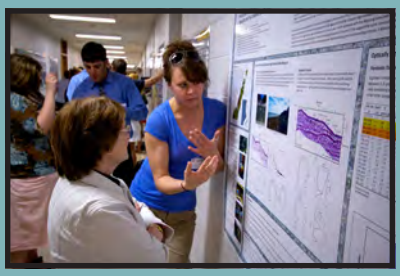
Realizing Our Vision as *The College-at-the-Core*

College of Letters and Science



Undergraduate Research Symposium
April 27, 2012

Dean's Welcome

Room D102, Science Building

2:00 – 2:10pm

Presentations

Science Building (A-wing) 1st and 2nd floor

Individual room locations and times inside

2:20 – 3:10pm

Oral presentations (pgs. 3-12)

3:10 – 4:00pm

Poster presentations (pgs.13-47)

4:00 – 4:50pm

Oral presentations (pgs. 48-55)

We encourage participants to attend both oral and poster presentations at the times designated above. Posters are on display all afternoon.

University of Wisconsin-Stevens Point
College of Letters & Science
Office of the Dean

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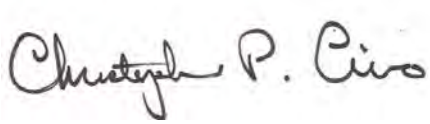
Welcome Students, Faculty, Staff, Parents and Community Members,

On behalf of the students, faculty and staff of the College of Letters and Science at UWSP, I am pleased to present the 13th annual Letters and Science Undergraduate Research Symposium. This symposium is an exercise in "engagement" where our students and faculty display to the public the "scholarship" we do, which is so often misinterpreted.

Research and scholarship is fundamentally an exercise in discovery. This exercise needs to be appropriately displayed to our stakeholders (the public, legislators, parents, etc.) as much as possible, since it is the exercise of "scholarship" which so often seems to be unclear and undefined. This is why we embark now on a new effort to "engage" the public in just why scholarship is important. UWSP is not a trade school, or a community college, where teaching is nearly the sole activity of the faculty. The activities of this day demonstrate the role of individual faculty scholarship "as it involves our students" as a critical "change" agent in the lives of our young people. In all cases, each experience demonstrated by the posters and presentations today is characterized by one common thread…*faculty working with students to generate and disseminate knowledge.* At the College of Letters and Science, we strive to free student minds to think and to begin to trust in their ability to in some way contribute to and change their world. This elevation of "expectations" results in our students beginning to realize that they too can be professionals, and someday mentor as examples to their own generation.

Take the time to congratulate our students on their work, and to meet their faculty mentors, sharing in their new and exciting ideas. Let our students know that it does matter that they have taken the time to get to know their professors as teachers, mentors, confidantes and friends.



Dean, College of Letters and Science
Professor of Geography and Geology

Oral Presentations 2:20–3:10pm

Science Building (A-wing) 1st and 2nd floor

Group 1 – Room A107, 2:20-3:10pm

Moderator: Devinder Sandhu

Using a "Jumping Gene" to understand fertility pathway in soybean
Jaydeep Raval, Shane Dillman
Faculty Mentor: Devinder Sandhu, Biology

The W4 gene in soybean controls the anthocyanin pigment biosynthesis in flowers. The mutant allele, w4-m, is characterized by variegated flowers. Loss of function in the w4-m mutant was shown to be due to insertion of a transposon. In the w4-m system, reversion of the unstable allele from variegated to normal purple color flower would indicate transposon's excision, and its insertion at a second locus. We identified a male-sterile female-sterile mutant from the progeny of w4-m line. The objectives of our investigation were to map the sterility mutant; to determine association between sterility and the presence of transposon; and to clone the fertility gene. We generated an F2 population by crossing fertile parent Minsoy (StSt) with the sterile mutant (Stst) in heterozygous condition. Bulked segregant analysis was used to map the gene to the Molecular Linkage Group J. We employed probe designed from transposon on the F2 population using DNA gel blot analysis. Banding pattern perfectly correlated with fertility/sterility phenotype suggesting that the sterility is caused by transposon. We used genome walking technique to sequence regions flanking the transposon. Comparison of the sequence with soybean genome sequence resulted in identification of the gene. Predicted protein is known to involve in crossing-over during meiosis, which is consistent with the sterile phenotype of the mutant. Further exploring downstream activity of fertility gene will provide vital insight on structure and function of genes involved in reproductive biology of soybean and other plants. This will also help us manipulate reproductive mechanism for commercial applications.

Bigger Isn't Always Better: Changing the agricultural game by shortening wheat
Jerott Moore, Alina Ott, Christopher Navarro
Faculty Mentor: Devinder Sandhu, Biology

The yield of wheat and other cereal crops is significantly impacted by their height. To account from damage due to wind sheering, dwarf commercial wheat lines throughout the world have been developed by modifying pathway involved in synthesis of gibberellins (GA) or its utilization. These GA mutants are not effective in regions where droughts are common. Besides GA, brassinosteroids are also known to affect plant height. One of the genes, Bri1 that is involved in

perception of brassinosteroids is particularly of interest. The Bri1 gene that was first characterized in A. thaliana presents an alternative to GA mutants and will possibly be much more adaptive to climates with drought. The Bri1 sequence from Arabidopsis thaliana (AtBri1) was used to identify homologues in barley, rice, sorghum, maize and wheat. Results from the sequence comparison suggested that the wheat Bri1 gene (TaBri1) was similar to AtBri1 in sequence, which suggests that the genes may be orthologous. The protein sequence allowed for prediction of the protein's three-dimensional structure, which yielded insight into the similarities between the protein's structure and function in wheat as compared to Arabidopsis. Expression studies using tissue from root, lower stem, upper stem, leaf sheath, leaf, and ear suggested that highest gene expression was observed in stem (lower and upper stem) and lowest in leaf and leaf sheath. The use of Virus-Induced Gene Silencing (VIGS) analysis using construct from TaBri1 aims to characterize the TaBri1 gene by transiently silencing it. We are currently conducting VIGS analysis. If VIGS analysis resulted in short phenotype, it will confirm that TaBri1 is indeed orthologue of AtBri1.

