18TH ANNUAL

CELEBRATION

OF STUDENT RESEARCH, CREATIVE WORKS
AND ACADEMIC SERVICE LEARNING

Thursday, April 11, 2013
Learning Resources Center

Northern Michigan University

Sponsored by the Offices of Academic Affairs and
Graduate Education and Research
18th Annual
Celebration of Student Research, Creative Works
and Academic Service Learning

Thursday, April 11, 2013
9 a.m. – 4 p.m.

Northern Michigan University
Learning Resources Center

Welcome to the 18th Annual Celebration of Student Research, Creative Works and Academic Service Learning. This symposium celebrates the scholarship and creativity of both undergraduate and graduate students. All students are welcomed to participate and showcase their work. Each entry is listed in this program in alphabetical order by last name of the submitter. Posters and art will be on display in the concourse and presentations/performances will be held in Rooms 235A and 235B. Thank you for supporting the exceptional work of these students and their advisors with your attendance and participation in this event.

9 a.m. Opening Ceremony
235B

President David S. Haynes
Brian D. Cherry, Assistant Provost of Graduate Education and Research

Michael Kowalczyk, Mathematics and Computer Science,
Chair of Educational Technology Resources and Policy Committee

2013 Northern Michigan University
Student Technology Innovation Award Winners

Ian Fox – Engineering Technology
Project Title: Diorama LED/MP3 Driver Printed Circuit Board
*Presentation at 1 p.m. in 235B*
Faculty Advisors: Jack Gumaer and Michael Rudisill

Scott Miljour – Nursing
Project Title: Creation of an Electronic Medical Record (EMR) for Nursing
Faculty Advisors: Lisa Flood and Katie Menard

2013 Celebration of Student Research, Creative Works and Academic Service Learning
Recognition of First Place Poster Display Winners

Posters were judged on Wednesday, April 10
First, Second and Third place ribbons were awarded in each category:

- Undergraduate -
- Graduate -
- Group -
LRC 235A - Presentation/Performance Schedule

9:30 a.m.  Tyler LaPlaunt, Rachel Sabin and Sarah Hellmann, Seniors, Health, Physical Education and Recreation  
\textit{Gain Experience-Share Yours}

9:45 a.m.  Kristin Denryter, Graduate Student, Biology  
\textit{An Ecosystem-Based Approach to Conservation Planning for Terrestrial Vertebrate Species in Michigan’s Upper Peninsula}

10 a.m.  Emily Durkin, Graduate Student, Biology  
\textit{Parasites of Parasites: The Chewing Lice of Brown-headed Cowbirds}

10:15 a.m.  Kristina West, Senior, Biology  
\textit{Is Catch-and-Release Fishing in Freshwater Effective?}

10:30 a.m.  Charlotte Cialek, Senior, Chemistry  
\textit{Measuring and Comparing Telomere Lengths of Wild Gavia Immer via Quantitative PCR}

10:45 a.m.  Charlotte Cialek, Senior, Chemistry  
\textit{Introducing Stabilization Mutations K82D and N108K to Circularly Permutated Human \( \beta \)-globin}

11 a.m.  Andrea Savord, Danielle Morrison and Jordan Marquez, Seniors; TJ Aiyash, Junior, Psychology  
\textit{Sexual Attitudes Show Little Change Over 25 Years}

11:15 a.m.  Morgan Raether, Senior, Secondary Education/English, Honors  
\textit{Native American Literature in the Secondary Classroom}

11:30 a.m.  Eric Alexander, Senior, Mathematics and Computer Science  
\textit{Bringing Mathematics to Life: Mathematical Modeling With Geometers Sketchpad}

11:45 a.m.  Robert Cross, Graduate Student, Biology  
\textit{Movement Patterns of Fluvial Brook Trout (Salvelinus fontinalis) Within the Lake Superior Tributaries of Pictured Rocks National Lakeshore, Michigan}

Noon  Rachael Guth, Graduate Student, Biology  
\textit{Urbanization Effects on Overwintering Brook and Brown Trout: Fish Condition and Movement}

12:15 p.m.  Ashley Schmeling, Senior, Psychology  
\textit{The Effects of the Neurotensin-1 Receptor Agonist PD149163 on Working Memory Performance in Brown Norway and Long Evans Rats}

12:30 p.m.  Ronald Allen, Senior, Earth, Environmental and Geographical Sciences  
\textit{Human Impact on the Eben Ice Caves}

12:45 p.m.  Daniel Wilbern, Freshman, Physics  
\textit{Time-of-Flight and Position Dispersion in Different Configurations of Plastic Scintillator Detectors}

1 p.m.  Lauren Smith, Senior, Biology  
\textit{The Gathering Storm: The Potential Epidemic of Eastern Equine Encephalitis Virus in the United States}
9:30 a.m. **Chanomi Maxwell-Parish**, Graduate Student, English  
*Mom*

9:45 a.m. **Melissa Orzechowski**, Sophomore, Modern Languages and Literatures/Honors; **Dana Koerner**, Sophomore, Political Science; **Tanya Ladensack and Elizabeth DeMarse**, Sophomores, Biology  
*Honors 111 Chicago Field Experience*

10 a.m. **Danielle Morrison**, Junior, Psychology  
*Relationships Among Adult Attachment Style and Aspects of Undergraduate College Life*

10:15 a.m. **Adam Papin**, Senior, Art and Design  
*Integration of Parametric Design into the Furniture Design Process*

10:30 a.m. **Benjamin Murphy and Kelli Arnold**, Seniors, Health, Physical Education and Recreation, **Jessica Frahm**, Fall 2012 Bachelor of Arts NMU Graduate  
*Effects of Cold Whirlpool on Performance*

10:45 a.m. **Melody McNeill**, Graduate Student, English  
"Come True," *A Short Story Set in Disney World*

11 a.m. **Lynn Fay**, Graduate Student, English  
*Research for Novel/Thesis, Part of Which Was Set on Drummond Island, Michigan*

11:15 a.m. **Shannon McNab**, Senior, Secondary Education/Mathematics  
*Light Bulb Volume*

11:30 a.m. **Breanne Young and Kaitlyn Hoffman**, Juniors, Mathematics and Computer Science  
*Demonstrating Musical Concepts using Geometer's Sketchpad*

11:45 a.m. **Alex Gubbins, Cory Ferrer, Geoffrey Gimse**, Graduate Students; **Martha Lundin**, Junior, English  
*Spoken Word Poetry: Bring This Noise to the Classroom*

Noon **Niall Belton**, Senior, Mathematics and Computer Science  
*Algebraic Classification of Connected Sums*

12:15 p.m. **Mackenzie Myers**, Junior, English  
*The Law of Motion*

12:30 p.m. **Linda Sirois**, Graduate Student, English  
*He's Mad! (Or Does he Simply Need Adjustment of his Selective Serotonin Reuptake Inhibitor?): Stigma and the Changing Understanding of Mental Illness through Literature*

12:45 p.m. **Mattie Ledy**, Sophomore, English; **Kara Wixtrom**, Freshman, Communication and Performance Studies; **Max Smith**, Freshman, Secondary Education/History; **Shannon Whitehouse**, Sophomore, Psychology  
*Critical Thinking in the Classroom: Interactive Learning through Students Teaching Students*
**LRC 235B - Presentation/Performance Schedule (Continued)**

1 p.m.  **Ian Fox**, Senior, Engineering Technology  
*Designing a Custom Printed Circuit Board for Controlling an Automated Exhibit*

1:15 p.m.  **Amy Peterson**, Freshman, Art and Design  
*Redesign of the NMU Freshwater Crab Website to Include Maps of Species Distributions, Species Richness, and the Location of Threatened Species of Central and South American Freshwater Crabs (Family Pseudothelphusidae)*

1:30 p.m.  **John Minser**, Graduate Student, English  
*Selections from "Ghost Work"*

1:45 p.m.  **Thorin Burkhard-Horn**, Senior, English  
*Mold Brothers: Short Fiction*

2 p.m.  **Brian McGowan**, Graduate Student, Health, Physical Education and Recreation  
*Application of Individual Post Activation Potentiation Recovery Times to a Complex Training Program*

2:15 p.m.  **Justin Cribley and Tyler Walls**, Seniors, Biology  
*Development of an Artificial Stream Monitoring System for Evaluation of Fish Movement Patterns*

2:30 p.m.  **Kelsey Huisman**, Junior, Biology  
*Hybridization Dynamics of Invasive Cattail (Typhaceae) Stands at Pierce Cedar Creek Institute: A Molecular Analysis*

2:45 p.m.  **Cameron Witbeck**, Graduate Student, English  
*The Chum Chum Thief: A Michigan Poet in the Mekong River Delta*

3 p.m.  **Haylie Armbruster**, Junior, English  
*Numbered*

3:15 p.m.  **Ashley Brooke Boulton and Ashley Goedke**, Graduate Students, English  
*Landscapes of the Mind: Identity & Place in Travel Poetry*

3:30 p.m.  **Emily Hansen**, Senior, Biology  
*A Sub-study of the Decolonizing Diet Project: An Exploration of an Indigenous Foods Diet of the Great Lakes Region*

3:45 p.m.  **José Miño**, Graduate Student, Psychology  
*International Musical Performance*
All Celebration Participants in Alphabetical Order by Submitter’s Last Name

**Bringing Mathematics to Life: Mathematical Modeling With Geometers Sketchpad**
Eric Alexander, Senior, Mathematics and Computer Science - Faculty Advisor: David Buhl
Presentation - LRC 235A at 11:30 a.m.

My project is a collaboration of my work in MA 310: Mathematical Modeling and Problem Solving this semester. Using Geometer’s Sketchpad software, I have been able to create real world representations of mathematical problems as well as utilize my creativity to push the realm of possibility on this software. My focus will be on utilizing Sketchpad and mathematics as a medium for creativity and innovation in the applications of math modeling. My presentation will include my mathematical chess board, balancing scales to find densities, and calculus based problems modeled with Sketchpad.

**Human Impact on the Eben Ice Caves**
Ronald Allen, Senior, Earth, Environmental and Geographical Sciences - Faculty Advisor: John Anderton
Presentation - LRC 235A at 12:30 p.m.

Impact on the earth landscape cannot be avoided with human beings living on it. The alterations that occur on this planet are extensive. This report will specifically look at the human impact on the Eben Ice Caves. The Ice Caves reside in the Rock River Canyon Wilderness in the Eastern Upper Peninsula of Michigan. To gain a better understanding of the human impact in the wilderness this research made observational notes on what exactly was happening in the specified area. The conclusions are neither rewarding nor degrading, they simply show what occurs during the winter months as visitors, recreationalists, or sojourners spend time admiring the ice caves.

**Identifying Ingredients of Food With DNA**
Jessica Anderson, Freshman, Chemistry - Faculty Advisor: Suzanne Williams
Poster

This experiment was conducted to determine if DNA can be used to identify ingredients in cooked food, and what DNA is contained in different types of burgers. Three different burgers were tested: a McDonald’s hamburger, a Culver’s hamburger, and a vegetable burger. The DNA was obtained from all three samples by grinding the burgers up and setting up a polymerase chain reaction. Once the DNA was amplified, a gel electrophoresis was performed. The DNA was sent to gene sequencing companies to obtain the nucleotide sequence. The sequences were then searched on a database and the organisms they came from were discovered. The results were expected; the hamburgers contained cattle and soybean, and the vegetable burger contained soybean and bacteria. By doing this experiment, we were able to find that DNA from cooked food can be used to identify the organisms that are in the food.

