciences, Barry University, 11300 NE 2nd Avenue, Miami Shores 33161, (2) Nova-Southeastern University, College Of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328. Carbohydrate glycocalyx of the vascular endothelium, basement membranes and smooth muscle are known to contain carbohydrates that act as receptors or repellants to the attachment of bio-active molecules. We hypothesized that the vessels of asthmatics would have altered carbohydrate content in their surfaces and their walls. We used a battery of lectins to map and quantify the carbohydrates in the pulmonary arteries of deceased asthmatics (4) and control subjects (3) that died from causes other them pulmonary disease. The histochemical binding of seven biotinylated lectins (PNA, DBA, GSA I, UEA I, MAL II, GNL, LCA, PSA) on to the pulmonary blood vessels of asthmatic and non asthmatic subjects was visualized with Vectastain® kit and the DAB reaction product in the tissue was measured with Image-Pro Plus® morphometric software. Carbohydrate expression in the asthmatic pulmonary arteries was generally lower as compared to the controls. PNA and DBA 10 fold, GSA, MAL II, LCA 3 and GNL 2 fold, while PSA and the Controls did not differ between the two groups. The carbohydrate staining of the pulmonary arteries and veins revealed differential expression of the endothelial glycocalyx and the smooth muscle in the vessels wall. The expression of carbohydrates may be correlated with the endothelial cell surface ability to mediate attachment of inflammatory and immune cells that occurs in asthmatic blood vessels and participate in the pathogenesis of the of the disease process leading to fatal asthma. (Supported by the NSU Faculty Research Grant)

MED-11 The expression of sialic acid in asthmatic airways detected by *Trithricomonas mobililensis* lectin (TML) histochemistry. R. SHIWMANGAL (1), J. KIM (1) and A.T. MARIASSY (2). (1) College of Health Sciences, Graduate Biomedical Sciences, Barry University, 1300 NE 2nd Ave, Miami Shores, FL 33161, (2) Nova-Southeastern University, College Of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328. Expression of carbohydrates on the airway surface is the basis of the interaction of the microorganisms and the host. Attachment to the airways cells and secretions is the initial step of facilitating or thwarting microorganisms access to airway cell surface and consequent infection. We examined ten patients who died of asthma. Their tissues were obtained at autopsy and used for histochemical analysis. *Trithricomonas mobililensis* lectin (TML) is a sialic acid-specific lectin from a colonic parasite of squirrel monkeys. TML recognizes the sialic acid in a number of stereological configurations. TML has also been tested on human and mouse tissue for histochemical staining properties to conduct a comparative analysis and specificity of the lectin binding. Due to the high-specificity for sialic acid, its long term stability and its wide commercial availability, TML is a useful tool in sialic acid histochemistry. Lectin binding was detected by Avidin-Biotin, Vector Kit® in the histological sections of the asthmatic (4) and control (4) lungs. The density of staining was evaluated on a scale from 0 = no staining to 4 = dense staining. Sialyl residues in the asthmatics were more abundant when compared to controls; in bronchi 2.29 *vs*. 0.00; in bronchioles, 1.50 *vs*. 0.53 and in glands 1.67 *vs*. 0.00. These preliminary data show an unexpected prevalence of sialic acid residues expressed in the asthmatic airways as compared to controls. Further examination of this carbohydrate distribution should be made. We conclude that these findings should be considered when deciding on the tools for estimations of specific, defined glycoconjugates and their differential expression of carbohydrates. (Supported by NSU Faculty Research Grant)

MED-12 Neoplastic transformation of pulmonary carcinoma is associated with altered expression of sialic acid. A. CARBO (1), M. ESTRADA (1), P. BABAL (2), L. DANIHEL (2) and A.T. MARIASSY (3). (1) College of Health Sciences, Graduate Biomedical Sciences, Barry University, 11300 NE 2nd Avenue, Miami Shores, FL 33161, (2) Comenius University, School of Medicine, Bratislava 81372, Slovakia, (3) Nova-Southeastern University, College of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328. Neoplastic changes in the lung tissue are associated with abnormal

glycosylation including changes in sialylation. Using a sialic acid-specific, *Tritrichomonas mobilensis* lectin (TML), extracted from colonic parasites of squirrel monkeys, we were able to detect the presence of sialylated glycoconjugates. We examined ten pulmonary adenocarcinomas for expression of sialic acid using TML. We compared and contrasted tumor tissue with adjacent non-affected lung parenchyma. The differences in sialylation among compared tissues were digitized with Leica/Olympus BX51 microscopic photography and graded on the scale of 0 to 4. Adenocarcinomas were classified into four subtypes: solid, finger-like projections, papillary/chord, and acinar. Staining patterns according to respective tissue type showed chord/papillary tissue stained an average intensity of 1.6, finger-like projections stained an average intensity of 1.8, solid tissue stained an average intensity of 1.75, the greatest stain intensity was in acinar tumor type (2.00), while the normal healthy tissue stained an average of 1.6. The majority of the stain in general was detected in normal, unaffected healthy lung, expressing the greatest presence of sialic acid residues. The least TML stain was found in the acinar subtype. Normal type tissue was found in 90% of the specimens, solid type was found in 80%, fingerlike projections were found in 50%, chord/papillary type was found in 50%, and acinar type was found in only 30% of the specimens. (Supported by NSU Faculty Research Grant)

MED-13 Effect of house dust mite antigens (HDMA) exposure on lung parenchyma of sensitized Rhesus monkeys. K. GUPTE (1), D. SHEHADEH (1) and A.T. MARIASSY (2). (1) College of Health Sciences, Graduate Biomedical Sciences, Barry University, 11300 NE 2nd Avenue, Miami Shores, FL 33161, (2) Nova-Southeastern University, College Of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328. We examined the lectin detectable carbohydrates distribution in the bronchioles and alveoli of HDMA challenged *Macaca mulatta* primates, a well established, controlled model of asthma (Anatomy Histology Embryology 30: 345-349, 2001). Lung sections were enzyme digested with hyaluronidase and trypsin and lectin histochemistry performed using biotinylated lectins GSA IB4 (*Griffonia simplicifolia*), DBA (*Dolichos biflorus*), PNA (*Arachis hypogea*), SBA (Glycine max) and UEA I (*Ulex europaeus* I), MAL-II (*Maackia amurensis*). The stained sections were photographed and lectin reactivity graded. The lectin staining with trypsin digestion achieved reaction only with DBA, UEA I and GNL lectins, all others required neuraminidase digestion. HDMA exposed primates showed 17 to 32 % increase in staining density of the bronchioles and parenchyma when compared to controls. The results confirm the anecdotal data from asthmatics, where airway cell population change towards the more abundant mucous secreting cell population is reported. Shift in the parenchyma surface lining may be interpreted along the same line. This alteration reflects the lungs response to protect the respiratory surface. The mechanism of the cell differentiation to that end and the pathways to achieve it remains to be further explored. (Supported by the NSU Faculty Research Grant)

