

The background of the entire page is a photograph of a university building's dome, likely the Stevens Point University building, set against a clear blue sky. The dome is dark and has a spire on top. The image is framed by a white, hand-drawn style border.

University of Wisconsin - Stevens Point

College of  
Letters and Science  
Presents

The 9th Annual

Undergraduate  
Research  
Symposium

Program

April 26, 2008



University of Wisconsin - Stevens Point  
College of Letters and Science

9th Annual  
Undergraduate Research  
Symposium

Program



Saturday  
April 26, 2008

Science Building  
UWSP Campus

# **Dean's Welcome**

Room A121, Science Building  
8:45 AM

## **Oral Presentations**

See Program for Individual Room Locations  
and Time Assignments

Session I: 9:00 AM - 10:00 AM

Session III: 11:00 AM - 12:00 AM

## **Poster Presentations**

1st Floor, Wings A and B  
Science Building

Session II: 10:00 AM - 11:00 AM

Dean Lance Grahn will welcome the participants and attendants at 8:45 AM in Room A121 of the Science Building. Please plan to attend this welcome and enjoy some pre-program refreshments in the east lobby of the Science Building.

Presentations will begin at the top of the hour, ending at 25 minutes past and beginning again at 35 minutes past, ending at the top of the next hour, i.e., 9:00 until 9:25 and 9:35 until 10:00 for Session I and 11:00 until 11:25 and 11:35 until 12:00 for Session III.

Please adhere to these starting and ending times. This will allow for smooth transitions between paper presentations. Thank you.

# Oral Presentations

## Session I: 9:00 - 10:00

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### Department of Biology

Science Building A203

Session Moderator: Professor Chris Hartleb

#### **Genetics of Sex in Soybean**

Katie Krause and Sarah Pritzl

*Faculty Mentor: Devinder Sandhu*

In sexual reproduction, a plant undergoes meiosis to produce pollen and egg cells. During this process, segments that contain genes are exchanged. Minor alterations in genes controlling meiosis can lead to male sterile and female sterile mutant plants. In soybean, three male sterile, female sterile mutants have been identified recently. The objective of this study was to find the genetic location of these male sterile, female sterile mutant genes. DNA analysis with 400 Simple Sequence Repeat (SSR) DNA markers suggested that all three mutant genes map on the same Molecular Linkage Group (MLG) B2. Fine mapping using F2 (2nd generation) populations confirmed the location of male sterile, female sterile mutant genes. All three genes are mapped in the same region and are flanked by markers Satt126 and Sat\_264. Sat\_264 is the closest marker to the gene at 4.6 centi Morgan away. Most likely all three genes are allelic, meaning they are at the same location on a chromosome. Further investigation will be needed to clearly demonstrate if all three genes are allelic or are three closely associated independent genes.

#### **Investigation of Whitetail Syndrome in Yellow Perch and Walleye**

Abby Purdy and Hilary Meyer

*Faculty Mentors: Chris Hartleb and Robert Schmitz*

During warm summer months, some cultured fish have developed a pale discoloration of the dorsal-posterior region that is soon followed by loss of appetite and death. Aquaculturists refer to this as “whitetail syndrome” but the exact causes, morbidity, and anatomical/physiological effects have not been documented. The Wisconsin Veterinary Diagnostic Lab examined the fish and ruled out any bacterial, fungal or viral causes. We examined yellow perch and walleye that were cultured in the summer of 2007 at the UWSP-Northern Aquaculture Demonstration Facility in Bayfield, Wisconsin and which showed signs of whitetail syndrome. Select specimens of preserved infected and healthy fish were prepared using histological methods and examined using light microscopy. All of the infected fish had a whitish lesion near the posterior area of the midsagittal section. All lesions appeared after the dorsal fin and before the tail fin and were on the dorsal side of the fish. Scales of the infected fish in and around the lesion appear to be raised from the skin, rather than flat against the skin. The location of the white lesions is consistent among all infected fish and may indicate circulatory complications along the spinal cord. We hypothesize that whitetail syndrome may either be affecting the osmoregulatory system or the circulatory system resulting in necrosis and eventual death.

## **Department of History**

Science Building A201

Session Moderator: Professor Nancy LoPatin-Lummis

### **An Open Eye to Water Management at the University of Wisconsin-Stevens Point**

Zach Bitter

*Faculty Mentor: Nancy LoPatin-Lummis*

This research paper deals with the major environmental movements that took place in the United States during the latter part of the 1960s and into the 1970s. The objective of this paper is to touch on how the University of Wisconsin-Stevens Point (UWSP) contributed to the wide scale movements that took place during this time period. By looking at various actions, such as curriculum change, faculty involvement in and out of the class room, building projects, public awareness, and student activities, this paper illustrates the University's strong involvement in the ongoing environmental movement, which took our nation by storm. Some findings include Dr. Trainer's pursuit to bring an environmental center to the University, the government's recognition of the UWSP as a prime location for a Water and Environmental Analysis Lab, and the introduction and speedy development of a Water Resource Major.

### **Changing Uniforms: The Effects of World War II on the Intercollegiate Athletic Program at the Central State Teachers College of Wisconsin**

David Chrisinger

*Faculty Mentor: Nancy LoPatin-Lummis*

The story of the Pointer football team from the Central State Teachers College of Wisconsin reveals several interesting characteristics about the community of Stevens Point and the faculty at the university. After the outbreak of war in 1941, the faculty and students of the university and the community of Stevens Point placed higher priorities on serving their country any way possible. While larger universities fielded teams and sold tickets to games, players at the university in Stevens Point were making admirable sacrifices. Two players on the 1941 Pointer football team paid the ultimate sacrifice by dying honorably on the field of battle. Star athletes for the Pointers were not given "soft" tours of duty like other college football super heroes. The sacrifices did not end with the players; the entire community sacrificed for the war effort by participating in metal scrap drives, gas rationing, and enlisting in the armed services. Only after the war was coming to an end did the priorities of the community shift. The importance of athletics was again realized. Football was seen as something more than just a game once again. The football team proved to not only unite students and community members, but they also boosted morale for a town that badly needed it.

## **Department of Psychology**

Science Building A208

Session Moderator: Professor Jody Lewis

### **Spatial Generalization Tests in Laboratory Mice**

Amy Ort

*Faculty Mentor: Jody Lewis*

Laboratory mice were trained to recover a sugary treat buried in a sand-filled cup. During training, mice were always rewarded at the center location of seven possible locations and not allowed to visit any of the other six possible locations. After training, mice were given generalization tests for all seven possible locations. The generalization tests consisted of placing an unbaited cup at each of the seven possible locations while the other six locations were unable to be visited. Two different measures were used to determine generalization. First, the time spent digging at each location during test trials was measured. If generalization has taken place, the data should show a large amount of digging at the center location and relatively little digging at end locations farther away from the reward location. Second, the amount of time it took for the animal to begin digging at each location was measured. If generalization has taken place, latency should be low in the center and high at each end.

### **Spatial Learning and Memory in Swiss-Webster Mice**

Matthew Florence

*Faculty Mentor: Jody Lewis*

The current study sought to study the spatial memory abilities of Swiss-Webster mice (*Mus domesticus*) using a method which had been developed for Clark's nutcrackers. The apparatus consisted of an open field where a food reward could be hidden in one of eight locations. The subject was allowed to study the apparatus until the reward was located. After a short retention interval, the subject was allowed to try and relocate the same location for another reward. The locations consisted of eight bottle caps. During the study phase, all but one location was capped. The remaining location was filled with sand, and the reward buried within. When the subject was allowed to relocate the reward, all locations were filled with sand, and only the previously rewarded location contained a reward. Each faulty attempt at locating the reward was counted as an error, defined by an attempt to dig, or the touching of the sand with the paws. An open field apparatus is thought to be more ecologically valid than various maze type apparatus (i.e., radial-arm maze, under-water maze, etc.) in that mice may locate a food source and then return to that same location multiple times from their nest. The open field also made use of landmarks, which were used to serve as visual cues.

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## **Department of English**

Science Building A202

Session Moderator: Professor Robert Sirabian

### **Appearance as Social Influence in Dickens' *Oliver Twist***

Amanda Maule

*Faculty Mentor: Robert Sirabian*

In *Oliver Twist*, Dickens' third-person omniscient narrator offers readers interpretations of Oliver's physical appearance through narrative asides and through other characters to show the precarious nature of identity as it continually shifts until the conclusion of the novel. Oliver's moral goodness is undermined by the fluctuations between the narrator's consistent portrayal and the shifting portrayals made by other characters. Though the narrator and most characters agree that Oliver appears innocent and good, they differ in their perception of the validity and usage of that innocence and goodness. This variance in moral judgments based on appearance shows the importance of character-to-character interpretation that mirrors Victorian society. The visual images that supplement the text, drawn by Cruikshank, reinforce the narrator's moral and passive portrayal of Oliver, but offer visual interpretations that go beyond the text to establish the identity of characters. Moral characters, like Mr. Brownlow and the Maylies, perceive only the true goodness in Oliver; immoral characters like Mr. Bumble only perceive corruption in Oliver. Fagin, nearly the worst of the class, tries to possess Oliver because he sees the innocence in him and wants to manipulate that advantage selfishly. Oliver is never recognized as Oliver; he is always recognized in the context of the person or people—his mother, his father, the middle class, the criminal class etc.—who see him. They assign either their own or their opposite identity onto him, and the conflicting views never allow him to finalize an identity of his own.