**Molecular Genetic Quantification of Common Loon (Gavia Immer) Blood Parasite Loads**
Chloe Apelgren, Senior, Biology - Faculty Advisor: Alec Lindsay
Poster

Members of the genus Leucocytozoon are blood parasites of birds and are transmitted when flies of the family Simuliidae (black flies) take blood meals from avian hosts. Once inside a bird, this parasite has stages which infect both erythrocytes and leucocytes. Consequently, when parasites are present in the blood of common loons (Gavia immer), DNA extraction of infected blood yields genetic information from both the loon host and the Leucocytozoon parasite. As a result, DNA extracts from G. immer blood can be used in endpoint PCR with the appropriate primers to test for infection. A set of seven samples collected from Wisconsin in 2005 were used to test four different primer sets, and a gradient PCR was performed with two primer sets to determine the optimum annealing temperature. In the near future, it should be possible to use quantitative PCR to determine the extent of infection of individuals by comparing the amounts of loon and parasite DNA. Eventually, the over 1,500 samples in the Lindsay Genetics Conservation Laboratory may be assayed to determine parasite loads. Being able to quantify
infections will enable further conservation work in G. immer by comparing levels of infection to other factors, such as mercury loads.

**Numbered**  
Haylie Armbruster, Junior, English - Faculty Advisor: Lesley Larkin  
Presentation - LRC 235B at 3 p.m.  
"Numbered" is a creepy short fiction; it deals with imprisonment and how everyone is a monster.

**Algebraic Classification of Connected Sums**  
Niall Belton, Senior, Mathematics and Computer Science - Faculty Advisor: Josh Thompson  
Poster and presentation - LRC 235B at Noon  
Topology is relevant to many areas of science as it is essentially the study of properties of spaces, how those properties are preserved in different spaces and how those different spaces relate due to their properties. Euler found a way to classify topological spaces by representing them as multidimensional surfaces and reducing them, algebraically, to an integer. However, it has been shown that each surface is a “sum” of at least two other surfaces. I explored the relationship between the classification system Euler gave and the summing of surfaces and found a relation between the Euler characteristic and connected sums. The relation provides an algebraic classification of connected sums of compact surfaces.

**Glioblastoma Multiforme Cell Line and Cancer Stem Cell Growth in Soft Agar Assays**  
Erica Bingham, Freshman; Nicholas Cook, Graduate Student, Biology - Faculty Advisor: John Lawrence  
Poster  
Glioblastoma Multiforme (GBM) is the most common and deadly form of malignant brain tumor, with only 3-4 percent of patients living three years after diagnosis. The preferred method of research to improve overall survival is in vivo; however, that is difficult in humans and costly in lab animals, meaning that innovative in vitro methods are necessary. Two studies were performed to investigate the growth of tumors given different circumstances. In Study 1, GBM cells were cultured in soft agar assays with or without nutrients added regularly, to determine how they would grow comparatively. In Study 2, GBM stem cells were cultured in soft agar with or without FBS to see if they would form foci. The results for Study 1 showed no significant difference in growth between those with added nutrients and those without. In Study 2, both variations grew, but those with FBS grew significantly larger. The results of Study 1 show that nutrients only need to be added once, so the cell cultures will not be compromised by a continuous addition of nutrients. The results of Study 2 indicate that cancer stem cells form foci and differentiate in soft agar, which can lead to further studies of their differentiation.

**Landscapes of the Mind: Identity & Place in Travel Poetry**  
Ashley Brooke Boulton and Ashley Goedker, Graduate Students, English - Faculty Advisor: Amy Hamilton  
Presentation - LRC 235B at 3:15 p.m.  
The poetry presented in this reading has been inspired by the collective influence of experience and landscape on identity when traveling. Our perceptions of the world change when we travel to different locations and experience different cultures, languages, and environments. These changes affect our perceptions and instigate complex reflections of the self as it reacts to these diverse experiences. When we return “home,” we are changed, and must re-interpret our identities based on what we have encountered while traveling. Our poems aim to capture the essence of reflection and change, and serve as a response to our unique traveling experiences.

**Unrealized Design: Costume Design for ‘Twelfth Night’ by William Shakespeare**  
Courtney Brown, Senior, Communication And Performing Arts - Faculty Advisor: Ansley Valentine  
Art Display
This researched design draws upon the concept of Bollywood and how costume design would play out with the concept. Research is drawn upon primary research including interviews and cinematic images, and secondary research including fashion history books and modern vocabulary for Bollywood wardrobe pieces. The series of renderings demonstrate preliminary sketches and the uses of the color and fabric chosen for selected characters from the production. This “Twelfth Night” series displays an overview of a Theatrical Costumer’s creative process and responsibilities. This mounted series was submitted to the 2013 Kennedy Center American College Theatre Festival: Region 3 in the Unrealized Costume Design Category.

Mold Brothers: Short Fiction
Thorin Burkhard-Horn, Senior, English - Faculty Advisor: Lesley Larkin
Presentation - LRC 235B at 1:45 p.m.

"Mold Brothers" is a lightly humorous, quirkily dramatic piece of short fiction. The story follows a cranky insurance agent with a strange past and his meeting with an energetic family working to mitigate flood damage at their home with the help of an industrial dehumidifier. It was presented at a convention in Portland, Oregon in March.

Counting the Number of Schedules by the Round Robin Algorithm
Alyssa Cherry, Senior, Mathematics and Computer Science - Faculty Advisor: Qinghong Zhang
Poster

If you are the organizer of your local sports team, you will need to coordinate a schedule. Whether you have 20 teams, 50 teams, or n teams, we have a solution. Suppose there are n teams, each team playing a team just once, not considering whether games are at home or away. If n is even, we have n-1 rounds with n/2 games in each round. If n is odd, we use a dummy team who acts as a bye week. When n is odd we have n rounds with (n-1)/2 games in each round. To set up a schedule, the round robin algorithm can be used. In this presentation our goal is not to find a schedule. Instead, we are interested in finding how many ways there are to set up a schedule. Through the use of the round robin algorithm, we have a solution with a lower and upper bound.

Measuring and Comparing Telomere Lengths of Wild Gavia Immer via Quantitative PCR
Charlotte Cialek, Senior, Chemistry - Faculty Advisor: Alec Lindsay
Poster and presentation - LRC 235A at 10:30 a.m.

Researching the common loon, Gavia immer, can help us better understand the health of freshwater environments in respect to loons' health, physical characteristics, proliferation patterns, and size. One vastly unstudied method which quantifies loon vitality is by means of telomere length (TL) measurement. Telomeres are found on the ends of chromosomes for protection against deterioration and loss of coding sections of DNA; however, telomeres are finite, and a cell’s life has been found proportional to TL. My research involves TL measurement using quantitative PCR of wild-caught common loons. Telomeres may be amplified from DNA extracted from loon blood samples collected across North America. Samples of the same bird across several years were specifically chosen to obtain data on telomere rate of change. So far, blood samples have been identified and retrieved, and DNA has been extracted from most. Primers have been designed to specifically bind to telomeres with limited dimerization, and reaction conditions have been determined via endpoint PCR. Schematics have been set up for qPCR. In the future, these qPCR plans will be carried out to collect telomere length data.

Introducing Stabilization Mutations K82D and N108K to Circularly Permuted Human β-globin
Charlotte Cialek, Senior, Chemistry - Advisor: Spencer Anthony-Cahill, Western Washington University
Poster and presentation - LRC 235A at 10:45 a.m.

Hemoglobin (Hb) is the oxygen carrying protein found in the blood. Hemoglobin-ligand binding is cooperative: When oxygen is bound to Hb, its conformation changes from R-state to T-state. Our long-term goal is to design and produce a single-chain Hb which can be potentially used as a blood substitute.
to use for transfusions in times of critical need. Wild type Hb introduced directly in the bloodstream will dissociate into α-β dimers, which causes kidney damage; however, Hbs with a higher molecular weight do not dissociate and have been determined in clinical studies to be less toxic than wt Hb. Hence, our research is focused on generating a single-chain Hb to facilitate the production of high MW Hbs. Our design includes a circularly permuted β-globin to allow novel covalent connections between the α-globin and the permuted β-globin (cpβ). Co-expression of α and cpβ globins yields a Hb with increased O2 affinity, which resembles R state Hb. In this study we introduced the point mutations β K82D and β N108K, which have been found to increase T-state stability of wt Hb. By stabilizing the T state, we hope to produce a permuted Hb with similar oxygen binding affinity to that of wt Hb. The mutant and wt Hbs were expressed in E. coli which were genetically manipulated to co express heme uptake genes. The proteins were purified using affinity, ion-exchange, and size-exclusion chromatographies. Characterization of the proteins included gel electrophoresis and ESI mass spectrometry.

The Relationship Between Visual and Performing Arts and ACT Scores
Olivia Crawford, Freshman/Freshman Fellow, Art and Design/Digital Cinema; Danielle Schafer, Sophomore/Freshman Fellow, Biology/Physiology - Faculty Advisor: Judith Puncochar
Poster
An increasing number of states use ACT scores as a baseline for school improvement efforts. Little research exists on the relationship between ACT scores and types of classes that high school students complete, and the ACT Board does not compile a report of correlations between different areas of coursework and ACT scores. The purpose of our research was to provide further insight about which areas of coursework are associated with higher ACT scores. Five hundred NMU undergraduates completed a three-item survey about their ACT scores and the number of performing and/or visual arts classes that they completed during high school. In addition, we interviewed twenty NMU students living in honors and general housing about their perceptions on the role of the arts in their secondary education. The prominent theme of the interviews was active participation, but low acknowledgement of the effect of the arts on their education

Development of an Artificial Stream Monitoring System for Evaluation of Fish Movement Patterns
Justin Cribley and Tyler Walls, Seniors, Biology - Faculty Advisor: Jill Leonard
Presentation - LRC 235B at 2:15 p.m.
Relatively little is known about overwintering brook trout (Salvelinus fontinalis), especially their behavior. To help answer some of these questions, we constructed and stocked an artificial stream that mimics a natural stream during winter. We constructed the stream to have a deep pool in the middle and three shallow pools on either side of the deep. Riffles connect all of the shallow pools and the deep pool. We stocked the stream with 30 brook trout, which we inserted with individually coded RFID tags. An antenna was placed in the entrance to each shallow pool and the deep pool. As a fish passes through an antenna, its RFID tag number, date, and time are recorded. Therefore, we are able to track an individual fish’s movement to see if a specific habitat is preferred. We have also set up two cameras that record during the day. These cameras will allow us to see what is happening as well as using the data from the antennas. Currently we are collecting data in three-day intervals to evaluate movement patterns.

Movement Patterns of Fluvial Brook Trout (Salvelinus fontinalis) Within the Lake Superior Tributaries of Pictured Rocks National Lakeshore, Michigan
Robert Cross, Graduate Student, Biology - Faculty Advisor: Jill Leonard
Presentation - LRC 235A at 11:45 a.m.
Movement of fluvial brook trout (Salvelinus fontinalis) is widely understudied. Assumptions of limited movement have been made about brook trout based on large scale mark-recapture studies. This study examined fine scale individual movement data collected for the study of adfluvial brook trout in Pictured Rocks National Lakeshore, Michigan. Brook trout were implanted with individualized passive integrated transponders and tracked on a monthly basis from May 2004 to November 2011. Sevenmile Creek and
Mosquito River showed large proportions of fluvial brook trout with movements < 150m from their original capture location (OCL) (48 and 59 percent, respectively). On average, fish moved 226m between capture events. Several fluvial brook trout were remotely detected as far as 2700m from their OCL. Individuals were characterized into four movement patterns (stationed, downstream, upstream, nomadic). These movement patterns were then compared to observe variation in condition, relative weight, length, and OCL. Only OCL varied significantly between movement patterns. The frequency of mobile brook trout per OCL was strongly correlated with brook trout and rainbow trout (Oncorhynchus mykiss) CPUE in Mosquito River. These results suggest that fish density may play a role in the frequency of the expression of fluvial brook trout mobility.