MED-14 Lectin histochemistry of lung parenchyma in severe asthmatics. J. BELCHER (1), K. MUNOZ (1) and A.T. MARIASSY (2). (1) Barry University, College of Health Sciences, Graduate Biomedical Sciences, 11300 NE 2nd Ave, Miami Shores, FL 33161, (2) Nova-Southeastern University, College of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328. The average adult lung, having a total internal surface area of about 70 m2 – roughly the same area as one side of a tennis court. This large area of the alveolar surface is exposed to agents that may be involved in the cascade that eventually develop into asthma. It is known that viruses, bacteria and physical stress cause alterations of the lung parenchyma; microorganisms need to attach and penetrate the epithelium to gain access to the lung. It is well established that many biological agents attach by a receptor/ligand mode. Carbohydrates in the secretions and the cell membrane glycocalyx have been shown to serve that purpose. Thus changes of carbohydrate expression on the respiratory surface of alveoli maybe an important change in the defense of asthmatic lung. To determine carbohydrates in the lung parenchyma we used biotinylated lectin probes: GNL, GSA I., DEL, MAL II, PNA. Their binding on the histological section was detected with ABC Vector kit, and the horse radish peroxidase converted the colorless DAB to a brown insoluble precipitate. We graded this product on a scale from 0–5 for surface alveolar staining in control (5) and asthmatics (13). The assessment was made of the reactivity of Type I and Type II cells, macrophages and vascular capillary endothelium. The density of brown precipitate in examined lung parenchyma ranged in Type I cells ranged from (1.5 – 4), Type II cells (1-5), Macrophages (3-5), and Endothelium (2-5). The most significant disparity of carbohydrate expression between the control and asthmatic tissues was observed with PNA lectin binding to β-gal(1-3)galNAc. The least significant difference was observed in the respective control specimens. In general the asthmatic tissue expressed a diminished lectin detectable carbohydrate compared to control tissue. The differences in the reactivity and carbohydrate expression as detected by lectin histochemistry need further exploration in its role in the pathogenesis of peripheral lung disease. (Supported by NSU Faculty Research Grant)

MED-15 Digital assessment of the neoplastic expression of sialic acid in pulmonary carcinomas. P. WEISMANN (1), P. BABÁL (1), L. DANIHEL (1), E. KUBÍKOVÁ (1) and A.T. MÁRIÁSSY (2). (1) Comenius University, School of Medicine, Bratislava 81372, Slovakia, (2) Nova-Southeastern University, College of Medical Sciences, 3200 S. University

Dr., Ft. Lauderdale, FL 33328. Carbohydrates on the cell surfaces interact with adjacent cells and the endothelium. Neoplastic cellular changes are known to affect the glycocalyx and the "stickiness" of the cell surface. We hypothesize that the sialic acid expression is differentially altered in pulmonary adenocarcinoma and this change maybe quantitatively assessed with a sialic acid recognizing *Trithrichomonas mobililensis* lectin (TML). Lectin binding was detected with Avidin-Biotin, Vector Kit.® Images of the TML reacted sections of pulmonary tumors were digitized at constant illumination with IMT4 CCD Camera and the images were morphometrically evaluated with the Olympus Analysis Program. For more efficient estimation of the reaction product we reduced the blue signal and accentuated the red one in all images equally with ADOBE Photo Shop Elements 2.0. The resulting edited images had more precise pixel definition of the reaction product and allowed a more precise measurement of the reactive sialic acid residues in the area of interest. Detected sialic acid ranged from 0.5% to 3.3% of the examined tissue. Correlation was sought with the tumor type, grade and metastasis. While there was a casual relationship of metastasis with low percentage of detected sialyl residues < 1.5%, the relationship was not entirely consistent. We wish to further explore the sialic acid involvement in the assessment of neoplastic transformation, especially with respect to the anomeric variation of this important molecule. We conclude that the configuration of the sialyl residues maybe important in the transformation of the cell glycocalyx in neoplastic cells. These findings should be considered when deciding on the tools for quantitative estimations of specific, defined areas of the differential expression of carbohydrates in the diagnosis of tumors. (Supported by NSU Faculty Research Grant)

MED-16 Airway remodeling in asthmatic lung: analysis of the basement membrane. S. BOLAND (1), J. FALLON (1) and A.T. MARIASSY (2). (1) College of Health Sciences, Graduate Biomedical Sciences, Barry University, 11300 NE 2nd Ave, Miami Shores, FL 33161, and (2) NOVA Southeastern University, College of Medical Sciences, 3200 S. University Dr., Ft. Lauderdale, FL 33328. Bronchial asthma can be characterized as a chronic inflammatory disorder that can cause shortness of breath, wheezing and permanent airway deterioration. Classical components of the airway remodeling are the thickening of the basement membrane; eosinophil infiltration of lamina propria, sloughing-off of epithelium, smooth muscle and connective tissue proliferation with edema. We present here a link between the severity of asthma and the measurement of the basement membrane thickness. Using the computerized, Image-Pro-Plus® morphometry program we examined digitized images of H & E stained bronchial sections from asthmatic and non-asthmatic subjects. We measured BM thickness at approximately 20 µm intervals in the 20× objective magnified in images. We determined the average thickness of basement membrane for each airway. The accepted range for non-asthmatic basement membrane is 6-10 µm, and < 11 µm in asthmatic subjects according to published data. We divided the subjects into respiratory disease free group (0.5-10 µm) and asthma group (> 10 µm). In the healthy, control subjects we observed normal respiratory epithelium. Basement membrane thickness in these subjects ($n = 7$) was $7.9578 \pm 1.5938$ which was significantly different from the asthmatic group $19.1585 \pm 6.6168$ ($p < 0.05$) in asthmatic subjects ($n = 16$). From our examined data we were able to support our hypothesis that the severity of asthma is tied to an increase in basement membrane thickness. (Supported by NSU Faculty Research Grant)

## MED Posters

MED-P43 Which nurses are being trained to respond to terrorist attacks? A. LAMET and D. MOLNAR. Barry University, College of Health Sciences, 11300 NE 2nd Avenue, Miami Shores, Fl. 33161. After the September 11 attacks, healthcare advocates agree that nurses must have the skills and abilities to respond to terrorist attacks. In this secondary analysis of 29,738 respondents to a 2004 National Sample Survey of Registered Nurses conducted by the Gallup organization for the U.S. Department of Health and Human Services, the following research questions were addressed: To what extent are nurses receiving terrorism training and what characteristics of nurses increase the likelihood of receiving terrorism training? First responders who were most likely (71%) to receive training. Excluding first responders, nurses in administration positions are significantly more likely (43%) to receive training than nurses who provide direct patient care (39%). Men (45%) are significantly more likely to receive terrorism training than women (38%). Doing a 2 way ANOVA, looking at gender and position, men and women in administration position are equally likely to receive training. However, using Mann-Whitney test of ranks it was determined that men received nearly twice the number of hours of training (27 *vs*.15). Men were also more likely to perceive that the training enables them to effectively participate in an organized multidisciplinary response to a terrorist event (77% *vs*.71%). Men receive more training than women regardless of position and men are more likely to receive training if they are in patient care. In responding to a terrorist attack more male voices will be heard, with less of a female perspective. This could lead to a response with social stereotypes of male roles.

MED-P44 Is RN job dissatisfaction related to return to education? D. RICE, F. BEASON, J. RITTER and D. MOLNAR. College of Health Sciences, Barry University 11300 NE 2nd Ave, Miami Shores, FL 33161. The nursing shortage of highly trained nurses in the United States has been a serious problem for years. Our exploratory study includes examining the results of 29,949 respondents in a 2004 National Sample Survey of Registered Nurses conducted by the Gallup organization for the U.S. Department of Health and Human Services Administration. This study specifically examines the results of the following questions: (1) The level of satisfaction associated with your current job related to enrollment in a formal education program and if so, does dissatisfaction make it more likely to choose another profession? (2) If enrolled in a formal education program, are you enrolled in a non-nursing field useful to enhancing your career in nursing or outside of nursing? (3) Finally, are you enrolled as a Registered Nurse that requires a license? This study had the following major purposes, the first being to determine nurses who are currently enrolled in a formal educational program and the level of satisfaction with their principal nursing position. Next, we looked at nurses involved in patient care and if they were currently enrolled in formal educational program. The Independent/Predictors Variables used include: age, ethnicity, income, marital status, and full time employment. The Dependent/Outcome Variables are the decisions in staying in or leaving the field of nursing. We examined associations using contingency tables as well as Cramer's V. As expected, there is a relationship between job satisfaction and the decision to return to school only for nurses in direct patient care. Another finding showed the higher the level of dissatisfaction, there more likely the nurse was to return to school. Our conclusion was the while job satisfaction is related to the return to school to further one's education, it is a small part of the decision. In addition, future health care policy will be needed to help determine other factors in returning to school such as time constraints and finances.

