Northeastern ILLINOIS UNIVERSITY

Student Center for Science Engagement

Sixth Annual Student Research Symposium

Featuring student presentations in:

Biology, Chemistry, Computer Science, Earth Science, Mathematics, Physics, and Psychology

September 26, 2014

The Student Center for Science Engagement
Sixth Annual Research Symposium

Friday, September 26, 2014
Northeastern Illinois University
Chicago, Illinois

David Rutschman, Ph.D.
Associate Dean
College of Arts and Sciences

Joel Olfelt, Ph.D.
Director (current)
Professor, Biology

Sudha Srinivas, Ph.D.
Director (2012-2014)
Professor, **Physics**

Sylvia Atsalis, Ph.D.
Coordinator, SCSE

Paloma Vargas, Ph.D.
Life Sciences Advisor, SCSE

Oneka Cummings, Ph.D.
Physical Sciences Advisor (through May 2014), SCSE

Laura West, M.S.
Student Academic Services Specialist in STEM, SCSE

Marilyn Saavedra-Leyva
Office Support Specialist, SCSE

Kathy Tomcik
Financial Manager and Project Coordinator, Title III

EXECUTIVE BOARD MEMBERS (2013-2014)
Paulo Acioli, Ph.D., Associate Professor, Chair of Physics and Earth Sciences
Ruth Church, Ph.D., Professor, Psychology
Elisabet Head, Ph.D., Assistant Professor, Earth Science
Francisco Iacobelli, Ph.D., Assistant Professor, Computer Science
Anuj Mubayi Ph.D., Assistant Professor, Mathematics
Ken Nicholson, Ph.D., Assistant Professor, Chemistry
Joel Olfelt, Professor, Biology

Table of Contents

Symposium Schedule 4

Associate Dean's Message 5

Director's Message 6

Coordinator's Message 7

SCSE Mission and Goals 8

Symposium Program 9

Podium Presentations - Session 9

Keynote Speaker Biography 11

Abstracts of Presentations 12

- Oral Presentations 12
- Poster Presentations 19

About the Student Center for Science Engagement 31

Acknowledgements 32

SYMPOSIUM SCHEDULE

Golden Eagles, Student Union (Oral Presentations)
Village Square, Student Union (Poster Presentations)

8:30-9:00 A.M.
Breakfast
Registration
Poster Set-up

9:00-9:10 A.M.
Opening Remarks

9:15 A.M.-12:04 P.M.
Oral Presentations

1:00-2:30 P.M.
Luncheon
Keynote Speaker

2:30 P.M.
Raffle prizes

2:30-5:00 P.M.
Poster Presentations
Coffee and Dessert
(Village Square)

4:00-5:00 P.M.
Presentation on getting into graduate school (open to all)
Dr. Corrie Moreau

ASSOCIATE DEAN'S MESSAGE

Congratulations!

You have succeeded in carrying out a significant research project and today you will be presenting your work. You are a scientist and we are all proud of you and your professors for your work, your dedication and your perseverance. We want to see you further develop your skills, knowledge and intellect and we are all here to help you!

Take a minute to think about everything you learned by carrying out your scientific research project this summer. Facts, yes. Lab and computing skills, probably. But even more than that I think you learned to think as a scientist. And just imagine where this can take you!

We are also very proud of the Student Center for Science Engagement – your Center - and of the Departments you are working with for their commitment to your success. All of us in the College of Arts and Sciences – faculty, staff and students, too – have the same vision of helping each student follow her or his dream.

We are looking forward to hearing from each of you about your discoveries and observations. You represent Northeastern as you present here today, and later, perhaps, at other conferences.

Make us proud!

David Rutschman
Associate Dean
College of Arts and Sciences

DIRECTOR'S MESSAGE

Welcome to the Sixth Annual Research Symposium of the Student Center for Science Engagement!

It is my pleasure to welcome you all to the Sixth Annual Research Symposium of the Student Center for Science Engagement (SCSE). Over the past summer, the SCSE facilitated and coordinated the research experiences of over 60 students at NEIU and partner institutions. This annual symposium serves to inform the NEIU community of the research carried out by this committed group of students, under the guidance of their faculty advisors. The Student Center for Science Engagement supported the research projects of over 50 students and 26 faculty on the NEIU campus. Thirteen students worked alongside as volunteers on these projects. The center also supported student groups working on research projects off-campus – one group at the Purdue University and another at the Field Museum. As our students share their discoveries with you today, you will have the opportunity to see first-hand just what they have achieved this summer. These achievements would not be possible without the mentorship provided by their faculty advisors, the leadership of the SCSE executive board, the support from the College of Arts and Sciences and the Office of Academic Affairs, and the participation of the broader NEIU community. The dedication of the staff at the SCSE ensured that the students and faculty had the infrastructure they needed for research. I thank all these individuals for their dedication to contributing to an environment at NEIU that makes such research experiences not merely possible but also rewarding for our students.

My congratulations to all the participants!

Joel Olfelt
Professor, Biology
Director of the Student Center for Science Engagement

STUDENT CENTER FOR SCIENCE ENGAGEMENT
Coordinator's Message

Greetings to all summer research participants and to all symposium guests!

Another year, another summer research season finished, with all the trials and successes that come from immersing into the challenges of the scientific process. Each summer research experience offers students so much more than data. Some learn how repetitive science can be, others learn how to work independently in a laboratory, and still others recognize, perhaps with dismay, that stated hypotheses are not always supported by the collected data. Students who boldly venture beyond NEIU for their summer research internship face the challenges of working in an unfamiliar environment. Taken together the summer research experience builds character, leads to self-discovery and to understanding one's strengths, and helps to develop strong critical thinking skills.

"All of life is an experiment", said the American philosopher Ralph Emerson, and in the process of experimenting, of failing and rolling around in the dirt, so to speak, we build the confidence and courage to make important decisions for our lives, to become professionals, to eventually *go beyond the ordinary*. To give an added boost in developing the confidence essential to career success, this year the SCSE initiated a special program to complement the lessons learned from conducting research, one that takes students through the paces of acquiring essential professional tools. Summer research students responded with great enthusiasm to our Individual Professional Development Plan program. It is our hope that students will build on the skills they learned to launch themselves further into making the best decisions for their future in the sciences.

In parting, we wish to extend a heartfelt thank you to all who comprise the NEIU community, to our high school and community college partners, and to our collaborating institutions, for making NEIU, the summer research program, and today's symposium, successful. To the summer research students, we say take your newly acquired experiences, reach for the stars, and *be extraordinary*. And know that the SCSE is always here to help you fulfill your dreams!

The SCSE team

Sylvia Atsalis (Center Coordinator)
Paloma Vargas (Advisor)
Laura West (Transfer Specialist)
Marilyn Saavedra-Leyva (Office manager)

MISSION AND GOALS

The mission of the SCSE is to significantly improve recruitment, retention and graduation rates for students in STEM disciplines, with an emphasis on minority, low-income, and first generation students. The goals of the SCSE are being achieved by enhancing academic support and mentoring through advising, faculty-student research projects, and peer mentoring, providing professional development opportunities to students through internships, networking opportunities, connections with leaders in STEM industries and academic institutions, career exploration in STEM fields and the development of programming focused on reaching minority, low-income and first generation students. The SCSE is proud to serve NEIU and support future student success in the sciences.

ORAL PRESENTATIONS
9:15 A.M.-12:04 P.M.
Golden Eagles

9:15-9:28- UNDERREPRESENTED SCIENCE AND MATHEMATICS MAJORS' PERSPECTIVES OF EXPERIENCES SUPPORTING THEIR MATHEMATICAL SUCCESS. Erik Muntz, Alejandro Sanchez, Jr., Peter Stilling, Ruben Echevarria, Sarah Cordell, Joseph Hibdon, Katherine Bird**.** Department of Mathematics**,** Northeastern Illinois University, Chicago, IL.

9:28-9:41- ZEBRAFISH BEHAVIORAL RESPONSES TO ENVIORNMENTAL AND PHARMACEUTICAL STRESSORS. Kate Hilliard[1] , Belkis Gavaria[1], Conor Smith[2], Shannon Saszik[2]. Department of Biology[1]**,** Department of Psychology[2] Northeastern Illinois University, Chicago, IL.

9:41-9:54- USE OF MICROSATELLITE MARKERS TO ESTIMATE HYBRIDIZATION BETWEEN *TYPHA LATIFOLIA* AND *TYPHA ANGUSTIFOLIA* IN THE MIDWEST. Sarah Whidden, Joseph Marsili, Joel Olfelt, and Pamela Geddes. Department of Biology, Northeastern Illinois University, Chicago, IL.

9:54-10:07- GEOMETRY OPTIMIZATION OF LENNARD-JONES CLUSTERS USING DRAG-ASSISTED SIMULATED ANNEALING. Bilguun Woods, David Capota, Paulo Acioli Department of Physics and Astronomy, Northeastern Illinois University, Chicago, IL.

10:07-10:20- TRANSMISSION OF STRIGIDEAE (PLATYHELMINTHES: TREMATODA) IN NORTHEASTERN ILLINOIS FRESHWATER PONDS. Jennifer Kawaguchi[1], Kimbalee Anderson[2], Romina Maldanado[1], Robert C. Jadin[1], Sarah A. Orlofske[1]**.** [1]Department of Biology, [2]Department of Chemistry, Northeastern Illinois University, Chicago, IL.

10:20-10:33- SCANNING PROBE MICROSCOPY ANALYSIS OF BACTERIOPHYTOCHROMES. Zain Malik[1], Rima Rebiai[1], Irvin Garcia[1], Marie Kroeger[1], Emina A. Stojković[2], Stefan Tsonchev[1], Kenneth T. Nicholson[1]. Department of Chemistry[1], Department of Biology[2], Northeastern Illinois University, Chicago, IL.

10:33-10:46- H5N1 AVIAN INFLUENZA ENTRY: SIALIC ACID'S POTENTIAL SIDEKICK**.** Rifka Joly[1], Kay McCorker[2], Emily Rumschlag-Booms[3].Department of Chemistry[1], Department of Biology[3]. Northeastern Illinois University, Chicago, IL[1,3], Illinois State University, Normal, IL 61761[2].

10:46-10:59- IDENTIFICATION OF THE PERIOD GENE IN THE PRAYING MANTIS HIERODULA PATELLIFERA. Emily Fioramonti, Greg Prete, Christina Carrion, Salim Patel, Frederick Prete, and Aaron Schirmer**.** Department of Biology**,** Northeastern Illinois University, Chicago, IL.