**Do Disturbances Affect Species Richness in Vascular and Non-vascular Plants?**

Jessica Crossman, Senior, Biology - Faculty Advisor: John Lawrence
Poster

The boreal forest ecosystems are continually threatened by disturbances. The controversial topics of logging and fire suppression rank high on the list. How are these disturbances affecting the species richness in vascular and non-vascular plants in those ecosystems? Knowing how species richness is affected, we can construct better plans for logging and fire suppression to keep our boreal forests alive with richness. The general approach of the papers studied showed researchers taking data on post disturbance forests throughout the United States and Canada throughout different time periods measuring percent cover, richness, and abundance of vascular and non-vascular plant species. After running Friedman's test on the data collected from each paper, results showed there was not a significant difference (p = 0.779) between early, mid and late succession for species richness. The mean ranks for each were close, but mid succession showed a peak in species richness (2.25). These results give hope that logging and natural fires will not leave harmful effects on our boreal forests. With further studies, we can create a system to continue logging and know we are not harming our own ecosystem.

**An Ecosystem-Based Approach to Conservation Planning for Terrestrial Vertebrate Species in Michigan's Upper Peninsula**

Kristin Denryter, Graduate Student, Biology - Faculty Advisor: Pat Brown
Presentation - LRC 235A at 9:45 a.m.

The ever-growing human population has increasing consumptive demands that threaten the natural world through habitat destruction, jeopardizing important habitats for many species and ecosystem processes. I used a conservation approach that would address both biodiversity and habitat losses in Michigan’s Upper Peninsula, if implemented. This study has three major components: (1) a land cover data accuracy assessment, (2) a delineation and evaluation of ecologically important zones (EIZs—from wetlands, uplands, and riparian zones), and (3) a delineation of species occurrences in EIZs and protected areas. I completed all geoprocessing steps and spatial analyses in ArcGIS using a variety of geoprocessing tools and ModelBuilder®. Land cover data was approximately 75 percent accurate. Of the EIZs delineated, wetlands comprised a majority of the lands in protected areas (50 percent), which was greater than their distribution in the U.P. (31 percent). Most of the protected EIZs occur within the lowest level of stewardship status and protection (90 percent or more for each EIZ). Under the proposed approaches, protected EIZs could contribute nearly $25 billion/year in ecosystem services values. Species predicted occurrences per hectare were greatest within wetland EIZs (40 percent of all predicted occurrences in EIZs). Most species occurrences are outside of protected areas (61 percent) and only approximately 3 percent of species predicted occurrences are in the most highly protected areas. Applying this or a similar approach could significantly benefit conservation in the U.P.

**Potential Impact of Highways on Coyote Vocal Behaviors and Its Use in Population Estimates in Michigan's Upper Peninsula**

Kristin Denryter, Graduate Student, Biology - Faculty Advisor: Pat Brown
Poster
Canids use vocalizations to communicate over long distances, but these vocalizations may be negatively impacted by anthropogenic noise, such as highway traffic. We conducted howl surveys at 95 sites in Michigan’s Upper Peninsula from 2009-2012 at three different traffic interference classes (high, medium, and low), which were derived from distance to nearest highway. We ran non-parametric statistical analyses on response rates (number of responses per elicitation attempt), number of individuals responding, and average time to first response. We hypothesized that all three response variables would be lowest for sites in the high traffic interference classes (less than 1 km from highways) and highest for low traffic interference classes (sites greater than 5 km from highways). We predicted that our detection of response variables would increase with distance from highway. The results provided evidence to support our hypotheses and predictions, suggesting that traffic noise may have an effect on coyote vocalization and communication behavior.

Spectrum
Kristi DiFulvio, Senior, Art and Design - Faculty Advisor: John Hubbard
Art Display
I am interested in using subconscious and intuitive artistic choices in order to create visual environments that explore the range of emotion. I am an incredibly emotional person and use changes in hue, pattern, and shape to document my emotional experiences. Studying screen printing the past four years has allowed me to experiment with color combinations and composition and to produce multiple images quickly. I do not work traditionally by making identical editions of prints. Instead, I use random registration and varying color combinations to create a series of monoprints. I examine each monoprint individually, before extracting the most developed areas. This step allows for editing before reassembling the chosen pieces into one large assemblage. My final assemblage, which has become an emotional self-portrait, represents a step towards turning raw, untamed emotion into self-knowledge and acceptance.

Parasites of Parasites: The Chewing Lice of Brown-headed Cowbirds
Emily Durkin, Graduate Student, Biology - Faculty Advisor: Jackie Bird
Presentation - LRC 235A at 10 a.m.
Chewing lice (Phthiraptera) are common bird parasites and are transferred nearly exclusively through direct forms of body contact. Brown-headed cowbirds (Molothrus ater) lay their eggs in nests of other bird species. Adult female cowbirds come in contact with the host nest while egg-laying and their offspring are cared for by a host parent. Both activities facilitate the transfer of chewing lice. I investigated the effects of host sex and age on chewing louse communities. Four hundred and one brown-headed cowbirds from northern Michigan were examined for lice. Lice were collected by blowing birds with compressed air in an enclosed chamber. Lice that had fallen within the chamber were counted and identified. Sixty percent of the cowbirds were infected (242/401) with at least one species of chewing louse. Five louse genera (Brueelia, Philopterus, Menacanthus, Myrsidea and Machaerilaemus) were identified. Significantly more males were infected (189/293) with chewing lice than females (53/108). Chewing louse intensity and diversity were similar between the sexes. Significantly fewer older males were infected (117/193) with chewing lice than younger males (72/100). Older males had greater infection intensity (median=9; range= 1-242) than younger males (median=5.5; range=1-96). Louse diversity was similar between younger and older males.

Fish Enrichment: Stimulus-Induced Habitat Use by Five Fish Species
Ariel Egan, Senior, Biology - Faculty Advisor: Jill Leonard
Poster
A behavioral study was conducted to determine appropriate enrichment settings for laboratory fishes. Five species of fish were introduced to various tank settings. The blacknose dace (Rhinichthys atratulus), longnose dace (Rhinichthys cataractae), brook stickleback (Culaea inconstans), yellow perch (Perca flavescens), and goldfish (Carassius auratus) were selected to study. Five experimental tanks were set up with different types of enrichment - substrate, plant cover, and hiding structures. The results of this
study show that, when presented with a stimulus, three out of the five species tended to swim away from the stimulus in all tank settings. Two of the five species tended to hide behind whatever was available in the tank and avoided the stimulus completely. In a tank with enrichment that did not provide cover, all species exhibited signs of distress and either attempted to hide behind the corner filter or swam continuously to the side of the tank where the stimulus was not present. In tanks where enrichment provided cover, two of five species consistently utilized the enrichment while the remaining three species were often associated with the enrichment, but not directly under cover. From this study, we hope to provide basic guidelines for optimal, species-specific enrichment for common laboratory fish.

**Diet Patterns and Feeding Habits of Type E Botulism Affected Birds**
David Essian, Graduate Student, Biology - Faculty Advisor: Jill Leonard

Poster

Avian mortality caused by type E avian botulism occurs more frequently and is more widely distributed in the Great Lakes since 1999. Piscivorous waterbirds have experienced the greatest mortality, presumably because they ingest fish that carry type E botulism neurotoxin (BoNT/E); however, important vectors for botulism neurotoxin into fish eaten by birds have not yet been identified. Dreisseniid mussels and round gobies (Neogobius melanostomus) are thought to play a role in the transfer of BoNT/E to piscivorous birds in the Great Lakes because they are dominant in benthic habitats where the botulism bacteria likely germinates and because they are important prey items of several of the birds species that regularly die in botulism outbreaks. Round gobies that are less than 60mm in length feed mostly on soft-bodied macroinvertebrates, like chironomids and amphipods, while round gobies that are greater than 80mm in length feed mostly on Dreisseniid mussels. Therefore, the mean size of round goby consumed by birds that die of botulism could provide information about how BoNT/E is being transferred through the food web. For my research, I am examining the gut contents of common loons (Gavia immer) and double-crested cormorants (Phalacrocorax auritus) collected on Lake Michigan that have tested positive for BoNT/E. I am estimating diet composition and mean prey size in individuals from different sex, age class, location, and season. Additionally, I am determining whether there is significant overlap in the gut contents of healthy cormorants and those that tested positive for botulism. Gut content analysis of birds that died in botulism related outbreaks at Sleeping Bear Dunes National Lakeshore in 2007 and 2008 showed that round gobies were present in 89 percent of Common Loons (n = 8) and 71 percent of Double-crested cormorants (n = 5). Furthermore, the mean estimated length of round goby found in the stomachs of loons and cormorants was > 100mm. A more extensive analysis of the diet composition, mean size of prey, and diet overlap of botulism positive and botulism negative birds from 2011 and 2012 could infer likely pathways of BoNT/E in Lake Michigan food webs, which will hopefully allow managers to generate plans for reducing avian mortality caused by the toxin.

**Research for Novel/Thesis, Part of Which Was Set on Drummond Island, Michigan**
Lynn Fay, Graduate Student, English - Faculty Advisor: Jennifer Howard

Presentation - LRC 235B at 11 a.m.

Part of my novel takes place on Drummond Island and further research was necessary to complete it; the island serves as the setting for two stories in the book. It was necessary for me to reacquaint myself with the setting, both the residential areas and the Maxton Plains, in order to write some sections of my novel. The Plains is a particularly unique ecological area and extremely rare. There were other research topics explored there as well. I will give a brief overview of my project and read a few short excerpts of the book which correspond to the research conducted there.

**Designing a Custom Printed Circuit Board for Controlling an Automated Exhibit**
Ian Fox, Senior, Engineering Technology - Faculty Advisors: Jack Gumaer and Michael Rudisill

Presentation - LRC 235B at 1 p.m.

For my senior project, I am in charge of leading a small group of Electronic Engineering Technology students to create a new solution for controlling a diorama about the Battle of Leyte Gulf at the
Marquette Maritime Museum. The current diorama, which contains over 150 individual LEDs that are synchronized with a MP3 sound track, is controlled by a malfunctioning and power inefficient desktop computer. After exploring all possible options, replacing the desktop computer with microcomputers that would control the automation was determined to be the best choice. During the design phase of the project, a method connecting the different controllers in a simple and efficient way also had to be developed. To solve this problem, we determined that using a printed circuit board would provide the best solution to answer to all issues. By using a printed circuit board, all of the connections for the project would be arranged on a flat 6 x 7 inch board, eliminating the need for connections requiring individual wires.

Spoken Word Poetry: Bring This Noise to the Classroom
Alex Gubbins, Cory Ferrer, Geoffrey Gimse, Graduate Students; Martha Lundin, Junior, English - Faculty Advisor: Beverly Matherne
Presentation - LRC 235B at 11:45 a.m.

Four poets share poems composed during Professor Beverly Matherne’s spoken word course during the fall of 2012. Each poet created, workshopped, and revised their own work in small and large groups. The live workshop process deemed valuable since, as opposed to poetry meant for the page, these poems intend performance. The content of these works reveal the poets’ passion, politics, and precision.