### **The Economics and Vengeance of Parenting in Dickens' Novels**

Kaitlin Rheingans

*Faculty Mentor: Robert Sirabian*

Through the novels *Oliver Twist*, *Dombey and Son*, and *Great Expectations*, Dickens offers his commentary on the parent-child relationship as one of selfish exploitation and abuse of children by their parents for their own economic purposes and revenge-seeking goals that lead to severe psychological effects for the children. With his own childhood experiences, Dickens uses the major characters of Fagin, Mr. Dombey, Magwitch, and Miss Havisham to illustrate the physical and psychological abuse neglected and orphaned children are subjected to. It is also through these characters that Dickens comments on the sick state of his society and the long-term effects on children, who are at risk of growing up to be just like their parents. Dickens' harsh feelings towards his mother, Elizabeth, manifest into his portrayal of a devil-like Fagin who corrupts and abuses children simply for monetary gain; Dickens also presents Mr. Dombey as a father only concerned with grooming his frail son into his successor with no regard for the well-being of either of his children, especially his long-suffering and neglected daughter, Florence. Dickens portrays the revenge-seeking aspect of parenting in Magwitch, an orphan who uses another young orphan as his delegate in the society that abandoned him; through Miss Havisham, motivation for revenge is rooted in heartbreak, leading to the destruction of Estella and the heartbreak of Pip.

Science Building A213  
Session Moderator: Professor Ken Menningen

**Florence Dombey and Her Resistance to Falling: Parallels between the Ideal and the Fallen Women Characters in Charles Dickens' *Dombey and Son***

Hannah Doudna

*Faculty Mentor: Robert Sirabian*

In *Dombey and Son*, Charles Dickens gives the reader insight into how Victorian women were put into two main social groups: the fallen woman, and the ideal woman. Dickens represents these groups through the characters of Florence, Edith, and Alice. Designating Florence Dombey as the ideal, and Edith Carker and Alice Marwood as the fallen, Dickens separates them accordingly, yet at the same time views them all as women, all the same, and draws many parallels that link them together. Therefore, with so many similarities it is a wonder Florence Dombey does not become a fallen woman herself. Florence, just like Edith and Alice, grows up without a solid family foundation, or essentially no father at all. This can greatly affect how a woman will grow to view men, influencing relationships with them as well as how the woman thinks men are allowed to treat her, contributing to the fallen woman. We see this aspect throughout *Dombey and Son* as well. Looking further into what it is that can create this ideal woman versus the fallen woman during the Victorian period, readers can see differences in social status and other aspects that hold Florence up above the rest, along with Dickens' providential authorship, which prevents her from becoming the Fallen Woman.

**The Influence of Charles Dickens on the Works of J.K. Rowling**

David Christensen

*Faculty Mentor: Robert Sirabian*

The essay explores the connections between the themes and techniques employed by Charles Dickens and J.K. Rowling. Its aim is to show not only that similarities between the works of both authors exist, but that Rowling was (at least at times) intentionally drawing on the work of Dickens and that a knowledge of the works of Dickens can help inform a more bountiful reading of Rowling's "Harry Potter" series.

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## Department of Chemistry

Science Building A210

Session Moderator: Professor John Droske

### **Halogenated Diaminotriphenylmethanes: Synthesis and Photochemistry**

Darwin Arifin

*Faculty Mentor: John P. Droske*

Our research group has synthesized a number of substituted diaminotriphenylmethanes for use in advanced composite resins and has shown that these monomers are compatible with existing PMR (Polymerization of Monomer Reactants) polyimide technology. When combined with suitable co-monomers, these monomers afforded high quality matrix resins for graphite composites. Neat resin disks containing these monomers have been prepared at UWSP and have been subjected to thermooxidative stability testing at NASA-Glenn Research Center. Several of these resins show excellent stability and are suitable for use in aerospace applications at elevated temperatures (>300°C). To further understand the stability of these resins, we have employed a Hammett linear free energy analysis. Good correlation in Hammett plots of long-term isothermal aging has been observed for substituted diaminotriphenylmethanes at 316°C (600°F).

Concurrent with these thermooxidative stability studies, we have observed interesting photochemical phenomena with the diaminotriphenylmethanes. In particular, the monomers readily change color when exposed to UV light. We also have observed that the color change can be effected chemically using DDQ (2,3-dichloro-5,6-dicyano-1,4-benzoquinone) and we also have found methods for reversing the color change. Other diaminotriphenylmethanes, such as malachite green, have been used for many years as dyes. We are particularly interested in the photochemistry of these diamines, as it may be helpful in elucidating the factors that contribute to the high thermooxidative stability of these monomers when used in PMR-type resins.

This presentation will include a discussion of the synthesis and purification of the halo-substituted diaminotriphenylmethanes, 4''-chloro-4,4'-diaminotriphenylmethane and 4''-fluoro-4,4'-diaminotriphenylmethane. Color changes that have been observed upon exposure of these monomers to UV light and also to DDQ will be presented, along with methods for reversing the color changes. Possible mechanistic pathways consistent with these observations will be discussed.

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## Poster Presentations

### Session II: 10:00 - 11:00

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### Department of Biology

#### **Analysis of the Parasite Community of Adams Lake Mudpuppies**

Michael S. Hughes

*Faculty Mentors: Todd Huspeni and Erik Wild*

The mudpuppy, *Necturus maculosus*, is a common amphibian found in many rivers and lakes in Wisconsin. Because little is known about the community of parasites that use mudpuppies as hosts, I examined the parasite community in local mudpuppies. In Adams Lake (Portage County), mudpuppies were captured by fyke nets anchored in shallow water during the spring and fall of 2007. Captured mudpuppies were returned to lab at UWSP, euthanized, measured, weighed, and examined for the presence of parasites. Parasites were removed, fixed in a mixture of alcohol-formalin-acetic acid, and were identified to lowest possible taxonomic level. Standard statistical analyses including Chi-square, analysis of variance, and logistic regression were employed to test for any effects of season, mudpuppy sex, and size on parasite prevalence (% hosts infected with a parasite species) and intensity (# of parasites of a single species per host). While no significant difference was found between numbers of each sex trapped between seasons (Fisher's exact test  $p=0.18$ ), females did outnumber males 11:7 in the spring, while males outnumbered females 11:6 in the fall. On average, female mudpuppies weighed ~15g more than males ( $p=0.04$ ), but there was no significant effect of season on mudpuppy size. Observed parasites included the monogenean *Sphyranura*, proteocephalid cestodes, acanthocephalans, and metacercariae of the digenean trematode *Clinostomum*. The proportion of mudpuppies infected with each type of parasite was not significantly related to host size, sex, or season of capture. However, the numbers of *Sphyranura* and cestode individuals were significantly related to mudpuppy sex, size, and season of capture (all  $p < 0.05$ ). A total of 286 *Sphyranura* worms were observed on 15 mudpuppies, but these were highly aggregated, as three mudpuppies accounted for 263 of the 286. Overall, mudpuppies in Central Wisconsin harbor a diverse and relatively rich community of parasites.

#### **A Survey of Parasitic Helminths in American Coots from Shawano Lake, Wisconsin**

Michelle Frank, Sheena Gill, Andrew Van Lanen, and Tanya Wayda

*Faculty Mentor: Todd Huspeni*

American coots, *Fulica americana*, die by the thousands each fall on Shawano Lake, Wisconsin. Most coot deaths on Shawano Lake have been attributed to the trematode parasite, *Leyogonimus polyoon*. However, morbidity and mortality may also be caused by other parasites, including two other digenean trematode parasites: *Cyathocotyle bushiensis* and *Sphaeridiotrema globulus*. *Leyogonimus polyoon*, *C. bushiensis*, *S. globulus*, and their required first intermediate host snail, *Bithynia tentaculata*, are each native to Europe and were introduced to the Great Lakes

region. To understand the possible relative contributions of different helminths to the annual mortality events, we examined dead and moribund coots that were collected by the Wisconsin DNR from Shawano Lake in 2007. We recorded bird condition variables including wing load, keel muscle depth, callus width, body mass, and total intestine length. Intestines and cecae from each bird were removed and separated into sections. The total number of each species, position in the intestine, and overall pathology associated with helminths were recorded. We observed *L. polyoon*, *C. bushiensis*, acanthocephalan worms, and a notocotyloid trematode. *Leyogonimus polyoon* and *C. bushiensis* were the most common trematodes, with prevalences of 71% and 43% respectively. Numbers of *L. polyoon* in infected individuals ranged from 22 to 3234 worms (average intensity = 1036), while *C. bushiensis* ranged from 3 to 45 worms (average intensity = 21). *Leyogonimus polyoon* was generally restricted to the anterior half of the intestine while *C. bushiensis* was only found in the cecae. We conclude that *L. polyoon* and *C. bushiensis* are common in coots from Shawano Lake, and that the local ecological conditions are conducive to the transmission of both species. To test for monthly and inter-annual variation in infections, we will perform necropsies on additional 2007 coots, as well as ones frozen in 2006.