10:59-11:12- THE EFFECTS OF OBJECTIVE AND SUBJECTIVE TASK DIFFICULTY ON MULTITASKING PERFORMANCE. Abdul Rahman Mohammad, Timothy Nguyen, Haridu Senadeera, Amna Irfan, Deena Rubin, Rachel F. Adler**.** Computer Science Department Northeastern Illinois University, Chicago, IL.

11:12-11:25- MICRO CLIMATES WITH MACRO IMPLICATIONS, HOW BRYOPHYTES MAY HELP DEFINE THE WORLD AROUND US. Brendon Reidy[1], Stephanie Maxwell [1], Charles DeLavoi[1, 2], Juan Larraín[2], Laura R. E. Briscoe[2], Matt Von Konrat[2], and Thomas Campbell[1, 2]. [1]Department of Biology, Northeastern Illinois University, Chicago, IL. [2]The Field Museum, Chicago, IL.

11:25-11:38- EVALUATION OF SOIL ERODIBILITY BY WIND EROSION USING SAND BLASTING. Mariah Green[1], Chi-Hua Huang[2], Javier M Gonzalez[2], Jean Hemzacek[1], and Laura Sanders[1]**.** [1]Department of Earth Science, Northeastern Illinois University, Chicago, IL**.** [2]National Soil Erosion Research Laboratory, USDA-ARS, West Lafayette, IN.

11:38-11:51- STRUCTURE AND FUNCTION OF BACTERIOPHYTOCHROMES IN MYXOBACTERIA. Chris Tong, Ayesha Mapara, Kevin D. Gallagher, Phu Duong, Angela Nugent, James Hopkins, Patricia Waltz, Joseph Varela, and Emina A. Stojković. Department of Biology, Northeastern Illinois University, Chicago, IL.

11:51-12:04- *CAENORHABDITIS ELEGANS* MODEL OF AMYOTROPHIC LATERAL SCLEROSIS: UNDERSTANDING THE ROLE OF TDP-43 EXPRESSION ON HSN MOTOR NEURON FUNCTION. Zelene Figueroa and Cindy Voisine**.** Department of Biology, Northeastern Illinois University, Chicago, IL.

Presenting students are underlined.

KEYNOTE SPEAKER BIOGRAPHICAL SKETCH

Corrie S. Moreau, Ph.D.
Associate Curator, Field Museum of Natural History

Title of Luncheon Keynote:
DNA, Climate Change, and Microbiomes: How Research on Ants Can Address Important Biological Questions

Dr. Corrie Moreau grew up in New Orleans, Louisiana where her passion for insects and evolution began. Dr. Moreau left New Orleans to complete her undergraduate degree in Biology at San Francisco State University in 2000. She then went on to receive her Master's degree in Ecology and Evolution from San Francisco State University and the California Academy of Sciences in 2003.

Dr. Moreau earned her Ph.D. in Evolutionary Biology from Harvard University in 2007 and then received a prestigious postdoctoral fellowship at the University of California, Berkeley as a Miller Fellow. In 2008 she joined the Field Museum of Natural History in Chicago, where she a tenured Associate Curator. She is also a Faculty Member and Lecturer at the University of Chicago in the Committee on Evolutionary Biology.

Dr. Moreau's research on the evolution and diversification of ants and their endosymbiotic bacteria leverages molecular and genomic tools to address the origin of species and how co-evolved systems benefit both partners. In addition, she pursues questions on the role of biogeography and symbiosis in shaping macroevolutionary processes to better understand broad-scale evolutionary patterns of life. Dr. Moreau has authored over 30 scientific publications and is heavily involved in science education and outreach including founding the Field Museum Women In Science with over 250 members.

Select Bibliography:

Moreau, C. S. & Bell, C. D. (2013). Testing the museum versus cradle biological diversity hypothesis: Phylogeny, diversification, and ancestral biogeographic range evolution of the ants. *Evolution* 67(8): 2240-2257.

Kautz S., Rubin B. E. R., Russell, J. A. & Moreau C. S. (2013). Surveying the microbiome of ants: Comparing 454 pyrosequencing with traditional methods to uncover bacterial diversity. *Applied and Environmental Microbiology* 79(2): 525-534.

Russell, J. A., Moreau, C. S., Goldman-Huertas, B. M., Fujiwara, M., Lohman, D. J. & Pierce, N. E. (2009). Bacterial gut symbionts are tightly linked with the evolution of herbivory in ants. *Proceedings of the National Academy of Sciences, USA* 106(50): 21236-21241.

Moreau, C. S., Bell, C. D., Vila, R., Archibald, S. B., & Pierce, N. P. (2006). Phylogeny of the ants: Diversification in the age of angiosperms. *Science* 312(5770): 101–104.

ABSTRACTS
ORAL PRESENTATIONS

UNDERREPRESENTED SCIENCE AND MATHEMATICS MAJORS' PERSPECTIVES OF EXPERIENCES SUPPORTING THEIR MATHEMATICAL SUCCESS

Erik Muntz, Alejandro Sanchez, Jr., Peter Stilling, Ruben Echevarria, Sarah Cordell,
Joseph Hibdon, Katherine Bird
Department of Mathematics
Northeastern Illinois University, Chicago, Illinois 60625

Currently, the mathematics education community uses generally outdated explanations that normalize underrepresented student failure. Our study intends to challenge this practice and to shift our understanding toward how and why these students succeed in mathematics. The project uses qualitative methods to examine nine underrepresented science or mathematics majors' perceptions of experiences that supported their mathematical success. In this study, *underrepresented students* refer to Latina/o students who are also low-income and/or first generation college students. Using an iterative coding scheme to analyze interview data we identified emergent themes for participants' perceptions of experiences that supported their mathematical success. We also explored connections among these themes, the role of participants' racial identity constructions, and experiences they managed in various sociopolitical contexts. Drawing on critical race theory, cross-case analysis indicates three main themes regarding experiences that supported their mathematical success: (a) experiences involving their personal agency and resilience, (b) experiences that strengthened aspects of their academic identities, and (c) experiences involving various in-school and/or out-of-school influences (primarily teacher influences, family influences, and academic resources). Such experiences that supported participants' mathematical success were complexly related to their racial identity constructions, the co-construction of their racial identities with other salient identities, and experiences they negotiated in multiple sociopolitical contextual layers. Examples of emergent connections between experiences that supported their mathematical success and their racial identity constructions included: resisting racialized experiences, functioning as cultural mathematical role models, and engaging with cultural academic role models. Participants' counterstories reveal how inequities, sociohistorical forces, sociopolitical constructs, contextual influences, agency, and resilience are intimately related to their mathematical success. Authors will present a video documentary that highlights examples of such counterstories.

ZEBRAFISH BEHAVIORAL RESPONSES TO ENVIORNMENTAL AND PHARMACEUTICAL STRESSORS

Kate Hilliard[1], Belkis Gavaria[1], Conor Smith[2], Shannon Saszik[1]
Department of Biology[1]
Department of Psychology[2]
Northeastern Illinois University, Chicago, Il 60625

Complex relationships exist between stress and dopamine circuitry in the midbrain, impacting and driving prosocial and anxiety related behaviors. The purpose of this research was to examine effects of stress on prosocial behavior in Danio Rerio (D. rerio, Zebrafish). Zebrafish are a reliable animal model due to a high degree of genetic conservation and similarities to human neural circuitry. Environmental (ostracism) and pharmaceutical (220 µM 1 Methyl-4 Phenyl, 1,3,3,6-tetrahydropyridine 220, MPTP) treatments served as agonists to neurological pathways involved in stress responses. Treatment was expected to decrease prosocial behavior, such as shoaling, while increasing anxiety behaviors, such as thigmotaxsis. Treatments across sixty adult zebrafish, were administered to three groups (n=20); Ostracized (T1), MPTP (T2), and ostracized and treated with MPTP (T3). One treated fish from each condition was observed and recorded for two minutes with four untreated fish. Videos were recorded and analyzed using Virtual Dub and Image J (NIH). The manual tracking plug in was used to measure velocity (cm/s), distance traveled (cm), nearest neighbor (distance in cm to nearest control fish), and thigmotaxsis (Time (s) in peripheral regions of tank). Microsoft Excel was used for statistical analysis. Analysis of velocity and distance showed that neither ostracism nor MPTP treatment had negative impacts on motor function. Nearest neighbor analysis showed deviations from shoaling norms in all treatment conditions ($p<.04$). Contradictory to our hypothesis, all treatment groups preferred to swim in open areas of the tank. When examined individually, T2 subjects spent more time in peripheral areas of the tank ($p<.02$), indicating higher anxiety. Collectively, results indicated that prosocial behavior of treated fish was reduced by anxiety inducing treatments. These results further provide insight into functions of dopamine and reward circuitry and their role in social behaviors as well as coping with stress.

USE OF MICROSATELLITE MARKERS TO ESTIMATE HYBRIDIZATION BETWEEN *TYPHA LATIFOLIA* AND *TYPHA ANGUSTIFOLIA* IN THE MIDWEST

Sarah Whidden, Joseph Marsili, Joel Olfelt, and Pamela Geddes
Department of Biology
Northeastern Illinois University, Chicago, IL, 60625

Two plant species- the native *Typha latifolia* and exotic *T. angustifolia*, hybridize to form *T. x glauca* (F1 hybrid). Fertile F1 hybrids backcross to either parental species creating advanced-generation hybrids. These hybrid swarms threaten wetlands by forming dense monocultures that out-compete native species and lower plant biodiversity. Our goal is to use previously-identified microsatellite markers from *T. latifolia*, *T. angustifolia*, and a related species, *T. minima*, to quantify hybridization rates in cattail populations across the Midwest. We sampled plants from 32 populations in 7 Midwestern states and identified 6 previously described microsatellite loci that discriminate between the parent taxa and hybrids. We are currently screening 7 additional loci. Contrary to a smaller study in the same region that found *T. latifolia* stands to be rare, we found that approximately 30% of the populations sampled contained pure *T. latifolia*. However, none of the populations contained pure *T. angustifolia*. Similar to another study of comparable size, we found regional differences in the relative abundances of each species. Comparing our two most sampled state, Illinois and Minnesota, we found a significantly greater abundance of *T. x glauca* in Minnesota than in Illinois (P=0.034). Furthermore, we found that the abundance of hybrids is negatively correlated with the abundance of the native *T. latifolia*. Our preliminary data suggest that the hybrid is replacing both parental species within the Midwestern region, which could have implications in the management of *Typha* stands as well as conservation of the native parental species.