Urbanization Effects on Overwintering Brook and Brown Trout: Fish Condition and Movement
Rachael Guth, Graduate Student, Biology - Faculty Advisor: Jill Leonard
Presentation - LRC 235A at Noon

Urbanization and wintertime are both influences on stream ecosystems and play important roles in fish condition and movement. In the Upper Peninsula of Michigan, we examined brook trout and brown trout overwintering in two fragmented urban streams and two rural streams, including wintertime fish condition and where fish moved during unstable ice conditions. Fish were captured with backpack electrofishing units in late fall 2011 and 2012 and marked with PIT tags. Bi-monthly sampling through April of both years via electrofishing allowed fish measurement. Fish position was assessed monthly using either a portable PIT “wand” reader or electrofishing. Within stream effects showed a significant difference in mean fish condition between stream reaches and dates in both urban and rural streams for both winters (P < 0.05). Between stream effects showed a significant difference in mean fish condition between all four streams and all dates for both winters (P < 0.05). A significant difference (P < 0.05) was also shown for the urban-rural effect on mean fish condition for both winters. This data suggests that there are differences in fish condition between urban and rural streams as species enter wintertime.

Emily Hansen, Senior, Biology - Faculty Advisor: Martin Reinhardt
Presentation - LRC 235B at 3:30 p.m.

The Decolonizing Diet Project (DDP) of Northern Michigan University aimed to answer the question, “What are the legal, social/political, and biological implications of consuming an indigenous foods diet of the Great Lakes Region?” For the purpose of this sub-study, only the biological factors were studied and this was completed by means of examining health physicals. The 25 research volunteers were of various ages, heights, weights, socioeconomic status, and both male and female. There was a not a target demographic for this study. Health physicals were completed in March of 2012 and included laboratory blood work and other non-blood health measurements. Physicals were completed on a quarterly basis with the sub-study ending in September 2012 with the entire DDP project completed March 25, 2013. The study concluded that an indigenous foods diet had positive health impacts on the research participants by lowering non-blood measurements such as blood pressure, pulse, weight, and waist and hip circumference readings. It was also found to lower the lipid profile including total cholesterol, triglycerides, and LDL. HDL increased slightly, which is desirable and beneficial to heart health. Random
glucose testing was the only measurement that unexpectedly increased, although glucose testing can be rather unreliable if the participants have not completely fasted before the blood draw.

**A Comprehensive Meta-analysis on a Feasible Future Vaccination Against Hand, Foot and Mouth Disease**
Adrienne Harrington, Senior, Biology - Faculty Advisor: John Lawrence
Poster

Enterovirus 71 (EV71) is the major causative agent of Hand, Foot and Mouth Disease (HFMD). Currently endemic outbreaks to the Asia-Pacific region cause socioeconomic turmoil infecting thousands of children and infants each year. HFMD can lead to severe neurological problems such as encephalitis, and in more severe cases, death. There is currently no treatment for HFMD. Various studies have been published on inhibiting cellular components of the virus during infection, using mice models to confirm passive or active protection against infection, and clinical trials carried out to assess the safety and immunogenicity among humans. This meta-analysis aims to analyze the complied research and evaluate the prospect of future development of a vaccine.

**Effectiveness of Vitamin D Supplementation on the Prevention of Type 1 Diabetes**
Rachel Heath, Senior, Biology - Faculty Advisor: John Lawrence
Poster

Understanding Type 1 Diabetes is a prevalent disease that affects millions of people and there has yet to be a clear upstanding what exactly causes this disease. There are speculations that this autoimmune disease might be prevented by a safe and simple intervention of Vitamin D supplementation. The objective is to test the effectiveness of whether supplementation of Vitamin D at an early age of life will help reduce the development of Type 1 Diabetes later in life. This is done by means of a systematic review and meta-analysis using numerous articles on this topic, along with controlled trials and observational studies to be included which have met all inclusion criteria. This allowed for analysis of the work done on Vitamin D supplementation versus little or no supplementation and the development of Type 1 Diabetes. An odds ratio will be calculated for the success of supplementation versus little or no supplementation. Conclusion: Early life Vitamin D supplementation may offer protective properties against the development of Type 1 Diabetes. Based on the evidence from the observational studies, along with control trials showing a positive relation between increased Vitamin D with decreased development of Type 1 Diabetes, this could mean a positive step forward in the prevention of this prevalent disease. Follow ups from extended period of time are needed in the testing of best dose, duration, period, and formulation of the supplemented Vitamin D.

**Detection of mRNA via Fluorescent In-Situ Hybridization**
Rozemary Howard, Senior, Biology - Faculty Advisor: Erich Ottem
Poster

The purpose of my study is to develop a new method to perform in-situ hybridization (ISH) to visualize mRNA in dendrites and neural cell bodies by using a combination of protocols from a PerkinElmer ISH kit and under the supervision of Erich Ottem. The necessity for a new protocol is due to a loss of an emulsion sold by Kodak Inc. that, when used with standard in-situ hybridization protocols, resulted in a clear image of mRNA within dendrites and soma. This emulsion was called NTB3, and it allowed researchers to label endogenous-mRNA targets with cDNA probes labeled with 33-Phosphorus and 35-Sulfur. This emulsion worked very well but was discontinued by Kodak. It is important to find a new method for labeling cRNA probes in order to visualize the mRNA in dendrites and soma clearly again and be able to quantify expression levels. The protocol we created utilizes Fluorescent In-Situ Hybridization, and it employs a confocal microscope for detection of the probe. We hope this research provides an efficient way to perform in-situ hybridization. Our protocol will aid individuals performing this type of research, because no one has access to the NTB3 emulsion to date.
Hybridization Dynamics of Invasive Cattail (Typhaceae) Stands at Pierce Cedar Creek Institute: A Molecular Analysis
Kelsey Huisman, Junior, Biology - Faculty Advisor: Alan Rebertus
Poster and presentation - LRC 235B at 2:30 p.m.
Three cattail taxa are recognized in Michigan: native *Typha latifolia* (broad-leaf cattail), the invasive *Typha angustifolia* (narrow-leaf cattail), and the hybrid of these two species *Typha × glauca*. *Typha angustifolia* and *T. × glauca* are of special interest because of their ability to aggressively spread and out-compete the native cattail *T. latifolia*. *Typha × glauca* has been shown to out-compete both its parental taxa and produce monospecific stands. We surveyed the Pierce Cedar Creek Institute (PCCI) property for cattails and located 25 distinct cattail marshes. We determined the total area of cattail marsh at PCCI to be roughly 10 percent of the 267 hectare property. Cattail individuals were sampled from each of the 25 stands and RAPD markers were used to identify the individuals to species. We found that 20 of the 25 stands were monospecific for the native cattail, *T. latifolia*. Five of the stands were mixtures of the native *T. latifolia* and the introduced *T. angustifolia*, and *T. × glauca* was found in two of the mixed stands. We recommend removal of the invasive *T. angustifolia* and *T. × glauca* individuals and the establishment of a monitoring plan in order to maintain the long-term health of the cattail marshes at PCCI.

Artificial Food Additives as a Treatment for Hyperactivity
Amelia Johnson, Senior, Biology - Faculty Advisor: John Lawrence
Poster
Attention Deficit Hyperactive Disorder is the most common ailment diagnosed in children, and improper treatment can cause severe learning and behavioral difficulties. However, treatment for the disorder is controversial and expensive. This meta-analysis will look at the effectiveness of artificial food additives as a treatment for reducing hyperactive behaviors. Using search engines, journal articles were found and reviewed that related to artificial food additives and hyperactive behavior. Inclusion criteria required that each study had a test and placebo group, objectively measured behavioral changes, and the methods must have shown validity in the procedure. The results of each study were then collectively statistically analyzed. After running a non-parametric test, the results showed a significant reduction in behavior with the implementation of an artificial food additive-free diet. The studies reviewed show that there is evidence that a diet free of food additives may decrease hyperactive behaviors. The result, however, are based on varied data, and most of the significance was found from parental ratings. More methodologically improved and extended trials should be completed to further analyze the effectiveness that an additive-free diet has on hyperactive behaviors.

The Process of Program Review: Utilizing HESI Results To Improve Program Outcomes
Samantha Jones, Freshman, Nursing - Faculty Advisor: Julie Higbie
Poster
Students who are admitted to the nursing program are ones who will successfully complete the curriculum and have a good chance of passing the NCLEX-RN examination. Passing results were directly related between key curricular course grades, HESI Specialty Exam scores, and NCLEX-RN results.

Asymmetric Ring Opening Reaction of Epoxides by Novel Macrocyclic Catalysts
Kurt Kinslow, Senior, Chemistry; Alejandro Macias Sevde, Senior, Biology - Faculty Advisor: Yu Liu
Poster
As important chemical materials, epoxides are produced in millions of tons by the petrochemical industry. Chiral Cr(III)-salen complexes can catalyze the asymmetric ring opening (ARO) reaction of epoxides to yield chiral 1,2-amino alcohols. The value of chiral 1,2-amino alcohols lies in their utility as intermediates for the synthesis of a wide range of drugs and bioactive molecules, and as precursors to reagents for stereochemistry-control reactions. In this project, we developed novel macrocyclic oligomer supported Cr(III)-salen catalysts and investigate their catalytic efficiency and stereoselectivity.
in ARO of epoxides. Three macrocyclic catalysts were synthesized. Each of them contains a linker of different lengths between the macrocyclic support and Cr(III)-salen complex. All three catalysts showed higher catalytic efficiency than the previously reported Cr(III)-salen catalysts. In addition, it was observed that the increase of the linker length leads to a lower ARO reaction rate but higher stereoselectivity. The recyclability of one of the catalysts was also examined. The catalyst showed high activity for five cycles of ARO.

**Efficacy of Antidepressants in the Treatment of Fibromyalgia**

Scot Koski, Senior, Biology - Faculty Advisor: John Lawrence

Poster

The direct and indirect costs of fibromyalgia syndrome (FMS) to both the individual and to society are extensive. Determining the efficacy of the different classes of antidepressants, compared to one another, allows clinicians to make informed decisions about which antidepressant they may want to prescribe a patient with FMS. A review of clinical trials was performed comparing tri-cyclic antidepressants (TCAs), selective-serotonin reuptake inhibitors (SSRIs), and serotonin-norepinephrine reuptake inhibitors (SNRIs) and their efficacy in treating FMS. Nine studies were identified through searching PubMed and Google Scholar. The Fibromyalgia Impact Questionnaire (FIQ) score and Number of Tender Points (NTP) score were the two outcome measures compared between trials to determine efficacy of antidepressants. Compared with placebo patients, those patients treated with antidepressants in all trials showed significantly more improvement in mean differences of FIQ scores. Both statistically significant and non-significant improvements in mean differences on NTP score were seen between placebo and treatment groups in trials of all three antidepressant classes, producing mixed results. Greater mean differences in FIQ score were seen in trials of SSRIs, compared to SNRIs and TCAs. Greater mean differences in NTP score were also seen in trials of SSRIs, compared to SNRIs and TCAs.

**Gain Experience-Share Yours**

Tyler LaPlaunt, Rachel Sabin and Sarah Hellmann, Seniors, Health, Physical Education and Recreation - Faculty Advisor: Breanne Carlson

Presentation - LRC 235A at 9:30 a.m.

The “Gain Experience-Share Yours” campaign is aimed at offering senior citizens ages 62 and older information on the senior citizen full tuition scholarship offered at NMU. Our goal is to increase senior citizen enrollment as well as to help spread awareness within the surrounding communities of this scholarship opportunity. We believe that the increased enrollment will benefit both the local senior community and traditional students by helping the seniors gain the experiences they always wanted and share their life experiences and wisdom with their fellow classmates.