## **Ethnobotany of *Prosopis* in Guatemala**

Christina Schuett

*Faculty Mentor: Virginia Freire*

In the summer of 2007 we traveled to the dry forest of Guastatoya, Guatemala, to participate in an ongoing ethnobotanical research project of *Prosopis juliflora*, a native mesquite tree. *Prosopis* is known to have many uses in other countries. Among those we can cite: edible legumes, pollen and nectar for honey production, emulsifying agent, fuel wood, natural fencing. The tree is also used in folk medicine to cure colds, diarrhea, dysentery, excrescences, eyes, flu, head-colds, hoarseness, inflammation, itch, measles, pinkeye, stomachache, sore throat, and wounds.

Unfortunately, in Guatemala the uses of *Prosopis* have been virtually reduced to firewood and occasionally live-stock feed. Fast-growing, drought resistant, and with remarkable coppicing power, *Prosopis* is a natural fuel wood candidate. The tree is usually seen as a pest due to its long thorns and therefore cut down resulting in low mesquite populations. This project has the goal of reintroducing *Prosopis* into the lives of the Guatemalan people in hopes of being a nutritional supplement due to the high rates of malnutrition in Guatemala. *Prosopis juliflora* produces bean pods known to have up to 29% protein compared to 9% in corn. Studies have shown that the fruits contain 13.9 g protein, 3.0 g fat, 78.3 g total carbohydrate, 27.7 g fiber, and 4.8 g ash per 100 grams. Seeds contain 65.2 g protein, 7.8 g fat, 21.8 g total carbohydrate, 2.8 g fiber, and 5.2 g ash per 100 grams.

In talking with some local villagers we were led to make a remarkable finding: some of the *Prosopis* trees had no thorns. This finding was very important because the main reason people cut down *Prosopis* and will not replant it is due to its large thorns.

Hopefully our research will contribute to better nutritional health for the people of Guatemala.

## **Prevalence of HGE Attributed to *A. phagocytophilia* Harbored by Deer Ticks from Schmeckle Reserve and Stockton, Wisconsin**

Erin Fischer

*Faculty Mentor: Diane Caporale*

Human granulocytic ehrlichiosis (HGE), an infection caused by the bacterium *Anaplasma phagocytophilum*, is transmitted through deer ticks (*Ixodes scapularis*) to the human host. If left untreated, HGE may have detrimental lifelong impact. In the past, HGE has only been identified in the Northwestern region of Wisconsin. Regardless, D. Caporale and C. Johnson (2003) identified a small number of occurrences ( $2/70 = 10\%$ ) of HGE caused by *A. phagocytophilia* in Stockton from 2000-2003. During that time, no ticks were found to have the HGE agent in Schmeckle Reserve. In addition, deer ticks are also vectors for the Lyme disease pathogen, *Borrelia burgdorferi*. After observing an increase in the abundance of deer ticks during the past couple years in Stockton and at Schmeckle Reserve located on campus, the prevalence of tick-borne pathogens needs to be reevaluated to see if an upsurge in infectious disease has occurred. Deer tick DNA previously isolated and tested for *Borrelia* in 2006 and 2007 are being analyzed further to detect *A. phagocytophilum* using PCR and DNA sequencing. Lab results will yield a coinfection rate of *B. burgdorferi* and *A. phagocytophilum* and individual prevalence rates of the HGE agent. To date, *A. phagocytophilum* has been identified for the first time in ticks from Schmeckle Reserve. Such a rise in prevalence indicates an increased risk for contracting both Lyme disease and HGE concurrently attributed to *Ixodes* ticks.

## **Spirochete Dispersal and Changing Population Structure of *Borrelia burgdorferi* in Areas of Wisconsin**

Cole Biechler and Chris Merkes

*Faculty Mentor: Diane Caporale*

Lyme disease results from the infection caused by the bacterial pathogen *Borrelia burgdorferi*. The bacterium is transmitted from its primary reservoir the white-footed mouse to the black-legged tick as it feeds upon the host. The infected black-legged tick may further transmit the pathogenic *B. burgdorferi* to humans. From 1999-2005, D. Caporale and students have investigated the spread of the tick-borne disease across the state of Wisconsin. The *ospB* gene that codes for a membrane protein of *B. burgdorferi* was sequenced among samples representative of Northwest, Central and Northeast regions throughout the state. Results suggested the *B. burgdorferi* populations to be distinct with certain strains representing a given region within the state. With strains remaining geographically distinct from one another, *B. burgdorferi* dispersal was concluded to be low. However, having recently sequenced the 2007 samples from Schmeckle Reserve, certain *Borrelia* strains have been identified within this Central Wisconsin region that had previously been localized to regions from the Northwest and the Northeast of the state. More samples from 2006 and 2007 are currently being sequenced to reevaluate the population structure of *B. burgdorferi* in areas of Wisconsin. Because of the low levels of recombination that occur within the bacterium, the presence of these strains would indicate that *Borrelia* dispersal may be increasing within the state and, overtime, end up being just one population.

## **Differential Gene Expression Related to Neuronal Development**

Dean Firkus, Brittney Epping and Justin Staubli.

*Faculty Mentor: Ed Gasque*

Microarrays were used to analyze gene expression related to neuronal development in cultured rat adrenal tumor (PC-12) cells, which differentiate into neurons after exposure to nerve growth factor (NGF). Total RNA was extracted from cells before and after exposure to NGF. Total RNA samples were checked for purity and then used as templates for the synthesis of complimentary DNA (cDNA) with reverse transcriptase. Subsequently, cDNAs were used as templates for in vitro transcription to produce biotin-labeled complimentary RNA probes (cRNAs). cRNAs prepared from undifferentiated and differentiated PC-12 cells were hybridized to separate DNA microarrays. Each microarray is a nylon membrane imprinted with oligonucleotides representing genes that code for proteins associated with neuronal development. If a particular gene is expressed, then the mRNA for that gene will be present in the total RNA extract, and that mRNA will be reverse-transcribed into cDNA. The cDNA acts as a template for producing biotin-tagged cRNA, which then hybridizes to the oligonucleotide in the array that represents the gene in question. The biotin tag is detected by “lighting it up” using chemiluminescent reagents. A digital image is captured, revealing the relative degrees to which specific genes are expressed—highly expressed genes light up intensely, while genes that are expressed weakly light up weakly. We discovered two genes in particular that are expressed in very different levels in treated versus untreated cells. The Npy gene that codes for a neuropeptide implicated in synaptic transmission is expressed fairly strongly in differentiated PC-12 cells; however it is not expressed at all in undifferentiated cells. The Vgf gene that codes for an inducible growth factor involved in neuronal differentiation is expressed very strong in differentiated cells, but is expressed only very weakly in undifferentiated cells.

## **Isolation and Characterization of 2-Methyl-3-buten-2-ol Synthase from *Pinus ponderosa***

Brent Rivard

*Faculty Mentor: Eric Singaas*

2-Methyl-3-buten-2-ol (MBO) is a five carbon volatile organic compound that is emitted from ponderosa pine and a small number of other plants under conditions of heat stress. MBO has potential use as an alternative fuel; when compared to ethanol, MBO has more energy per mole and is less soluble in water, thus requiring less energy to produce. The DNA sequence for MBO synthase is not known. The goal of this research is to isolate and sequence the gene for MBO synthase. Once this is accomplished, the gene can be spliced into a plasmid and transformed into *E. coli* to produce significant quantities of MBO. Proteins sequences present only in heat-stressed ponderosa pines where isolated and sequenced. The sequence information was used to create several degenerate primers. RNA extracted from ponderosa pines confirmed to be emitting MBO by gas chromatography was reversed transcribed to cDNA. The cDNA was used as the template nucleic acid in PCR with the degenerate primers in attempts to amplify a part of MBO synthase. Degenerate primed PCR must be used because little of the DNA sequence of ponderosa pine is known. To date no unknown genes have been amplified with certainty. The degenerate primed PCR technique continues to be run under varying conditions and improved.