GEOMETRY OPTIMIZATION OF LENNARD-JONES CLUSTERS USING DRAG-ASSISTED SIMULATED ANNEALING

Bilguun Woods, David Capota, Paulo Acioli
Department of Physics and Astronomy
Northeastern Illinois University, Chicago, IL 60625

One of the ways of finding the global minimum of the potential energy surface (PES) of a physical system within molecular dynamics is through simulated annealing. Simulated annealing is a process of slowly cooling down a system of a high temperature, by gradually reducing the energy. Therefore, the particles have a chance to explore other degrees of freedom before reaching a minimum. In one of the methods implemented by Woodcock in 1971, velocities of the particles are scaled after a given few steps until global minimization is attained. Our work focused on the introduction of a viscous friction term as a mechanism for reducing energy (or cooling) that is similar to the Langevin dynamics. The viscous friction term goes to zero as the system reaches a minimum. We applied the method for Lennard-Jones clusters of up to 21 atoms. To ensure that the method worked satisfactorily, we started from different initial conditions and varied both the temperature and the drag coefficient. Then we studied the effects of the temperature the drag coefficient of the system in its ability to find the global minimum. We have determined that the method is conceptually simple but very robust in finding global minima.

TRANSMISSION OF STRIGIDEAE (PLATYHELMINTHES: TREMATODA) IN NORTHEASTERN ILLINOIS FRESHWATER PONDS

Jennifer Kawaguchi[1], Kimbalee Anderson[2], Romina Maldanado[1],
Robert C. Jadin[1], Sarah A. Orlofske[1]
[1]Department of Biology
[2]Department of Chemistry
Northeastern Illinois University, Chicago, IL 60625

Freshwater ecosystems consist of communities of interacting species including predator-prey and parasite-host relationships. For trematodes, or parasitic flatworms, the life cycle is dependent on trophic interactions between intermediate and final hosts. The life cycle begins when an egg is excreted from adult worms in the final host. From here, the eggs hatch into larvae that use snails as the first intermediate host. Within the snail, the larvae produce sporocysts through asexual reproduction, which then produce cercariae (tailed free-living stages). These cercariae can encyst in its next host, forming metacercariae, and wait until a consumer, such as birds or fish, eat the snail. The trematode then develops into an adult and releases eggs, repeating the cycle. Strigideae is a family of trematode that can potentially transmit between freshwater snails forming a type of metacercariae called tetracotyle. During field surveys of natural wetlands in Northeastern IL, we observed both strigea type cercariae and metacercariae in *Lymnaea* snails. We hypothesized that these stages were part of the same life cycle. We predicted that cercariae identified as a strigea morphotype could transmit to other uninfected *Lymnaea* and encyst as tetracotyle. We conducted a laboratory experiment where we exposed six *Lymnaea* snails in individual petri dishes to ten cercariae and six controls not exposed to cercariae. After 1 or 5 weeks at 22°C, we dissected the *Lymnaea* and found no infection after one week, but that after 5 weeks all exposed snails were infected (mean= 6.33). None of the control snails were infected. The next step of this research is to confirm the identification of the strigea species, which is potentially a parasite of waterfowl. Birds become infected through consuming tetracotyle metacercariae in infected snails. These parasites can exhibit high intensity infections, which heighten the chance of pathology for the bird.

SCANNING PROBE MICROSCOPY ANALYSIS OF BACTERIOPHYTOCHROMES

Zain Malik[1], Rima Rebiai[1], Irvin Garcia[1], Marie Kroeger[1], Emina A. Stojković[2],
Stefan Tsonchev[1], Kenneth T. Nicholson[1]
Department of Chemistry[1]
Department of Biology[2]
Northeastern Illinois University, 5500 N. St. Louis Ave., Chicago, IL 60625

Bacteriophytochromes (BphPs) are red-light photoreceptors found in bacterial proteins; these macromolecules are recognized for initiating an important physiological response upon perceiving light. However, their physiological role in non-photosynthetic bacteria is not well understood. In addition, BphPs have been engineered as infrared fluorescent protein markers (IFPs). This research project aims to gain further insight into the function and light-sensing behavior of these macromolecules through structural characterization. Using Atomic Force Microscopy (AFM) and Scanning Tunneling Microscopy (STM), the domain structure of BphPs derived from non-photosynthetic *Stigmatella aurantiaca* (SaBphP2) and photosynthetic *Rhodopseudomonas palustris* (RpBphP3) are investigated in their respective light-adapted states. In both cases, individual proteins, also referred to as dimers, are observed on the surface. With STM, the dimers have been observed to self-organize into fiber-like structures on highly-ordered pyrolytic graphite (HOPG). With AFM, fiber-like structures are not detected on a mica surface. Instead, several orientations of single-dimers have been detected and compared to a theoretical model of an intact BphP generated using Pymol software. The complementary nature of these scanning probe methods will be presented. In order to gain a better understanding of BphP functionality and to observe the anticipated global structural changes upon light exposure, dark-adapted state imaging is a future goal.

H5N1 AVIAN INFLUENZA ENTRY: SIALIC ACID'S POTENTIAL SIDEKICK

Rifka Joly[1], Kay McCorker[2], Dr. Emily Rumschlag-Booms[3]
Department of Chemistry, Northeastern Illinois University, Chicago, IL[1]
Department of Biology, Northeastern Illinois University, Chicago, IL[3]
Illinois State University, Normal, IL 61761[2]

Influenza A viruses are highly pathogenic and continue to pose threats to human health. These viruses have the potential to cause disease in humans by crossing the species barrier. After crossing the species barrier, these viruses can gain the ability to pass easily from human to human. H5N1 avian influenza is a prime example. H5N1 emerged in 1997 and has continued to reemerge since 2003. To cross the species barrier, the viral surface protein hemagglutinin (HA) must be able to utilize the appropriate host cell receptor(s). The only known receptor for influenza is sialic acid; however, recent research suggests the presence of a co-factor. To study the potential presence of a co-factor, we generated mutations in HA's sialic acid binding domain to disrupt the use of sialic acid as a receptor. We then produced viruses that contained the mutated viral surface proteins, and compared levels of viral entry mediated by viruses carrying wild type HA or its mutants. Our preliminary analysis shows that single mutants (E190A and L194A) mutants had comparable levels of viral entry to wild type in the host cell. Our future goal is to mutate the amino acids that directly and indirectly bind to sialic acid and then determine their effect on entry. These combination mutants will be a better tool for analyzing H5N1 entry without the use of sialic acid. Confirming and identifying the presence of a co-factor could open the door for future therapeutic developments.

IDENTIFICATION OF THE PERIOD GENE IN THE PRAYING MANTIS HIERODULA PATELLIFERA

Emily Fioramonti, Greg Prete, Christina Carrion, Salim Patel,
Frederick Prete, and Aaron Schirmer
Department of Biology
Northeastern Illinois University, Chicago, IL 60625

The clock protein PERIOD (PER) is a critical constituent of insect molecular circadian clocks which control a number of biological rhythms from the cellular to the organismal levels of analysis, including peptide synthesis, egg deposition, and locomotion. Although much is known about the molecular constituents of circadian clocks in model organisms such as *Drosophila melanogaster* (fruit fly), understanding lesser-known insect models is critically important in that it provides novel insights into the ways that biological systems operate. These expanded approaches are becoming possible due to advances in molecular techniques and DNA sequencing technology. One example of a novel system is the praying mantis (Insecta, Mantodea). We study this system because of its unique constellation of complex motor behaviors, sensory and circadian systems. The molecular components of the mantis circadian systems remain unknown. However, based on preliminary data, we hypothesize that the mantis circadian systems are similar to those of its sister taxon, the *Blattodea* (cockroaches). Utilizing highly conserved regions of the PER protein from the American cockroach, *P. americana*, we designed degenerate primers which have been used to successfully amplify 720 and 1000 bp putative *period* fragments from our mantis cDNA. Once sequenced these fragments will be used as templates for RACE (Rapid Amplification of cDNA Ends) PCR to identify the *per* gene sequence in the mantis, *Hierodula patellifera*. Results from this experiment represent a significant step forward in our understanding of the ubiquity of the *per* gene and conservation of the genetic underpinnings of molecular clocks across taxa.

THE EFFECTS OF OBJECTIVE AND SUBJECTIVE TASK DIFFICULTY ON MULTITASKING PERFORMANCE

Abdul Rahman Mohammad, Timothy Nguyen, Haridu Senadeera, Amna Irfan, Deena Rubin, Rachel F. Adler
Department of Computer Science
Northeastern Illinois University, Chicago, IL 60625

Human-Computer Interaction has a considerable impact on the lives of many. As systems grow in complexity, there are more tasks that people want to complete simultaneously. Our research intends to better understand the performance implications of people multitasking during simple and complex tasks. We developed two hypotheses for our experiment: (1) Participants who complete a difficult task without an interruption will perform better than those who receive interruptions; (2) Participants who complete an easier version of the task and receive interruptions will perform better than those without interruptions. To test the hypotheses, 726 participants were assigned into one of four conditions in our web-based experiment: easy without interruptions, hard without interruptions, easy with interruptions, hard with interruptions. In the first two conditions, participants received the easy or hard version of the primary task and did not receive interruptions. In the latter two they received interruptions. The primary task for all conditions is a word search puzzle where participants were given eight minutes to find as many of the words as they could find. Those in the interrupting conditions were forced to play the game Snake approximately every two minutes. We measured performance by comparing the number of correct words found for all four conditions. We examined subjective difficulty by asking participants to rank the level of difficulty of the task and comparing participants' scores depending on subjective, rather than only objective, task difficulty. Results of the analysis are forthcoming. We expect that the results of our experiment can help system designers understand more about the effects of everyday multitasking.

MICRO CLIMATES WITH MACRO IMPLICATIONS,
HOW BRYOPHYTES MAY HELP DEFINE THE WORLD AROUND US

Brendon Reidy[1], Stephanie Maxwell [1], Charles DeLavoi[1, 2], Juan Larraín[2], Laura R. E. Briscoe[2], Matt Von Konrat[2], and Thomas Campbell[1, 2]
[1]Department of Biology, Northeastern Illinois University, Chicago, IL 60625
[2]The Field Museum, Chicago, IL 60605

Bryophytes (liverworts, hornworts, and mosses) play important roles both ecologically and economically in ecosystems worldwide, yet their role in community interactions remains widely unknown. Their small sizes allow them to fill essential niches within the food webs to which they belong. Bryophytes also contribute to global carbon and nitrogen fixation capacity, absorb large quantities of water, and release organic acids, which can decrease decomposition rates within their communities. Their unique physiology makes them particularly vulnerable to climatic variations, as well as to changes in soil and water pH. Given their acute sensitivity and reliance upon environmental conditions, their presence in the ecosystem has the potential to indicate broader trends in forest health. To examine bryophyte and forest community interactions in particular, we are conducting a multisite survey of bryophyte species between high and low quality oak woodlands within the Northeastern Illinois area. We chose one high quality area as judged by the presence of invasive species, canopy trees, history of the woodland, presence of streams and decorticated wood, and one area of low quality defined by these same standards, but at a lower level overall. We then compared the areas for bryophyte diversity. Preliminary results indicate marked differences in species quantity and diversity between the two areas. Furthermore, we correlated species distribution patterns with climate data and hope to determine the relative utility of using bryophytes as an indicator of overall forest health in Illinois.