Group 2 – Room A111, 2:20-3:10pm

Moderator: Todd Huspeni

A Comprehensive Survey of Metazoan Parasites of Fishes from Lakes in Marathon County, WI

Jenna Hulke, Misbah Razvi
Faculty Mentor: Todd Huspeni, Biology

The Marathon County Eastern Lakes Project (MCELP) was established to assess the water quality and biodiversity of lakes in Marathon County, WI. The objectives of the MCELP study are to provide a comprehensive assessment of lakes as habitats for the organisms that comprise these important ecosystems, and for the stakeholders who determine impacts. We agreed to participate in the MCELP by conducting a parasite inventory of fishes from the sampled lakes. During the fall of 2011, two lakes, Lost Lake and Rice Lake, were each sampled by seine and fyke net, and captured fishes were counted, measured, and weighed. Individuals of the most commonly encountered fish species (e.g., bluegill, bullhead, and yellow perch) were collected, euthanized, and returned to UWSP for dissection and parasite recovery. During dissection all major organ systems were examined including (but not limited to) the gills, stomach, intestine, liver, gonads, and musculature. Our dissections recovered adult tapeworms in the intestines and black spot and *Clinostomum* metacercarial infections in the skin and viscera. At Lost Lake, 64% of bluegills had tapeworms while only 39% were infected with black spot. Bullheads from Lost Lake were not infected with black spot, but 60% did have at least one tapeworm. Conversely, at Rice Lake only 37% of bluegills had tapeworms while black spot was found on 67% of the bluegills. *Clinostomum* was also found in 13% of bluegills at Rice Lake. Fish collections are scheduled to continue through 2012, and we will provide an update that includes analyses of fish parasites from recently sampled lakes, and evaluations of the effects of lake, fish mass, and other variables on parasite prevalence, intensity, and community composition.

Prevalence of Filaroides martis in short-tailed weasels (*Mustela erminea*)
Robert Lisiecki
Faculty Mentors: Shelli Dubay, CNR and Todd Huspeni, Biology

Short-tailed weasels (*Mustela erminea*) are trapped as furbearers but are not actively managed by the WI DNR. Trappers usually trap from late November to late January, providing us a unique opportunity to acquire carcasses. We have been necropsying weasels and looking for internal parasites for 5 years (251 total necropsies with 38 more in process), so we are beginning a long-term health assessment of the weasels in WI to better understand the ecology of free-ranging weasels. In the past, we have identified *Filaroides martis*, a parasitic nematode of the respiratory tract, in approximately 35 % of weasels examined. *Filaroides martis* is transmitted to weasels when they consume an infected adult gastropod or small mammal. This year, our goals were to: 1) identify differences in prevalence & intensity by year, & 2) identify differences in parasite prevalence & intensity by gender, and 3) investigate if infection affects body condition of weasels. Using a Fishers Exact test for a comparison of prevalence of *F. martis* in males and females, we found that males have a higher prevalence (P=0.00, df=1). A Mann-Whitney U-Test showed no difference in intensity of *F. martis* in males and females (P=0.055, df=1). We used a chi-square test to identify relationships in prevalence by year, and found that more weasels were infected in 2010-2011 (P = 0.005, df = 3). Using ANCOVA, we found that infected males had higher body condition scores than uninfected males (P=0.007, df = 1), but we found no difference in body condition score in females (P=0.479, df=1). To date this year 13 weasels have been necropsied with 5 of 12 (40%) of them being infected with *F. martis*. We will update statistical analyses to include data from this year and discuss implications of our findings.

Group 3 – Room A110, 2:20-3:10pm

Moderator: Ken Menningen

Developing an Application for Researching the Health of the IT Sector in Central Wisconsin
Andrew Frisk
Faculty Mentor: Tim Krause, Computing and New Media Technologies

During summer 2011 I worked with Professor Krause to create a computer application that is designed to monitor a series of Web sites for IT-related job openings, capture all of the information associated with those openings, and then store them for later analysis.
It is common for this kind of information to be readily available for large metropolitan areas, and at the state and national level. However, it tends not to be available for more rural settings, like Central Wisconsin. With this data, we're hoping to be able to compare local trends with broader trends in the industry in an effort to accomplish a couple of goals. First, we want to develop a better understanding of employment opportunities to better match prospective employers and employees. Second, we want to inform local educators like UW-SP and Mid-State Technical College so that curriculum is closely aligned with

local needs. And, last, we want to be able to better anticipate future changes in the IT Sector so that we can more easily adapt to those changes.
This oral presentation will include an overview of the development work, the primary research that we've conducted, and a look at the first set of results that we have gathered. The project was a collaboration between UW-Stevens Point, Mid-State Technical College, MIT, incourage Community Foundation, the North Central Wisconsin Workforce Development Board, and Workforce Central.

VXPath: A Visual XPath Query Evaluator
Matthew Meis
Faculty Mentor: Weimin He, Computing and New Media Technologies

In this research project, we develop a proto type software system named VXPath to facilitate the efficient evaluation of XPath queries over XML data. VXPath is a visual XPath query evaluator that allows the user to evaluate an XPath query by clicking the nodes in an expanding tree instead of typing the whole XPath query by hand. The system supports most common XPath axes, such as child, descendant, predicate and so on.
To present an XML document to the user as a tree view, we exploit the DOM API in the .NET library to parse the document and construct a DOM tree in memory. However, this approach has a limitation because it can only handle smaller XML documents due to the fact that the size of a DOM tree grows very fast when the size of the XML document increases. In order to handle an XML document in any size, we extract a concise data synopsis called Structural Summary from an XML document, which is a structural markup that captures all the unique paths in the document. Instead of loading the original XML document into memory, we load and present the structural summary to the user. To achieve this goal, we leverage a third party SAX parser named SAX for .NET to parse an XML document. We also develop a novel algorithm to extract the structural summary from the document.
This project serves several purposes. First, it helps the student involved in the project improve his/her critical thinking skills and research abilities during the process of developing the novel algorithm for structural summary extraction and incorporating the third party SAX parser into the system. Second, the finished software system can be used as a teaching tool for the students learning XPath. Students can click around an XML file and learn how to construct an XPath expression in real time.