**The Relationship Between Non-Suicidal Self-Injury and Disordered Eating in Female Collegiate Athletes**

Mariah Lash, Graduate Student, Health, Physical Education and Recreation - Faculty Advisor: Maggy Moore

Poster

Societal and sport pressures in female NCAA athletes contribute to an increased risk of disordered eating. Disordered eating and self-injury are both negative behaviors that affect female athletes. Current research examining all aspects of non-suicidal self-injury (NSSI) in athletes, as well as the co-occurrence of these behaviors with disordered eating is lacking. Objective: To investigate the prevalence of disordered eating (DE), non-suicidal self-injury (NSSI) overall and by sport type (individual or team), and the co-occurrence of the two in NCAA female collegiate athletes. Design: Cross-sectional Cohort. Setting: Online survey administered via Qualtrics Survey Software. Patients or Participants: Approximately 1,400 female NCAA Division II varsity athletes. Main Outcome Measures: Survey comprised of the Eating Attitudes Test (EAT-26) and a portion of the Self-Harm Information Form (SHIF). Results: The lifetime prevalence of NSSI was 30.6 percent. 18.5 percent fit the criteria for NSSI, with no
significant difference by sport type \((t_{266} = 1.248, P = .213)\). The DE risk was estimated at 26.5 percent and there was no difference by sport type \((t_{267} = .916, P = .361)\). There was a significant correlation between NSSI and DE \((r_{269} = .123, P = .043)\). Conclusions: The findings of this study support increasing screening of DE and including questions related to NSSI in pre-participation examinations.

**Critical Thinking in the Classroom: Interactive Learning through Students Teaching Students**
Mattie Ledy, Sophomore, English; Kara Wixtrom, Freshman, Communication and Performance Studies; Max Smith, Freshman, Secondary Education/History; Shannon Whitehouse, Sophomore, Psychology - Faculty Advisor: Jo Doran
Poster and presentation - LRC 235B at 12:45 p.m.

In this presentation, four undergraduate students present how they used inventive, interactive, and analytical interpretations of classical rhetorical learning methods through Powerpoint, Prezi, traditional chalkboard, and video clips to enhance students’ capacity to intellectually and emotionally engage in the absorption and retention of materials in a critical thinking class. Class interest and involvement by the student audience was determined by noting oral communication, observing students’ reactions during presentations and considering written survey feedback as they used various teaching techniques to involve the class. This method of active learning made the task of teaching information to students easier and made learning the information easier for the student audience. This group will also compare their methods of presentation, teaching, and learning to common student presentation methods of oratory lecture with standard visual aids. Jo Doran, professor of this EN 211 critical thinking course, supported these presenters in their dynamic teaching processes that encourage active learning of classical rhetorical methods by modeling each assignment and allowing the students to teach one another. This presentation provides insightful information on how students can learn more effectively with active methods and how a foundation of rhetorical critical thinking can aid students in future learning.

**From Bibles to Building Blocks: The Obstacles Pre-Service Teachers Face in Planning and Assessing the Teachings of World Religions**
Holly Mathys and Tanya Cook, Graduate Students, Education - Faculty Advisor: Derek Anderson
Poster

The planning, teaching, and assessing of world religions is often overlooked or briefly touched upon in the middle school social studies classroom, despite its direct link to social studies. Additional research is needed to support the planning and teaching of world religions; therefore, the purpose of this study was to investigate how 22 preservice teachers (PSTs) planned, taught, and assessed lessons on world religions to 7th-grade students as part of their field-experience as an undergraduate elementary education major. PSTs’ lack of content knowledge and fear of being biased exemplified difficulties in PSTs’ planning and teaching of world religions as well as the assessment of student work. Student-centered instruction was found to be the more effective teaching approach over any other exhibited approach. To teach world religions effectively in the classroom, teacher education programs need to prepare PSTs with the capacity and willingness to teach world religions.

**Reduction Potential Determination of 1,3-diethynylbicyclo[1.1.1]pentane Derivatives by Cyclic Voltammetry**
Anthony Mattioli and Jeff Van Raden, Seniors, Chemistry; Parker Bambenek, Graduate Student - Faculty Advisor: Frankie McCormick
Poster

With the cost of production and the laws of physics limiting electronic miniaturization, organic molecules pose an attractive option in the field of electronics. The electronic properties of organic molecules can be altered through synthesis, which is not possible with typical inorganic compounds. Generally, a “top-down” approach is used for the fabrication of typical electronic devices, while molecular synthesis offers a “bottom-up” approach using smaller pieces to build upon each other furthering the ability of electronic miniaturization. Our group at NMU has developed a novel class of
propellane based donor/acceptor molecules, which may find use in a variety of electronics applications in communications, batteries, lasers, and data storage. Based on UV-Vis and fluorescence spectroscopy data, these molecules are highly polarized and utilize non-classical conjugation through a diethynylbicyclo[1.1.1]pentane spacer. This non-classical conjugation has provided a novel method of electron transfer from donor to acceptor, while preserving the compound’s transparency. The degree of electron transfer varies depending on the particular combination of donor/acceptor molecule, making the molecule’s electronic properties tunable. Now, we have used cyclic voltammetry to further investigate the magnitude of charge transfer. Using cyclic voltammetry, the reduction potentials have been determined for several of these novel molecules and will be reported.

Mom
Chanomi Maxwell-Parish, Graduate Student, English - Faculty Advisor: Matthew Frank
Presentation - LRC 235B at 9:30 a.m.

I will read the first half of a creative nonfiction essay, in which I explore my grandmother’s young adult life in the Upper Midwest. This piece is part of my MFA thesis project, which is an exploration of personal identity as it relates to location and family identity.

Same-Sex vs Opposite-Sex Athletic Trainers: NCAA Athletes’ Comfort and Preference
Megan McCullough, Graduate Student, Health, Physical Education and Recreation - Faculty Advisor: Maggy Moore
Poster

Female AT’s are underrepresented in the NCAA collegiate setting. Athletes’ gender preference may be an explanation of employment inequity. Objective: To identify the potential existence of a preference for NCAA athletes for same-sex vs. opposite-sex care provided by athletic trainers. Specifically, to determine if athletes/patients prefer care by same sex or opposite sex athletic trainers regarding care and treatment of general medical conditions, athletic injuries, psychological conditions, and sex-specific injuries and conditions. Design: Cross-sectional study and frequency distribution. Setting: Online Survey. Patients or Other Participants: 450 NCAA student-athletes from Divisions I, II, and III. Data Collection/Analysis: Prevalence data on preference are presented in table format. Results: There was no gender preference for AT’s at all Divisions. There was a same-sex preference with conditions that are intimate in nature. Conclusion: The overall lack of gender preference depicts no bias for treatment by either male or female ATs. The same-sex preference with certain conditions exemplifies the need for both male and female ATs to be on staff for the best interest of the athletes. Key Words: Athletic trainer, gender preferences, gender equity, female athletic trainers.

Application of Individual Post Activation Potentiation Recovery Times to a Complex Training Program
Brian McGowan, Graduate Student, Health, Physical Education and Recreation - Faculty Advisor: Sarah Breen
Presentation - LRC 235B at 2 p.m.

This was an applied study looking at jumping and strength performance with a female track team. Doing three rep max back squat before drop jumps can improve subsequent jump performance. This improvement in performance is referred to in the literature as post activation potentiation (PAP). This training program applied the individual recovery times to the sets of resistance training and plyometrics. The use of PAP as part of a training protocol has become known as complex training (CT). CT is popular as it combines plyometrics with resistance training saving time in practice sessions. This study included pre- and post-tests as well as the four weeks of complex training. The results were equivocal with athletes showing 54 percent increases and 15 percent decreases in drop-jump performance. The variations in performance are not fully explained by any of the data recorded. The data does point to the fact that practice sessions may not have targeted the fast stretch shortening cycle as efficiently as intended due to having contact times >250ms. The conclusions of this study are that future training programs should teach athletes to utilize the fast stretch shortening cycle to increase the specificity of the training program.
**Water Quality and Rights: A Focus on the Wind River Indian Reservation**
Emily McGrath, Senior, Education - Faculty Advisor: Carl Wozniak
Poster

Wyoming’s Wind River Country is home to the seventh largest Indian reservation in the country. Encompassing more than 2.2 million acres, the Wind River Indian Reservation is home to the Eastern Shoshone and the Northern Arapaho tribes. In the last decade, the Wind River Indian Tribes have experienced an increased concern of the amount and quality of water on their lands. The Wind River Indian Reservation is home to a dozen oil and gas fields. In recent years, contamination in creeks and rivers has become an issue. The establishment of Wind River Indian Reservation in 1868 set boundaries in Wyoming for the tribes. Since this time, those boundaries have grown smaller and populations in the west have increased. Water rights have become more strictly regulated for tribal and non-tribal people, but the controversy for American Indians lies within who regulates the rights. This project’s purpose is to investigate both the quality of water and water rights of tribal people on the reservation. Research will be conducted in a non-bias format, seeking information from multiple sources. It will include a brief history of water rights on the Wind River Indian Reservation, current water rights, and past and present hydrologic data.

**Light Bulb Volume**
Shannon McNab, Senior, Secondary Education/Mathematics - Faculty Advisor: David Buhl
Presentation - LRC 235B at 11:15 a.m.

“Light Bulb Volume” is a visual tutorial that models the steps for determining the volume of a standard light bulb, based on a digital picture of a light bulb. The audience for the tutorial is a high school/college Pre-Calculus or Calculus class. The project was designed to be instructive and interactive in order to model the multiple areas of mathematics used to understand the mathematical topic of volumes of solids of revolution. “Light Bulb Volume” represents these topics in a visual, more comprehensive way, and illustrates how mathematics can be used to solve a physical problem. The program used was The Geometer's Sketchpad.

**‘Come True,’ A Short Story Set in Disney World**
Melody McNell, Graduate Student, English - Faculty Advisor: Jennifer Howard
Presentation - LRC 235B at 10:45 a.m.

For my presentation, I will read an excerpt from my master’s thesis. My thesis is a fictional short story collection centered on women encountering challenges and learning to cope with their problems. The story I will read, tentatively titled “Come True,” follows two friends named Katie and Anna on their fifth grade graduation trip to Walt Disney World in Orlando, Florida. Unexpected conflict transforms a lighthearted excursion to a loss of innocence, and it functions as a catalyst for growth. This summer, I conducted research on Walt Disney, supported by an Excellence in Education grant from NMU. I also visited Disney World and took notes on the facts about nature that were displayed throughout the parks. A number of these facts appear in “Come True,” offering an engaging forum for educational facts. In my story I also explore the nature of reality, because many people appreciate Disney for the wholesome anecdotes and reminders of their childhood, but fairy tales rarely align with personal experience. “Come True” addresses the paradox of problems arising in “the happiest place on earth.” Katie and Anna must periodically reassess their preconceived notions of reality as events shatter assumptions.

**Modeling Tensegrity Structures for Research Into Alternative Robotic Locomotion**
Matthew Menze, Junior, Mathematics and Computer Science - Advisor: Vytas SunSprial, NASA
Poster

My work focused on contributing to the ongoing development of a tensegrity simulator currently under development at the NASA Ames Intelligent Robotics Group. These tensegrity structures inherently
exhibit an ability to adapt to their external environment making them uniquely suited for robots designed to operate in analog environments. While biological examples exist of tensegrity structures in animal physiology, little is known about controlling these non-linear structures from a robotics standpoint. This project hopes to expand the tool set available to researchers for studying these non-intuitive constructions.

**International Musical Performance**
José Miño, Graduate Student, Psychology
Performance - LRC 235B at 3:45 p.m.

I am from Quito, Ecuador and will be playing the guitar and singing folk, popular and self-written songs in Spanish, Portuguese, and English.

**Selections from ‘Ghost Work’**
John Minser, Graduate Student, English - Faculty Advisor: Austin Hummell
Presentation - LRC 235B at 1:30 p.m.

Reading of several poems from John Minser’s upcoming thesis, entitled "Ghost Work."