EVALUATION OF SOIL ERODIBILITY BY WIND EROSION USING SAND BLASTING

Mariah Green[1], Chi-Hua Huang[2], Javier M Gonzalez[2], Jean Hemzacek[1], and Laura Sanders[1]
[1]Department of Earth Science, Northeastern Illinois University, Chicago, IL 60625
[2]National Soil Erosion Research Laboratory, USDA-ARS, West Lafayette, IN 47907

This study investigates the erodibility of chiseled and no-till soils from a Midwest farm through the erosive agent wind. The hypothesis was that no-till soils would be more resistant to wind erosion than chiseled soils, thus representing a more efficient tillage practice for agricultural productivity, soil health, and water quality. Soil probes were used to retrieve 20 soil samples at depths of 0-6 and 6-12 inches from 16 Long Term Erosion (LTE) chiseled and no-till treatment plots planted in continuous corn, continuous soybean, corn/soybean, and soybean/corn crop rotations. The soil type consisted of silty loam. Each soil profile was segregated by depth and labeled. The soil samples were dry sieved to the exact fraction with grains smaller than 2 mm, placed inside plastic pipe rings, and weighed. A rain simulator was used to rain on the soil inside the rings for 30 minutes at a rate of 10 mm/hour, and then samples were dried for a week. After the drying process each sample was individually weighed. A sand blaster was used to represent wind erosion and blast the samples for times ranging from 2.5 to 45 seconds. Loose soil and sand was removed from the sample and re-weighed. The chiseled soils exhibited less soil loss than the no-till soils. Samples from plots planted continuously in soybeans showed less soil loss than those from plots in continuous corn and other rotations. Soil at the 0-6 inch depth exhibited less soil loss than soil at the 6-12 inch depth. The results show the relationship between tillage practices and wind erosion, which can lead to better understanding the best soil management practices to reduce soil erosion.

STRUCTURE AND FUNCTION OF BACTERIOPHYTOCHROMES IN MYXOBACTERIA

Chris Tong, Ayesha Mapara, Kevin D. Gallagher, Phu Duong, Angela Nugent, James Hopkins, Patricia Waltz, Joseph Varela, and Emina A. Stojković
Department of Biology
Northeastern Illinois University, 5500 N St. Louis Ave, Chicago, IL 60625

Bacteriophytochromes (BphPs) are red-light photoreceptors found in photosynthetic and non-photosynthetic bacteria. However, BphPs' role in non-photosynthetic bacteria has not been well understood. Here, we present the first structural characterization of BphPs from non-photosynthetic myxobacteria, *Stigmatella aurantiaca.* Myxobacteria have a unique multicelluar stage in their life-cycle during which they form fruiting bodies, a process induced by starvation. Fruiting bodies carry desiccation resistant spores that, upon nutrient availability, will convert into vegetative cells. Interestingly, fruiting body formation in *S. aurantiaca* is stimulated by red and/or blue light. *S. aurantiaca* genome codes for two BphPs denoted SaBphP1 and SaBphP2 while related *Myxococcus xanthus* genome completely lacks photoreceptors and light negatively impacts its fruiting body formation. *Cystobacter fuscus* that belongs to the same suborder of Myxococcales as *S. aurantiaca* is the only known myxobacterial species that contains three BphPs. Myxobacterial BphPs share the same domain composition as classical BphPs from photosynthetic bacteria with photosensory module covalently linked to histidine kinase, important in regulating various signaling cascades. However, unlike classical BphPs, SaBphP1 and two BphPs from *C. fuscus* lack a conserved His that forms a hydrogen bond with an organic bilin chromophore essential for protein's photoresponse. Introduction of His via site-directed mutagenesis restored photoresponse in SaBphP1 while removal of His in classical BphPs resulted in reduced/incomplete response to light. To determine the function of BphPs in myxobacteria, we cultured *S. aurantiaca* DW4/3.1 and *C. fuscus* on low nutrient starvation plates on agar as well as filter paper in light and dark conditions at 32°C. As opposed to the dark, we observed large, orange-pigmented fruiting bodies in light-incubated *S. aurantiaca*, and *C. fuscus.* Our goal is to determine mechanistic changes that accompany light-induced morphogenesis in myxobacteria and the novel role of photoreceptors in these non-photosynthetic microorganisms.

CAENORHABDITIS ELEGANS MODEL OF AMYOTROPHIC LATERAL SCLEROSIS: UNDERSTANDING THE ROLE OF TDP-43 EXPRESSION ON HSN MOTOR NEURON FUNCTION

Zelene Figueroa and Cindy Voisine
Department of Biology
Northeastern Illinois University, Chicago, IL 60625

Neurodegenerative diseases are often characterized by a continual loss of neuron abilities. Amyotrophic Lateral Sclerosis (ALS), also known as Lou Gehrig's disease is a progressive neurodegenerative disease affecting nerve cells that are important for locomotion. When motor neurons atrophy, due to their lack of regenerative ability, muscle control is severely impaired. Some individuals with ALS carry mutations in a gene called TDP-43. It is hypothesized that mutations in TDP-43 cause TDP-43 to aggregate leading to motor neuron degeneration. We have generated a nematode *C. elegans* model for ALS. This model was made by cloning the human version of the TDP-43 gene under the control of a pan-neuronal promoter. Taking advantage of the transparency of *C. elegans*, the human TDP-43 was tagged with a YFP (yellow fluorescent protein) to provide visual representation of its aggregation during development and aging. Egg laying assays were performed as an indication of neuronal function, specifically, to monitor TDP-43 and the effect of its aggregation on HSN motor neurons, which are responsible for vulval muscle contraction and thus the reproductive success of *C. elegans*. Preliminary data suggests that there is a 55% decrease in progeny production in animals expressing TDP-43. Furthermore, TDP-43 expressing animals have a 30% decrease in egg laying rate compared to wild-type animals. Taken together, our data indicates defects in HSN motor neurons. Our studies using this *C. elegans* model will continue to enhance our understanding of the connection between the proposed aggregation of TDP-43 and motor neuronal defects associated with ALS, through the examination of HSN motor neuron defects demonstrated in TDP-43 transgenic *C. elegans* lines.

POSTER PRESENTATIONS

1. PRELIMINARY RESULTS TOWARDS A PHYLOGEOGRAPHIC SURVEY OF THE *RACOMITRIUM LANUGINOSUM* SPECIES COMPLEX

Asadullah Ahmadi[1], Juan Larrain[2], Lynika Strozier[2, 3],
Matt von Konrat[2], and Thomas Campbell[1,2]
[1]Northeastern Illinois University, Department of Biology, Chicago, IL 60626
[2]The Field Museum of Natural History, Chicago, IL 60605
[3]Loyola University Chicago, Department of Biology, Chicago, IL 60660

Racomitrium s.s. (*Grimmiaceae*, Bryophyta) is a fairly common taxon in temperate areas of the world, growing on every continent, including Antarctica. Currently, four taxa are recognized within the group including two subspecies of *Racomitrium lanuginosum* (the type subspecies and the subsp. *geronticum*), plus the southern South American endemic *R. patagonicum*, and the mainly Australasian *R. pruinosum*. Whereas in the Northern Hemisphere only the type subspecies of *R. lanuginosum* exists, in the Southern Hemisphere all four taxa coexist, and their morphological plasticity, together with the cryptic morphological characters traditionally used to separate them, make the identification of some herbarium specimens very difficult. The objective of this study is to compare gene sequences from highly variable regions (ITS and rpl16) from more than 70 samples collected from all around the world. We anticipate that molecular data will provide a better understanding of the phylogenetic relationships among these taxa, which would lead to a better understanding of their morphological variability and later help us with the process of field and/or laboratory identification. The questions we want to address with this study are (1) whether *R. lanuginosum* subsp. *lanuginosum* is indeed a cosmopolitan species as currently believed; (2) whether *R. lanuginosum* subsp. *geronticum* is indeed a subspecies of the former or a species on its own; (3) what is the actual distribution range of *R. lanuginosum* subsp. *geronticum* and *R. pruinosum*; (4) what is the actual taxonomic status of *R. patagonicum* and how might it relate to the other South American taxon *R. lanuginosum* subsp. *Geronticum*; and (5) how useful are the traditional characters used to identify and separate the species.

2. NUTRIENT CONCENTRATION AND INTENSITY OF LAVAL FLATWORM (TREMATODA) INFECTION IN FIELD COLLECTED SNAILS

Kimbalee Anderson[1], Romina Maldonado[2] Jennifer Kawaguchi[2],
Robert C. Jadin[2], and Sarah A. Orlofske[2]
Department of Chemistry[1], Department of Biology[2]
Northeastern Illinois University, Chicago, IL. 60625

The use of chemical fertilizers for agriculture results in unintended runoff into wetlands of the Midwest, often leading to eutrophication. Excess nutrients such as Nitrate (NO_3), Nitrite (NO_2), Ammonia (NH_3), and Phosphate (PO_4) have cycled into aquatic ecosystems affecting animal communities, including freshwater snails. The high amounts of nutrients lead to an increase of plant and algae biomass that is consumed by snails. As the populations of snails rises, so does the infection of Trematodes (flatworms). Trematodes have a complex, multi-host life cycle, which starts with eggs that are released into the water through bird feces, where they hatch and infect snails. Inside the first intermediate host (snail), the eggs develop into rediae that release cercariae. These cercariae move out of the snail and enter their second intermediate host (invertebrate or vertebrates) where there is a development into metacercariae (encysted larval stages). The metacercariae awaits transmission to the definitive host through consumption of the second intermediate host. Our research objective was to relate the concentration of nutrients to the intensity of larval trematode (metacercariae) infection in fresh water snails. We collected samples of snails (*Lymnaea* and *Physa*), water, and measured temperature, Dissolved Oxygen (DO) and pH from four different wetlands in Northeastern IL and Southeastern WI in June and July 2014. We dissected the snails in the laboratory to identify and quantify metacercariae infection. We used the water samples to determine NO_3, NO_2, NH_3, and PO_4. The relationship between nutrients and parasite infection differed for the two species of snails, but nitrite and ammonia were important independent variables in the generalized linear models. Our results are consistent with other studies relating excess nutrients to the increased parasitic level in freshwater ecosystems. Our study found a connection between nutrients in fresh water wetlands and the intensity of parasite infection in wildlife.