## **New Report of *Calypogeia fissa* in Portage County, WI**

Adam Peterson

*Faculty Mentor: Virginia Freire*

Research on liverworts, tiny non-vascular plants in the phylum *Marchantiophyta*, is often overlooked in favor of studying their more well-known relatives, the mosses. There are currently four published liverwort reports for Portage County, WI, and it is unlikely they represent the diversity of species actually present in the county. In October and November of 2007, specimens were collected from Schmeekle Reserve and later identified as *Calypogeia fissa*. There have been no previous reports of this genus in Portage County. The natural habitat consisted of a moist, low-lying area beneath tree cover, and samples were found both directly on the soil and on a decaying log. The specimens are stored in a growth chamber, where they are kept moist and under artificially-controlled lighting conditions. Many photographs have been taken to highlight various features of *Calypogeia fissa*, including the shallow notches at the end of each leaf and the shape of the under leaves. SEM images were captured to show the leaf and stem surfaces, as well as gemmae, asexual reproductive structures that can detach from the parent plant and grow into a new gametophyte. It is possible that additional species may be present within the collected samples, so continued efforts will be made to examine them further.

## **Fossil Stag Moose (*Cervalces scotti*) from Central Wisconsin: Is There Radio-carbon Evidence that the Species Followed the Glaciers North**

Nathan Aalund

*Faculty Mentor: Chris Yahnke*

In May of 2006, a resident of Bevent, WI excavated what seemed to be a fossil moose basicranium and parts of both antlers. After being donated to the UW-Stevens Point mammalogy collection and examined in greater detail, it was concluded that the skull and antlers were from an extinct cervid: *Cervalces scotti*, the stag moose. A section from the beam of the right antler was sent to Beta Analytic Inc. to determine the age of the specimen. After undergoing AMS radiocarbon dating, an age of 10,850 +/- 60 ypb was estimated. Using the Illinois State Museum Faunmap database of known *Cervalces* fossils, we were able to compare age, location, and aging technique of most of the known fossil specimens of *Cervalces*. Our specimen is the only one reported from Wisconsin and the northernmost fossil for this species. Using the locations and ages listed, our hypothesis is that *Cervalces* fossils listed in the database (and our specimen) will follow the northward retreat of the glaciers during the Pleistocene era, thus fossils found at more northern latitudes will be younger than those found further south.

## **Ethnobotany of Skunk Hill (Powers Bluff County Park)**

Alicia Grimm

*Faculty Mentor: Virginia Freire*

Skunk Hill or Powers Bluff County Park is located in Wood County, Wisconsin. This is a vast area with a great variety of native and non-native plant species. Skunk Hill is also an area rich with history. Many Native American tribes once occupied the area including the Ho-Chunk (Winnebago), Menominee, Ojibwa (Chippewa), and Potawatomi. This research was conducted at Skunk Hill for the above reasons and with the specific goal of documenting useful flora of the area to improve and enhance the existing collection of Skunk Hill plants at the Robert W. Freckmann

Herbarium, University of Wisconsin-Stevens Point. After attainment of state and county collecting permits, plants were collected and photographed during the late spring, summer, and fall of 2007 based on a list compiled from a review of preexisting plants from the Robert W. Freckmann Herbarium. Plants were located by area recognition and two to three samples were collected only if they were abundant, not threatened, endangered, or of special concern. Specimens will be properly labeled and entered into the Herbarium. A corresponding research paper will be completed, containing information about the history and importance of Skunk Hill and plant information including the ethnobotanical uses for the four tribes listed earlier. A total of 40 plants were collected / photographed. Collecting and research will continue into spring, summer, and fall of 2008 to attain more specimens.

## **What's Wrong with the Males? Toward a Better Understanding of Male Sterility in Soybean**

Courtney Wiegand, Ryan Frasch and Carol Kropidlowski

*Faculty Mentor: Devinder Sandhu*

In previous studies a fully male sterile (ms8ms8) mutant and a partial male sterile (mspm) mutant were identified in soybean. Both the mutants were temperature sensitive and initial observations suggest that other environmental differences may play a role in sterility. Reciprocal crosses between mutants showed that these are two non-allelic genes and exhibit epistasis with a 9:7 fertile to sterile ratio. Identification of an environmentally stable male-sterility system will enable production of large quantities of hybrid seeds and will be commercially valuable. Objectives of this project were to confirm that msp and ms8 are independent genes and to find genetic location of msp and ms8. Two F2 populations consisting of 150 plants each were generated from a cross between ms8ms8 x Minsoy (male fertile) and mspmsp x Minsoy (male fertile). In the initial step we have isolated DNA from 300 F2 soybean plants using CTAB DNA extraction method. We are in the process of identifying markers associated with the genes using bulk segregant analysis method. Once markers are identified, we will fine map the genes on F2 populations.

## **The Biology of Magnolia Scale**

Abigail Strobel

*Faculty Mentor: Jamee L. Hubbard*

Magnolia scale, *Neolecanium cornuparvum* (Thro), is one of the most conspicuous scale insects in North America. It feeds solely on trees in the genus *Magnolia* and is native to the southern portions of the United States. Magnolia scale is not ordinarily a pest on native species of magnolia trees, and many factors have allowed this insect to become a pest in Wisconsin within the past 10 years. Nothing has been published about the biology of this insect, and little is known about magnolia scale in northern states, such as Wisconsin, where the climate is very different than in the insect's native range. During the summer of 2006, magnolia scale was observed on a weekly basis. The size, color, consistency of the exoskeleton and associated components, molting events, presence of males, presence of eggs, and presence of parasitoids, as well as any other associations, were noted each week. This poster presents the results of these observations.

## **Fantail Crayfish (*Orconectes virilis*) in Adams Lake, Wisconsin: A Case Study**

Scott Vulstek

*Faculty Mentor: Chris Hartleb*

Crayfish community dynamics can include migration, predation, and competition. Within a lake, crayfish can migrate longitudinally from deep to shallow water in search of food, habitat, or to avoid predation and competition. The northern fantail crayfish, *Orconectes virilis*, is one of the largest native crayfish in Wisconsin and its movement patterns are less likely to be affected by competition and more dependent on environmental and habitat choices. To investigate within lake migration patterns I examined the seasonal movements of fantail crayfish in Adams Lake, Portage County, WI in summer and fall 2007 and collected weekly data on the environmental and chemical properties that may be affecting distribution. I trapped 297 male (65.2%) and 158 female (34.7%) crayfish in Adams Lake using baited, cylindrical, wire minnow traps set at depth intervals of 2 ft. starting at 8 ft. and ending at 20 ft. Weight and length relationships were measured and calculated for male and female crayfish based on depth of capture and date. The depths at which crayfish were trapped changed significantly by month, but these movements were not correlated to physical and chemical lake properties. Males and females were trapped at significantly different depths during July, but no difference in depth was observed from August through October. Weight-length relationships did not differ significantly between male and female crayfish in Adams Lake. I recommend further study of crayfish in Adams Lake, including trapping a wider variety of depths and a longer sampling season to better understand the biotic and abiotic factors regulating seasonal migration.

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## **Department of Chemistry**

### **Controlling the Properties of Organic Materials through Synthetic Design and Transition Metal Coordination**

Leah Doyle

*Faculty Mentor: Nathan Bowling*

The goal of the current research is to synthesize an arylenethynylene oligomer that has many potential applications in nanotechnology. There are two routes of synthesis that are being attempted. The first begins by adding Br via a bromination reaction and I via a Sandmeyer reaction. An ethynyl group is then added via two palladium coupling reactions and a final deprotection. In the final synthesis of the arylenethynylene oligomer, the two synthesized molecules are joined via a palladium coupling reaction. The second reaction sequence involves similar Sandmeyer reactions, the use of a TMS protecting group, and palladium coupling reactions. Upon completion of the synthesis, the molecule will be studied in the presence of transition metals to better understand how this molecule can be useful for the design of functional organic materials.

## **Applications of M<sub>2</sub> Complexes in Solar Cells: A Computational Investigation**

Benjamin Gamoke

*Faculty Mentor: Jason D'Acchioli*

Dye sensitized solar cells (DSSCs) are currently being investigated as an alternative fuel source because of their potential for efficient light conversion and low production costs compared to conventional silicon solar cells. Quadruply-bonded complexes containing Mo<sub>2</sub> or W<sub>2</sub> were analyzed using B3LYP Density Functional Theory to determine potential dyes and hole transport materials for their use in DSSCs. Results show that by adding Mo<sub>2</sub> or W<sub>2</sub> to  $\pi$  systems creates lower energy electron excitations in the range of visible light and changing the length and functional groups between the quadruply-bonded metals will affect the amount of light harvesting. Therefore, investigation of these systems is worthwhile for their theoretical knowledge and ability to determine synthetically valuable materials.

