Welcome to the 12th Annual P.U.R.E. Symposium! *"Spring Session"*

Thursday Apr 20, 2017, LSF 102

Snacks 3:45, Talks begin at 4pm

ABSTRACTS:

4:00 – 4:15pm:

"Female rats help more after receiving help, but not after simple prior experience of distress."

Student: Devin Kellis; Faculty Mentor: Dr. Shayna Wrighten.

Humans' robust display of reciprocity in pro-social (helping) behavior is clearly apparent empirically and in everyday experience. Recent research has revealed that many other species (e.g., rats) also show reciprocity, suggesting that this behavior may be conserved through evolution. This experiment aimed to examine the role of simple prior experience versus prior experience of help on pro-social behavior in female rats. In one condition (pre-exposure), one rat (1st helper) was pre-exposed to a restrainer for five days. This rat was then given the opportunity to release its cagemate (2nd helper) from the restrainer for twenty days. Subsequently, the roles of the rats were reversed for another twenty days. In a separate condition (non-pre-exposure), there was no pre-exposure to the restrainer before a rat was given the opportunity to help its cagemate. Instead, a rat was given the opportunity to help its cagemate (twenty days) and then subsequently experienced a role reversal (twenty days). There was no difference between the help provided by 1st helper pre-exposure and non-pre-exposure rats (suggesting that mere exposure to a stressor was not sufficient for enhancing pro-social behavior). 2nd helper rats, however, helped more (and faster) in both pre-exposure and non-pre-exposure conditions than 1st helper rats – suggesting that experience of being released from a stressful environment is important in enhancing pro-social behavior. 2nd helper rats in the pre-exposure condition helped more than all other rats, which may suggest that the magnitude of distress experienced by the restrained rats played a role in enhancing the pro-social behavior of the 2nd helper rats. These results suggest a multifactorial mechanism driving reciprocity in rats, including social learning, experience being released from a stressor, and – possibly – pro-social concern.

4:15 – 4:30pm:

"Plant biomass allocation response to land-use history and canopy thinning."

Student: Kyle Stewart

To maximize photosynthesis, plants must allocate their biomass across three resource extraction organs: roots, stems, and leaves. To do this, plants alter their growth behavior in response to differences in resource levels. Across the Savannah River Site, most of the land was once used for agriculture, but was abandoned in 1951 when the site was created. Within a matrix of agricultural land-use history, patches of remnant habitat exist that were never cultivated. Studies have shown that between these two types of land-use histories there exist different levels of resources due to abiotic and biotic factors. Given this, it is predicted that plants found in both of these landscapes may allocate their biomass differently to compensate for altered levels of resources. Twenty-seven remnant patches were identified using historic aerial photographs in the SRS and four hectare experimental blocks created to investigate the effects of land-use history on plant communities. Within these blocks, a canopy thinning treatment was crossed with land-use history to additionally investigate how land-use history alters restoration outcomes. To assess the effect of land-use history and canopy thinning on plant behavior, I excavated roots and shoots of three common perennial herbs: *Scleria triglomerata, Pityopsis graminifolia,* and *Hypericum hypericoides*. Three samples of each species were collected from each of the four land types in their entirety. Each sample was then washed of excess dirt and dried. These samples have yet to be processed by dividing organ mass over whole mass to produce a mass fraction, but preliminary data from the previous year has shown alterations in biomass allocation behavior in at least three other species. In field observations of root and leaf abundance have shown that differences clearly exist, though further analysis will be needed to confirm this.

4:30 – 4:45pm:

"The Forensic Discrimination of EDTA in Dried Bloodstains Using Diffuse Reflectance Infrared Fourier Transform Spectroscopy and Attenuated Total Reflectance"

Students: Colby Witt and Caroline Granger; Faculty Mentor: Dr. Jessica McCutcheon

Ethylenediaminetetraacetic acid ($C_{10}H_{16}N_2O_8$), more commonly known as EDTA, is used in forensic science as an anticoagulant for blood samples collected from crime scenes. Consequently, differentiating between whole blood and a doped amount of EDTA in blood is crucial to the efficacy of the judicial system. In the O.J. Simpson murder trial, defense lawyers claimed that police planted the blood found at the murder scene in order to incriminate Simpson. The lawyers claimed that the blood must have been planted due the excessively high levels of EDTA. This, along with several other factors, eventually gave the jury enough reasonable doubt to dismiss the murder charges. This situation has become a more common occurrence in violent crimes today. So, it was proposed that a combination of mathematics and chemical analyses be used to differentiate between neat (whole blood) and doped blood (EDTA) samples. To aid in the qualification of EDTA in the blood samples, Spectrum 10 Spectroscopy software was used to help in differentiating the spectra. Our work using DRIFTS to differentiate between doped and whole blood resulted in data that was inconclusive in that the average correlation values of whole blood failed when compared to a whole blood standard. Additionally, the average correlation values for whole blood passed when compared to a ppm standard. In order to conclude that the results were statistically significant, 5 more samples were analyzed via DRIFTS and ATR. It was found that the first round of results were, in fact, not statistically significant under the conditions set.

4:45 – 5:00pm:

"Survey of parasites infecting *Hexagenia* (Ephemeroptera: Ephemeridae) nymphs from western Lake Erie."

Student: Amber Zonca; Faculty Mentor: Dr. David Malakauskas

Hexagenia spp. are important biomonitoring indicators of the mesotrophic water quality. However, little research has been done on parasites infecting *Hexagenia* spp. and what role parasites may play in *Hexagenia* population dynamics. Therefore, the aim of our study is to catalog parasites of these mayflies and examine host-parasite population dynamics. Specimens were collected from Lake Erie, MI and were examined for parasites. Based on tentative morphological identifications, *Hexagenia* are infected with trematodes in the genus *Crepidostomum*, protists of the genera *Vorticella* and *Epistylis*, and an as yet unidentified nematode. DNA from parasites and mayflies will be sequenced to molecularly characterize parasites and to accurately identify nymphal mayflies. Results from the genomic analysis of mayfly nymphs show that there are both species present in the samples. Majority of the species are *Hexagenia limbata* and the minority of them are *Hexagenia rigida*, the ratio determined is 18:5. Results from the *Hexagenia* spp. and parasites will be analyzed to infer correlations of host-parasite population dynamic relationships.

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 (BIOL 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://people.fmarion.edu/tbarbeau/PURE.htm*. You can also contact Dr. Barbeau (tbarbeau@fmarion.edu), the coordinator of P.U.R.E., to answer any questions you might have and get you started on a research project!