**Infliximab as an Anti-TNF Antibody Therapy in Crohn’s Disease and the Risk of Serious Infections and Adverse Effects: Analysis and Review of Harmful Effects in Randomized Controlled Trials**
George Montgomery, Senior, Biology - Faculty Advisor: John Lawrence
Poster

Tumor Necrosis Factor (TNF) is an important antibody for a person’s defense and tumor control. A total of 10 papers were used to evaluate the degree to which Infliximab an anti-TNF therapeutic drug may increase the risk of serious infections and malignancies in patients with Crohn’s disease by performing an analysis to derive estimates of harmful events occurring in randomized trials of infliximab therapy. The papers used focus on administration of the drug and were from a wide range of areas across the world. Patients needed to have active Crohn’s disease either with or without fistulas. Results of the studies were correlated together to focus attention on the percentages of patients who saw clinical remission compared to patients that had adverse-side effects. There is evidence of an increased risk of serious infections and a dose-dependent increased risk of tumor growth in patients with Crohn’s disease treated with infliximab. This analysis with data from randomized controlled trials serves as a tool to evaluate the harmful drug’s effects.

**Relationships Among Adult Attachment Style and Aspects of Undergraduate College Life**
Danielle Morrison, Junior, Psychology - Faculty Advisor: Maya Sen
Presentation - LRC 235B at 10 a.m.

Attachment style, which originally forms in the first year of life, is the quality of the bond between child and parent. Attachment style affects multiple aspects of development through its transference to other platonic and romantic relationships, but its relation to college functioning is yet unexamined. The current study investigated the relationships among adult attachment style and various aspects of college life, such as stress, GPA, alcohol consumption, and studying. For 68 students (53 female, 65 Caucasian) attending Northern Michigan University, attachment style was determined according to anxiety and avoidance scores obtained through the Experiences in Close Relationships-Revised Questionnaire (Fraley, Waller, & Brennan, 2000). Anxiety positively correlated with Perceived Stress, r(66)=0.63, p<.05, and Avoidance, r(66)=0.33, p<.05. Help-seeking behavior was negatively correlated with both Avoidance, r(66)=−0.34, p<.05, and Perceived Stress, r(66)=−0.33, p<.05. Anxiety could exacerbate Perceived Stress, as well as incline an individual to avoid contact with others, at least until the anxiety lessens. Higher levels of avoidance could logically incline an individual to avoid seeking assistance. Without help, an individual’s stress level could increase. In sum, the findings demonstrate that both dimensions of attachment style are related to college students’ coping. Future analyses will examine these findings in more detail.
A Review of Studies: Could Aspartame be a Carcinogen?
Jason Mottes, Senior, Biology - Faculty Advisor: John Lawrence
Poster

The Aspartame molecule consists of two amino acids: phenylalanine and aspartic acid. In the gut, metabolism of Aspartame can give off the byproducts methanol and formaldehyde, which have both been shown to cause mutagenic effects. The safety of Aspartame has seen a great deal of controversy among the scientific community. This small scale meta-analysis looks into Aspartame as a carcinogen in case control, gene expression, and in-vivo studies. Sixteen studies total were kept for examination (three case-controls, nine in-vivo, and four gene-expression) after they had met specific selection criteria. Studies were given a scaled rank in order to run statistical analysis. A Chi-Squared test comparison was also made. Future studies are needed to more thoroughly understand the long term effects that Aspartame has inside the body.

Effects of Cold Whirlpool on Performance
Benjamin Murphy and Kelli Arnold, Seniors, Health, Physical Education and Recreation; Jessica Frahm, Fall 2012 NMU Bachelor of Arts Graduate - Faculty Advisor: Julie Rochester
Poster and presentation - LRC 235B at 10:30 a.m.

For our research project, we examined the effects of cold whirlpool on performance in a 40-yard sprint and vertical jump. Each subject tested was their own control group; there was a pre- and post-test for both the sprint and vertical jump to see the effects after ten minutes in a cold whirlpool. The cold whirlpool was kept between 50-55 degrees Fahrenheit. The purpose was to determine whether cryotherapy in the form of cold whirlpool would enhance performance when done prior to the activity desired to be enhanced. Our results showed no significant increase in performance.

The Law of Motion
Mackenzie Myers, Junior, English - Faculty Advisor: Lesley Larkin
Presentation - LRC 235B at 12:15 p.m.

This was a piece originally written for EN 300. It explores stereotypes in three main characters – the nerd, the jock, and the girl they fight over. It also explores the idea of karma, that whatever you do will come back to you in due time. This piece was presented at the 2013 Sigma Tau Delta International English Honor Society convention on March 23. It also was the first-place winner in the original fiction category out of 116 submissions.

Effects of Organic Compounds and pH Changes on the Denaturation of Cytochrome C Protein
Madeline Neubauer, Freshman, Chemistry - Faculty Advisor: Mark Paulsen
Poster

The purpose of this research was to determine which of two organic compounds best denatures the protein Cytochrome C. Denaturing a protein means to unfold it from its most stable shape. When the protein is denatured, it does not function very well. Cytochrome C is found in the mitochondria and is involved in transferring elections as part of aerobic metabolism. We used Cytochrome C from horse heart because it is small, globular, well-characterized and is commercially available. To determine the extent of denaturation of the protein, the absorbance and fluorescence of different solutions were measured. The more the solution fluoresced, the more denatured the protein was. Absorbance was measured to ensure that each solution had about the same protein concentration. The solutions contained the protein and either urea or guanidine hydrochloride in a pH 7 buffer. Later, more acidic buffers were used to determine the effect of pH on the unfolding. It was found that the solutions with guanidine hydrochloride denatured the protein more easily than the solutions with urea. It was also found that the more acidic the buffer, the more easily the protein is denatured.
Research on Eating Disorders  
Emily Nordlund, Freshman/Freshman Fellow, Psychology - Faculty Advisor: John MacDevitt  
Poster  
My involvement as a Freshman Fellow led me to research various eating disorders. This topic came up because of my mentor needed some information regarding the topic as he worked at the counseling center. My research is focused mostly upon the mortality of anorexic patients. I found that the chances of death due to an eating disorder are slim. The main cause of death, however, was not due to complications with the disorder itself but due to other obsessions such as drinking and drug use. I also discovered that having a low weight does not necessarily cause death either, especially if that weight is maintained. Along with these findings, I found information on inpatient care, follow ups, and specific case studies.

Comparison of Two Working Dog Populations on a Cognitive Test Battery  
Ricki Oldenkamp, Senior, Biology - Faculty Advisor: Erich Ottem  
Poster  
Two working dog populations of labradors, who were trained for different jobs, were presented with a battery of cognitive tests to evaluate potential cognitive differences between the groups. The testing battery consisted of 28 tasks administered over four days. The service dogs were tested at Canine Companions for Independence (CCI) and military dogs tested at K2 Solutions. The main question posed: Do these genetically similar dogs, being the same breed, which have been trained for different jobs, have significantly different ways of solving cognitive problems? The ultimate goal is to take the measures acquired for both populations and then revise the battery tailoring it to the specific skill set desired for each respective job-training program. This allows the battery to be used as a tool to predict success in each training program, creating a prescreening process before entrance into the programs. Selecting dogs that already possess desired traits can effectively reduce the number of dogs beginning but not completing these expensive programs.

Honors 111 Chicago Field Experience  
Melissa Orzechowski, Sophomore, Modern Languages and Literatures/Honors; Tanya Ladensack, Sophomore, Biology; Dana Koerner, Sophomore, Political Science; Elizabeth DeMarse, Sophomore, Biology - Faculty Advisor: Nell Kupper  
Presentation - LRC 235B at 9:45 a.m.  
In Honors 111: Modern Art through European Sources, we learned in class about nine aesthetics beginning in classicism and ending in surrealism. We learned about written works, including poetry, short stories, and poetry, as well as the visual art and philosophies of the time period. We then visited the Chicago Art Institute where we took our base of knowledge from the classroom and applied it to the real world.

Characteristics of Trees Infected with Inonotus Obliquus  
Melissa Orzechowski, Sophomore; Alex Graeff, Junior, Biology - Faculty Advisor: Alan Rebertus  
Poster  
Inonotus obliquus is a black charred looking fungus that grows on birch trees. Inonotus obliquus has long been used in folk medicine, recently its anti-inflammatory, anti-cancer, anti-influenza and anti-HIV properties are being studied. Infection rates have been reported to be extremely low, but no well-designed, systematic sampling methods, or studies on stand and tree characteristics that favor infection have been carried out. Our objective was to document rates of infection and record the stand and tree characteristics that favor trees infected with Inonotus obliquus. Out of 349 birch sampled, 4.55 percent were infected. The DBH was strongly related to the probability of infection; trees with a smaller diameter had a much lower probability of infection while trees with a DBH of 45 centimeters or larger had an infection rate of 25 percent. The average height of infection was 1.59 meters ranging between .45 meters and 5.6 meters. Interestingly no Inonotus obliquus within our plots faced between 0 and 120
degrees and the vast majority of Inonotus obliquus we recorded were between 150 and 180 degrees. Although many scholars believe Inonotus obliquus to infect trees after they have already died, we found many infected living trees.

**Avian Migration at Important Stopover Sites in Delta County**
Gary Palmer, Graduate Student, Biology - Faculty Advisor: Alec Lindsay
Poster

The Great Lakes Region is host to a vast number of migrating avifauna each spring and fall. While on their migratory journeys, birds must periodically stop to rest and replenish the reserves that power their energetically costly travels. During these migratory “stopovers,” birds may stop briefly or for days to weeks at a location. The quality of stopover sites varies greatly in the heterogeneous landscape; a model describing three categories of stopover habitat as “fire escape,” “convenience store,” or “full-service hotels” (Mehlman et al. 2005) has become widely used in conservation. We review the current state of knowledge of migration through the Stonington Peninsula and the surrounding area of the Bay De Noc located in Delta County, Michigan, at the northernmost extent of Green Bay. Significant songbird, waterbird (Haas 2010), hawk (Chartier 2002, 2003, 2004, Chartier & Wuepper 2011), and owl migration (Grigg 1994) has been documented in this area, along with multiple sites hosting large numbers of staging waterfowl and shorebirds (Haas 2010, Reinoehl 2011). It is with these data that the Important Bird Areas program identified six IBAs in Delta County, supporting the premise that region represents a “full-service hotel” and warrants further study.

**Integration of Parametric Design into the Furniture Design Process**
Adam Papin, Senior, Art and Design - Faculty Advisor: Ted Ross
Presentation - LRC 235B at 10:15 a.m.

I researched parametric design techniques using Rhino and Grasshopper. Once I gained an understanding of the process, I then implemented the techniques in a number of small formal studies. From there, I constructed a series of side tables using parametric techniques.

**Genetic Investigation of Brook Trout (Salvelinus fontinalis) Population Structure in Six Lake Superior Tributaries Located in Pictured Rocks National Lakeshore, Michigan**
Jonathan Pearce, Graduate Student, Biology - Faculty Advisor: Katherine Teeter
Poster

Brook Trout (Salvelinus fontinalis) found in the Lake Superior basin present significant difficulties for fisheries managers due to the complexity of this species. In the Lake Superior basin, brook trout display two major life histories including stream residents and adfluvial and lacustrine coasters, which have been recognized by federal, state, provincial, and tribal agencies as important to management concerns (Schreiner et al. 2008, Huckins et al. 2008). There is a need to clarify the delineation of populations (and metapopulations) around Lake Superior using genetic techniques that characterize appropriate management units based upon the amount of genetic divergence between recognized populations. Our study being conducted in Pictured Rocks National Lakeshore (PIRO) is sitting at the nexus of these issues as we intend to determine the genetic interrelationships between assumed populations of brook trout (watershed groups) that are known to be connected by the movement of individuals (i.e. coaster brook trout). Management decisions will be formulated by PIRO and Michigan DNR Biologists based on findings from the proposed study, which should help further the conservation of the coaster brook trout in the Lake Superior basin.