## **A Computational Study of the Structure of the *p*-Benzoquinone Manganese Tricarbonyl Anion**

Brennan Walder

*Faculty Mentor: Jason S. D'Acchioli*

DFT optimizations at the B3LYP level were performed on the three resonance forms ( $\eta^x$ ;  $x=4, 5, 6$ ) of *p*-benzoquinone manganese tricarbonyl (*p*-QMTC) anion in order to determine the most contributing resonance structure. Approximations of the atomic charge on the manganese center were also performed on each single point resonance structure and the optimized structure using both Mulliken and natural population analyses. All three resonance structures optimized to the  $\eta^4$ -*p*-QMTC resonance structure, providing evidence that the  $\eta^4$  structure is the largest contributor of the three. Furthermore, the Mulliken and natural population analyses of the optimized structure showed a significant negative charge on the Mn center, helping to confirm the structure of this anion.

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## **Department of Geography and Geology**

### **Morphometric Characteristics of Cirques in the Grand Teton Mountain Range**

Felice Stukenberg

*Faculty Mentor: David Ozsvath*

Cirque development in the Grand Teton mountain range of western Wyoming has been affected by several glaciations as well as various physiographic and geologic factors. Using Geographic Information Systems, 172 cirques were identified throughout the range and their morphologic characteristics measured. A comparison between 42 cirques on the west side of the north-south trending range and 42 cirques on the east side reveals that length:width ratio, area, elevation and aspect are significantly different on the two sides of the ridge. This suggests that factors such as wind patterns, topography and insolation are important to cirque development. Geology also appears to play a role in that cirques in igneous and metamorphic rock tend to be larger in area and taller than those cirques located in sedimentary rock. In the east-west comparison, cirques on the east side appear to favor a northeast or southeast aspect, while cirques on the west side appear to favor a northeast or northwest aspect.

## **The Bus Stops Here: How Population Densities and Socioeconomic Status Affect the Availability and Use of Public Transit**

Virginia Elandt, Jordan Scupien, Jason Boudreau, and Bennett Noel

*Faculty Mentors: Lisa Theo and Neil Heywood*

This study compares the public transit systems of Milwaukee, Wisconsin and Portland, Oregon. Using spatial, population, and budgetary analyses in conjunction with transit routes, we will determine if each system is serving the largest number of individuals who demonstrate financial and/or physical need for it. Socioeconomic data may include but is not limited to: income levels, physical and/or mental disability, and individuals without alternate forms of transit such as a personal vehicle. Data will be acquired from the Census Bureau site along with state and federal transportation departments.

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## **Department of Psychology**

### **Content Analysis of Student Reasons for Studying Psychology**

Natalie Yoder, Stephanie Holden, and Michelle Smith

*Faculty Mentors: Amy Herstein Gervasio and Craig Wendorf*

Researchers have suggested that students in different majors have diverse motivations for success. Breen and Lindsay (2002) developed a 49-item survey identifying motivations in students across different majors in the British university system and theorized the existence of eight overarching student learning goals. We adapted this work for an American collegiate audience twice (Peaslee, et al., 2006; VanBerkel, et al., 2007), but a factor analysis of our Learning Goals in Psychology survey did not replicate Breen and Lindsay's (2002) six factors nor was it conceptually consistent. Instead, we analyzed student-generated, open-ended responses in our survey to further understand student motivations. Over 370 students in psychology classes at all levels in the major were administered a three-part survey in which students answered open-ended questions regarding the two most important reasons for studying psychology. We performed content analysis on a pilot sample of 35 surveys, using Neuendorf's (2002) principles to identify overarching message units. After a trial sampling, we developed 10 categories and systematized them in a codebook. Using the codebook, two researchers independently coded 150 randomly-selected responses to the most important reasons to study psychology. Inter-rater reliability for the two most important reasons revealed a high Cohen's kappa of .906 and .948. Preliminary results revealed that a vague general interest in psychology (36%), desire for a career in counseling and clinical psychology (34%), and general knowledge of psychological principles (34%) were the most common reasons for studying psychology. Implications of the findings for including realistic career planning earlier in the major and broadening student interest in psychology as a science are discussed.

## **The Role of Personality and Similarity in Interpersonal Interactions**

Christin Rausch

*Faculty Mentor: Erica S. Weisgram*

In this study, we explored attractiveness among males and females and how they determine whether or not they would like to see each other again in a romantic context. In previous studies, researchers have examined the matching hypothesis, how similarity in personality predicts attraction to a potential mate (Walster and Walster, 1969). Here, we focused on how similarity to their partner in terms of sense of humor, lifestyle, and values related to whether or not females and males found each other physically and romantically attractive and were interested in going on a date with an individual.

Participants (N=50) were heterosexual college students in an introductory psychology class that were not currently in a romantic relationship. The study began by pairing one male and one female as “discussion partners.” Pairs were given 10 minutes to get to know each other; after the conversation they completed a short questionnaire about themselves and their partner. These questions measured their similarity, degree of attraction to their partner, and whether they would be interested in seeing their partner romantically (i.e., on a date).

In examining the correlations among variables, we found that the more physically attractive one found his or her partner, the more romantically attractive he or she also perceived them. Women found their partners more romantically attractive when they perceived they had similar values and lifestyle. For men, perceived similarity in their partners’ humor, values, lifestyles were related to one another and also related to the belief that the partner wanted a romantic date with them. Regression analyses found that among women, romantic attraction and similarity in humor predict interest in a future date. Among men, romantic attraction and perceived similarity in values predicted interest in a future date.

## **Effectiveness of Clicker Classroom Response Systems in Small College Courses**

Katie Becker, Christina Burek, Amber McDougal, and Autumn McKeel

*Faculty Mentor: Jeana L. Magyar-Moe*

This study was designed to assess the effectiveness of the use of clickers (electronic classroom response systems) in small (i.e., 40 person) college classrooms based on student perceptions. To date, much of the literature on clicker technology is related to use in large university lecture courses that enroll hundreds of students. Likewise, many studies in this area fail to include a formal evaluation of student perceptions of clicker use while focusing instead on anecdotal evidence from a small number of students or from faculty perspectives and information related to student grades in the course. This study was conducted with undergraduate college students who completed an upper-level abnormal psychology course in which clickers were utilized. At the end of the semester, students were posed both open and closed-ended survey questions regarding the role of clickers in enhancing or detracting from their learning experiences. Survey items centered on questions related to the use of clickers as facilitators of more active and deeper learning and the effects of clickers on classroom participation, student accountability, and performance/speaking anxiety. In addition, students were surveyed regarding the ways in which the instructor best utilized the clicker technology and ways in which the clickers could be better utilized in the future. Finally, information was also collected regarding the use of clickers to ask about sensitive topics relevant to an abnormal psychology course. The data from this study can be used to help instructors who teach small college classes decide whether or not clickers may be right for their classrooms and if so, how to best utilize this technology. In addition, the utility of clickers for destigmatizing mental illness is also briefly discussed.

## **Examining Associative and Semantic Relationships**

Jeff Hayton

*Faculty Mentor: Patrick Conley*

A critical issue of cognitive psychology explores how we associate concepts and how we meaningfully store information that we perceive every day. Up to this point, researchers have struggled to clearly define and operationalize such concepts as “associative” and “semantic” priming. The main goal of this experiment is to clearly define and discriminate between the two concepts to provide for an easier and more accurate way of interpreting related data. Associative relationships are precisely defined as word pairs that continually appear in everyday situations but have no other real meaningful relationship (such as “taco” and “bell”). These pairs were then compared to semantically related word pairs such as dog-horse (category relatedness), grass-green (featural information), and chair-furniture (hierarchical information) to find discrepancies in the priming effect. To determine this, participants in this study were told to make a judgment on word pairs displayed via a computer screen to measure their reaction time when presented with word pairs that displayed the characteristics of the three main relatedness types (categorical, featural, and hierarchical), associative-only word pairs, and non-word pairs. This experiment shows that when associative-only word pairs are compared to the different semantically-based word pairs there is little evidence for a priming effect. The greatest amount of semantic priming is found in the featural word pairs with hierarchical and categorical word pairs also displaying a strong priming effect. This paper shows evidence that proper definitions for “associative” and “semantic” relationships yield results that are both clear and easy to interpret.