## PSS = PHYSICS & SPACE SCIENCES |return to top|

PSS-01 Search for a Z' boson in the dimuon channel in p-p collisions with the CMS experiment at the Large Hadron Collider. H. KALAKHETY and M. HOHLMANN. Department of Physics and Space Sciences, Florida Institute of Technology, 150 W. University Blvd., Melbourne, FL 32901. Many models that have been developed to describe potential new particle physics and to explain electroweak symmetry breaking include extra U(1) factors in the gauge boson sector. A resonance structure at the TeV energy scale is common to many of these models of new physics. One of these particles, a Z' boson, would be expected to appear as a TeV scale resonance at LHC at CERN, and is of particular interest to us. Z' bosons are expected to couple with electroweak strength to Standard Model fermions and could be observed at the LHC as narrow resonances in the dimuon mass spectrum. We have been searching for such a boson in the dimuon channel at the CMS experiment and present results on this Z' search from the first data taking run in 2010.

PSS-02 Imaging with, spatial resolution of, and plans for upgrading a minimal prototype muon tomography station. J. LOCKE, W. BITTNER, L. GRASSO, K. GNANVO and M. HOHLMANN. Florida Institute of Technology, Department of Physics and Space Sciences, 150 West University Blvd, Melbourne, FL 32901. Muon tomography uses multiple Coulomb scattering of cosmic-ray muons in matter to reconstruct tomographic images of matter. A muon tomography station (MTS) consists of at least four detectors: two on top and two on bottom. The active volume is between the top and bottom detector sets. Muons are detected by the top detectors, scattered by material in the active volume, and detected by the bottom detectors. The locations and angles of muons scattering are computed from the incoming and outgoing muon tracks; denser and higher-Z materials scatter the muons more. The locations and compositions of materials in the active volume are computed from the reconstructed muon tracks, and tomographic images of matter in the active volume are produced. In April 2010, a minimal MTS using gas electron multiplier (GEM) detectors and having an active volume of approximately 5x5x10 cubic centimeters was constructed and tested. Reconstructed, tomographic images of small iron, lead, and tantalum targets are presented. Muon track data are used to align the detectors, and comparisons with Monte Carlo simulations are used to estimate the spatial resolution of the detectors. The detectors achieve a spatial resolution of approximately 130 microns. Monte Carlo simulations are used to estimate the capabilities of an improved MTS currently under construction with a cubic foot active volume and muon detectors on the sides of the active volume to improve muon coverage. Simulations of the tomographic imaging capabilities and muon coverage of the improved MTS are presented.

PSS-03 Characterization of triple-GEM detectors constructed with a low-cost stretching technique using infrared heating. M. STAIB, M. ABERCROMBIE, B. BENSON, K. GNANVO and M. HOHLMANN. Florida Institute of Technology, Department of Physics and Space Sciences, Florida Institute of Technology, 150 West University Boulevard, Melbourne, FL 32901. The foil framing process is one of the critical steps in the production of gas electron multiplier

(GEM) detectors. As GEM foils continue to increase in size, traditional methods of stretching and framing become more cumbersome and costly. We have developed a low-cost method of foil stretching based on a modified thermal technique using Plexiglas frames and infrared heat lamps. We have applied this scalable technique to stretch and frame several 30 cm × 30 cm GEM foils for use in our muon tomography station and one 1 m × 50 cm drift foil for the prototype of the CMS high-η muon detector upgrade. Two triple-GEM detectors were constructed using foils stretched by this method. The gain uniformity of these detectors has been mapped using measurements from a Cd 109 gamma ray source. The efficiency of charged particle detection has also been measured using cosmic ray muons. Results will be discussed and appear to be consistent with those from detectors assembled by traditional methods.

PSS-04 Effects of interplanetary transport on the event integrated spectra of solar energetic particles observed in the inner heliosphere. I. DIAZ, M. ZHANG and H.K. RASSOUL. Department of Physics and Space Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. It takes from a few minutes to hours for solar energetic particles to transport from the Sun to Earth. Because the speed of particle transport and scattering are energy dependent, the instantaneous spectrum of solar energetic particles rapidly varies over the time scale of an event. As a result, we typically look at their event-integrated spectrum, in order to infer the spectral properties of source particles and to minimize time dependent variations. Observed event-integrated spectrum often shows a joint double power-law distribution with a smaller spectral slope at lower energies. The energy at the spectral break or roll-over depends on the charge-to-mass ratio of particles (Mewaldt *et al*., 2006; Tylka *et al*., 2005). We have used a stochastic model of solar energetic particle transport (Zhang *et al*., 2009) in a 3-dimensional Parker magnetic field to study the event-integrated solar energetic particle spectrum. With this model we can study how the event-integrated spectra at different locations in the inner heliosphere, particularly at Earth or at Mars orbit, depend on the properties of particle transport in the interplanetary medium. Our model results show the event-integrated spectrum still has an approximate power-law distribution but the spectral index is smaller than that of source particles injected at the Sun. At high energies, the event-integrated spectra shows a gradual roll-over to steeper spectral slopes. The value of the roll-over energy and observed spectral index depends on the spectrum of injected particles and on the radial distance. In addition, we will show how the event-integrated spectrum is affected by interplanetary transport coefficients.

PSS-05 Development of laser-based therapeutics for skin cancer: Immunolocalization of heat shock proteins in laser-irradiated mouse skin. A.Y. SAJJADI (1), B. REINARD (2), K. MITRA (1) and M.S. GRACE (2). (1) Department of Mechanical and Aerospace Engineering, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901, (2) Department of Biological Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. In order to develop effective laser-based therapeutics for skin cancer, the extent of laser-induced damage must be quantified for given laser parameters (power, intensity, duration, *etc*.). Therefore, we set out to determine the spatiotemporal expression patterns of heat shock proteins, both to understand the roles of heat shock proteins in laser-induced tissue damage and repair and to develop heat shock proteins as tools to illustrate the extent of laser-induced damage and wound healing following irradiation. We exposed anesthetized mouse skin to the focused beam of a short-pulse Nd:YAG laser (1,064 nm; 200 nsec pulsewidth) for 15 sec, while continuously measuring temperature distribution in the skin using an infrared thermal camera. Following irradiation, we examined expression of 47 kDa and 70 kDa heat shock proteins (HSP47 and HSP70) over time (0 to 36 hours) as indicators of the heat shock response and recovery from damage in the laser-irradiated region. Double-label immunofluorescence was performed using HSP47- and HSP70-specific primary antisera followed by Alexa-dye-labeled secondary antisera; DAPI-labeled DNA was used to illustrate tissue architecture, and images of immunolabeled tissues were obtained by laser scanning confocal microscopy. We also performed histological analyses to measure the ablation area and to visually estimate the extent of the heat-affected zone for comparison with HSP expression patterns. Both HSP70 and HSP47 were expressed in dermis and epidermis following laser irradiation, and the spatial and temporal changes in HSP expression patterns define the laser-induced thermal damage zone and the process of healing in tissues. HSP70 may define biochemically the thermal damage zone in which cells are targeted for destruction, and HSP47 may illustrate the process of recovery from thermally-induced damage. Studying the effects of different laser parameters on HSP expression will allow development of effective laser therapies that provide accurate and precise tissue ablation and may promote rapid wound healing following laser-based surgery.