**Redesign of the NMU Freshwater Crab Website to Include Maps of Species Distributions, Species Richness, and the Location of Threatened Species of Central and South American Freshwater Crabs (Family Pseudothelphusidae)**
Amy Peterson, Freshman, Art and Design - Faculty Advisor: Neil Cumberlidge
Presentation - LRC 235B at 1:15 p.m.
The NMU Freshwater Crab websites (first created in 2001) were completely updated by rewriting their foundational codes. The websites were made compatible with current internet browsers, the text was rewritten, and downloadable publications were made available. The visual impact of the website was improved with a host of new graphics. However, the website still lacked interactive species distributional maps showing the conservation status of the world’s freshwater crabs. To this end locality data were georeferenced for all 250 species of Central and South American freshwater crabs (Family Pseudothelphusidae) and maps created by uploading data into Google Earth. Conservation assessments from the International Union for the Conservation of Nature Red List were used to map the distributions of species with an elevated risk of extinction (Vulnerable, Endangered, or Critically Endangered), of species not at-risk (Least Concern), and of species too poorly known to assess (Data Deficient). The study found that Mexico and Colombia were the hotspots of freshwater crab species richness, as well as the two countries with the most threatened species. The results represent a baseline that can be used to design strategies to save threatened species of freshwater crabs.

**Vaccine Efficacy in Regards to Adjuvants**
Shelby Pfeiffer, Senior, Biology - Faculty Advisor: John Lawrence
Poster

The ultimate goal of receiving a vaccination is to prevent the spread of infectious diseases. Influenza virus is researched each year to come out with a proper vaccination for that year’s influenza strand. Analysis of nine articles for research done on the efficacy of influenza vaccinations and the use of adjuvants in vaccinations was key for this study. Adjuvants were also looked at in respect to efficacy in vaccinations. The efficacy of the influenza vaccination was compared to the efficacy of the influenza vaccination with adjuvant. By looking at the results of efficacy with adjuvant vaccinations and normal influenza vaccinations we are able to see a difference in efficacy. Data from various studies prove the effectiveness of vaccinations and also the effectiveness of vaccinations that use adjuvants. A large increase of efficacy was recorded when the adjuvant IC31 was added to the influenza vaccine. These results were the same for other adjuvant such as GK1, and alpha-GalCer.

**Characterizing the Role of Brain-Derived Neurotrophic Factor in the Health and Maintenance of Motoneurons**
Emily Pomeroy, Graduate Student, Biology - Faculty Advisor: Erich Ottem
Poster

Neuromuscular diseases are characterized by degeneration of motoneurons and atrophy of the muscles which they innervate. Cellular markers include a decrease in cell body size, dendritic atrophy, and loss of synaptic input. These markers are precursors to eventual death of neurons. Although the hallmarks of most neuromuscular diseases are well-characterized, their origins remain largely unknown. One possible trigger of pathology associated with neuromuscular diseases is a loss or reduction of brain-derived neurotrophic factor (BDNF) in the motor unit. BDNF is a protein which promotes cell survival, growth, and differentiation. Preliminary data indicate that mice with missing or reduced BDNF synthesized by muscles display behavioral deficits in adulthood. We hypothesized that absent or reduced BDNF in muscles would lead to many of the same neuropathological markers present in neuromuscular diseases. We used a Cre-recombinase/LoxP gene knockout system to generate mice missing one or both alleles of the BDNF gene from skeletal muscle. We performed widely-used techniques to identify and characterize potential pathological changes in motoneurons. Results indicate that reduced or absent muscle-synthesized BDNF leads to decreased cell body size, altered amounts of BDNF protein present in motoneurons, and decreased dendritic arborization. This phenotype is similar to neuropathy seen in neuromuscular diseases.

**Effects of Mercury Amalgam Fillings**
April Pratico, Senior, Biology - Faculty Advisor: John Lawrence
Poster
The effect that mercury has on humans can lead to serious problems. Amalgam fillings have been used over the past 150 years and are still being used today. These fillings are 50 percent mercury which has raised much concern on the effects they could have on humans. Trials involving patients with amalgam were compared to patients with composite fillings and those with no fillings. These investigations were sought out to gain insight on if there are negative effects due to mercury. Mercury concentrations were seen in the urine of patients with amalgam, as well as a decrease in B and T cells. There were no significant changes seen in the mental or the physical health of patients. Amalgam fillings do not cause any significant change or damage to humans. It is important to note the decrease in certain cells of the body when having amalgam fillings. This does give a push for further investigation.

**Native American Literature in the Secondary Classroom**
Morgan Raether, Senior, Secondary Education/English, Honors - Faculty Advisor: Kia Richmond
Presentation - LRC 235A at 11:15 a.m.

This project began as research regarding Native American literature and whether, how, and why it was being used in secondary (middle and high school) classrooms in the Upper Peninsula. Then I began looking into what books are available at that age level that are appropriate, respectful, and interesting. The end goal is to create a website for teachers around the country, especially in the U.P., to access. I have read many books and created a database of sorts that focuses on age group, tribe, and themes within the novels. This research all centers around the push for culturally relevant teaching and creating a diverse and applicable learning environment for students.

**Identifying the Genetic Signature of a Disease**
Kaylee Rowe, Freshman, Clinical Sciences - Faculty Advisor: Catherine Bammert
Poster

This year I worked with Cathy Bammert on two main projects. We did experiments dealing with Factor V Leiden and Hereditary Hemochromatosis. Both of these disorders can be detected by their specific genetic signatures. Hereditary Hemochromatosis is an inherited iron storage disorder. It can be detected using PCR testing to determine if the DNA of the disorder is present. Factor V Leiden is another inherited disorder. Factor V Leiden deals with blood clotting, and it can be detected using PCR and a Roche LightCycler to analyze melting curves.

**Induction of T Cell Apoptosis by Glioblastoma-derived Exosomes**
Keith Sabin, Graduate Student, Biology - Faculty Advisor: Robert Winn
Poster

Glioblastoma multiforme (GBM) is the most malignant and common form of brain tumor in adults with an average survival rate of 15 months. One contributing factor to this dismal prognosis is the systemic immune suppression induced by the tumor. Many immunosuppressive pathways have been investigated, but the role of GBM-derived exosomes remains poorly understood. Exosomes isolated from colorectal and prostate cancer are able to kill T cells via the Fas ligand (FasL) signaling pathway. This has not been shown for GBM. Exosomes were isolated from GBM cell lines and co-cultured with Jurkat T cells. After 24 hours, a luminescent cell viability assay was performed. The ability of GBM-derived exosomes to induce T cell apoptosis was investigated in a similar manner. RT-PCR and Western blotting was used to determine FasL expression in GBM cell lines. We showed that FasL was expressed by GBM cell lines and GBM-derived exosomes were able to induce T cell death, which resulted in decreased T cell viability. GBM-derived exosomes could contribute to immune suppression by activating cell death pathways in anti-tumor T cells distal from the tumor bed. This is a novel finding in glioma biology and could lead to the development of novel therapies.

**Sexual Attitudes Show Little Change over Twenty Five Years**
Andrea Savord, Danielle Morrison and Jordan Marquez, Seniors; TJ Aiyash, Junior, Psychology - Faculty Advisors: Charles Leith and Sheila Burns
Presentation - LRC 235A at 11 a.m.
Sexual attitudes, measured on a survey which might be called “adventuresomeness” or “openness,” were assessed over a 25-year period at a small rural Midwestern university. The survey asked students to examine statements pertaining to sexual attitudes in four settings: evaluating their own attitudes as sophomores in high school and their current attitudes, and predicting the attitudes of other people of the same sex and other people of the opposite sex. Our general finding was that males self-report more adventuresome attitudes than females and that while male attitudes decline a little between high school and college, female attitude scores increase between high school and college. Unexpectedly, we also found that males accurately predicted female self-reported attitudes, but females were very inaccurate in predicting male self-reported attitudes. Our original interest in this latter outcome appears to contradict the common belief that women are more socially perceptive than men, and that men “don’t understand women’s attitudes,” or at least are less sensitive to attitudes, and hence don’t understand females’ reactions to flirtatious overtures. This analysis looks at seven sets of data, over 25 years, including data from January 2013.

The Effects of the Neurotensin-1 Receptor Agonist PD149163 on Working Memory Performance in Brown Norway and Long Evans Rats

Ashley Schmeling, Senior, Psychology - Faculty Advisor: Adam Prus
Presentation - LRC 235A at 12:15 p.m.

Ashley Schmeling and Melissa Esser, Seniors; Katelin Matazel, Graduate Student, Psychology - Faculty Advisor: Adam Prus
Poster

Cognitive impairments are prevalent among patients with schizophrenia and are not adequately treated by current antipsychotic drugs, which mainly function as antagonists for dopamine and serotonin receptors. Improved antipsychotic medications may derive from preclinical models for identifying cognitively-enhancing antipsychotic drugs. Recent studies identified prepulse inhibition deficits in Brown Norway rats, suggesting that these animals may model the same deficits found in patients with schizophrenia. Further, neurotensin receptor agonists have been found to exhibit antipsychotic-like effects in animal models. The present study further evaluated the antipsychotic efficacy of the neurotensin-1 receptor agonist PD 149163 and working memory performance of Brown Norway (BN) and Long Evans (LE) rats in a delayed non-match to position radial arm maze task. BN rats took significantly longer to meet the training criteria vs. LE rats and committed significantly more errors vs. LE rats following a 24-hour delay. PD 149163 significantly reduced working memory errors after a 24-hour delay in the BN but not LE rats. These data suggest that BN rats may possess innate cognitive deficits useful for testing cognitive enhancing drugs. Also revealing that the neurotensin system may be a novel pharmacologic target for enhancing cognitive functioning in schizophrenia and suggesting that efficacy of this drug may be dependent on innate deficits of the subject studied.

Jealousy in Friendships

Brittany Schryvers, Senior, Psychology - Faculty Advisor: Francella Quinnell
Poster

This study looks at jealousy in friendships in six different types of friendships: casual same sex friends, casual opposite sex friends, close same sex friends, close opposite sex friends, best same sex friends and best opposite sex friends. The hypotheses of the study were: the higher quality of a friendship as measured by the McGill Friendship Quality Inventory, the more jealousy will be reported and the higher quality of a friendship, the longer the friendship will be. Participants were recruited from introductory level psychology courses at Northern Michigan University with some students having the option for course credit for participation in the study. The survey contained multiple sections including demographics questions, items concerned with common ways of communication in their friendships, the McGill Friendship Questionnaire, and nine items relating to the experience of jealousy. Statistically significant, moderate correlations were found between jealousy and friendship quality for casual opposite sex friends and between jealousy scores and friendship quality for close opposite sex friends.
These findings are similar to previous findings, which suggest jealousy is more common in romantic relationships that are not deemed exclusive and in which there is a moderate amount of intimacy (e.g., Knobloch & Solomon, 1999). The present study did not address the issue of whether or not opposite sex friendships included romantic involvement or a desire for the friendship to evolve into a romantic relationship. Future research should differentiate between opposite sex friendships with romantic involvement and opposite sex friendships that are non-romantic in nature.