Group 4 – Room A109, 2:20-3:10pm

Moderator: Palash Banerjee

Rapid Evolution in Peromyscus leucopus and Microtus pennsylvanicus in Response to Elevated Atmospheric Carbon Dioxide Levels.
Lucy Hatfield
Faculty Mentor: Christopher Yahnke, Biology

Atmospheric carbon dioxide levels have been rising steadily since it first being tracked in 1958. Atmospheric carbon dioxide has been shown to affect how a plant acquires nutrients. Increases in carbon dioxide levels affect plants by decreasing the nitrogen level in plant leaves, while increasing starch levels in the plant. We investigated two small mammal species found in Wisconsin. The species studied were Peromyscus leucopus, a granivore, whose diet consists of seeds that have high starch levels, and Microtus pennsylvanicus, an herbivore, which feeds on leaves and grasses. Both of these animals have an average life span of one year in the wild. These two species were studied to analyze how an increase in carbon dioxide levels affect the growth of these small mammals. Our sample consisted of 50 skulls of each species per decade from the 1960's and to the 2000's. We obtained the majority of the data from skulls in the UW- Stevens Point mammal collection. The UW-Madison collection provided skulls for the decades where the UW-Stevens Point collection was short. Even with UW-Madison's contributions, several decades don't have a full 50 skull sample size. All samples were collected in the state of Wisconsin. We took a series of 12 cranial measurements with a digital caliper, accurate to .01mm per skull. That data, combined with the four standard museum measurements, was used to assess the growth of the animal. We used statistical analysis to compare each species separately across the 5 decades. We hypothesize that the Peromyscus leucopus will show rapid evolution with an increase in cranial measurements over the decades. The Microtus pennsylvanicus will show rapid evolution with a decrease in cranial measurements over the decades.

Life history trade-offs of breeding in one year old male Cooper's Hawks.
Jenna Cava
Faculty Mentor: Robert Rosenfield, Biology

Life history theory suggests that delayed maturation is beneficial in birds when costs are high for breeding early in life. Most studies have focused on the costs of early reproduction in females, yet these costs may be higher for males, especially in male birds of prey. We compared selected aspects of the biology of male Cooper's Hawks (Accipiter cooperii) who began breeding at one year of age (SY males) vs. males who began breeding > 2 years of age (ASY birds) in an effort to elucidate what renders SY males as rare breeders. We detected 13 (2%) SY and 719 (98%) ASY males among 732 (80%) aged males at 911 total Cooper's Hawk nests in Wisconsin across 32 years (1980-2011). SY birds exhibited a marked and statistically significant temporal change in occurrence across all study years as 12 (92%) and 1 (8%) of the total 13 SY males were detected in the first and second 16 years of our study, respectively. We suggest that SY males could more readily attain nest sites when an apparent lower

breeding population of ASY males occurred in the first half of the study. SY males were on average similar in size to ASY males, and were molting to a greater extent than ASY males. There were notable differences in the maximum extent of duration of lifetime breeding as SY males may have sacrificed greater longevity for breeding early. ASY males lived longer and exhibited greater maximum lifetime production of nestlings. We suggest that a facultative breeding strategy in response to the constraints of a higher numbers of older males and the restraints of energy allocation trade-offs explains why SY male Cooper's Hawks rarely breed in our population.

Group 5 – Room A202, 2:20-3:10pm

Moderator: Jason D'Acchioli

Moral Limits On War: A Response to Clausewitz
Nichole Guelcher
Faculty Mentor: David Chan, Philosophy

Carl von Clausewitz argued that there did not exist (nor should there) moral limits on war in large part because war is political and is thus "a mere continuation of policy by other means". While Clausewitz presents a strong argument to evidence his supposition that any semblance of morality is merely a political strategy, I will argue that he is incorrect. While it is true that limiting bloodshed and the use of force may be politically strategic, there also stands to reason that the individuals who fight wars are well imbued with a moral code which may limit their violent actions. Furthermore, I will argue that it is erroneous to disregard morality based upon the presumption that it occupies a realm separate from politics, for surely the two are forced to coexist within the same realm. Additionally, Clausewitz' assertion that war is a continuation of policy evades the very human, morally concomitant components which should be considered before any declaration of war is made. Although Clausewitz would have argued the strategic value in this consideration, I will argue that moral considerations are vastly important when surmising the individual and cultural costs of war, specifically in regards to the return of morally distraught soldiers when acclimatization to their native, morally coded cultures becomes necessary. Finally, Clausewitz evidenced his views with examples of face to face combat. While there does still exist face to face combat today, I will argue that the advent of impersonal weapon technology provides ample justification to declare Clausewitz' theory to be not only out-dated, but irrelevant.

Who are Ethically Disabled Agents? A Comparison of Contemporary Virtue Ethics and Nietzsche's Overman
Devin Christensen
Faculty Mentors: David Chan and Karin Fry, Philosophy

In his 2001 book, Choosing Character: Responsibility for Virtue and Vice, Jonathan Jacobs suggests that past approaches to virtue ethics have failed to acknowledge a symmetry between virtuous and vicious agents. Right action is said to flow automatically from virtuous agents without requiring the agent to

struggle against urges to act otherwise. Why is it not granted, Jacobs asks, that vice can be displayed in the same way? He argues that agents exist who are incapable of properly experiencing moral truths and incorporating ethical considerations into their day-to-day lives, and he calls this state "ethical disability." However, Jacobs acknowledges there are reasons to resist the urge to assume any actual person who acts immorally does so out of a state of ethical disability. Who, then, are the members of Jacobs' ethically disabled conceptual class? I argue in this essay that a fruitful comparison can be drawn between Nietzsche's Overman and Jacobs' ethical disability, and that such a comparison will provide a well-known conceptual instantiation of an ethically disabled agent without suggesting that any have actually existed. Furthermore, Nietzsche's doctrine of eternal recurrence can solve the epistemic problem Jacobs faces with ethical disability and reinforce the reasons we should not, in any actual circumstances, assume an individual is ethically disabled.

Group 6 – Room A210, 2:20-3:10pm

Moderator: Jennifer Collins, Brad Mapes-Martins

The Singing Revolution: How Culture Saved the Baltic States
Aldis Siltumens
Faculty Mentor: Jennifer Collins, Political Science

The Singing Revolution was an independence movement in the Baltic States that occurred between 1987 and 1991. This paper examines the central role that culture and nationalism played in this non-violent revolution and focuses in particular on how the Baltic traditions of song and folklore served to keep Baltic nationalism alive and finally to galvanize people to demand independence.
I discuss the continuities between the Singing Revolution and longer historical patterns of resistance in which Baltic culture survived what often seemed like insurmountable odds. For example, song festivals have a rich history in the Baltic States and during the Soviet period were extremely important places for the Balts to unite and remember their cultural identity in the face of Soviet censorship.
Heroic narratives were part of this culture, and they give a glimpse into the mindset of the people who would in 1987 engage in a non-violent revolution against the Soviet occupation. What is particularly interesting about these narratives is that while early versions glorified violence, by the time of the revolution they had been rewritten to extol the virtues of non-violence. Instead of meeting Soviet tanks with bullets, the Balts responded with what would end up being their most powerful weapon, song.
The Baltic States and their Singing Revolution are in many ways a modern day David and Goliath story, only in this case, David did not come with a slingshot; he came with a love for freedom, a love for his culture, and a love for song. The Singing Revolution is the story of how culture saved a nation.