PSS-06 Improving gas mileage with hydrogen. M. BECKER (1,2). (1) Indian River State College, 3209 Virginia Ave, Fort Pierce, FL 34981, (2) Olivet Private School, 568 SE Port Saint Lucie Blvd, Port St. Lucie, FL 34984. As gas prices have started to rise again, many people are beginning to realize that, because our fossil fuel supplies are limited, our society will not be able to run solely on them forever and that a solution needs to be developed immediately. The solution I

propose is an emerging technology known as a hydrogen generator system, which uses the process of electrolysis to break down water molecules into gaseous hydrogen and oxygen ($2\ H_2O \rightarrow 2\ H_2 + O_2$) Once this process has taken place the gaseous hydrogen and oxygen, known as oxyhydrogen, are fed into the engine to be burned along with the gasoline. My hypothesis is that, by implementing this technology in a test vehicle (1998 Chevrolet 1500 v6), a fuel mileage increase of at least 10% can be achieved. In 2009-2010 I designed, built, and tested two generators which mechanically failed partway through testing, making data inconclusive. Although it appears that both generators improved the vehicle's fuel mileage, sufficient data could not be collected to draw credible conclusions as to how much increase was achieved. This year I analyzed the failures of last year's test and completely rebuilt one of the generators, correcting the design flaws which led the generator to fail. This improved generator remained fully functional throughout the entire testing process which demonstrates that the repairs I made were able to correct the problems. In addition, the data collected during this experiment conclusively showed that I was, in fact, able to improve the gas mileage of the test vehicle. Although I was unable to meet the 10% hypothesized, I came very close with an average fuel mileage increase of 8%. In the near future I plan to increase the hydrogen output which should easily push the increase to over 10%.

## PSS Posters

PSS-P45 Weekly fleet assignment with continuously adjus-table flight schedule. C.-M. LI and T.-C. WANG. Institute of Civil Aviation, National Cheng-Kung University, No. 1, University Road, Tainan City 70101, R.O.C. Fleet assignment is one of the four major steps in airline planning. The objective of fleet assignment problem (FAP) is to determine which type of aircraft should fly on each flight leg while considering the fact that different fleet types have different characteristics and costs. The main purpose of FAP is to maximize revenue or minimize total operation cost with a given airline schedule. The constraints involved in FAP are flight cover, aircraft balance, and the fleet size. The resulting problem is usually formulated as an integer programming problem. Due to the size of the FAP, various heuristic methods have been studied to solve the problem. This report proposes two-phase approach to solve the fleet assignment problem (FAP). First, we use backward arcs in the basic FAP. By allowing backward time, we seek for the optimal feasible solutions with minimum required flight reschedule. Second, we solve a continuously adjustable flight schedule problem using linear programming model instead of using time window to change flight schedules. Our formulation has similar flexibilities as fleet assignment with time window (FAMTW). Comparing our model with FAMTW, we have fewer variables than FAMTW. This means that we can save more computation time because the searching space is reduced. To demonstrate the effectiveness of our approach, examples with real data obtained from a major airline are included in this paper.

PSS-P46 Determining the location of termination shock using signature of galactic cosmic ray modulation by Global Merged Interaction Region in the heliosheath. X. LUO, M. ZHANG and H.K. RASSOUL. Department of Physics and Space Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Global Merged Interaction Region (GMIR) is a shell-like solar wind structure with enhanced magnetic field and solar wind speed. Acting as a propagating diffusion barrier, it is known that GMIR affects the cosmic ray transport inside the termination shock. In order to investigate the GMIR effect in the heliosheath region, we incorporate a GMIR model into our cosmic ray modulation code, which uses stochastic integration method to solve the Parker transport equation. Our simulations show that GMIR still affects cosmic ray modulation inside the heliosheath. But details of modulation profile are different from the supersonic solar wind region: cosmic ray intensity inside heliosheath experiences two transient decreases, one corresponding to GMIR arrival at the termination shock, the other occurring at GMIR arrival locally. Voyager-1 2006 cosmic ray intensity also shows similar two-step decreases. Based on this feature, we estimate the TS should locate at radial distance ~ 91AU along Voyager-1 direction in March 2006, indicating that TS has moved in ~ 3AU since first crossing by Voyager-1 in December 2004 at ~ 94AU.

PSS-P47 The chromospheric activity and age relation among main sequence stars in wide binaries. T.D. OSWALT and J.K. ZHAO. Physics and Space Science Department, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. We present a study of the chromospheric activity levels in 36 wide binary systems. Thirty one of the binaries contain a white dwarf component. In such binaries the total age can be estimated by adding the cooling age of the white dwarf to an estimate of the progenitor's main sequence lifetime. To better understand how activity correlates to stellar age, 14 cluster member stars were also observed. Our observations demonstrate for the first time that in general activity decays with age from 50 Myr to at least 8 Gyr for stars with $1.0 < V\text{-}I < 2.4$. However, little change occurs in activity for stars with $V\text{-}I < 1.0$ between 1 Gyr and 5 Gyr. The slope of constant age lines in the activity *vs*. V-I plane for young stars is

relatively steep, while for old stars it appears to be flatter. In addition, our sample includes five wide binaries consisting of two main sequence stars. These pairs provide a useful reality check on our activity *vs*. age relation.

## RES = FLORIDA COMMITTEE ON RARE AND ENDANGERED SPECIES |return to top|

RES-01 Post-fire resprouting and flowering in Florida scrub. E.S. MENGES (1), S.A. SMITH (1), S.J. HALLER (1), C.W. WEEKLEY (1), B. POIRIER (1), D. HORTON (1), A. MAGUIRE (2) and J. OLANO (3). (1) Archbold Biological Station, PO Box 2057, Lake Placid, FL 33862, (2) Department of Biology, Michigan State University, East Lansing, MI 48824, (3) Botany Lab, EUI Agrarias, Universidad de Valladolid, Los Pajaritos s/n, Soria E-42003 Spain. Most dominant shrubs in Florida scrub (*e.g*. oaks, palmettos, ericads) resprout from belowground parts after fire, the predominant ecological disturbance in Florida. Resprouting shrubs form patches, between which are gaps that support many endangered plants in the first few decades post-fire. We describe results from four studies that explore the diversity of resprouting species and limits to resprouting. Fire produces very little < 5%) mortality in most resprouting shrub species. Resprouting shrubs show a range of post-fire growth rates, with palmettos growing fastest followed by obligate resprouters followed by species that combine resprouting with seedling recruitment. Larger pre-fire plants grow fastest post-fire (pre-fire size explains 50% of post-fire growth rates) and there are strong ($r = -0.6$) tradeoffs between height growth and numbers of stems produced. Some species recover pre-fire size in six months; others take more than three years. Post-fire reproductive effort is strongly related to time-since-fire; in some species it also decreases seven-fold over a range of fire frequencies. A fire frequency experiment underway suggests that very frequent fires can significantly ($p < 0.05$) reduce height growth and starch concentrations of resprouting shrubs. Post-fire resprouting is variable depending on the species, plant size, and the fire regime. Fire management in the endangered Florida scrub ecosystem needs to move beyond cataloging facts about the fires (*e.g*. frequency, season) to considering its effects on vegetation structure and dynamics. In turn, vegetation structure influences the demography and metapopulation dynamics of endangered plants.

RES-02 Reintroduction of the fragrant prickly apple cactus (*Harrisia fragrans*) at several sites in Indian River and St. Lucie counties. J.A. MOORE (1) and C.A. VANDELLO (2). (1) Florida Atlantic University, Wilkes Honors College, 5353 Parkside Dr., Jupiter, FL 33458, (2) Savannas Preserve State Park, 9551 Gumbo Limbo Lane, Jensen Beach, FL 34957. The endemic fragrant prickly apple cactus (*Harrisia fragrans*) is found on well-drained shell mounds and sandy xeric habitat on the Atlantic Coastal Ridge and barrier islands in eastern Florida. The species formerly extended from Volusia County south to the St. Lucie River. Along much of its range this cactus was extirpated due to development on the coastal ridge and barrier islands. This loss of habitat and reduction in overall population size led to the federal and state listing as an endangered species. Since 2000, we have been raising cactus seedlings and have now initiated a program of replanting in several protected sites in St. Lucie and Indian River counties. We will discuss methods of raising cactus seedlings, transplantation, and the monitoring program that has begun. Our goal is to expand the established population at Savannas Preserve State Park and create new experimental populations outside the park that will be self-sustaining in the future.