3. CAN PLANT JUICE BE USED TO MINIMIZE WIND EROSION OR DUST EMISSION?

Bella Arroyo[1], Chi-hua Huang[1], Jean Hemzacek[1], and Laura Sanders[1]
[1]Department of Earth Science, Northeastern Illinois University, Chicago, Illinois 60625
[2]National Soil Erosion Research Laboratory, USDA-ARS, West Lafayette, Indiana 47907

Wind erosion and dust emission degrades air quality and can cause health concerns. In agricultural lands, keeping a vegetative cover has been the most efficient way to minimize wind erosion. With the increasing use of biomass for fuel conversion, there is a need to find a way to reduce wind erosion when the biomass is removed. Plant juice, a natural product from harvesting fiber from green biomass, may have a potential to reduce wind erosion. We tested the soil crust strength under a sand abrader with and without the plant juice extracted from field corn, sweet corn and kudzu plants. The wind erosion resistance was measured by the amount of soil lost from different abrading times. The Amarillo soil from western Texas, where dust storms occurs frequently, was used in the study. With 10 ml of 25% juice (a mix of 1:3 juice/water dilution) applied to the soil contained in a 3-inch diameter ring, the soil lost was reduced from 2.6 g (the control treatment with 10 ml of water applied) to 0.2 g under the juice treatment after 2.5 second sand abrading. We found very similar levels of reduction from corn and kudzu juices as compared to the control. Results from this investigation may lead to the commercial development of a natural product from green biomass that can be used to reduce wind erosion and dust emission. The beneficial use of a nuisance plant, such as kudzu, may also change how we manage invasive species in the ecosystem.

4. THE ROLE OF LANGUAGE IN STORYTELLING: COMPARING ENGLISH AND SPANISH SPEAKERS

Kenny Aspurez, Fernando Limón, Ruth Breckinridge Church
Department of Psychology
Northeastern Illinois University, Chicago, 60625

Story telling is one of the oldest ways to communicate. What determines a good story? Story research examines syntactic devices, such as length of story, content of a story, and elaboration of detail. We asked if these devices differ between English and Spanish speakers as they recount story events. Twenty-one Spanish monolinguals, 22 English monolinguals and 24 English-Spanish bilinguals (13-43 years old) watched 4 cartoon stories differing in complexity. Examination of bilinguals raised in the U.S. allowed for the control of culture. We analyzed length of story, the number of words used, and number of dysfluencies (stuttering, pauses and speech repairs) produced during these story narrations; features indicative of mental effort in structuring story information. Using a T-test, we found that Spanish monolinguals had significantly lengthier stories (*M*=82 seconds vs 59 seconds, respectively; $p < .001$), and more dysfluencies (*M*=13 vs 9, respectively; $p < .002$) than English monolinguals even when story complexity, number of words used or the age of the participant did not differ across languages. This suggests a difference in the way that narratives are mentally structured between languages. English-Spanish bilinguals showed some similarities to the monolinguals. Using a Paired Samples T-test, the same individual, when telling a story in Spanish, produced longer stories, (M=80 seconds vs. M=67 seconds, respectively) and more dysfluencies (M=12 vs. M=11) than when they told the same story in English. The differences did not reach statistical significance possibly due to low sample size. Qualitative analysis of the content of stories showed that narratives told in Spanish were more elaborate and richer in detail than stories told in English. Future examination will explore story elaboration and detail. Results suggest that languages may differ in grammatical structure and thus, may reflect different cognitive representations and organization of experience.

5. SORPTION OF CYANOTOXINS BY NATURAL AND MODIFIED CLAY MINERALS

James Beer[2], Javier Gonzalez[1], Janae Bos[1], Jean Hemzacek[2], and Laura Sanders[2]
[1]National Soil Erosion Research Laboratory, USDA-ARS, West Lafayette, IN 47907
[2]Department of Earth Science, Northeastern Illinois University, Chicago, IL 60625

Microcystin-LR is a toxin produced by cyanobacteria that are associated with harmful algal blooms, and eutrophic surface water. Microcystin-LR contamination in drinking water is a problem worldwide, and has been linked to various health problems. Microcystin-LR is often considered to be the most important cyanotoxin because it is the most common, and among the most acutely toxic. Most of the commonly used water treatment methods are ineffective or impractical for the removal of microcystins. The goal of this project is to investigate the efficacy of several materials for the removal of microcystin-LR from water. We will produce microcystin-LR sorption isotherms using several materials, and combinations of materials. These include clays, organoclays, tannins, and organoclays with sorbed tannins. Analysis of the equilibrated samples will be performed on UPLC-MS. Data will be interpreted using the Freundlich isotherm, and regression analysis. We expect that organoclays with sorbed tannins will be the most effective material for removing microcystin-LR from water. The reason for this is that organoclays are an effective sorbent material for tannins and other organic species, while tannins have the ability to precipitate proteins. Because microcystin-LR is a polypeptide, the combination of organoclays and tannins should be an effective sorbent material. Because many conventional water treatment methods are considered impractical for removal of microcystin-LR, it is imperative that new methods be investigated. Tannins and organoclays are promising materials for the removal of microcystin from water. Water treatment methods utilizing these materials could potentially eliminate the risk of health problems associated with microcystin-LR contamination, and reduce treatment costs for public water supplies.

6. MOLECULAR DYNAMICS SIMULATION OF THE REACTION OF CARBON MONOXIDE AND SILVER

Cesar Bustos, David Capota, John Gonzales, and Paulo Acioli
Department of Physics and Astronomy
Northeastern Illinois University, Chicago, IL 60625

An end product of the burning of fossil fuels in the internal combustion engines of automobiles is toxic carbon monoxide. The catalysis of carbon monoxide into the less toxic carbon dioxide is therefore a very important chemical reaction. In this work we study the catalytic properties of silver and its reaction with carbon monoxide through molecular dynamics simulations. We use the velocity Verlet algorithm together with a realistic interaction potential that includes two and three-body terms for the study. For the interaction between silver, carbon, and oxygen, we use a modified Sutton-Chen potential with appropriate parameters to describe the accepted bond lengths and energies for the atoms and molecules under consideration. The parameters were calculated from the pair interactions between each possible combination of the atoms, and they were adjusted to describe the proper ground state configuration of the AgCO molecule as obtained from density functional theory calculations. We present the simulations of the reaction of Ag and CO and give the probabilities of each of the channels (Ag + CO, AgC + O, AgO + C, and AgC) as a function of the initial velocity of the silver atoms and the vibrational energy of CO. Future work includes the extension of the work to study the absorption reaction $Ag_N + CO \rightarrow Ag_NCO$.

7. EARLY LAND PLANTS TODAY: TREE OF LIFE EXTENDS ITS BRANCHES TO EDUCATION AND CITIZEN SCIENCE

Anthony Carmona[2], Justyna Drag[2], Lauren Hasan[1], Charlie DeLavoi[1], Brendon Reidy[2], Jonathan Scheffel[1], Juan Larraín[1], Matt Grief[1], Thomas Campbell[2], and Matt Von Konrat[1]
[1]The Field Museum, Chicago, IL 60605
[2]Department of Biology, Northeastern Illinois University, Chicago, IL 60625

The earth is currently undergoing the sixth mass extinction period in its history. Spurred by global climate changes and pollution, many species are diminishing in the number of species and genetic diversity. One such group of organisms are the Bryophytes (liverworts, hornworts, and mosses). Liverworts (Marchantiophyta) are a particularly diverse and evolutionary significant group of plants found worldwide that can be used as indicators to monitor and measure environmental changes. Therefore, it is imperative that we identify and study these species before they go extinct. However, due to their cryptic nature and small size, liverworts are often overlooked and can be very difficult to describe and classify. To this end, we have designed an engaging online citizen science project in partnership with Zooniverse.org that allows amateur scientists (the public) to measure and classify various liverwort species. A large portion of this project is conducted behind the scenes at The Field Museum where we collect and prepare samples for the website. To date, we have received over 35,000 measurements from over 3000 participants. Here we report on using this novel citizen science approach as a tool to help accelerate the process of biodiversity discovery and documentation.

8. COMPUTATIONAL AND PROBABILISTIC PREDICTION OF ENHANCER-GENE INTERACTIONS

Christopher Castro[1], Joseph Azofeifa[2], Robin Dowell[2]
[1]Department of Mathematics, Northeastern Illinois University, Chicago, IL 60625
[2]BioFrontiers Institute, University of Colorado, Boulder, CO

Regulation of cellular transcription coordinates proper synthesis of proteins. In order to achieve optimal transcription regulation, regulatory elements are needed. Often, mutations in these regulatory elements arise, causing genes to be expressed improperly, leading to phenotypic abnormalities such as tumorigenesis. We focus our study on enhancers: regions of DNA that directly control the level of transcription of a target gene subset. Here, we provide a computational framework for making fast and accurate gene-enhancer prediction pairs. Our method relies on a key finding that enhancers are transcribed at the same level as their target gene pair. Although this correlation has been observed through previous studies, there has not yet been a way to predict links between specific enhancer regions and specific target genes. Here, we measure transcription via global nuclear run-on sequencing (GRO-seq) which provides a direct read-out of nascent RNA transcripts and identify these transcripts using a new algorithm, Fast Read Stitcher (FStitch). Put simply, we seek to compare regions of transcription with similar levels of expression in order to later provide a list of putative enhancer-gene relationships.

9. EVALUATING WHETHER THE INTERNET TOPOLOGY IS FLATTENING

Charla Earls, Michael Abreu, Bonnie Tong, Karl Amjad-Ali, Graciela Perera
Computer Science Department
Northeastern Illinois University, Chicago, 60625

The Internet topology is a hierarchical system of interconnected networks. These networks are known as large, mid-size, and small Internet Service Providers (ISP) such as Comcast, AT&T and RCN. This Internet topology includes consumers (i.e., students) as well as content providers such as Google, Facebook, and others. Consumers as well as content providers have always accessed the Internet via smaller ISPs, but recent studies have stated that access means have been changing. Furthermore, with the emergence of applications such as Netflix and Hulu, large content providers may be deploying their own wide area networks (WANs) so that consumers may be able to directly have access to their content instead of using small ISPs. We investigated whether the conclusion of an increase in WAN deployments shown in previous research had proven to be enduring and continuing. We modified previous methods used to include the automation of the data collection process. Data are stored in XML formats for easy extraction and analyzing. Our contributions are: 1) providing a set of automated tools to collect and analyze the data, which allow experiments and results to be replicated at a later time, and 2) consumer's or student's typical top ten go-to websites as a means of validating the trend previously found. We were able to successfully automate the collection of data from each host server to destination server in XML format. Our preliminary results show that the previous findings have continued to hold in the ensuing four years. Also, we are currently analyzing an additional metric. This metric measures the geographical distribution of major companies by showing how many well-known Internet Exchange Points are found in the paths towards content providers.