The Free Movement of Europeans: Immigration in the European Union
Crystal Laabs
Faculty Mentor: Brad Mapes-Martins, Political Science

In 1952, France, Belium, Italy, Luxembourg, Germany and the Netherlands came together and created the European Coal and Steel Community (ECSC). Subsequent treaties followed the ECSC treaty that expanded the power of the super-national government that became the European Union. The only free movement of people that was encouraged through the founding treaties of the European Union was free movement of workers. In 1985, five of the six founding EU countries came together to encourage the free movement of all people under the Schengen Agreement. This agreement was outside of the European and remained so until the adoption of the Treaty of Amsterdam in 1997. With the adoption of the free movement of people, also known as Title IV in the Treaty of Lisbon, the European Union allowed all people to move freely throughout the EU Member States. Even though some of the EU countries have unique opt-outs of certain Title IV provisions, intra-EU immigration is not viewed as a priority for most EU countries. This paper argues that Europeans have come to value the free movement of people on the grounds that doing so increases economic prosperity. With a few countries limiting the free movement of people during the current economic crisis, Europe is welcoming of many internal immigrants.

Group 7 – Room A208, 2:20-3:10pm

Moderator: Robert Sirabian

***Frankenstein* and the Perspective of Experience**
Leslie Spear
Faculty Mentor: Robert Sirabian, English

Mary Shelly's Frankenstein (1818) is well known for the horrific terror that the creature produces while he roams the countryside attempting to find understanding about his identity. The Romantic concept of experience often deals with an outlaw or visionary whose personal code and actions prevent him or her from living as an individual in society. Isolation, or the idea of loneliness, is one of the factors involved in the struggle of experience which both Victor Frankenstein and the creature deal with. In the context of twentieth-century psychologist Abraham Harold Maslow's usage, the definition of experience becomes a very different struggle; it becomes one that involves a painful realization of identity and a discovery of individualism with the goal of assimilation into society. The manner in which Victor and the creature struggle shows they are incapable of advancing beyond the initial stage of experience, making their behavior childlike.
This analysis will examine three of the aspects that need to be present to achieve Maslow's definition of a self-actualized individual, which is the highest level of experience a person can reach where inner turmoil no longer exists and integration into society is achieved. Both Victor and the creature fail to reach this level of experience because of the isolation both are forced to endure. With this analysis, *Frankenstein* becomes more than a horror story and even more than a

moral; it shows that the isolated individual's internal struggle can lead to assimilation into society if he or she is willing to adopt specific behaviors.

The Hypocrisy and Weaponry of Religion in Ivanhoe
Kaitlyn Luckow
Faculty Mentor: Robert Sirabian, English

In the Victorian and Romantic periods, it was common for authors to write about the medieval past to illuminate issues in the nineteenth century. *Ivanhoe* (1819), by Walter Scott, is a fine example of this theme. Scott uses his medieval setting to draw attention to the hypocrisy found in Christianity and Judaism. Sets of characters represent religious turmoil, hypocrisy, and the misuse not only in the medieval period, but also in the Romantic period in England. The past and present Christian history of England show a religion that uses its influence to gain power. Scott reveals this corruption in his Christian characters who are depicted as power-hungry hypocrites, such as Prior Aymer, the Holy Clerk of Copmanhurst, and Prince John. Throughout history Christians have used this power to persecute Jews, and this persecution only strengthened their power. The Jewish population of England had negative stereotypes imposed on them due to prejudice, and some characters in *Ivanhoe*, such as Isaac, portray these detrimental cultural stereotypes. All of these characters represent religion in Romantic England, where The Church of England was legally part of the political power in the country and where Jews were still being persecuted. Scott also portrays characters in *Ivanhoe* who represent what religion should be—a moral set of beliefs individuals act upon. Rebecca and Rowena do not abuse their religion, but truly believe and act on their religious beliefs. Interestingly enough, these two characters are the two female characters in the novel, one Christian and one Jewish. In contrast to the corrupt men in the novel—they are women with morals and values and show sympathy towards other's differences, using their religion as a righteous path instead of a corrupt one.

Group 8 – Room A207, 2:20-3:10pm

Moderator: Nancy LoPatin-Lummis

Of Arteries and Armies: How the Medicus of the Roman Legions Invented Modern Medicine
Christopher Lyon
Faculty Mentor: Brian Hale, History

From the first century BC until the fall of Rome in 476 AD, the military machine that was the Roman legion possessed a weapon unrivaled in all of ancient history and unappreciated until modern times. The Roman legionary doctor, trained for battlefield surgery, was equipped with instruments and knowledge without parallel or peer until the late nineteenth century. The presentation will cover the periods of Roman military medicine from its infancy during the Republic to its heyday under the Caesars and finally its mysterious disappearance when the legions faded from memory. Topics covered include techniques used, the variety

and breadth of the medicus' duties, as well as the instruments, facilities, and the men themselves.

Libraries to the People: The Traveling Libraries of South Wood County, Wisconsin: 1896-1914

Charissa Janik
Faculty Mentor: Nancy LoPatin-Lummis, History

The presentation presents a historical overview of the development of the late nineteenth century traveling library system in Wisconsin, a precursor to what would later be known in the twentieth century as the “bookmobile” in rural regions of the state. Although the impact of urban institutional libraries upon American society has been thoroughly examined by historians and librarians alike, it continues to remain a history from the top down. Library history scholars continue to largely persist upon several main topics of study: the evolution on the large, urban, public libraries during the progressive era, class distinctions and subsequent library usage during the era, gender issues and library usage, or the feminization and professionalization of librarianship during the late nineteenth century. This presentation offers the little known history of the traveling library system in Wisconsin as well as the major role several Wisconsinites played in the development of traveling library systems throughout the nation.
Research indicates that in the late nineteenth century America, access to print materials and information varied widely between urban and rural areas of Wisconsin. In 1896 South Wood County Philanthropist J.D. Witter of Grand Rapids and the newly developed Wisconsin Free Library Commission (WFLC) set out to provide access to free reading materials to thousands of southern Wood County rural residents through a system of traveling libraries. Witter and WFLC librarians Frank Hutchins and Lutie Stearns strongly believed free and equal access to information was a public good and led the charge for the development of a professionalized traveling library system not only in Wisconsin, but around the nation.

