P.U.R.E. Symposium (Program for Undergraduate Research Experience)
Francis Marion University, Florence, South Carolina
April 20, 2006

3:45-3:55 pm: ***Polymorphism and Ultrastructural Organization of Prion Protein Amyloid Fibrils: An Insight from High Resolution Atomic Force Microscopy***
Maighdlin Anderson
Mentor: Ilia Baskakov, University of Maryland Biotechnology Institute

Amyloid fibrils were produced from the full-length mouse prion protein (PrP) under solvent conditions similar to those used for the generation of synthetic prions from PrP 89-230. Analysis of the ultrastructure by atomic force microscopy revealed extremely broad polymorphism in fibrils formed under a single growth condition. Fibrils varied with respect to the number of constitutive filaments and the manner in which the filaments were assembled. PrP polymerization was found to show several peculiar features: (i) the higher-order fibrils/ribbons were formed through a highly hierarchical mechanism of assembly of lower-order fibrils/ribbons; (ii) the lateral assembly proceeded stepwise; at each step, a semi-stable fibrillar species were generated, which were then able to enter the next level of assembly; (iii) the assembly of lower into higher-order fibrils occurred predominantly in a vertical dimension *via* stacking of ribbons on top of each other; (iv) alternative modes of lateral association co-existed under a single growth condition; (iv) the fibrillar morphology changed even within individual fibrils, illustrating that alternative modes of filament assembly are inter-convertible and thermodynamically equivalent. The most predominant fibrillar types were classified into five groups according to their height. High polymorphism in fibrils generated *in vitro* is reminiscent of high morphological diversity of scrapie-associated fibrils isolated from scrapie brains, suggesting that polymorphism is peculiar for polymerization of PrP regardless of whether fibrils are formed *in vitro* or under pathological conditions *in vivo*.

4:00-4:10 pm: ***Conservation Economics of Wetlands: A Transdisciplinary Approach to Maintaining Biodiversity in Mitigation Banking***
Joseph R. Burger
Mentors: Travis Knowles, FMU Biology; Jeffrey Pompe, FMU Economics

Wetland mitigation banking (WMB) has afforded those who impact wetlands the latitude to purchase restored wetlands elsewhere as compensation. The primary goal of mitigation banking has been a no-net-loss of wetland size and function as they relate to direct human benefits. These include wetland ecosystem services such as flood control and water purification, but may not accomplish the conservation goal of maintaining biodiversity. I present an ecological-economic approach to conservation reserve design through WMB. I then discuss how WMB can provide an economic incentive to restore endangered and ecologically valuable Carolina bay ecosystems. Although these two approaches may resolve some of the ecological issues concerning WMB, ultimate wetland biological conservation will only be obtained once human consumption of natural capital shifts towards sustainability rather than growth.

4:15-4:25 pm: ***Mating Preference in Male Mice***
Brent Coker
Mentor: Peter King, FMU Biology

The objective of the project is to determine if male mice prefer mating with virgin female mice or non-virgin female mice. I will determine if male mice are more attracted to virgin or non-virgin females. A variety of virgin and non-virgin female mice all of at least two months of age are older were introduced separately to three different male mice and their interactions were recorded. The data will be analyzed to determine if there is an overall preference by the males. The research is still ongoing.

4:30-4:40 pm: ***Spatial Ecology of the Banded Watersnake (Nerodia fasciata)***
Lacy Danikas
Mentor: Jeff Camper, FMU Biology

Little is known about the spatial ecology of banded watersnakes (*Nerodia fasciata*). Radiotelemetry was used to follow the movement of selected individuals of *N. fasciata*. Snakes were trapped in ponds with shallow water at the property of Pee Dee Research and Education Center, Darlington Co., SC. The captured snakes were weighed to determine if they were large enough to insert a transmitter. The snakes were put under anesthesia and a 5-gram transmitter was abdominally inserted. A canula was used to thread the antenna under the skin of the snake. A

PIT tag was also inserted under the ventral scales for identification purposes. The snakes were kept in the lab after surgery for observation and released two to three days later. Once released, the snakes were trailed on a daily basis Monday through Friday. Global positioning system coordinates were recorded along with habitat descriptions, date, time of day, accuracy of satellites, and specific comments related to habitat and/or behavioral observations. Data was loaded into the computer into ArcView where distances traveled were determined.

4:45-4:55 pm: ***Monitoring Herpetological Diversity as Succession Occurs in a Disturbed Woodland Habitat***
Stephanie Miller
Mentor: Tamatha Barbeau, FMU Biology

The objective of this study was to monitor herpetological species diversity in a mixed pine and hardwood forest that had been recently disturbed by logging. This pilot study will serve as a reference for future studies of herpetological diversity in this study site as succession occurs over a five year period. To monitor species diversity we installed three drift fences in disturbed areas and one fence in an undisturbed area to serve as a reference site. Each fence contained a 50 foot silt erosion fence, 6 pit fall traps, 2 cover boards, and an array of PVC pipes inserted into the ground and attached to the north-facing side of nearby trees. The drift fences were monitored in March and April 2006 when reptiles and amphibians were more likely to be active with higher environmental temperatures and rainfall. At the completion of the study I will report baseline data for herpetological diversity, which will serve as an important foundation for monitoring ongoing changes in species diversity at this site.

5:00-5:10 pm: ***Using Molecular Markers to Measure Genetic Diversity in Cotton***
Ginny Williams
Mentor: Todd Campbell, USDA-ARS

The genetic diversity of upland cotton (*Gossypium hirsutum* L.) is important for the development of improved germplasm lines and varieties. Genetic diversity allows for the opportunity to survey a large number of progeny with different allele combinations that allow a greater chance of developing crops with improvement in specific traits such as yield. There are several ways to measure genetic diversity in cotton and other plants. One of the most common methods to measure genetic diversity relies on pedigree information and ancestry to calculate coefficients of parentage among a set of cotton lines. A newer method to calculate genetic diversity used more frequently today involves molecular marker technology. Using molecular markers to determine diversity offers a precise method to calculate genetic diversity, because the actual DNA segregation is measured showing allelic variation among specific lines. Microsatellites, or simple sequence repeats, are one type of molecular marker that are useful for genetic analysis, because they show polymorphism in the number of repeat units in the DNA sequence. The objective of this study was to use a set of microsatellite markers, polymerase chain reaction (PCR), and gel electrophoresis to measure the genetic diversity among a specific group of cotton lines. The information gained from this study can be used to select specific parents for crosses in order to develop cotton lines with more favorable characteristics.

The Department of Biology at FMU strongly encourages student participation in research activities. We offer many opportunities for undergraduates to assist in faculty research or develop their own independent research projects. Students can earn academic credit through Special Studies (BIO 497) and Honors Independent Study.

If you are interested in learning more about P.U.R.E. or available research opportunities, please visit our website at: *http://www.fmarion.edu/academics/Biology* and click on the 'Research' link. You can also contact Dr. Barbeau (tbarbeau@fmarion.edu) or Dr. Pryor (gpryor@fmarion.edu), the coordinators of P.U.R.E. We can answer any questions you might have and get you started on a research project!