## **Visual Distinctiveness and Memory: Does the Degree of Difference Matter**

Angela Bowe, Lindsay Ambrosius, and Megan Hertrampf

*Faculty Mentor: Robert Nemeth*

Memory researchers have long debated the role of distinctiveness on memory. Hunt (2006) argued that distinctiveness is best conceptualized as a psychological event rather than a property of the to-be-remembered stimulus. For example, in the prototypical distinctiveness phenomenon, the isolation effect, subjects are presented with a list of to-be-remembered items in which one item is isolated or made different from all the rest (e.g., a letter in a list of numbers). Memory for this different item is better than if that item were the same as all the other items in the list (e.g., all numbers or all letters). Does the enhanced memory stem from difference? If so, then we would expect to find enhanced memory in lists where every item differs from all the other list members (e.g., a letter, a number, a picture, etc.). Compared to the isolation list item, the all-different list item is poorly recalled. The present research was designed to expand on this theoretical debate by varying the degree of visual distinctiveness of the isolated item. Subjects were presented with lists of 9 letters one at a time on a computer screen and asked to recall the letters in the order they were presented immediately afterwards. We isolated a letter from the rest of the list in font size, font color, or font size and color compared to a control list in which all the list letters were the same font size and color. We ran three versions of the experiment varying the placement of the isolated item, either early (position 2), middle (position 5), or late (position 8). The results of the three experiments will be discussed in light of the debate concerning how best to conceptualize distinctiveness and memory.

## **Heinous and Horrific versus Gruesome and Gory: The Influence of Graphic Evidence of Violence on Mock Jurors' Decision-making**

Matthew Florence and Monica Asuquo

*Faculty Mentor: Robert Nemeth*

The judicial system assumes that criminal court jurors are capable of being objective fact-finders and suppressing their emotions throughout the decision-making process. Graphic evidence of violence (GEV) poses a problem for the judicial system in that it may have a prejudicial effect on the jury against the defendant. As a possible consequence, an innocent person may be convicted. GEV can be defined as evidence (either visual in the use of photographic evidence or verbal in oral descriptions of death present in witness testimony) that enhances the vividness/imagery of the crime without altering the probative value of the evidence. Specifically, this may involve depicting the state of the victim after death, the cause of death and the crime scene itself (Thompson and Dennison, 2004). To date, only one study out of four has found a significant effect of verbal GEV (Bright and Goodman-Delahunty, 2004). This study suggests that verbally presented GEV may bias jurors to be more conviction prone. However, we believe the authors may have confounded the heinousness of the crime (e.g., mutilation of the body after death) with the gruesomeness of the crime (e.g., vivid descriptions of the wounds of the victim). The current experiment attempted to tease apart these two possible effects on mock juror decisions by manipulating heinousness and gruesomeness separately. College students played the part of jurors by reading a trial transcript and deciding on whether to find the defendant guilty or not guilty of two counts of first-degree murder. The results will be discussed in light of the distinction between the heinousness and gruesomeness of a violent crime.

## **Perceptual Differences in Character Values and Behavioral Desirability among Civilian and Military College Students**

Randie Lom and Sara Rae

*Faculty Mentor: Justin Rueb*

The principles of integrity, selflessness, competency, and spirituality are often challenged throughout one's lifespan. This challenge to character is often overcome based on his/her experiences and educational background, which suggests that individuals from different ways of life may have different values associated with the desirability of certain behaviors. This implication would suggest a military organization might differ from a civilian organization concerning their valued behaviors. Rokeach (1973) found that these values can change over time due to the social environment, which implicates training. Consequently, we investigated if differences existed between military and civilian undergraduates and whether they were the result of previous experiences or due to training. The participants consisted of 1,591 college students. One group of participants were freshmen status (N= 490) and the second group were senior status (N= 190) from a civilian university. The remaining participants were cadets at a military academy (568 freshman and 343 seniors). Participants took a questionnaire that consisted of 82 questions, which depicted events involving work, community, family, religious, and globally based scenarios. The items associated with each factor (i.e., integrity, selflessness, competency, and spirituality) were then averaged to determine each individual's factor score. A higher score represented a higher value placed on that behavioral factor.

## **Outcomes for College Students Participating in Mandatory Team-testing**

Katie Becker, Christina Burek, Amber McDougal, and Autumn McKeel

*Faculty Mentor: Jeana L. Magyar-Moe*

Past research indicates that when college students are allowed to choose to test in two-person teams, learning is facilitated, course exam scores go up, and positive attitudes toward the team-testing experience are apparent (Zimbardo et al., 2003; Magyar-Moe et al., 2004, 2006). The current study was conducted in order to partially replicate and expand the findings of previous research whereby team-testing was evaluated in terms of exam performance and course grades, however, in this study team-testing on one course exam was mandatory rather than optional as in past studies. Additionally, student decision methods regarding choice of partners, the studying and test taking methods used to prepare for the mandatory partner exam, state anxiety levels just prior to each course exam, and student attitudes regarding the mandatory team-testing process were examined. Results support the hypothesis that mandatory team-testing in the college classroom is beneficial. Students who chose to test with a partner had significantly higher test scores on exam two than those who chose to test individually and test scores improved significantly for test three when team-testing was mandatory for all students. Scores on the multiple choice section of the final exam were significantly higher when students completed those items with a partner in contrast to first completing the items alone. In comparison to anxiety levels at exam one, both team-testers and individual test takers had significantly lower anxiety levels at exam two, however, team-testers reported significantly lower anxiety levels at test two than the individual testers. In addition, students also endorsed that participating in team-testing enhanced learning in the course, encouraged them to share knowledge and to negotiate differences with partners, and reduced cheating in the course. The list of advantages reported by both groups of students (i.e., those who chose partner testing as well as those who chose to test alone for exam two) was far greater than the list of disadvantages reported.

## **Post-Examination Reflection Strategies and their Effect on Subsequent Exam Scores**

Joseph W. Parks, Kristen A. Sernett, and Scott V. Asbach

*Faculty Mentor: Jody Lewis*

Undergraduate students enrolled in an introductory psychology class participated in reviewing their exams following the third exam of the semester. Students were randomly assigned to one of two groups. The review group received a demographic survey and their third test to review. In addition to their tests and demographic survey, students assigned to the reflection group received a self-reflection questionnaire in which they were asked to identify all of their incorrect answers and categorize them based on the reason they felt they were answered incorrectly. The reflection group also answered a section pertaining to what they felt they could do to improve their scores on the remaining two exams. Data from the review/reflection surveys will be compared to their scores on later exams as part of a continuing study. Our hypothesis is that exam reflection practices will improve both studying and test taking strategies resulting in improved scores on subsequent exams.

## **The Development of an Experiment: Spatial Cognitive Memory in Swiss-Webster Mice**

Ethan H. Hodek and Vanessa A. Williams

*Faculty Mentor: Jody Lewis*

The present study has evolved over a year's time to explore and demonstrate the limits of spatial cognitive memory and the cognitive mapping phenomenon in Swiss-Webster mice. The mice were shown a correct location (sand-filled cap baited with a treat) in the study phase, then after a retention interval of 5 minutes, they were required to choose the previously baited correct location out of a cluster of four choices. The first phase of the experiment involved giving the mice one of 36 locations to remember when released from a fixed point in the center. The next development in the experiment consisted of a random start location (each of the four corners and the center) and the introduction of a negative punishment. The third phase involved reducing the maximum number of possible locations in the testing cage to the north half (16 total). The start location was the middle of the southern wall, facing north, and two landmarks were added to see whether the mice would utilize this new information. In another phase, a retention interval of 5 minutes and a second recognition phase were added. We examined if the mice were given a chance to learn from their mistakes, it would increase performance on the task. The final phase of the experiment involved a single recognition phase and a reduction of maximum possible choices to eight locations. Two more landmarks were added for a total of four; one in each corner. The development of a study is an important part of research to help understand the effectiveness of different methods and techniques.

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## Department of Physics

### **Enthalpy Values in Liquid-crystal Compounds**

Larkin Duelge

*Faculty Mentor: Mick Veum*

A liquid-crystal compound is a material that has at least one stable phase that is both liquid-like and crystal-like. One class of liquid-crystal compounds, the smectics, can be prepared as free-standing films, like a soap bubble on a ring. The high-surface-area-to-volume ratio makes a free-standing film a good system in which to study surface-induced order. When heated to a sufficiently high temperature, such a compound undergoes a phase transition from the liquid crystal phase to the ordinary liquid phase. In most compounds, a free-standing film will rupture at or just above that melting temperature. In this study, we investigate a series of compounds that are unusual in that the free-standing films do not rupture immediately and are stable to a higher temperature. The stability of these compounds above this melting temperature is not well understood.

Previous studies of film tension in these unusual compounds have shown that when heated above the bulk melting temperature, the tension increases noticeably with temperature. This increase in tension is shown to be proportional to the thickness of the film and also dependent on the molecular weight. The tension measurements are qualitatively consistent with an existing theory that predicts that the stability of this film is intertwined with the energy released/absorbed through the phase transition, i.e., enthalpy. In order to make quantitative comparisons between the theory and the tension experiments, measurements of the enthalpy are required.

We used a Differential Scanning Calorimeter to find enthalpy values in these compounds. In the poster, we will report the measured enthalpy values and show preliminary results in comparing theory to experiment.