RES-03 The distribution and ecology of the endangered lichen (*Cladonia perforata*) along the Atlantic Coastal Ridge in Florida. S.L. RICHARDSON and J.A. MOORE. Florida Atlantic University, Wilkes Honors College, 5353 Parkside Dr., Jupiter, FL 33458. The Florida perforate lichen, *Cladonia perforata*, is a federally-listed, endangered lichen found only in Florida. It remains very rare and is currently known from three regions: the Lake Wales Ridge, the Panhandle, and the Atlantic Coastal Ridge. We have surveyed undeveloped scrub sites along the Atlantic Coastal Ridge to better understand the distribution of this species in eastern Florida. We previously located this species at 15 sites along the ridge, and have now found several more populations in Martin County. Various microhabitat requirements of this lichen, including substrate, canopy cover, associated plant and lichen flora, and position in clearings, were noted in several measured quadrats. The densest accumulations of *C. perforata* are found on the margins of open sandy areas, associated with a low-diversity community of ground-dwelling lichens (*Cladina evansi*, *C. subtenuis*, *Cladonia leporina*, *C. pachycladodes*, and C. prostrata) and vascular plants (sand pine [*Pinus clausa*], scrub oaks [*Quercus* spp.], saw palmetto [*Serenoa repens*], sand spike moss [*Selaginella arenicola*], three-awn grass [*Aristida* spp.], nodding pinweed [Lechea cernua], milk pea [Galactia spp.], silk grass [*Pityopsis graminifolia*], and yellow buttons [*Balduina angustifolia*]). Substrate typically consists of dense scrub oak leaf or sand pine needle litter at the margins on these sites. Very sparse individuals may be found isolated in the center of sandy areas. Canopy cover is typically low (mean of 6.6% for six different sites), ranging from 0% to 54.6% (underneath a large sand pine). Length from the base of the thallus to the most distal tip was measured for 616 specimens of *C. perforata* from all six sites. The overall mean is 19.5 mm ($s = 8.52$, $s^2 = 72.61$).

RES-04 Using GIS to investigate environmental factors contributing to the presence of an endangered plant (*Campanula robinsiae*). S. LEWIS (1), T. HINDLE (1) and C. PETERSON (2). (1) Department of Geosciences, Florida Atlantic University, 777 Glades Road, Boca Raton, FL 33431, (2) Bok Tower Gardens, 1151 Tower Blvd. Lake Wales, FL 33853. GIS (Geographical Information Science) plays an increasingly important role in efforts to protect rare and endangered flora and fauna. In this project, GIS is being used to assist in efforts to protect a federally listed endemic plant (Brooksville Bellflower, *Campanula robinsiae*) that is found in only four locations in two Florida counties (two in Hernando and two in Hillsborough). GIS spatial analysis is used to identify environmental factors that potentially play a key role in the plant's presence. The use of GIS also allows the prediction of additional sites where the plant might be found and identification of potential sites for outplanting of cultivated seedlings, which is part of the planned conservation effort for this endangered species. In order to pinpoint the factors that might contribute to the growth and survival of *C. robinsiae*, written reports and researchers working to conserve the plant were consulted to identify potential critical habitat factors. The geographic factors (proximity to wet areas, amount of precipitation, elevation, slope, and aspect) were examined with respect to their ranges in locations of known populations of *C. robinsiae*. The resulting parameters were used to create a model to select areas that satisfied the criteria. The model was used in conjunction with background GIS layers to locate potentially similar areas where the plant might be found. Follow up plans include searching these areas for evidence of *C. robinsiae* and using the results to fine-tune the model and the use of GIS to locate additional populations and potential reintroduction sites for future conservation efforts.

RES-05 Metapopulation structure, population trends, and status of Florida Grasshopper Sparrows. J.W. TUCKER (1,4), G.R. SCHROTT (1), M.F. DELANY (2), S.L. GLASS (3), C.L. HANNON (3), P. MILLER (4) and R. BOWMAN (1). (1) Archbold Biological Station, Avian Ecology Lab, P.O. Box 2057, Lake Placid, FL 33862, (2) Florida Fish and Wildlife Conservation Commission, 1105 SW Williston Road, Gainesville, FL 32601, (3) Florida Fish and Wildlife Conservation Commission, Three Lakes Wildlife Management Area, 1231 Prairie Lakes Road, Kenansville, FL 34739, (4) Florida Department of Environmental Protection, Division of Recreation and Parks, Kissimmee Prairie Preserve State Park, 33104 NW 192nd Avenue, Okeechobee, FL 34972. The federally Endangered Florida Grasshopper Sparrow (FGSP, *Ammodramus savannarum floridanus*) is endemic to dry prairie habitat in central Florida and is currently only found at three public management areas (Avon Park Air Force Range, APAFR; Kissimmee Prairie Preserve State Park, KPPSP; and Three Lakes Wildlife Management Area, TLWMA). We analyzed long-term (1991–2008) point-count data to compare population trends of FGSPs at these management areas to determine if they function as independent populations. We also examined banding and re-sighting data to infer metapopulation structure. Populations fluctuated across years at all three sites, declining significantly at APAFR and KPPSP and remaining stable at TLWMA. Population trends among the three management areas appeared independent. Previous studies indicated that sparrows in the three areas were not genetically differentiated, and two cases of dispersal between APAFR and KPPSP have been documented. However, dispersal rates among areas appear to be too low to influence demographic dynamics within individual areas. Within APAFR, FGSPs are aggregated into three spatially distinct habitat patches previously considered separate populations, but dispersal among these patches is more frequent than previously reported and population trends among these patches are correlated. These patterns suggest that a single metapopulation of FGSPs exists consisting of three distinct populations (APAFR, KPPSP, and TLWMA). The population at APAFR is at risk of extirpation, and immediate action is needed if that population is to recover. Taking broader metapopulation dynamics into account will be useful for guiding management efforts aimed at conserving the FGSP.

## TCH = SCIENCE TEACHING |return to top|

TCH-01 Reflections: Lessons learned from 25 years in a Biology classroom. P.L. ZALO. Manatee High School, 902 33rd Street Ct W, Bradenton, FL 34205. Biology is a "*foreign language*" to most students. Vocabulary strategies are required to increase students' understanding. Initial evaluation of the unit's terms with identification of Greek and Latin word roots begins the process. Daily students refer to the same list and use the terms in sentences to display what they learned that day. At the end of the unit students must use the previously unknown terms in sentences, thereby exhibiting that they have gained understanding of those terms. Pre-reading techniques can help students obtain meaningful information from textbooks. A weakness in most Biology classrooms is the collection and evaluation of data. Reviewing simplified inferential statistics is the first step to enable students to properly discern conclusions from data. Adapted experiments from AP Biology increases the critical thinking and problem solving experiences that students need to reinforce these concepts. The State of Florida has identified benchmarks that will be tested in the future end-of-course exam and yet most students

have never seen these benchmarks. By giving the students a copy of the benchmarks and having them reflect on the relevant benchmarks at the end of each unit the students can see how the course is preparing them for the exam. Students need to be taught in the way that they learn best, this means that a teacher must address all learning styles to help each student find success. Each day in the classroom is a learning experience for both the teacher and the students.