10. ENCAPSULATION OF A MODEL COMPOUND DELAYS ITS RELEASE FROM A BIOBASED POLYMERIC MATERIAL

Jennifer Eler[1] and Victoria L. Finkenstadt[2]
[1]Chemistry Department, Northeastern Illinois University, Chicago, IL 60625
[2]National Center for Agricultural Utilization Research, Agriculture Research Service
United States Department of Agriculture, Peoria, IL 61604 USA

Biobased polymers have several advantages over petroleum-based polymers such as polystyrene or polyethylene in that they can be less expensive and more environmentally friendly while retaining functional properties such as controlled release of biologically active compounds. The food-contact tray was originally designed with a biobased polymer infused with an anti-microbial agent such as Nisalpin™; however, caffeine was substituted as the model compound in our preliminary investigations. This composite was then extruded with thermoplastic starch for preliminary investigations in constructing a food contact tray. Caffeine was combined with pectin and then extruded with thermoplastic starch to form a composite suitable for food-contact trays. Pectin is a cell-wall polysaccharide with unique functionality that makes it ideal for controlled release systems using encapsulation. Starch is the main energy storage polysaccharide for several cereal crops. Both starch and pectin can be processed into a thermoplastic material. Caffeine was physically mixed or encapsulated through dissolution and freeze-drying with pectin. UV-VIS spectroscopy (λ=273 nm) was utilized to measure the release of caffeine from the composite submerged in water. A spike standard curve was used to compensate for any UV absorption by the polysaccharide in the region of interest. Encapsulation did delay the release of the caffeine. The release rate was delayed by at least one hour when the model compound was encapsulated before extrusion. The three types of starch were normal, high-amylose, and waxy corn starch with different amounts of amylose and amylopectin. The type of starch did not affect the release profiles in a significant manner.

Acknowledgement: Funding for Summer Undergraduate Fellow was provided by the Midwest Area (Dr. Robert Matteri, Director) of the Agricultural Research Service. This work was authorized under USDA National Program 306: Quality and Utilization of Agricultural Products and Project 157: Advanced Starch-based Materials (National Program Leader: Dr. Robert Fireovid).

Disclaimer: Names are necessary to report factually on available data; however, the USDA neither guarantees nor warrants the standard of the product, and the use of the name by USDA implies no approval of the product to the exclusion of others that may also be suitable.

11. BACTERIOPHYTOCHROMES IN MYXOBACTERIA: IMPLICATIONS FOR LIGHT-CONTROLLED MORPHOGENESIS

Kevin D. Gallagher, Phu Duong, Angela Nugent, Dorina Bizhga, Hardik Patel, Nicole C. Woitowich, and Emina A. Stojković
Department of Biology
Northeastern Illinois University, Chicago, IL 60625

Bacteriophytochromes (BphPs) are red-light photoreceptors found in photosynthetic and non-photosynthetic bacteria. However, their physiological role in non-photosynthetic bacteria is not well understood. Here, we present the first structural and functional characterization of two BphPs (SaBphP1 and SaBphP2) from the non-photosynthetic myxobacterium *Stigmatella aurantiaca*. Among prokaryotes, myxobacteria are distinguished by a unique multicellular stage in their life-cycle in which fruiting bodies are formed during starvation conditions. Interestingly, fruiting body formation in *S. aurantiaca* is markedly stimulated by red and/or blue light. Our hypothesis is that BphPs may play a role in the fruiting body formation of *S. aurantiaca*. Like classical BphPs, SaBphP1 and SaBphP2 are composed of a photosensory module covalently linked to a histidine kinase and require biliverdin (BV) as a cofactor for photoactivity. They share 41% amino acid sequence identity and yet have distinct photoconversion properties. Unlike SaBphP2 and classical BphPs, SaBphP1 undergoes limited red light to far-red light photoconversion. The complete photoconversion of SaBphP1 can be restored by mutating threonine (Thr289) to a histidine (His) in the photosensory module. Besides BphPs, the *S. aurantiaca* genome annotation also indicates the presence of a putative heme oxygenase, which is essential in BV synthesis. Conversely, the genome of the closely related *Myxococcus xanthus* completely lacks BphP and heme oxygenase genes. We cultured *S. aurantiaca* DW4/3.1 and *M. xanthus* DZ2 on starvation agar plates in both light and dark conditions. In contrast to *M. xanthus,* which forms fruiting bodies in the dark, *S. aurantiaca* produces orange-pigmented fruiting bodies only in the presence of light. Currently, we are investigating the role of BphPs in fruiting body formation by inactivating/mutating genes coding for BphPs and screening for expected phenotypes. Our goal is to determine what mechanistic changes accompany light-induced morphogenesis in myxobacteria and the novel role of photoreceptors in these non-photosynthetic microorganisms.

12. CONSTRUCTION OF A MICROSATELLITE ENRICHED GENOMIC LIBRARY FOR *RHODIOLA INTEGRIFOLIA*

Jose L. Hermosillo, Gwendolyn A. Murphy, Marisela Rodriguez, Mary Kimble, and Joel Olfelt
Northeastern Illinois University, Department of Biology, Chicago, IL 60625

We are developing DNA based molecular markers called microsatellites to investigate the population genetics of *Rhodiola integrifolia* (king's crown)*,* a North American and Eurasian plant species that is widespread in alpine and arctic habitats. Distinct populations of conservation concern also occur at several locations in Minnesota and New York. Microsatellites are regions of DNA that have specific short nucleotide sequences that are repeated in tandem many times. To use such regions, the specific DNA sequences that flank the microsatellite tandem repeats must be identified so that primer pairs specific to each microsatellite region can be designed. To begin identifying microsatellites for analysis, we extracted DNA from two *R. integrifolia* sub-species, cut the DNA using the restriction enzyme *Alu I,* added double stranded oligonucleotide linkers to the ends of the resulting DNA fragments, and selected for fragments with repeated DNA sequences regions by hybridizing them with a single stranded, biotinylated oligonucleotide having a microsatellite like sequence. The selected fragments were recovered using streptavidin coated magnetic beads, ligated into plasmid vectors, and subsequently transformed into *Escherichia coli* to construct the microsatellite enriched library. We have identified bacterial colonies potentially carrying plasmids hosting microsatellite marker inserts, which we are beginning to characterize. The new microsatellite markers can be used to estimate levels of genetic variation within and among *R. integrifolia* populations. This information in turn, can be used by conservation professionals to understand the evolutionary potential of *Rhodiola* populations as well as population genetic parameters such as effective population sizes and gene flow, which are needed by conservation professionals to make informed management decisions. We will use the microsatellites that we develop for molecular genotyping and they may also be useful in the study of related pharmaceutically important members of the genus *Rhodiola*.

13. BEHAVIORAL TESTS TO ASSESS AFFECTIVE DISORDERS IN NEONATAL PIGLETS

Angelina Jaimes[1], Adrienne Antonson[2], and Rodney Johnson[2]
[1]Department of Psychology, Northeastern Illinois University, Chicago, IL 60625
[2]Department of Animal Sciences, University of Illinois Urbana- Champaign, Urbana, IL 61801

Similarities in porcine and human neuroanatomy make the pig a preferable model for human neurodevelopmental research. At present, little work has been done to develop behavioral tests for young piglets that can be used in place of human infant testing. Common areas of interest for detecting deficits in neurodevelopment include behavioral domains such as learning and memory, anxiety or stress response, sociability, and stereotypic behaviors. The present research is developing and validating five different behavioral tests related to these domains, which can be utilized with neonatal piglets. Naturally farrowed piglets were placed in individual caging units at Post natal Day 2. Piglets began testing at Post natal Day 11 and experienced the following order of behavioral tests: an open field test for anxiety; a spatial T-maze task to determine learning and memory; a consummatory extinction-based frustration test; a sociability test that included measurements for general sociability and preference for social novelty; and a restricted repetitive behaviors test using an open arena with four different enrichment objects. These behavior measurements will be used in current research focusing on the effects of maternal immune activation during pregnancy on the neurodevelopment of the fetus. Infection in the mother during pregnancy may lead to dysregulation in normal brain development and therefore manifestations of aberrant behaviors in the offspring. The behavioral tests are intended to be sensitive in detecting heightened anxiety and frustration, deficits in learning and memory, decreased social approach, decreased preference for social novelty, and increased restricted repetitive behaviors compared to controls.

14. CHOOSING TOPIC MODELS: AN AUTOMATIC GUIDE

Danilo Jara, Sadiya Sultana, Jeremy Grajales, Rachel Trana, Francisco Iacobelli,
Department of Computer Science
Northeastern Illinois University 5500 N St. Louis Ave, Chicago, IL 60625

Topic modeling techniques analyze text and produce clusters of words called topics. Some topics can be highly interpretable and some may not necessarily contain useful information. For example, a topic comprised of words such as {President, campaign, election, candidate}, can be easily understood in the context of an election. However, a topic that includes words such as {game, car, tree, dog, phone}, does not provide a clear context for interpretation. Research on topic modeling has focused on the design of individual algorithms to model specific kinds of textual information based on salient dimensions of the text. However, it is not clear if the different algorithms produce output that is significantly different from one another for practical purposes. Our research investigates whether algorithms aimed at specific kinds of texts provide significantly different output than a generic approach to topic modeling in a diverse pool of textual data. We test three seminal topic models based on Latent Dirichlet Allocation (LDA) –the most widely used topic-modeling technique so far. Namely, hierarchical LDA, generic LDA, and dynamic LDA on three datasets: (a) senate speeches from 1989 to 2006; (b) twenty years of articles from the New York Times (1987-2007); and (c) tweets from a large group of individuals, from April 2010. All of the data sets differ widely from each other in terms of length of documents (e.g. news articles are longer than tweets), types of words (e.g. senate speeches are formal, tweets are informal and abbreviated), and time span (e.g. a topic in twitter can last a few days. In the senate;a few years). We evaluate the topics using point-wise mutual word information (PMI), a measure that correlates well with human judgments of topics, and we provide results and recommendations for social scientists that use these models to answer questions in their data.

