

## Research Presentations - Sigma Xi - Mar. 5, 2018

Talk  
6:40 Assessing the Biodiversity of the Microscopic Moss Forests of Rock Island County (IL)  
**Sarah Lipps**  
Augustana College, Dr. Rafael Medina

Within any ecosystem assessing the biodiversity provides insight into its health, especially considering how species diversity changes over time. An up to date checklist of organisms is a crucial research tool for different disciplines. Not all groups of organisms are sampled with equivalent collecting effort. While vertebrates or some flowering plants are commonly included in local surveys, groups of organisms that are difficult to study remain overlooked. One of these groups is bryophytes. We have been conducting the first systematic bryophyte sampling in Rock Island Co., resulting in the first checklist at the county level of mosses and liverworts. Our total count comprises more than 60 species from which more than 20 are recorded in the county for the first time. This checklist has been made public, and the specimens databased, in the Consortium of North American Bryophyte Herbaria. We have demonstrated that it is possible to make new findings in ordinary places.

Talk  
6:50 Role of the Thalamic Reticular Nucleus in Alzheimer's Disease  
**Kia Lechleitner**  
Jeannie Chin Lab, Memory & Brain Research Center, Department of Neuroscience, Baylor College of Medicine, Dr. Jeannie Chin, Dr. Rohan Jagirdar

Alzheimer's disease (AD) is often characterized by loss of hippocampal memory. However, it can also include other symptoms that often precede memory deficits and can be attributed to dysfunction of the thalamic reticular nucleus (TRN) such as sleep fragmentation, attention deficits, epileptiform activity, and decreased levels of slow wave sleep (SWS). The TRN is a major control nucleus in the corticothalamic network that exhibits decreased activity in the AD mouse model. Using EEG/EMG and immunohistochemistry results, the Chin Lab was able to determine that the AD mice with lower SWS quality

Talk  
7:00 Unsteady Flow of Water through Sediments  
**Andrea Bonetto, Andrew Huffman, Sheiny Tjia-Fleck, Ethan Zeller**  
St. Ambrose University, Dr. Susa Stonedahl

In river and streams water flow goes through sediments, where solutes such as nutrient and pollutants are transformed and delayed. Many studies have focused on steady water flow, but in natural systems, water levels and water flow rates can be changed by storms, tides, dams, melting snow, etc. In order to investigate variable flow conditions we built a system, which allowed us to control the water level and produce oscillations. In this system we used both images of dye flowing through the system and electrolytic conductivity measurements to successfully compare our physical model to a simulation.

Poster  
1 Characterizing Fear Behavior in Young Chickens: Effects of Time, Predator Stimuli, and Environmental Cues  
**Lauren Muzzalupo and Kayli Ahuja**  
Augustana College, Dr. Shara Stough

Posttraumatic stress disorder (PTSD) is characterized by intense fear experienced when an individual is exposed to a stimulus that was present at the time of the traumatic event, or similar to that original stimulus. This association of fear, thought to occur via Pavlovian conditioning, has led to interest in animal fear conditioning as possible models of PTSD. We investigated the role of visual and olfactory environmental cues in triggering fear memories by placing chicks individually in a unique testing environment where experimental chicks were presented with audio-visual predator cues and control chicks remained in the testing environment in the absence of any predator cues. We currently have yet to observe fear memory in chicks exposed to predator stimuli, but this research is ongoing.

Poster  
2 **Graph Spectrum Analysis Implementation**  
**James Larson**  
Pacific Northwest National Laboratory, Jonathan Lalo

Our team worked with other research staff to implement a novel analytic method into operational data analysis software for cyber security. From a working proof of concept, the prototype analytic code was integrated into an existing data analysis pipeline and was optimized by reducing the number of I/O operations and data transformations. In addition to reducing complexity, we leverage the memory and computation available to a cluster, decreasing overall execution time. Additionally, the script was modified to compute many different categories of common network analyses instead of a single result. Analytic output is stored in an index to enable real time interaction with the results using JavaScript and a web interface. As a supplemental research effort, we use regression to predict potential outliers in the analytic output.

Poster  
3 **The State of Trash in America**  
**Miranda Noack and Perla Hernandez**  
St. Ambrose University, Dr. Yunye Shi

According to the World Bank, the world currently generates about 4 billion tons of all types of waste per year. The world's cities alone generate about 1.5 billion tons of solid waste per year. This volume is expected to increase to 2.4 billion tons by 2025. Three-fourths of this waste is disposed of in landfills, with only one fourth being recycled. Municipal solid waste (MSW) is one of the major environmental threats to cities all over the world. Through this poster, we gathered data of MSW production in the United States. For each state, total landfill tonnage, landfill tonnage by person and landfill percentage were compared to show waste-to-energy (WtE) potential. Theoretical energy production through MSW combustion is also calculated to quantitatively analyze the amount of energy contained in MSW.

Poster  
4 **Project Whirligig: Modeling Swarming Behavior in Whirligig Beetles**  
**Kyle McCaw and Tan Nguyen**  
Augustana College, Dr. Forrest Stonedahl

This project involved the automatic identification and extraction of whirligig beetle locations from video frames using a variety of computer vision and machine learning methods, and tracking the beetle locations over time. Preliminary work was also done on an agent-based computer simulation that aims to replicate the beetles' swarming motions.