TCH-02 The impact of online homework on assessment scores in college General Chemistry. B. LYP, A. HOARE and K.M. CARVALHO-KNIGHTON. Environmental Science, University of South Florida, 140 7th Ave South DAV 258, St. Petersburg, FL 33701. World Wide Web learning continues to rapidly expand in the higher level education universities nationwide. Students are transitioning and adjusting from in classroom learning to web based technology learning which continues to prepare many students for future classes, graduate work and careers. Using online educational applications allows students to gain valuable skills for the future including learning how to communicate effectively, interpret data, understand computation models, establish time management and engage in problem solving. Understanding and comprehending chemistry can be challenging for many students and therefore examining utilization of the World Wide Web and technology programs is worthwhile. This study evaluated two sections of the General Chemistry 1 course and the General Chemistry 2 course over the course of two years to determine if the Mastering Chemistry online learning approach increases final exam and final grades compared to the in classroom with no online learning homework. Multi-factor unbalanced analysis of variance (ANOVA) was used to test at 5% significance level whether an assessment score (final exam and final grade) is the same across a given demographic variable (homework, gender, ethnicity and student classification). The results from this study will be discussed.

TCH-03 Comparative analysis of student achievement in an online versus traditional General Chemistry first semester lecture course. K.M. CARVALHO-KNIGHTON (1) and L.S. KEEN-ROCHA (2). (1) Environmental Science, University of South Florida, 140 7th Ave South, DAV 258, St. Petersburg, FL 33701. (2) Marang Science and Math Centre, University of Witwatersrand, Private Bag 3 Wits 2050, Johannesburg, South Africa. Distance learning via online courses has become an expected component of higher education to accommodate a variety of students. Many higher learning institutions offer online courses across a variety of disciplines. This empirical study compared the achievement of several sections of a first semester, undergraduate general chemistry lecture online course with an equivalent traditional face-to-face course on a variety of dimensions. Four outcome dimensions were measured: participants' quiz scores, exam scores, final exam scores, and final course grades. The sections were taught by the same instructor with the same instructional materials with the exception of lecture *via* podcast access to only online students. Using independent samples t-test, results indicated there was a significant difference in the quiz and final exam scores between the online and traditional sections. However, the results revealed no significant differences in exam scores or final grades between the online and traditional course.

TCH-04 Utilizing memory matrices to facilitate learning in science courses. T.P. ARNOLD. Health Science Program, South University, 4401 North Himes Avenue, Tampa, Fl. 33614. Lecture material is organized into structured elements by the faculty and presented in multi media. Students are expected to retain this material and see elaborate patterns which will be tested on at a later date. To see these patterns and increase understanding of them, a series of charts or matrices are developed for each subject and course. These matrices are used in development as a formative assessment. For the formal summative assessments (exams), subject material is drawn from these matrices and tested for retention and critical understanding. Examples will be discussed including essay and multiple choice questions developed from these matrices according to Bloom's Taxonomy.

TCH-05 Results of integrating research-inspired laboratory modules in the general chemistry curriculum. K. WINKELMANN, M. BALOGA, G. ANQUANDAH and P. COHEN. Department of Chemistry, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Beginning in the fall 2010 semester, Florida Tech updated its general chemistry-I laboratory curriculum in order for students to engage in interdisciplinary, research-inspired lab modules. Each multi-week module was based on research currently being conducted at Florida Tech in the departments of physics, marine and environmental science, mechanical and aerospace engineering, and chemistry. The respective module topics are: generation of $NO_x$ gases via electrical discharge, use of nanoparticles to remove water pollutants, effect of surface treatment on composite properties, and removal of aqueous pharmaceutical pollutants using high oxidation state iron (ferrate). Working in groups of four, students chose a particular aspect of the module's central chemical reaction to investigate, then wrote a laboratory report describing their work. Students completed surveys at the beginning and end of the semester to determine their familiarity and comfort level working in a chemistry lab and performing open-ended research projects or

inquiry-based laboratory experiments. Results of this ongoing project will be presented, along with future planned changes and improvements to the curriculum.

TCH-06 New nanotechnology experiments for first-year students. K. WINKELMANN, A. CAMP, C. HODES, M. PRICE, C. TERMINI and C. THIELE. Department of Chemistry, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Two new chemistry experiments have been added to Florida Tech's Introduction to Nanotechnology Laboratory course. Freshman students prepare polymethylmethacrylate (PMMA) composites containing aluminum oxide nanoparticles. These nanocomposites are stiffer than the pure PMMA solid material and their mechanical properties vary with the amount of nanomaterial added. A maximum stiffness is achieved at low concentrations but the material becomes more flexible at higher aluminum oxide concentrations. A homemade device allows students to measure the deflection of their nanocomposite samples as a function of applied force. In a second experiment, freshman students synthesize iron nanoparticles and add them to a dye solution. During a five minute period, students measure the decrease in dye concentration as the iron nanoparticles chemically reduce the dye molecules. Students then use iron powders with different particle sizes to perform the same reaction. The reaction rates vary with particle size with larger particles reacting more slowly. Students discuss the advantages and disadvantages of using nanoparticles for waste water remediation.

TCH-07 Antibiotic resistance in the normal biota of the nares may lead to a secondary infection. A. STEWART-AKERS and R. WOLFF. South University-Columbia, 9 Science Court, Columbia, SC 29203. A laboratory exercise to determine the antibiotic resistance carried in normal flora was used to demonstrate how the treatment with antibiotics may result in the occurrence of a secondary infection. Antibiotic resistance of *Staphylococcus aureus* from nare samples was examined using the Kirby-Bauer plate diffusion assay. Nares samples were inoculated on MSA agar plates. Manntiol-fermenting bacteria was gram-stained and those that were gram-positive cooci were presumed to be *S. auerus*. These samples were then inoculated, grown in nutrient broth and spread as a lawn for use in the Kirby-Bauer plate diffusion assay. After the bacterial was spread on Mueller Hinton agar, an eight disk Dico Dispens-O-Disc was used to place antibiotic disks on the plates. After 48 hours incubation at 37C, the zones of resistance to tetracycline, erythromycin, kanamycin, chloramphenicol, neomycin, novobiocin, penicillin and streptomycin were measured and compared to standard charts. In a total of 19 samples the number of antibiotics a single sample showed resistance to ranged from 0 to 8. The mode of antibiotic resistance was 3 with 6 different samples having this value. While 16 of the samples had resistance to 4 of less antibiotics 2 samples showed resistance to all 8 antibiotics tested. When a patient is treated with an antibiotic the normal flora may also be reduced by the treatment. If the patient is caring an antibiotic resistant strain of *S. aureus* in their normal flora then that bacteria may have a growth advantage and a secondary infection may occur. This exercise will help our students see that antibiotic resistance in bacteria can be found in our normal biota and therefore play a role in secondary infections when a patient is treated with an antibiotic.

## TCH Poster

TCH—P48 Integrating science outreach into the curriculum. G. FAWKS, M. VERBEEK, P. TRESSLER and S. GILCHRIST. Division of Natural Sciences, New College of Florida, 5800 Bay Shore Road, Sarasota, FL 34243. Science literacy is very important. People continue to learn about the world around them their whole lives, both in formal and informal ways. New College of Florida offers a class called Science Outreach Seminar to learn how to facilitate science learning for all different ages and how to set up outreach activities. A project that several students have taken an interest in is using origami as a way of inviting people to learn about science. Origami is a hands-on activity that is fun and stimulating. It creates a learning space where risk taking is rewarded and the youngest folder can be the teacher. Before, during, and after folding teaching can be incorporated to the project. For example, during an open house at the marine lab on campus, participants folded fish, whales and turtles. Although many parents see origami as challenging several kindergartners were able to show proudly what they had accomplished. Seminar students then talked about the parts of a fish, discussed how fish differ from whales and offered brochures on turtles and turtle conservation. When people feel like they have a connection to an animal they are more likely to make efforts towards the conservation of that animal and its habitat. Origami can give them that connection. Come fold with us at the conference.