Poster Presentations 3:10–4:00pm

Science Building (A-wing corridors) 1st and 2nd floor

Biology

"Continuous junctions" of interdigitating epidermal cells of teleost tail fins
Timothy Rushmer, Robert Goodwin, Rita Kenner
Faculty Mentor: Robert Schmitz

The teleost tail fin consists of several pairs of segmented bony fin rays, which undulate to generate propulsive forces. The fin rays are held together by connective tissue and covered in a layer of epidermal cells. The ultrastructure of the proximal and distal portions of tail fin epidermis was examined in the minnow, Pimephales promelas. Structural variations are observed along the length of the fin. Goblet cells are present proximally, but less so distally. Keratinocytes along the entire length of the fin are interdigitated. The distal cells are more extensively interdigitated and flattened than the proximal cells. The plasma membranes of these cells are very electron dense with no intercellular spaces. These "continuous junctions" do not resemble typical junctions seen in vertebrate tissues. These "continuous junctions" may function to mechanically hold the epidermal cells together, allowing the epidermis to transmit tensile forces needed to undulate the tail fin during swimming. The increasing proximal to distal cellular interdigitation observed is consistent with increasing proximal to distal tensile load on the surface of the fin during swimming. Supported by UWSP UEI Student Research Funds.

An efficient method for georeferencing frequently collected localities for historical, non-referenced ichthyological collections
Michael Howard, Caitlin Enright, Adam Nickel
Faculty Mentor: Justin Sipiorski

A wealth of ecological data exists within the ichthyological specimen collections of natural history museums. A great deal of data mining within existing collections begins with georeferencing. In order to obtain meaningful data quickly, we constructed a geographic information system (GIS) basemap of all public access localities for the Plover River system, which encompassed Portage, Marathon, and Langlade counties in Wisconsin. Public access sites were referenced using the North American Datum 1983 (NAD83) coordinate system via web resources. Public Land Survey System (PLSS) coordinates assigned to specimen lots collected in the Plover River system were converted to the NAD83 system as well using a number of online resources and government publications. By referencing all possible collection localities in an often-collected region, historically collected lots may be referenced in batches rather than iteratively. The specific attributes of each collection lot associated with the Plover River were translated into map layers as well. To test our georeferenced lots, we created

a map layer identifying black spot parasite spread and persistence throughout the Plover River system.

Are there two species of "blue-spotted" salamanders in Wisconsin?
Matthew Rucker,
Faculty Mentors: Justin Sipiorski, Todd Huspeni

Biodiversity is a vital element necessary to maintain a healthy ecosystem. However, even in well-studied fauna, some unidentified biodiversity remains cryptic. This may be the case with Wisconsin salamanders. A single "blue-spotted" salamander species, *Ambystoma laterale*, is currently recognized. Historically, purported polyploid hybrids within the *A. laterale-jeffersonianum* (l-j) complex have been documented in the state. However, no Wisconsin record for non-hybridized *A. jeffersonianum* currently exists. Recent studies have examined the phylogeography of a unisexual kleptogen ambystomatid. This kleptogen is often sympatric with the sexual *A. laterale*, but these studies have not included individuals collected from Wisconsin. Kleptogens are unisexual females whom 'steal' the sympatric sexual male spermatophore. It has been hypothesized that Wisconsin may be suitable for either the kleptogen or *A. jeffersonianum* to maintain persisting populations. Our field work has recently uncovered additional morphologically unusual *A. laterale* specimens that could represent non-hybridized *A. jeffersonianum*, hybrids within the l-j complex, or kleptogens. Using nonlethal molecular analyses of tissue samples taken along the tension zone, we are attempting to further characterize blue-spotted salamander populations in Wisconsin. Our long-term goals are to identify the actual species present, evaluate any patterns of hybridization among species, and assess any potential evidence of kleptogenesis. As more samples are analyzed, and a more fully resolved picture emerges regarding the diversity of blue-spotted salamander forms in Wisconsin, future questions concerning the conservation status of these species in the state may need to be addressed.

Assessment of frog abundance as influenced by pH, specific conductance, and temperature
Alyssa DeRubeis
Faculty Mentors: Todd Huspeni, Erik Wild

Anurans are known worldwide as biological indicators due to their sensitivity to changes in water quality and habitat. Additionally, frogs and other anurans are experiencing population declines across the globe. One common and easy method used to estimate frog abundance is to conduct a frog call survey. We adopted the Wisconsin Department of Natural Resources' (WI DNR) Frog and Toad Survey protocol to detect abundance of three frog species at 18 haphazardly chosen sites located in the Stevens Point, Wisconsin area. The three targeted frog species were spring peeper (*Pseudacris crucifer*), wood frog (*Rana sylvatica*), and western chorus frog (*Pseudacris triseriata*). We also monitored the water for temperature, pH, and specific conductance to determine if there was a correlation between these attributes and the frogs' abundances. The surveys were conducted from 11 April 2011 through 27 April 2011. Water temperature ranged from 41.7°F to 53.8°F (5.39°C to 12.1°C), pH varied from 7.1 to 9.0, and specific

conductance varied from 34 µS/cm to 1995 µS/cm. *Pseudacris triseriata* were not detected at any of the sites. We observed that *R. sylvatica* calls were never recorded when measured water temperatures were below 50°F. However, P. crucifer were found vocalizing in temperatures as low as 41.7°F. We observed a possible negative correlation between frog abundance and increasing water pH. We did not detect any significant relationship between specific conductance and frog abundance. Due to significantly cooler 2011 spring air temperatures, only three sites met the WI DNR protocol's minimum water temperature requirement. Because of this small sample size, we are currently unable to make strong inferences regarding the effects of the measured variables on frog abundance.

Assessment of hemoparasites infecting White-throated Sparrows
Jenna Cava
Faculty Mentors: Todd Huspeni, Brent Horton (Emory University), Donna Maney (Emory University)

White-throated Sparrows (*Zonotrichia albicollis*) have been widely studied as a model for discovering the mechanisms underlying aggressive and parental behaviors. A genetic inversion on a single chromosome determines an individual's plumage morph, and the two morphs have been shown to exhibit differing behaviors and physiology. This study seeks to elucidate another facet of this sparrow's ecology—blood parasite prevalence and intensity as they relate to season and individual characteristics such as sex, morph, mass, age, and breeding stage. We collected blood smears from 78 White-throated Sparrows during the breeding seasons of 2010 and 2011. Smears were Giemsa stained and evaluated for the presence of protist and helminth parasites. Smears found positive for intracellular protist parasites were further evaluated for relative infection intensity by counting the number of infected cells per 2,000 red blood cells. We found four different species of blood parasite in one or more individuals: a *Haemoproteus* sp., a *Plasmodium* sp., a filarial nematode, and another helminth species. Prevalence of each parasite species varied, with *Haemoproteus* the most common infection (65%), then the filarial nematode (44%), next *Plasmodium* (39%), and finally the other helminth (15%). We will also be conducting multiple regression analyses to measure the relationships between parasite prevalence and intensity, and the measured variables mentioned above.