### **Surface Modification of GaInP<sub>2</sub> for Photoelectrochemical Water Splitting**

K. G. Larsen and J. M. Perket

*Faculty Mentor: Ken Menningen*

Hydrogen production through photoelectrochemical (PEC) water splitting has been an area of interest for researchers since the 1970s and 1980s. If the technology becomes more developed, the field has the potential to provide a hydrogen source for fuel cells from solar energy. The p-type semiconductor GaInP<sub>2</sub> is a good prospect for PEC water splitting due to its band gap energy and photovoltaic properties. In practice, a potential of 1.6 – 1.8 eV is necessary to split water. P-type GaInP<sub>2</sub> has a bandgap of 1.8-1.9 eV, making it a semiconductor worth investigating.

In our work, surface modification of GaInP<sub>2</sub> to a porous state through cathodic etching was explored. Surface modification is necessary because the band energies of untreated GaInP<sub>2</sub> do not straddle the hydrogen and oxygen redox potentials as required for hydrogen production to occur. Previous work has indicated that the flatband potential of p-GaInP<sub>2</sub> sits at 100 – 400 mV too negative for water splitting to occur. We hope to positively shift the flatband potential ~300mV, and so far have achieved a result of ~80mV, insufficient to split water.

In addition, we substituted our platinum counter electrode with a Ru<sub>0.99</sub>Fe<sub>0.01</sub>S<sub>2</sub> counter electrode hoping the current density would increase. Past reports have shown that a Ru<sub>0.99</sub>Fe<sub>0.01</sub>S<sub>2</sub> counter electrode catalyzes the oxygen half-reaction of water splitting and therefore the current density in the electrolyte. Our first attempt did not reveal an increase in the current density within our PEC cell while using a Ru<sub>0.99</sub>Fe<sub>0.01</sub>S<sub>2</sub> counter electrode.

# Oral Presentations

## Session III: 11:00 - 12:00

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### Department of Biology

Science Building A201

Session Moderator: Professor Nathan Bowling

#### **Photosynthetic Demand Limitation Limits Tree Responses to Increased CO<sub>2</sub> Availability**

Tyler Fuhrman and Brent Rivard

*Faculty Mentor: Eric Singaas*

Humans have been elevating the atmospheric CO<sub>2</sub> levels since the advent of the industrial revolution. Because CO<sub>2</sub> is a substrate for photosynthesis, it is often assumed that atmospheric change will lead to more photosynthesis and hence larger plants. While some experiments have shown elevated CO<sub>2</sub> benefits plant productivity, others show either no effect or negative effect. Our research goal was to apply a model of photosynthesis to understand why some plants respond more to CO<sub>2</sub> than others. We measured photosynthesis and spectral reflectance of leaves at the FACE (Free Air CO<sub>2</sub> Enrichment) experiment site in Rhinelander, WI. In elevated CO<sub>2</sub> experimental plots, photosynthesis became depressed in the afternoon versus the control (normal CO<sub>2</sub>). The photosynthesis model results from these data show that different areas in the photosynthetic pathway were controlling the rate of photosynthesis. Also, the spectral data show a significant change in the afternoon between the control and the CO<sub>2</sub> feeding areas at FACE. Both the photosynthesis and spectral response data differed between current and elevated CO<sub>2</sub> levels, as predicted by the model. These differences show that feeding of CO<sub>2</sub> does not have the desired effect we believe it did and that the demand for light entering a plant versus the availability of CO<sub>2</sub> controls photosynthesis.

#### **Prevalence of MRSA in Vet Isolates in Midwest USA**

Yihan Lin

*Faculty Mentors: Sol Sepsenwol and Sanjay K. Shukla*

Methicillin-Resistant Staphylococcus aureus (MRSA) is a significant public health problem in hospitals and the community. Recent reports of possible zoonotic transmission of MRSA from Europe and Canada further highlight the potential public health crisis this pathogen may bring. However, little is known about the prevalence of MRSA in domesticated and farm animals in the United States. The aim of this study was to determine i) the prevalence of MRSA from veterinary samples in Wisconsin, ii) genetic features of MRSA strains, and iii) if they were related to existing human MRSA clones.

**Biological Fixation of Molecular Nitrogen by Free-living Bacteria: Population Differences of *Azotobacter spp.* in Soil Samples from California, Illinois, and Wisconsin**

Erin Johnson

*Faculty Mentor: Terese Barta*

Nitrogen fixation is an important part of the global nitrogen cycle, and is carried out by a select few genera of bacteria, including the free-living genus *Azotobacter*. The goal of the current project is to quantify the colony-forming units of *Azotobacter* in different soil samples. Samples were obtained from agricultural, forested, urban, and volcanic regions of California, as well as woods bordering a suburban area in Southern Illinois. Soil samples are currently being analyzed for the presence of *Azotobacter spp.* using dilution plating techniques and a nitrogen-free mineral salt medium. Cultures of *Azotobacter chroococcum* and *A. vinelandii* are being used as controls to test the effectiveness of the selective medium being used. Soil samples from Wisconsin will also be analyzed when the snow cover is gone and soil temperatures permit sampling. Our hypothesis is that different soil types will contain different numbers of *Azotobacter* bacteria due to chemical and biological factors, which future investigations will explore.

**Boosting the Rate of Isoprene Synthesis in Genetically Modified Bacteria**

Becky Slattery

*Faculty Mentor: Eric Singaas*

The goal of our research is to develop biorefinery processes to make biochemicals that will replace toxic petrochemicals. Our aim is to build bacteria that will produce higher amounts of isoprene. Isoprene is a natural product made by plants and bacteria, and when it is polymerized, it can be used to make natural and artificial rubber products such as tires, shoe soles, etc. We used genetically modified *E. coli* that contained the gene responsible for isoprene synthesis to measure the rate of isoprene synthesis via gas chromatography. To test whether ethanol production competes with isoprene production, we used the inhibitor CPB (4-(4-chlorophenyl)-2-oxo-3-butenoic acid), which blocks ethanol synthesis by inhibiting the enzyme pyruvate decarboxylase. Small amounts of the inhibitor decreased ethanol production but had little effect on isoprene production, so we investigated the close response relationship between CPB and ethanol and isoprene production. These experiments provide evidence that ethanol production competes with isoprene production. We will use this information to develop bacteria with higher isoprene production rates by reducing or eliminating ethanol production. The bacteria that we develop will be used in biorefineries to use Wisconsin's valuable wood products for industrial chemicals to replace petrochemicals.

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## **Department of History**

Science Building A203

Session Moderator: Professor Susan Brewer

### **Strange Bedfellows: The Relationship between the Irish Parliamentary Party and the Liberal Party during the Irish Home Rule Movement**

Joshua Shaffer

*Faculty Mentor: Nancy LoPatin-Lummis*

The goal of this research paper is to look into the up-and-down relationship between the Irish Parliamentary Party and the Liberal Party between 1880 and the introduction of the first Home Rule Bill in 1886. The work will look at the dynamic leader of the IPP Charles Stewart Parnell MP, and his pragmatic relationship to head of the Liberal Party and Prime Minister William Ewart Gladstone. This paper aims to chronicle the rise of Parnell's power in the Parliament and his *quid pro quo* relationship with the Liberals in order to force them into adopting an Irish Home Rule platform, which was eventually adopted by Gladstone, and rejected by others. This paper plans to research scholarly works ranging from books chronicling the entire history of the Home Rule movement, to works dealing exclusively with the Liberal Party's reaction during the introduction of the Home Rule Bill, to speeches made by Prime Minister Gladstone on the subject to Parliament. This paper will remain limited to the IPP's relationship to Gladstone and the Liberals up to and during the first Home Rule Bill, since that was where Parnell was most influential and still living.

### **The Oneida Indians of Wisconsin and the Great Depression**

Nicolas A. Reynolds

*Faculty Mentor: Susan Brewer*

This paper shows that while poverty was rampant on the Oneida Reservation during the Great Depression, tribal members used their talents to sustain themselves and reach out to others in need. An unexamined oral history project of the Oneida Indians of Wisconsin has left a wealth of knowledge about the tribe's struggle during the hard times of the 1930s and early 1940s. The oral histories coupled with other primary and secondary sources reveal that the Oneidas were at a level of poverty far greater than that of the surrounding communities. The effects of The Dawes (General) Allotment Act of 1887 left tribal members without sufficient land holdings to depend upon a subsistence farming lifestyle, creating a crisis on the reservation during the depression years when work became scarce. By 1937 nearly 77 percent of the Oneida population within Brown and Outagamie Counties had received assistance in the form of work relief through such New Deal programs as the W.P.A. and the C.C.C., as well as general relief or unemployment relief. In the midst of the extreme poverty found on the reservation, certain individuals made a living using the skills that they learned both on and off of the reservation. William Skenandore planted and raised raspberries in a profitable establishment that allowed him to hire other Oneidas. Several Oneidas learned the art of lace making and produced beautiful works that sold for hundreds of dollars and won awards in expositions as far away at Paris. Carrying on a tradition that was about three quarters of century old by the time of the depression, community members performed in the Oneida Band, traveling all around the United States and earning a living.