## SOC = SOCIAL SCIENCES |return to top|

SOC-01 Changes in annual *per capita* wealth and oil consumption habits during 2001-2006 for 186 nations: The trend does not look promising for long-term decreases in global *per capita* oil consumption. J.R. MONTAGUE and M. BRITTON. Department of Biology, Barry University, 11300 NE 2nd Ave, Miami Shores, FL 33161. Current social, political and economic opinions vary greatly on the long-term global trends expected for future economic growth and oil consumption. Using data collected from the U.S. State Department *CIA Factbook*, the World Bank, and *NationMaster.com*, we calculated the annual percent changes in: (1) per capita GDP ($); and (2) per capita oil consumption for 186 nations. Based on the six-year interval 2001-2006 (the latest oil consumption data available as of August 2010, and preceding the global recession beginning in 2007) we found 178 of the 186 nations showed positive annual growth in *per capita* wealth, but 72 of the 186 nations (including the U.S.) showed negative annual growth in *per capita* oil consumption. We regressed change in annual oil consumption onto change in annual GDP and found an insignificant relationship according to the function: (% change annual *per cap* oil consumption) = 0.0265×(% change annual *per cap* GDP) + (0.69), n = 186 nations, $r^2$ = 0.004, p = 0.40). We used geospatial information systems (GIS) mapping to show the disparity among nations (particularly China *vs*. the U.S.) in their patterns of recent changes in wealth and oil consumption. We look forward to new analyses using the post-2007 data.

SOC-02 Stereotype threat and cognitive ability. M. DEDONNO. Department of Psychology, Barry University, 11300 NE 2nd Avenue, Miami Shores, FL 33161. The purpose of the present study was to investigate the effect of stereotype threat on math and verbal task performance. A stereotype is a standardized or generalized perception of a specific group based on prior information or assumptions. When we recognize ourselves as being a member of a specific group and a known stereotype pertaining to a task happens to be negative, we may underperform at the task thereby confirming the negative stereotype. This action is known as stereotype threat. There have been a myriad of studies that explored the effects of stereotype threat on task performance (Obrien, & Crandall, 2003; Steele, &Aronson, 1995). A classic study found African American but not European American students underperformed on Graduate Record Examination (GRE) type tests that were labeled as diagnostic of intellectual ability (Steele, & Aronson, 1995). Gender stereotype threat has been found to hinder women's performance on math and science tasks (O'Brien, & Crandall, 2003). A question arises as to the sensitivity of an ethnicity stereotype threat on both math and verbal type tasks. Participants completed math and verbal tasks under one of two conditions: a stereotype threat (treatment) and a no threat (control) condition. Prior to completing the task, participants were given envelopes based on the research assistant's perception of the participant's ethnicity. The envelopes contained the same cognitive task but different instructions based on condition. The treatment group read instructions stating that their respective ethnicity typically underperformed other ethnic groups on the upcoming cognitive task. The control group read instructions that stated no ethnic difference in task performance. Results indicated that the stereotype threat had an effect on math test performance but not verbal test performance. It is possible that a decrease in effort and the use of less effective strategies due to the effects of stereotype threat may have imparted a stronger influence on the math test than the verbal test. Future researchers could explore the effects of positive reinforcement in the hopes of negating stereotype threat.

SOC-03 Various ways to communicate the Miranda Warnings to a deaf suspect. E.M. ROMERO and D.M. FELDMAN. Department of Psychology, Barry University, 11300 NE 2nd Avenue, Miami Shores, FL 33161. Administrating the Miranda Warnings can be problematic when it comes to a deaf suspect. There are three possible options for the presentation of the Miranda Warnings to a deaf suspect: (1) written form, (2) *via* lip-reading, or (3) sign language (Vernon, Raifman, & Greenberg, 1996). Each of these options has specific problems related to ensuring that the deaf suspect comprehends what is being conveyed. The purpose of this literature review is to discuss several factors related to the Miranda Warnings and deaf suspects such as reading level necessary to comprehend the information given and the warnings via sign language, most likely through a sign language interpreter. Research will be discussed to clarify and examine the ways to communicate the Miranda Warnings and how effective they are to deaf suspects.

## SOC Posters

SOC-P49 Nepotism as a counterproductive behavior in organizations. E. BRIGGS and G. WATED. Department of Psychology, Barry University, 11300 NE 2nd Avenue, Miami Shores, FL 33161. Counterproductive work behaviors have the potential to be extremely costly and thus present a threat to organizational success. This literature review focuses on one particular counterproductive work behavior, nepotism. Nepotism may be defined as the practice of giving preferential treatment to relatives and friends in workplace settings (Arsali and Tumer, 2008). Examples of nepotism in the workplace

include hiring unqualified family members, awarding kin for performance without merit, granting undeserved incentives, or administering unfounded wage increases. There is currently scarce information available about the antecedents and predictors of nepotism in organizations. The present work aims at summarizing the existing literature in order to foster a better understanding of the phenomenon.

SOC-P50 Those evil girls: Attitudes towards gender on sentencing juveniles. G. MARTINEZ and L. BACHELLER. Department of Psychology, Barry University, 1300 NE 2nd Avenue, Miami Shores, FL 33136. In the past decade, the number of female juveniles committing crimes has increased dramatically. Both gender and societal factors that have been proposed to explain this phenomenon. It is hypothesized that this may be due to the Behavior Change Hypothesis which states that females are displaying more masculine traits, and thus, engaging in more aggressive behavior. As well, the Policy Change Hypothesis states that competitiveness among females is increasing their risk-taking behaviors. Further, this hypothesis cites family structural changes, violence within the family of origin, and previous exposure to abuse may contribute to this increase in incidents of female juvenile crime. This rise in crime has affected how society and the courts respond to female juvenile offenders. It appears that society's view female offenders may fall into two categories. Society and the courts either view female juvenile offenders as evil and breaking with traditional gender stereotypes, thus called the Evil Woman Theory. Or on the other hand, society and the court may take a more paternalistic and protective approach, thus termed the Chivalry Theory. It is proposed that the way in which society and the court views female juvenile offenders will impact on their treatment within the juvenile justice system.

SOC-P51 Perceptions of sexual contact based on stereotypes. A.C. MORALES, D.M. FELDMAN and G. WATED. Department of Psychology, Barry University, 11300 NE 2nd Avenue, Miami Shores, FL 33161. The purpose of the present study is to examine perceptions of sexual contact based on gender stereotypes. The present study intends to examine if sexual contact is considered a serious crime, and this will be on the basis of morality, legality and attribution of blame. Participants will read a vignette describing a hypothetical sexual situation and then rate the scenario on perceived seriousness. It is anticipated that offenses involving an adult male and an adolescent male will be perceived as more serious than all other scenarios.

SOC-P52 Examining the self-esteem of Haitian adolescents. K. RIVERA-TORRES (1), P. HALL (1) and C. DESIR (2). (1) Department of Psychology, Barry University 11300 NE 2nd Avenue, Miami Shores, FL 33161. (2) Fischler School of Education and Human Services, Nova Southeastern University 1750 NE 167th Street, North Miami Beach, FL 33162. Self-esteem among adolescent children has been a topic of much research in modern psychology. Rosenberg (1985) defined self-esteem as "*the feeling of being satisfied with oneself, believing that one is a person of worth*." Self-esteem can be related to positive behaviors and emotions and it can also be related to negative ones, depending on the culture studied (Gentile, Twenge & Campbell, 2010). However, not much research has been conducted regarding the self-esteem of ethnic minority adolescents. In the present study, self-esteem of Haitian American high school students is being measured. To measure self-esteem, the Rosenberg Self-esteem scale has been used in various populations and has excellent validity and reliability (Heaven, Ciarrochi &Davies, 2007). Gentile, Twenge & Campbell, 2010 conducted a longitudinal study from 1998 to 2004 on adolescents ages 14 to 17. They found that the average scores on the Rosenberg Self-esteem scale rose from 29.86 to 31.84 [(SD = 5.09), d = 0.39]. Greene and Way (2005) found Asian adolescents have lower self-esteem than other ethnicities and Black adolescents reported the highest level of self-esteem, from age 13 to age 18. Further, they found that Latino and Black adolescents have similar self-esteem levels by the late adolescence. The present studied examined the self-esteem of Haitian adolescents living in South Florida to determine if their scores are similar to any other ethnic minorities. Results will be analyzed to determine if their self-esteem is consistent with other ethnicities.