15. BILINGUALISM ENGLISH-SPANISH AND CODE SWITCHING: RELATIONSHIP OF COGNITIVE PROCESING AND AUTOMATIC LANGUAGE ACTIVATION

Fernando Limon, Kenny Aspurez, R. Breckinridge Church,
Psychology Department
Northeastern Illinois University, Chicago, IL 60625

Approximately 16% of the U.S. population is Spanish-English bilingual with the number increasing. This phenomenon has prompted the study of bilingual cognitive processes underlying language. Our previous research showed that bilinguals had less working memory available when performing under experimentally induced cognitive load than monolinguals. This decreased memory capacity is hypothesized to be the result of the activation of two language systems simultaneously while speaking. The research reported here examines the language of our subjects to provide additional evidence that bilingual individuals activate multiple language systems when speaking. Nine bilingual, 11 Spanish-monolingual and 9 English-monolingual participants performed two tasks simultaneously (a classic cognitive load paradigm): (1) memorizing lists of numbers and (2) retelling cartoons just viewed. The results presented here are an in-depth examination of their story narrations. We examined code-switching (inserting a word from English into a story told in Spanish; or vice versa) in the bilinguals produced during the story narrations. Additionally, we examined one cartoon event expressed by all of our participants to explore the use of language-specific syntax. This cartoon event was chosen for the preliminary investigation. Additional cartoon events will be the focus of future explorations. Preliminary results suggest that the number of code-switches produced, negatively correlated with memory. Moreover, using a Chi-square statistical test we found that significantly ($p < .05$) more Monolinguals (English and Spanish) used only one language-specific syntax (English used syntax specific to English and Spanish used syntax specific to Spanish) when verbally expressing a cartoon event (75%), than the Bilingual group who used both Spanish and English-specific syntax equally (55.6%). Our results provide corroborating evidence to the cognitive load findings supporting the notion that bilinguals are activating two language systems simultaneously as they speak. Implications for how cognitive processes may underlie language tasks such as story-telling will be discussed.

16. UNDERSTANDING THE INVOLVEMENT OF TPR-1 IN PROTEIN MAINTENANCE AND CELLULAR PROTECTION IN *C. elegans*

Edith Morales and Cindy Voisine
Department of Biology
Northeastern Illinois University, Chicago, IL 60625

The stability of the proteome depends on the activities of molecular chaperones that prevent the accumulation of aggregated proteins in cells. Since protein aggregation is a hallmark of many age-related neurodegenerative diseases, identifying chaperones that fail to remedy folding problems during the disease process is important. Using well-established *C. elegans* Alzheimer's disease and Huntington's disease models, a chaperone-wide RNAi (RNA interference technology) screen in *C. elegans*, a well-established Alzheimer's and Huntington's disease model, revealed that knockdown of an uncharacterized conserved gene, *tpr-1*, enhances age-related cellular dysfunction that is linked to protein misfolding. We use the nematode *C. elegans* to characterize the effect of three different mutations, two missense mutations and one nonsense mutation, in the *tpr-1* gene on protein misfolding. In this investigation, we use genetic crosses and molecular techniques to genotype strains carrying the *tpr-1* mutation. Our goal is to evaluate the effect of mutations in *tpr-1* on the longevity of the *C. elegans* nematode and to gain an understanding of how *tpr-1* may be involved in aging-related neurodegenerative diseases.

17. THE MECHANISMS INFLUENCING SPREAD OF ADDICTIVE BEHAVIOR THROUGH TWITTER SOCIAL NETWORKS: A DATA-DRIVEN MODELING BASED APPROACH

Carl Joseph Nadela, Dr. Lydia Filus[1], Dr. Anuj Mubayi[2]
Department of Mathematics[1] Northeastern Illinois University, Chicago, IL, 60625-4699
Department of Mathematics[2] Arizona State University, Tempe, AZ, 480-965-2100

Twitter is a microblogging website where individuals freely share their opinions on various topics and potentially influence followers by their tweets. In this project, we attempt to model the spread of addictive behavior through social network models using real Twitter data as a proxy. The basis of the project is predicated on the notion that behaviors such as alcoholism, illicit drug use and abuse are the result of one's behavioral choices. Whatever the reasoning, one can always argue that people's decisions and behavior are influenced by social factors; their social relationships. Our claim that these behaviors are affected by social interactions is backed by the results of the well-known paper, The Spread of Obesity in a Large Social Network over 32 Years, by Nicholas A. Christakis and James H. Fowler. In this study, we use real data from twitter that included dates, usernames, user posts ("tweets") and followers list. The data was cleaned and parsed using a code in Python programming language that counts time sensitive usage of words relating to the categories of alcoholism, drug addiction. Weekly network structure was generated using weekly user-follower activity. I use Python plotting code to create weekly frequency histograms for each keyword to measure increases in usage. With these results, I plan to find a time varying network structure that shows the effect that individual-user's posts on these topics have on their neighbors', "followers'," posts. We can see if, and to what degree, one user's posts contain keywords in addictive behavior. Some network metrics like clustering, influence, passivity, and social distancing are computed to study dynamics of addictive behavior. The model aim was also to locate the sources or mechanisms responsible for the "infection" that cause these behaviors to proliferate.

18. FIRST DESCRIPTION OF DISCONTINUOUS RESPIRATION IN THE PRAYING MANTIS HIERODULA PATELLIFERA

Salim Patel[1], Christina Carrion[1], Emily Fioramonti[1], Greg Prete[1], Bart van Alphen[2], Frederick Prete[1], Aaron Schirmer[1]
Department of Biology[1], Northeastern Illinois University, Chicago Illinois 60625
Department of Neurobiology and Physiology[2], Northwestern University, Evanston, Il 60208

Unlike many vertebrates, insect respiration is unusual in that it is both irregular and discontinuous, giving rise to discontinuous gas-exchange cycles (DGC). Gas movement through the respiratory system in insects is regulated by abdominal pumping and the opening/closing of small orifices in the thorax and abdomen (spiracles) that are continuous with a network of tubules (trachea). Discontinuous breathing patterns have been described in a number of insects including cockroaches, beetles, and locusts by flow-through respirometry or video monitoring of spiracles or abdominal movements. However, no such analyses have been done using praying mantises (Insecta, Mantodea). Here we used a custom designed MatLab based video analysis system to study the respiration-related abdominal movements in the praying mantis, *Hierodula patellifera*. Observations were conducted over time periods ranging from 24-72 hours and under different feeding regimes. Overall, mantis respiration occurred in discrete 30-45 second bouts with inter-bout-intervals ranging from 50-60 seconds. Individual bouts consisted of three distinct phases: phase one was characterized by shallow, irregularly spaced breaths; phase two consists of a series of 15-20 rapidly occurring, deeper breaths collectively lasting 17-20 seconds; and, phase three consisted of 3-5 very deep breaths each lasting 18-20 seconds. The three phases were characterized by progressive abdominal elevation superimposed on the breathing-related oscillations. In addition, our preliminary data suggest that there are post-feeding increases in breath rate, which we hypothesize are associated with increased metabolic activity. These experiments represent important steps forward in our understanding of the complex patterning and respiration regulation in this model system.

19. DOMAIN STURCTURE OF BACTERIAL RED LIGHT PHOTORECEPTORS AS REVEALED BY ATOMIC FORCE MICROSCOPY

Rima Rebiai, [1] Zain Malik, [1] Marie E. Kroeger, [2] Emina A. Stojković, [2] Stefan Tsonchev, [1]
Kenneth T. Nicholson [1]
[1] Department of Chemistry, [2] Department of Biology
Northeastern Illinois University, 5500 N. St. Louis Ave., Chicago, IL 60625

Atomic Force Microscopy (AFM) has been used to analyze a wide variety of samples to provide insights into material functionality at the nanoscale. This technique uses a mechanical probe to magnify surface features in order to produce three-dimensional images of samples at high resolution. In this particular study, AFM has been employed to characterize the structure of intact bacteriophytochromes (BphPs) in biologically relevant media. BphPs are red light photoreceptors found in both photosynthetic and non-photosynthetic bacteria. These photoreceptors are responsible for perceiving light and initiating an important physiological response to optimize growth and development. Structural characterization of these proteins may also play an essential role in the engineering of infrared fluorescent tissue markers. Intact BphPs are very challenging to crystallize, especially in the light-adapted state for X-ray crystallography and are too large for analysis by nuclear magnetic resonance. Using AFM, we have collected images of intact BphPs found in non-photosynthetic *Stigmatella aurantiaca* (SaBphP2) and photosynthetic *Rhodopseudomonas palustris* (RpBphP3) in their respective light-adapted states. Both P2 and P3 contain a light sensing module, which has a covalently bound biliverdin chromophore, a chemical moiety that is responsible for absorbing light. For both photoreceptors, global conformational changes are anticipated to occur upon light exposure. As a result, multiple orientations of P2 and P3 have been observed on mica and compared to models of intact BphPs generated using PyMOL software and X-ray crystallographic structures of related BphPs in the dark-adapted states. The cross-sectional analysis and total volume measurements of the proteins are in close agreement with the models. Our future goals include characterization of intact BphPs in their dark-adapted states and visualizing dynamics of receptor–ligand interactions in live bacterial cells using AFM.

20. AMYOTROPHIC LATERAL SCLEROSIS IN *C. elegans*: THE EFFECTS OF TDP-43 EXPRESSION ON NEURONAL HEALTH

Emily Rendleman and Cindy Voisine
Department of Biology
Northeastern Illinois University, Chicago, IL 60625

TDP-43 is an RNA-binding protein that has been linked to neurodegenerative diseases, such as Amyotrophic Lateral Sclerosis (ALS). TDP-43 becomes inappropriately cleaved and accumulates in the cytoplasm of affected cells, forming aggregates. To study the effects of TDP-43 on neuronal function, we generated a *C. elegans* model for ALS by cloning the human wild-type TDP-43 gene tagged with a yellow fluorescent protein under a pan-neuronal promoter. Animals expressing TDP-43 have severely limited motor neuron capabilities. To explore whether these motor deficits are a result of neurodegeneration we introduced a red fluorescent protein reporter into GABAergic motor neurons. Microscopy was used to visualize and compare the neuronal health of motor neurons in TDP-43 transgenic animals to wild type. In addition, the subcellular localization of TDP-43 was assessed in order to determine whether cytoplasmic accumulation was contributing to motor deficits and neurodegeneration. When comparing control and TDP-43 worms, all 19 GABAergic neurons were present in 60 worms suggesting no neuronal cell death. However, when the motor neurons of 60 worms expressing TDP-43 were examined, we observed evidence of axon abnormalities. Understanding whether there is neurodegeneration along with TDP-43 cytoplasmic localization and accumulation will give insight into potential pathogenic pathways and mechanisms that could be targeted for therapeutics in the future.