# Departments of Psychology and Foreign Languages

Science Building A207

Session Moderator: Professor Tobias Barske

## **Do Your Country a Favor...Leave, for a While: UWSP Students' Attitudes Toward Studying Abroad**

Sara Rae

*Faculty Mentor: Justin Rueb*

Interracial and multicultural interactions are greater than ever in the United States due to the increase of ethnic diversity within the nation. Recent research revealed that international study programs offered to students enhanced awareness and acceptance in regard to cultural and ethnic diversity (Greatrex-White, 2007; Mapp, McFarland and Newell, 2007). Consequently, students who participated in a short-term or semester-long study abroad program increased their likelihood of cultural sensitivity (Ruddock, 2007).

Each year, 2-3% of college students within the United States study internationally. During the 2006-07 academic year, 436 (approximately 20%) of 8,823 UW-Stevens Point students participated in a study abroad program. Nearly 75% of the students who studied overseas that year were female, despite the fact that only slightly more female students (54%) were enrolled at the university than male students (46%). This study explored the attitudes of students toward international study. More specifically, the study investigated what may hinder a student's participation in a study abroad program. Participants (N = 418) consisted of undergraduate college students (males = 178, females = 240), made up of freshmen, sophomores, juniors and seniors from a variety of academic backgrounds. The participants completed a short survey that asked if they planned to study abroad prior to graduation. Participants who selected "no" were required to rate statements that inquired about their reasons for not planning to study abroad (e.g., "My family does not support participation in a study abroad program"). Sixty-three percent of the participants reported that they did not plan to study abroad before graduating. The cost of a study abroad program was rated as a significant factor in a student's decision not to participate. Students indicated a significant interest in the geographical locations of the programs offered. In addition, participants largely disagreed that his/her family would not support their decision to travel and study internationally. Future implications will be discussed.

## **Social Inequality in the German School System**

Joanne M. Goskowicz

*Faculty Mentor: Tobias Barske*

Although the German Constitution states that the dignity of the individual is inviolable, the German education system fosters social inequality. Developed in the 1960s, a three-track education system separates children at age ten, determining whether a child succeeds to the upper, middle, or lower levels of society. Children begin school in the same classrooms with the same teachers, but by fifth grade, the eventual future of the children is decided. Some students advance to upper-tier schools (Gymnasium) to pursue the Abitur, the German university entrance examination. Other students forge ahead to a middle-tier school (Realschule) to obtain the Realschulabschluss, preparing them for careers in technical fields. The remaining students start down the path for the Hauptschulabschluss, which is typically followed by an apprenticeship. Although the system allows for children to advance from the lowest-tier schools to the upper-tier schools, being placed into the lowest track in and of itself creates a barrier to

obtaining that education. Additionally, not all students receive a certificate of completion or diploma. This further hinders employment opportunities and suppresses chances for social equality. In investigating the impact of the current German education system, I utilize different sources: First, I use personal interviews with native Germans of various social standings, in various occupations, and with varied educational experiences to highlight the reality of social inequality in Germany. Second, I collect information from German human rights organizations regarding educational inequality. Finally, I survey current media sources and academic writings to supplement my findings. In a last step, I draw comparisons to alternative education systems and propose realistic solutions for the German education system.

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## **Departments of Philosophy and English**

Science Building A202

Session Moderator: Professor David Chan

### **Fear as a Justification for War and the Role of the Evil Other as Personified Fear**

Jeremiah Bowden

*Faculty Mentor: David Chan*

Throughout the ages men have justified violence on the basis of fear. In this essay I intend to show how fear has been personified in the role of an “evil other” and how fear can be seen as a justified means for going to war. I will begin by displaying how different sects have personified fear in the form of an evil other from the time of ancient Judaism and their conflicts with the Babylonians, to present-day Fundamentalist Islam and their hatred of the West. After I have established the fact that the role of an “evil other” is nothing more than a sect’s or nation’s personification of fear, I will present the arguments given for and against using fear as a justification for war. For this portion of the presentation I will be focusing on the philosophers Alberico Gentili and Hugo Grotius. Gentili argues, in his essay *The Law of War*, that fear can be utilized as a justification to go to war. Gentili makes the claim that this is because all defensive wars are justified and attacking out of fear is a form of self-defense. Hugo Grotius asserts that fear is not a proper justification for going to war, and that reasons given for going to war should be free from reproach. In conclusion I will be asserting how Augustine and Levinas think we ought to treat the “other” and what this might mean for our current world climate. I posit that it is permissible to use fear as a justification for war and that the role of an “evil other” is nothing more than the personification of this fear.

## **Riddling the Giant**

Zach Brandl

*Faculty Mentor: W. John Coletta*

In folklore and mythology we can identify patterns. Certain themes are common to all humans. One such theme would be “Riddling the Giant.” That such themes are prevalent in our narratives irrespective of culture, time, and place suggests their origins in our biological evolution—that is, such narratives may have survival value. While their existence now is often thought trivial, their commonality to humans indicates necessity.

That human beings are fond of riddles and the act of telling them is not unknown. Children learn riddles and fairy tales, and these stories not only keep them entertained but, in subtle ways, shape the course of their lives. If riddling is inherent, when was it necessary? That is, has riddling an ecologically adaptive function?

An antagonist who poses a physical threat could be deemed a giant. So who were the giants we shroud in metaphor? The coexistence of humans with species like the Neanderthals might indicate the origins of the folk-tale giant.

The European conquest of America and the American conquest of the old west serve as examples where modern riddling served an adaptive, albeit violent, function. This much indicates that riddling is not a vestigial practice after all. The act of riddling is not trivial; it is a weapon. And in our evolution the wielding of such a weapon might mean the difference between life and death.

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Science Building A213

Session Moderator: Professor Robert Sirabian

## **Dickens’ *Oliver Twist* and *Dombey and Son*: Abuse of the Victorian Child between Two Worlds**

Cassie Young

*Faculty Mentor: Robert Sirabian*

Dickens communicates to readers the abuse of children during the Victorian Era in several of his novels. *Oliver Twist* and *Dombey and Son* both exploit the abuse of children, the ideology of the innocence of the child, and the two separate worlds of the criminality and the angelic. The abuse of children, also a component of the ideology of the innocent child, is specifically apparent in *Oliver Twist* among the lower to working classes, especially at the beginning of the novel in the warehouses and orphanages. In *Dombey and Son*, education is responsible for the ill treatment of the children in the middle to upper classes. The ideology of the innocence of the child is a repetitive theme among Dickens’ novels. The idea of the innocence of the child comes from the quietness of the child; for example, Oliver is considered innocent because he has no voice throughout the novel, and Paul Dombey in *Dombey and Son* is killed off earlier in the novel to ensure that he cannot grow into an adult because of his innocence. The two separate worlds are those of the city and the country. In *Oliver Twist*, the Maylies and Brownlows represent the country world while Fagin and the criminal gang represent the city, which is a place of corruption.

## **Fagin's Gang versus the Middle Class: Political Philosophy in Charles Dickens' *Oliver Twist***

Justin W. Fischer

*Faculty Mentor: Robert Sirabian*

In *Oliver Twist*, the reader can discover that there are three competing political world views expressed: natural rights liberalism, Burkean conservatism, and utilitarian liberalism. These world views are expressed in the form of two competing groups of characters struggling to determine Oliver Twist's fate. Specifically, there is the criminal class that the text associates with the two varying strands of liberal thought. Also, there are the middle class figures that the text connects to a conservative outlook. The focus is centered on the criminal class, though, as they represent liberalism in a state of flux between two different strands. This has the effect of making them more interesting than their competitors, but it is also what results in their destruction as they have no firm theoretical basis on which to justify their actions. Examples of this plurality of political views are found in the text through its use of situating the characters geographically, and the rhetoric that the characters employ. Specifically, the setting of the novel is predicated on the dichotomy between the rural and the urban. The text links the urban environment with the political philosophy of liberalism and the rural environment with the political philosophy of conservatism.

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*The College of Letters and Science wishes to thank the  
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**Sandra Bauman**  
College of Letters and Science  
Information Technology

**Charles Clark**  
Office of the Dean

**Richard Crowther**  
Department of Biology

**Eugene Johnson**  
Department of Chemistry

**James Lawrence**  
Department of Chemistry

**Andrea Medo**  
Office of the Dean

**Whitney Medo**  
Honors Intern

**Craig Wendorf**  
Department of Psychology

**Lee Willis**  
Department of History

**Lisa Yolitz**  
Office of the Dean