## URB = URBAN AND REGIONAL PLANNING |return to top|

9:00 a.m. URB-01 Complete streets: Road diets for healthier com-munities. J. BARNES. Operations, Village of Wellington,14000 Greenbriar Boulevard, Wellington, FL 33414. The concept of "complete streets" is gaining momentum as a way to make communities more livable. A complete street accommodates all users, including pedestrians, bicyclists, and transit users. Furthermore, a complete street considers the needs of children, elderly, disabled persons, and those using the street as public space for leisure and socializing. If a street does not meet these diverse needs, then it is not complete. This presentation examines the complete streets concept and its application in various situations and conditions. We also review tools for complete streets including "road diets", traffic calming, and other approaches.

9:15 a.m. URB-02 Identifying barriers to low impact development and green infrastructure. J. BARNES. Operations, Village of Wellington, 14000 Greenbriar Boulevard, Wellington, FL 33414. Many municipalities are now implementing stormwater management techniques that integrate and utilize stormwater in urban design, while greatly reducing urban runoff and non-point source pollutants. These techniques, often referred to as Low Impact Development (LID) or Green Infrastructure (GI), include bio-swales, rain gardens, green roofs, porous pavement, and curb cuts, among many others. The United States Environmental Protection Agency (EPA) is strongly encouraging the implementation of LID and GI stormwater management programs. The purpose of this presentation is to identify barriers to the widespread implementation of LID and GI.

9:30 a.m. URB-03 Coastal property insurance subsidies and climate adaptation in Florida. H. YU and K. LINDEMAN. Department of Marine and Environmental Systems, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. The economy and culture of Florida are tied to the ocean – and coastal real estate. The private sector and local government focus has typically been on increasing development and density in coastal flood zones. Much flood zone development has been subsidized in very complicated manners by taxpayers who do not live in coastal areas. Diverse questions regarding the long-term sustainability of current trends are often unaddressed, particularly with the likely acceleration of sea level rise. We examined the economic efficiency, financial equity, and long-term sustainability of property insurance and associated subsidies in selected areas of coastal Florida. Specific attributes of subsides that foster development were detailed by comparing data sets from coastal and inland counties. In support of these analyses, the largest coastal insurer in Florida (Citizens Property Insurance Corporation), was quantitatively and qualitatively characterized in terms of revenue and debt structures, and its near- and long-term exposure from storm impacts. We applied these findings to refine new and existing tools for optimizing the Florida coastal insurance market and future adaptation to coastal change. Given the pending acceleration of sea level rise, Citizens' revenue structure (including diverse indirect and direct subsidies), deficit status, and relationship with the state government's Florida Hurricane Catastrophe Fund, result in a highly subsidized insurance market that undervalues risk while indirectly promoting development in flood zones. A variety of subsidies external to the insurance market also support this trend. Inland states and Florida counties bear a high component of some subsidies, reflecting tenuous financial equity. Suggestions focus on modification of insurance markets and subsidy drivers to reduce current liability imbalances, geographic inequities in revenue generation, and the power of pro-active markets to initiate modest adaptive actions for sea level rise and other impacts from coastal climate change.

9:45 a.m. URB-04 An assessment of the structure and environmental benefits of urban forests in Orlando, Florida. E.K. EKPE (1), K.E. BECKER (1), J. LAB (1), C.R. HINKLE (1) and F. ESCOBEDO (2). (1) Biology Department, University of Central Florida, 4000 Central Florida Blvd, Orlando, FL 32816. (2) School of Forest Resources and Conservation, University of Florida, Gainesville, FL 32611. Urban forests provide environmental benefits to cities in the form of ecosystem services such as carbon storage and sequestration and interception and retention of precipitation. We estimated these in the City of Orlando by assessing the urban forest structure, composition, carbon dynamics, and related parameters from May to September 2010. We based this study on the USDA Forest Service's Urban Forest Effects (UFORE) model. We collected field data on ground cover, trees, shrubs, and tree-building interactions in 150 randomly selected 400m2 plots within the city boundary. At each sampling plot, we also determined the land use type. We estimated 9,207,910 trees, 84% of which were evergreen. Average tree density was 294 trees per hectare. We estimated total carbon storage of 474,539 tons and carbon sequestration of 29,370 tons per year. We estimated a total of 1,564 tons of carbon was avoided annually due to tree-building interactions in single and two-story residential areas; total energy savings of 11,122 megawatts equivalent to $1,270,892. Using a multiplier of tree leaf area to a one-dimensional mass and energy balance model of rainfall interception, we estimated the annual stormwater interception was 5.2% of annual rainfall citywide. The results indicated that both the number of trees and tree density were highest in cypress domes and pine flatwoods, and that tree density is relatively low in the inner city areas. Increasing trees in certain areas namely residential, utility, and transportation areas will improve carbon storage and sequestration, energy savings and reduce storm water runoff. Orlando's urban forest structure and the consequent carbon storage and sequestration services were also compared to those of Gainesville, Miami Dade and Tampa. This study also provides a baseline for long-term monitoring of the dynamics and benefits of the urban forest in the City of Orlando.

10:00 a.m. URB-05 Mangrove shoreline fish assemblages of Oleta River State Park: Baseline conditions in an urban system. J.A. DE ANGELO. Marine Affairs and Policy, RSMAS, University of Miami, 4600 Rickenbacker Causeway, Miami, FL 33149. Oleta River State Park (ORSP), located in North Miami-Dade County is known as the most highly

urbanized State Park in all of Florida. The present study was conducted as part of an ongoing seasonally-resolved survey of fish utilization of the mangrove shorelines of Biscayne Bay. Previous Unit Management Plans published by the Division of Recreation and Parks have lacked information concerning the park's prominent mangrove forests along with its icthyofauna. The main purpose of this investigation was to provide a baseline characterization of the mangrove-fish assemblages and microhabitat trends of ORSP, against which future changes in and around the Park can be gauged. Fish assemblages inhabiting the mangrove shorelines were examined using a visual "*belt-transect*" census method over 11 consecutive seasons. Microhabitat variables including salinity, water temperature, water depth, water clarity and distance from Baker's Haulover Inlet were examined for possible correlations with fish metrics. Several significant differences were evident in the taxonomic richness (number of taxa per unit area) and densities of the five most abundant taxa within the shoreline habitats in terms of seasonal variation and microhabitat variable distribution along the river. Taxonomic richness was typically greater in survey sites located closer to Baker's Haulover Inlet. Oleta River's mangrove shoreline fish assemblages appear to reflect: (1) proximity of the mangroves that they occupy to Baker's Haulover Inlet; (2) temperature regime along the shoreline; and (3) the salinity gradient found within the river. Fish assemblage and microhabitat information collected here could serve as a 'baseline' in future investigations of the effects of further urbanization or the effects of other anthropogenic changes to Oleta River and its mangrove habitat, including possible changes to freshwater flow associated with the Comprehensive Everglades Restoration Plan. (Project supported in part by NOAA)

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The members and officers of the Florida Academy of Sciences are grateful for the continued support of the Orlando Science Center (***osc.org***), and the Barry University Division of Information Technology (***barry.edu/fas/***). Sponsorship for the FAS 2010 meeting was provided by HDR Engineering, Inc. (***hdrinc.com***), and Florida Seagrant (***flseagrant.org***).

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