21. THE INFLUENCE OF FLORAL-VISITOR ANATOMY ON POLLEN REMOVAL FROM THE COMMON MILKWEED (*ASCLEPIAS SYRIACA*)

Adriana Roman, Aaron Howard
Department of Biology
Northeastern Illinois University, Chicago, IL 60625

Flowering plants use vectors, such as wind or animals, to move pollen between plants. From the plant's perspective, it is important that the vector fits well with its flowers, so that its pollen movement and reproduction are efficient. For this study, we investigated the relationship between insect visitor anatomy (animal vector) and its ability to remove pollen from flowers of *Asclepias syriaca* (Common Milkweed). We collected 323 insects after they visited flowers of *A. syriaca*, which were located on the campus of Northeastern Illinois University, and preserved the insects in a freezer for further analysis. We quantified the amount of pollen each visitor carried along with the size of various insect anatomical features, such as body length, intertegular length, and tibia diameter. Tibia diameter was the strongest predictor of the quantity of pollen carried by a visitor. The amount of pollen carried was maximized when a visitor's tibia diameter was similar in size to *Apis mellifera*'s (Western Honey Bee) tibia diameter. *Apis mellifera* carried significantly more pollen than native bumblebees, lepidopterans (butterflies and moths), papilionids (swallowtails) or vespids (wasps). This difference may be due to the fact that, across traits, *A. mellifera* is generally smaller in size than the other visitors and similar in size to native apids (*e.g.*, *Anthophora abrupta*) that were more abundant pre-European settlement. Through this study, we hope to gain a better understanding of the pollination system of *A. syriaca* and conserve it for organisms, such as *Danaus plexippus* (Monarch Butterfly), that rely on it as a host.

22. AMYOTROPHIC LATERAL SCLEROSIS IN *C.elegans*: UNDERSTANDING HOW TDP-43 EXPRESSION AFFECTS LONGEVITY

Anthony Salamanca[1], Cindy Voisine[2]
[1]Department of Chemistry
[2]Department of Biology
Northeastern Illinois University, Chicago, IL, 60625

Amyotrophic Lateral Sclerosis (ALS), also known as Lou Gehrig's disease, is a neurodegenerative disorder that primarily affects motor neurons, eventually leading to death. Protein aggregation is a hallmark of many aging related neurodegenerative diseases, including ALS, leading to neuronal dysfunction. In affected tissues of multiple ALS patients, one particular protein, TDP-43, has a propensity to aggregate in motor neurons. TDP-43 is a DNA binding protein and assists in transcription. In addition, TDP-43 binds to mRNA and is involved in alternative splicing. The process of splicing is how the cell controls the production of certain version of proteins. Numerous mutations in the gene that encodes TDP-43 lead to its aggregation and have been associated with ALS and other neurodegenerative diseases. The mechanism by which motor neurons dysfunction in ALS patients carrying mutations in the gene product that encodes TDP-43 is still unclear. To understand the connection between TDP-43 aggregation and motor neuron dysfunction, we have established a *Caenorhabditis elegans* model in which wild type worms express human TDP-43 in all neurons. Previous studies have shown that TDP-43 overexpression in *C. elegans* leads to motor neuron dysfunction early in development. Therefore, we evaluated the impact of this neuronal dysfunction on aging of the organism. Lifespan assays were performed and preliminary results indicate that expression of TDP-43 decreases lifespan. Our data suggest that TDP-43 disrupts normal neural function leading to a decline in overall health of the organism.

23. MATHEMATICALLY MODELING THE INNER MEMBRANE OF A MITOCHONDRIA

Alejandro Sanchez, Jr.[1], Dr. Michael J. Miksis[2], Dr. Joshua B. Bostwick[2]
[1]Department of Mathematics, Northeastern Illinois University, Chicago, IL 60625
[2]Department of Engineering Sciences and Applied Mathematics
Northwestern University, Evanston, Illinois, 60208

The mitochondrion is enclosed by a double layer membrane and produces most of the adenosine triphosphate (ATP) that powers the cell's activities. Some specific mitochondrial inner membrane organization represents the highest number of multi-layer cubic membrane structures reported in biological systems. So being able to mathematically represent the inner membrane, when holding the outer membrane of the mitochondria as not active, would be a great first step to better understanding the complexity of the mitochondria as a whole. The inner membrane has many folds known as cristae and is composed of smoothly varying regions that hug the outer membrane. This project aims to better understand and develop a model for the cristae and its shape. Few studies have examined the topology of the mitochondrial inner membrane, and these studies have concluded that the shape of the inner membrane might directly affect specific functions. Our model consists of an elastic membrane confined between two parallel rigid walls. As the length of the membrane is increased, it deforms into a complex series of shapes that depend on the elastic properties of the membrane and the amount of fluid it bounds. The mathematical model consists of a 4^{th} order differential equation with parameters for tension, σ, pressure, P, and a parameter A that quantifies the magnitude of the hydration forces between the membrane and the parallel walls. In our periodic model we found the tension analytically when the hydration forces were neglected. When the hydration forces were included in the model, our computational results showed that as the length of the membrane increased, the value of the tension increased in order to fit the length of the membrane between the two walls.

24. IS THERE EVIDENCE OF EUTROPHICATION IN VOLO BOG NATURE PRESERVE? A PALEOLIMNOLOGICAL STUDY WITH DIATOMS

Charles C. Sandusky, Jennifer E. Slate
Department of Biology
Northeastern Illinois University, Chicago, Illinois 60625

Volo Bog Nature Preserve in northeastern Illinois may be impacted by eutrophication due to increasing development. The purpose of this investigation is to analyze the diatoms in sediment that has been deposited in the bog over time, to determine if there is evidence of recent eutrophication. Diatoms were counted at several depths (0-2 cm, 30-32 cm, 66-68 cm and 90-92 cm) in the sediment core to determine how the community has changed over time. One hundred valves were counted at each depth, and *Gomphonema gracile* and *Encyonema silesiacum* were the two most common diatoms found. These species both thrive in low nutrients, indicating no evidence of eutrophication in Volo Bog. This result implies that maintaining Volo Bog within a nature preserve is an effective way of preventing eutrophication. The investigation will be continued by taking a new, deeper sediment core and increasing the number of valves counted at each depth to find out when and perhaps how Volo Bog became acidic.

25. Implementing Silt Socks in Tile Risers to Reduce Sediment and Nutrient Transport

Jazmin Villegas[1], Thalika Saintil[2],Wendy Francesconi[2], Laura Sanders[1], Jean Hemzacek[1]
[1]Department of Earth Science, Northeastern Illinois University, Chicago, IL 60625
[2]USDA-ARS National Soil Erosion Research Laboratory, West Lafayette, Indiana 47907

Given the growing environmental problems associated with eutrophication in surface waters receiving agricultural runoff, there is a need for low-cost and high impact management practice solutions. This study evaluates the impact of remediation agents in silt socks to remove sediment, phosphorus, and nitrogen from surface runoff. Tile risers located in closed depressions within agricultural fields act as direct pathways for sediment and nutrient transport to surface waters. Four series of experiments were conducted: tile riser without silt sock (TWS), tile riser with silt sock only (TSO), tile riser with silt sock and charcoal (TSC), and tile riser with silt sock and steel slag (TSS). Runoff water was collected from a 9.75-m by 3.66-m laboratory soil box placed under a rainfall simulator. Soils given each of the treatments were exposed to four runoff events lasting 30 minutes each at an intensity of 50 mm h^{-1}. Differences between treatments will be evaluated using Kruscal-Wallis tests. While previous findings have demonstrated silt socks to be effective at removing sediments in runoff, preliminary results of this study suggest that flow rate is reduced by about 0.18 L/s (50%) in TSO compared to TWS, by 0.05 L/s (13%) in TSC, and by 0.01 L/s (1%) in TSS. This indicates that from the agents utilized charcoal is the most effective. Reductions in flow rate using silt socks could serve as an initial mechanism to promote water ponding and nutrient infiltration. Remediation agents, in contrast, could serve as a second mechanism of nutrient pollution mitigation and further improve water quality.

ABOUT THE STUDENT CENTER FOR SCIENCE ENGAGEMENT

The Student Center for Science Engagement is a resource to help students succeed at NEIU and in their future careers in the sciences. We serve all students interested in the sciences, and we support the following departments: Biology, Chemistry, Physics, Earth Science, Computer Science, Mathematics, and Psychology.

We offer:

- **One-on-One Holistic Advising** – Through close mentorship, our advisors help students explore majors, internships, graduate school and other career options. We encourage students to advance their professional training, helping them to secure resources to advance their academic and professional goals.

- **Workshops**-On a monthly basis, our workshops cover a broad range of topics. We emphasize building strong professional development skills.

- **Tutoring and GRE Preparation**-We provide daily tutoring services in upper-level Biology, Chemistry, Computer Science, Earth Science, Genetics, Mathematics, and Physics courses. Free GRE classes are offered during the summer.

- **Research Opportunities** – We encourage students to gain valuable hands-on experience by helping them find summer research opportunities with NEIU faculty and at other institutions.

- **Conference Attendance and Participation**-The SCSE supports students to attend and present their research at conferences locally and nationwide.

- **Invited Speakers-**The SCSE invites individuals representing organizations and industry to inform students on internships and career opportunities in a broad range of fields.

LOCATION
BBH 235 and BBH 247

HOURS
9 A.M.-5 P.M Daily
Evening hours:
T 5-6 and Thursday 5-7

ACKNOWLEDGEMENTS

The research presented at the Sixth Annual Research Symposium of the Student Center for Science Engagement has been funded by several internal and external agencies. On behalf of our students and faculty, the SCSE acknowledges financial support from the College of Arts and Sciences at NEIU, the Office of Academic Affairs at NEIU, the United States Department of Education Title III HSI STEM initiative, and the National Science Foundation Louis Stokes Alliances for Minority Participation. We also thank the agencies and institutions that partnered with the SCSE this year to support the summer research of NEIU students, which include Illinois State University, The Field Museum of Chicago, University of Illinois Urbana, Northwestern Illinois, Loyola University, BioFrontiers Institute (University of Colorado), National Soil Erosion Research Laboratory, USDA-ARS, and National Center for Agricultural Utilization Research, Agriculture Research Service United States Department of Agriculture, Peoria.