Assessment of the genetic distinctiveness of the gigantism-displaying American Toads of Washington Island, Door County, Wisconsin
Nicholas Barbian
Faculty Mentors: Justin Sipiorski and Erik Wild

Many scientists have reported that American Toad, Bufo Americanus, of Washington Island of Door County, Wisconsin, display considerable gigantism compared to mainland populations. Numerous explanatory hypotheses have been proposed, however the most likely is that their geographic isolation on the island has allowed them to diverge genetically. To test this hypothesis I have undertaken a genetic assessment of the population of toads on Washington Island in comparison with mainland populations. Using DNA sequence data from mitochondrial markers is a critical first step to understanding the Washington

Island toads' potential genetic distinctiveness and reproductive isolation from mainland toad populations. This study is important because it has the potential to document a unique member of the State's fauna, and potentially documenting a distinct species that may then be in need of immediate conservation attention.

COLS museum of natural history Ichthyological and herpetological collections offer students a full suite of professional development opportunities

Emily Fleischauer, Forrest Fleishauer (co-lead), Andrea Wollscheid (co-lead), Taylor Hecht (co-lead), John Small (co-lead), Benjamin Balika (supporting), Nicholas Barbian (supporting), Benjamin Ewoldt (supporting), Steven Gindeld (supporting), John Grosch (supporting), Heidi Hargarten (supporting), Michael Howard (supporting), Mark Moua (supporting), Courtney Neumeyer (supporting), Joel Porter (supporting), Jacob Richter (supporting), Matthew Rucker (supporting), Joshua Schreiber (supporting), Jesse Schulz (supporting), Spencer Schulz (supporting), Spencer Siddons (supporting), Andrew Stevens (supporting), Nathaniel Stewart (supporting), Jacob Toben (supporting), Elizabeth Vega (supporting), Stephanie Verjinski (supporting), Sarah Ziemer (supporting)
Faculty Mentors: Justin Sipiorski and Erik Wild

UWSP biology students occupy leading roles in the management and curation of the UWSP COLS Museum of Natural History Ichthyological and Herpetological collections. Most recently student have completed a physical reorganization of the ichthyological collection and created a library of supporting materials associated with the fish and herp collections. Students manage ongoing electronic databasing and georeferencing of specimens. They accession new vouchers and tissues and cross-reference the tissue and voucher collections. Students design and carryout field collection activities. Using specimens from both collections, students conduct research on the past and present local ichthyological and herpetological phenology--using GIS methods, conducting diet and parasite studies. They examine changes in local fish communities over time. Students have also begun photographing all fish and herp specimens as part of the databasing efforts. A host of genetic analyses are ongoing to understand biogeogrpahic and evolutionary phenomena. Live animal collections are managed as part of the teaching collections used in UWSP biology courses. Students also help curate the teaching collections of preserved specimens used in Ichthyology and Herpetology. Museum curation students also serve as representatives to the faculty curators committee, conduct biological illustration work, carry out morphometrics studies, manage specimen labeling efforts, and map the physical locations of specimens in the collection areas. The Ichthyological and Herpetological collections offer students a full suite of professional development opportunities.

Comparing diatom communities of the Plover River through the past 45 years by analyzing gut contents of the central stoneroller (Campostoma anomalum)

John Grosch, Joshua Wied
Faculty Mentor: Justin Sipiorski

Stonerollers are small, benthic, stream dwelling fish that feed on periphyton--microscopic plant communities covering most sunlit surfaces in aquatic ecosystems. Diatoms, single-celled algae that produce silicaceous frustules in which they reside, are well represented in the periphyton consumed by the stonerollers. Stonerollers from the Plover River dating back to 1967, deposited in the Becker Memorial Ichthyological Collection, were preserved with their gut contents intact. Protocols were developed to extract and treat the gut contents with acid and peroxide to clean the diatoms of all organic material leaving only the silica frustules of the diatoms. Subsampled frustules were photographed on a scanning electron microscope to provide high resolution photographs for diatom identification. Genera were quantified to determine composition and abundances within the gut contents. Diatoms, single-celled, short-lived organisms capable of prolific reproduction, may react to environmental or land use changes relatively quickly compared to other species in the Plover River. Perhaps changes in diatom communities over the past 45 years can be observed by the analysis of stoneroller gut contents.

Comparing Rainbow Trout Growth Rates Based on Two Different Feeding Techniques

Sherri Hartmann
Faculty Mentor: Chris Hartleb

In the past, feeding regimens were given as a task to the most inexperienced personnel at hatcheries and regarded as an insignificant part of the lifecycle of a trout at a fish farm. Since then it has been realized that it is vital to the health and growth of rainbow trout, Oncorhynchus mykiss, in order to achieve the maximum growth potential. This study took place at Kettle Moraine Springs State Fish Hatchery in order to understand the best possible feeding regimen to grow rainbow trout to their greatest growth potential in order to maximize survival rates in the wild. Two different feeding techniques were tested: 1) feeding rainbow trout small amounts of feed each day, and 2) feeding rainbow trout twice per week to satiation. Rainbow trout that were fed small amounts everyday showed the greatest growth rate compared to rainbow trout that were fed to satiation twice a week. (one-tailed t-test, df=63, $P<0.0001$). By giving the rainbow trout smaller amounts of food everyday more energy was diverted to growth instead of maintenance. Feeding to satiation twice per week, which was based on the concept of compensatory growth, led to more wasted feed on the day of feeding, stressed fish, and a greater degree of intraspecific predation.

Curating Ecological Representations of Plant Insect Interactions
Steckart Bradley, Brandon Selner
Faculty Mentor: Jamee Hubbard

As part of a University of Wisconsin Stevens Point Natural History Museum and Department of Biology curatorial project, we are developing displays that exhibit ecological interactions between insects and vegetation. These displays will describe the ecological significance of the relationship between insects and vegetation including adaptations to specific plant interactions. This project will include plant damages like leaf skeletonization, stippling, and wood boring to name a few. The displays will be used to compliment the general entomology lectures on insect-plant interactions and to help educate the public.