**Discovery of a New Exotic Slug Species (A. fuscus) in the Upper Peninsula of Michigan and Its Possible Role in the Decline of the Threatened Calypso Orchid (Calypso Bulbosa)**

Rachel Sines, Fall 2012 Bachelor of Science Graduate, Biology - Faculty Advisor: Alan Rebertus

Poster

Recent surveys of orchids in the Grand Sable Dunes, Pictured Rocks National Lakeshore from 2008 - 2010 noted a significant decline in the Calypso orchid (Calypso bulbosa) population. The decline was so much so that calculations predict the plants in the park will face extinction within 11 years. Observed damage to the plants is believed to be from slugs and more specifically the invasive dusky arion (Arion subfuscus). Of the several European species of terrestrial slugs introduced into North America, the dusky arion has become the most abundant. Through PCR-RFLP analysis and DNA sequencing the identity of the slug was identified to be Arion fuscus. A. fuscus was first reported in the USA from Europe in 2009 in Vermont and Massachusetts. The identity of a newly discovered invasive species in Michigan’s Upper Peninsula has been confirmed.

**He's Mad! (Or Does he Simply Need Adjustment of his Selective Serotonin Reuptake Inhibitor?): Stigma and the Changing Understanding of Mental Illness through Literature**

Linda Sirois, Graduate Student, English - Faculty Advisor: Kia Richmond

Presentation - LRC 235B at 12:30 p.m.

According to the Report of the Surgeon General on Mental Health, the range of mental disorders suffered by nearly one in five Americans (including children and adolescents) is “spoken of in whispers and shame.” This presentation will explore social stigma within contemporary nonfiction written by authors living with mental illness. Participants who attend this session will be introduced to narratives which will open conversations within the high school and college classrooms about mental illness in the context of literature and composition study. Attendees will leave with a list of suggested texts which may expand their acceptance and understanding of disabled individuals.

**The Gathering Storm: The Potential Epidemic of Eastern Equine Encephalitis Virus in the United States**

Lauren Smith, Senior, Biology - Faculty Advisor: Robert Belton

Poster and presentation - LRC 235A at 1 p.m.

Eastern Equine Encephalitis is a viral disease endemic to the southeastern United States and spreads by the bite of infected mosquitoes. Horses infected by the Eastern Equine Encephalitis Virus (EEEV) have a mortality rate up to 90 percent. Humans infected with the virus have a mortality rate of nearly 70 percent, with permanent brain damage resulting for those who recover from the viral infection. EEEV is an arbovirus that is normally transmitted between mosquitoes and birds, but humans and horses can become dead-end hosts if bitten by an infected mosquito. While this disease is not prevalent in the United States at this time, there has been a marked increase in cases reported throughout the eastern United States during the last 40 years as the range of the virus has expanded northward. We hypothesize that Eastern Equine Encephalitis could become epidemic in the United States due to the effects of climate change and the resulting changes in bird migration patterns. The lack of treatment options for infected individuals and the high mortality rate of this disease would have devastating consequences on both human and equine populations. We discuss preventative health care measures that can be taken to prevent this potential epidemic.
The Role of Skeletal-Derived BDNF in the Health and Maintenance of Muscle Physiology
Amanda Taisto, Graduate Student, Biology - Faculty Advisor: Erich Ottem
Poster

Motorneuron diseases (MNDs) are historically thought to originate from motorneuron pathology which subsequently leads to muscle atrophy over time. Newer research suggests oppositely, that cellular pathology may occur in skeletal muscle before motorneurons are affected. Brain-derived neurotrophic factor (BDNF) is a diffusible protein produced by skeletal muscle and motorneurons and a critical bidirectional signaling molecule. BDNF is implicated in to maintenance of motor unit health. This study addresses whether the reduction or absence of muscle-derived BDNF leads to myopathy. Transgenic mice were created with the use of Cre/lox gene knockout technology such that they expressed reduced or absent skeletal muscle derived BDNF. The gastrocnemius, extensor digitorum longus, and soleus muscles from these animals were harvested and examined for cellular markers for muscle pathology. We compared the average number of muscle fibers, fiber area, and fiber perimeter for each age group (30d and 120d) and across all genotypes for the three muscle types. From this analysis we were able to determine that only the gastrocnemius muscle in 120d Muscle^{BDNF+/−} (ht), and Muscle^{BDNF−/−} (hm) showed signs of myopathy. No difference was found in either the extensor digitorum longus or soleus muscles in either 120d or 30d age groups.

Academic Achievement in Montessori vs. Traditional Students: A Modified Meta-analysis
Cora Thiele, Senior, Biology - Faculty Advisor: John Lawrence
Poster

Academic achievement levels in American students are average, globally. In order to be competitive on the global stage, alternative educational methods, such as Montessori, have been gaining popularity in the United States. Academic achievement outcomes of the Montessori method have not been conclusively presented. This meta-analysis compares the longitudinal effects of exposure to early childhood development Montessori methods vs. traditional programs using the academic achievement data from ten primary research studies published in the last fourteen years. These studies were compared based on their support or failure to support the hypothesis that higher academic outcomes were observed in students with exposure to Montessori. A Chi-Square analysis was used to determine statistical significance. The meta-analysis reported no statistically significant difference in academic achievement between students exposed to the Montessori curriculum compared to students in a traditional curriculum control. More research is necessary to determine the efficacy of the Montessori method in improving academic achievement outcomes.

Secrets Revealed: The Real Ingredients of Fish Food
Shaley Valentine, Sophomore, Chemistry - Faculty Advisor: Suzanne Williams
Poster

Various recent studies have shown alarmingly high rates of mislabeled food sold in stores and restaurants. These notable reports led to wondering about whether this mislabeling not only affects human foods but also pet foods. Three types of betta fish food—ZooMed, HBH and TetraO brands—were tested to see whether the labeling matched the actual ingredients. DNA Barcoding was used to find which species composed the different fish foods. Barcoding is sequencing the extracted and amplified DNA to obtain a unique DNA sequence that is identifiable among species, similar to barcodes on merchandise identifying items. DNA was extracted from each brand of food, amplified and sequenced. The results showed flies and plants were found in all the fish foods but no fish DNA was amplified well enough, if at all, for sequencing. As fish meal is the number one ingredient and no flies are on the ingredient list, this leads to skepticism over the food processing and labeling by the companies.
Increased Ejection Fraction During and After Chemotherapy on a Breast Cancer Survivor: A Case Study
Ryan Weatherwax, Graduate Student, Health, Physical Education and Recreation - Faculty Advisor: Scott Drum

Poster

Trastuzumab (Herceptin), a humanized monoclonal antibody, is part of the standard therapy for breast cancer overexpressing the HER2 gene. However, trastuzumab has been associated with asymptomatic left ventricular ejection fraction (LVEF) reduction and congestive heart failure. Purpose: To investigate the impact of a newly implemented exercise program on the increase in LVEF in a HER2-positive breast cancer survivor undergoing adjuvant Herceptin treatment. Methods: A retrospective analysis of a 47-year-old woman (ht 165 cm; wt 61.4 kg; BMI 22.6) diagnosed with HER2-positive breast cancer was examined. A baseline resting multi gated acquisition (MUGA) scan was completed with follow-up MUGA scans completed every third month. During chemotherapy, a new exercise program was implemented. Results: LVEF at baseline or prior to exercise training was 53 percent followed by 59 percent, 66 percent, and 61 percent. Adherence to the exercise program was 95.8 percent. Conclusions: LVEF increased by 24.1 percent throughout a known cardiotoxic chemotherapy treatment. The trend of increased LVEF during and shortly after exercise was eventually followed by a decreased LVEF. The exact cause of increase is not known, but there is strong evidence that the implementation of the exercise program may be a critical factor as to why the increase in LVEF was observed.

Analysis of The Effects of Spinal Manipulation on Resting EMG Scores
Nathaniel Weiss, Senior, Biology - Faculty Advisor: John Lawrence

Poster

This meta-analysis investigates the effect of spinal manipulation on the neuromuscular excitation or inhibition of resting muscles and the efficacy of EMG to detect these changes. The intention of this investigation is to see if any general trends in muscle responses could be applied to optimizing treatment for muscle weakness or pain. Papers to be included were in the English language, treatment method by spinal manipulation, results measured by EMG, and at least one reading taken at rest. Mean EMG scores pre- and post-manipulations were extracted and entered into IBM SPSS Statistics 20. Each score was grouped based on control, positive changes, and negative changes. A one-tailed T-test was performed twice to investigate whether positive and negative EMG scores were significantly different from the control groups. Both negative and positive changes in resting EMG post manipulation showed significant changes from the controls. Results suggest that Spinal Manipulation is not limited to either inhibitory or excitatory responses. Further investigation is required to fully understand the interaction between spinal manipulation and neuromuscular effects.

Is Catch-and-Release Fishing in Freshwater Effective?
Kristina West, Senior, Biology - Faculty Advisor: John Lawrence

Poster and presentation - LRC 235A at 10:15 a.m.

Catch-and-release fishing is a management strategy for multiple fish species practiced all over the world. This method of angling has the potential to slow results from various human actions that lead to habitat loss, pollution, and overexploitation. Scholarly websites were used to derive the orderly hits on the debate if catch-and-release fishing is effective. Going through citations of the selected papers, and developing on new scholarly articles was very productive. A chi-squared analysis was done using the 26 articles reviewed. It revealed a chi-squared value of 18.62 resulting in the final statistical analysis of .815. Twenty-four out of the 26 articles were significant enough (p <0.05) to state the angling method is effective and little to no mortality is done. Multiple factors for potential mortality was a possibility and was tested including bait type, water temperature, and hook location. All this has major impacts on behavior, growth, reproduction, and physical condition. Modern regulations have effectively improved most issues but need continuation and possibly stricter conditions. To conclude, I rejected the null hypothesis of there are no positive outcomes for catch-and-release angling.
Time-of-Flight and Position Dispersion in Different Configurations of Plastic Scintillator Detectors
Daniel Wilbern, Freshman, Physics - Faculty Advisor: William Tireman
Presentation - LRC 235A at 12:45 p.m.

Time-of-Flight and position dispersion are measured in different configurations of large-volume plastic scintillator detectors. Tests are being carried out on two new configurations of large-volume plastic scintillator detectors with subnanosecond timing capabilities. Comparisons are made to values found from measurements made previously on similar detectors. For these tests, cosmic ray muons are used as a source of ionizing radiation to cause events in the scintillator which are detected by photomultiplier-tubes. Dispersions are determined by fitting the time-of-flight and position peaks with Gaussian functions and calculating the full-width at half-maximum. The outcomes of these tests have implications for experimental setups in future experiments concerning the internal structure of neutrons.

The Chum Chum Thief: A Michigan Poet in the Mekong River Delta
Cameron Witbeck, Graduate Student, English - Faculty Advisor: Austin Hummell
Presentation - LRC 235B at 2:45 p.m.

My presentation will be focused on my summer research trip to rural Vietnam and the effect that my time there has had on my poetry. The trip, which was funded by an Excellence in Education grant from NMU, has proved invaluable in terms of the images and experiences that I gathered while spending two weeks in the Mekong River Delta. During the presentation, I will also read poems that been directly or peripherally inspired by the research trip.

Demonstrating Musical Concepts Using Geometer's Sketchpad
Breanne Young and Kaitlyn Hoffman, Juniors, Mathematics and Computer Science - Faculty Advisor: David Buhl
Presentation - LRC 235B at 11:30 a.m.

Using Geometer's Sketchpad, we will model the development of musical instruments and the programming involved to play a popular piece of music. A demonstration of how a basic scale can be performed will accompany each instrument, which includes a trumpet, alto saxophone, and a string bass. Following the presentation of each instrument’s basic scale process, there will be a demonstration using the explained instruments to create a musical composition. Throughout the presentation we will explain the process of how we utilized Geometer’s Sketchpad to compose the individual elements of our project.