Development of a Toxicological Model: Relationship between Structural Features of Early Development and Osmotic Challenge in the Brine Shrimp, *Artemia Franciscana*.
Shannon Gildersleeve, Courtney Neumeyer
Faculty Mentor: Joseph Covi

Little is known about the effect of environmental toxicants on the development of dormant zooplankton embryos. We are developing the brine shrimp, *Artemia franciscana*, as a model species for toxicological research on embryonic development. *Artemia franciscana* is a commercially available species with a cosmopolitan distribution and long history of use for biochemical, molecular, ultrastructural and developmental studies. Based primarily on structural differences, the first 36 h of development in *Artemia* is classically divided into four stages: encysted embryo, emergence stage 1, emergence stage 2, and nauplius larva. These discrete categories, however, do not fully describe the structural changes that are observed on a fine time scale, and describing the effects of toxicants on *Artemia* requires a more detailed analysis of structural changes during early development. Preliminary data suggest that developmental arrest in these embryos is often associated with structural characteristics that are not fully described in the literature. These characteristics may originate in an inability to emerge from the first or second embryonic cuticles. Because emergence is achieved by the development of osmotic pressure within the embryo, we hypothesize that arrested embryos may be unable to generate the osmotic pressure required for emergence. These embryos would then demonstrate structural characteristics in line with continued development in a confined space, namely the space available within the embryonic cuticle that was not shed. To assess the relationship between osmotic pressure and aberrant developmental features, hatching was conducted in varied salinities (20, 25, 30, and 35 ppt artificial seawater), and developmental characteristics were correlated with osmotic challenge.

Does a high prevalence of Extra-pair copulations influence offspring sex ratios of Cooper's Hawks?
Noah Levine
Faculty Mentor: Robert Rosenfield

Urban environments are relatively new habitats for Cooper's Hawks (Accipiter cooperii) and other birds of prey. That said, little research has been done on breeding raptors in urban settings and even fundamental ecological understanding of these populations is lacking. There is a high nesting density of Cooper's Hawks that recently colonized Milwaukee, Wisconsin. Indeed this urban population is still growing as of 2010 (Stout and Rosenfield 2010, W. E. Stout and R.N. Rosenfield, unpubl.). We studied the sex ratios in nestling Cooper's Hawks in Milwaukee during 2001 – 2011 to investigate an earlier prediction by Rosenfield et al. (1996) that sex ratios should be skewed toward males in bird species where extra-pair copulations (EPCs; i.e., a male or female seeking copulations outside of their pair bond) are common. EPCs are indeed prevalent in this urban population of breeding Cooper's Hawks (S.A. Sonsthagen and R. N. Rosenfield, unpubl.). Our finding of a non-significant skew toward nestling males (52% of 923 offspring from 52 broods) in Milwaukee did not seem to support the afore-stated prediction. By contrast, offspring sex ratios in the same study years were significantly skewed toward males (57% of 726 offspring from 57 broods) elsewhere in southern and central Wisconsin where long-standing Cooper's Hawk populations appear stable at high densities. Our results underscore how little is known about the social behavior and population biology of urban breeding Cooper's Hawks.

Effects of Maternal Separation in Male Rats
Aldis Siltumens, Julie Krzykowski
Faculty Mentor: Karin Bodensteiner

Stressful events during childhood are risk factors for the development of psychopathologies in adulthood and rodent maternal separation protocols are widely used as animal models to study the possible mechanism(s) behind these behavioral changes. To further develop an understanding of the effects of neonatal maternal separation on adult male aggression and reproductive behaviors, male pups were separated from their mothers for 0 hr (control) or 3 hr daily from postnatal day (PND) 1 through 14. It was hypothesized that maternally separated males would exhibit decreased time to puberty, increased aggression, and reduced reproductive ability. Following neonatal maternal separation, subjects were examined for testicular descent and preputial separation between PNDs 35 and 44. Juvenile aggressive behaviors were recorded on PND 36. In addition, adult aggressive and reproductive behaviors were recorded between 15 and 17 weeks of age. After behavior testing, rats were necropsied to obtain data on reproductive organ weight and sperm count. Blood samples were also collected periodically throughout the study for serum hormone analyses. Maternally separated rats exhibited significant delay to onset of puberty, and lower testes and epididymides weights at adulthood. Maternally separated rats also displayed increased intruder investigation and cage exploration as juveniles, along with more aggressive behavior as adults. In addition, maternally separated

males tended to exhibit less reproductive behavior as adults. Information gained from this study will further our understanding of how events during the early neonatal period influence later adult behaviors.

Effects of Rotenone Bioaccumulation on the Early Development of Encysted *Artemia franciscana* Embryos.
Evan Hutchison, Jenna Cava, Matt Gunderson
Faculty Mentor: Joseph Covi

Micro-crustacean embryos may be more susceptible to lipophilic toxicants than the adults that are currently used as a standard for environmental assessment of toxicity. Most invertebrate embryos possess large stores of lipids in the form of lipid granules. These granules present a location for the bioaccumulation of lipophilic compounds that could interfere with metabolic or developmental processes. Because these embryos remain metabolically and developmentally arrested for years to centuries, pollutant levels that are permissive for short-lived adults could negatively impact embryos during recruitment from dormancy. The implications of this are profound. Exposure of these genetic storehouses to lipophilic toxicants could drastically, and irreversibly, reduce genetic variation in isolated populations. Individuals and/or species with the greatest capacity for embryonic dormancy would be most affected by bioaccumulation of toxicants. As a test of the bioaccumulation hypothesis, embryos of the brine shrimp, *Artemia franciscana*, were exposed to the common piscicide, rotenone. Pretreatment of encysted embryos with rotenone profoundly decreased subsequent hatching success in rotenone-free sea water. Blockage of development was dependent both on rotenone concentration and the duration of exposure. Extreme washing methods failed to reverse the effects of rotenone treatment. These data indicate that invertebrate embryos possessing only cuticular barriers are susceptible to lipophilic toxicants. Given the broad distribution of invertebrates that rely on dormant embryos for survival of adverse environmental conditions, and their essential role in diverse ecosystems, it is imperative that we understand the effects that toxicants have on embryo viability.

Electron Microscopy and the Minimal Inhibitory Concentration of Bleach to the Invasive Aquatic Pathogen Viral Hemorrhagic Septicemia Virus in the Great Lakes Region
Moua Yang
Faculty Mentors: Richard Crowther, Sol Sepsenwol, Robert Schmitz, Robert Michitsch and Brian Sloss

Viral Hemorrhagic Septicemia Virus (VHSV) type IVb is a single stranded RNA virus from the Family Rhabdoviridae and the Genus Novirhabdoviridae. This invasive aquatic pathogen causes viral hemorrhagic septicemia disease in many freshwater fish species in the Great Lakes Region. Regulations were implemented by the WI DNR and WI Department of Agriculture to prevent the spread of VHSV to uninfected bodies of water. However, these regulations do not require disinfection. VHSV can be devastating to the sport and commercial fishing industries and it is unknown whether the pathogen will spread to other areas of uninfected water, so disinfection is essential. A 10% bleach solution is the current

standard for disinfection but the minimal inhibitory concentration (MIC) of bleach to VHSV is unknown. End-point dilution assays were performed on cultures of virally infected Fathead Minnow (FHM) (Pimephales promelas) epithelial cells to determine the MIC of bleach to the virus. Preliminary results from these assays indicated that a bleach concentration of 0.3% is required to neutralize the virus. Initially it was unknown whether the stock of VHSV at UW-SP consisted of complete infectious virions from prior projects involving the virus. Transmission electron microscopy (TEM) of negatively-stained and embedded samples was used to view the virus in cell culture fluid as well as within infected FHM cells. TEM of the virus showed rhabdovirus morphology, but consistent results are needed to verify this morphology of the viral stock. The results from this experiment lends support to the fact that VHSV is highly sensitive to bleach, and therefore it is critically important for the general public to consider bleach disinfection as a standard procedure to prevent the spread of this pathogen.

Fish-effluent enriched water as a nutrient solution for lettuce (Lactuca sativa) and Wisconsin Fast Plants® (Brassica rapa).

Kristina Kober, Brian Luedtke
Faculty Mentors: John Hardy, Rob Michitsch and Justin Sipiorski

Recycling of reusable waste products is a crucial sustainability practice. The UWSP Department of Biology Lower Vertebrate Laboratory regularly discards significant quantities of excess nutrient-rich fish byproduct water, while the university greenhouses use water and fertilizer to maintain a large population of plants. The ultimate goal of this research is to find a method to recycle the fish byproduct by using it to irrigate greenhouse plants.
We examined the effects of using water enriched with red-bellied Pacu (Colossoma brachypomum) effluent on the biomass production of lettuce (Lactuca sativa) grown in commercial potting soil and Rapid Cycling Brassica rapa (Wisconsin Fast Plants) grown in a sand/vermiculite mixture. Pacu were raised in a 100 gallon tank in the TNR Building greenhouse as part of an adjoining aquaponics project. Along with tap water, water from this tank was used to irrigate our lettuce and Fast Plants as needed for the duration of the project. Twenty-four lettuce plants were used for each treatment (tap water vs. fish effluent). Wisconsin Fast Plants were grown under 24 hour fluorescent lighting in two sub-irrigated flats of 126 plants each. Solution samples were taken at the start, half-way through, and at the end of the project to trace nutrient availability (mineral plant nutrients, electrical conductivity, pH, and temperature) over time. Leaf chlorophyll and nitrogen content of lettuce were also sampled. At the end of the experiment, the lettuce plants were harvested, dried, and analyzed for nutrient content. The Wisconsin Fast Plants were analyzed for biomass, height, developmental stage, and visible nutrient deficiency symptoms.

Genetic Inheritance for Coat Color in Alpacas
Pamela Whyms
Faculty Mentor: Diane Caporale

Alpaca fur is one of the most highly regarded specialty fibers in the industry and alpacas are widely bred for this reason. Breeders often selectively breed for certain coat colors that are more valuable; however this does not always yield the desired results due to the complexity of coat color inheritance. In this research project, a pedigree of 26 alpacas from the Canadian Llama & Alpaca Association and the Noble Alpaca Farm was generated to determine the inheritance pattern for coat color. It was found that black and red were the two basic colors, which are encoded by two separate genes. A third gene coding for the presence or absence of color is also involved. Genotypes of the 26 alpacas within a multigenerational pedigree were determined to demonstrate the mode of inheritance of coat color in alpacas.

Genetics of Breast Cancer
Erica Swenson
Faculty Mentor: Diane Caporale

Breast cancer is the most commonly diagnosed cancer among women in the United States, causing approximately 40,000 deaths annually. Approximately 5 to 10 percent of breast cancer cases are hereditary (Lim et al., 2010), and about 84% of those cases are due to mutations in two large breast cancer predisposition genes, BRCA1 and BRCA2 (Chenevix-Trench et al., 2006). Since the discovery of these two genes in 1994 and 1995, respectively (Purnomosari et al. 2005), several other breast cancer predisposition genes have been identified, including the CHEK2 gene. Few studies have provided data on multiple mutations of interest within one group of related individuals. Most studies of this type include either analysis of mutations in just one breast cancer gene or look for mutations in several genes in unrelated subjects, but not both. My objective was to conduct a case study on the Caporale family, which has had multiple cases of cancer. This study analyzed cancer history and risk factors in each individual of the family and tracked the inheritance through multiple generations. DNA was extracted and isolated from 16 individuals' cheek cells. So far, specific regions of the BRCA2 and CHEK2 genes were screened for mutations by molecular methods, such as DNA sequencing and allele-specific polymerase chain reaction (AS-PCR). Because this family has a member with a known BRCA2 mutation, a strong history of breast cancer and other cancers associated with the BRCA2 mutation, it provided an opportunity to evaluate multiple genes and mutations within one family and identify which of the individuals are carriers.

Green vs. Yellow: Characterization of a chlorophyll-deficient mutant in soybean
Callie Johnson, Matthew Weiss
Faculty Mentor: Devinder Sandhu

Photosynthesis is an extremely important process for plants; it is required for the production of simple sugars which allows plants to create their own food and

energy source. Plant pigments, chlorophylls, play vital role in absorbing sunlight that is utilized to fix carbon dioxide into glucose. Any mutations in development of chlorophylls are detrimental to plants. In soybean, we have identified a mutant plant that is chlorophyll deficient and is named as yellow lethal. The mutant plant dies, and therefore cannot reproduce to the next generation. The trait is recessive, only shows the phenotype in homozygous recessive condition. Two previous identified yellow mutants, y18 and y20, have already been mapped in soybean. Objectives of this investigations are to i) determine if the new mutant is a unique mutant or is one of the already characterized mutants, ii) to map the new mutant to soybean genome. We generated F2 population between homozygous green plant (YY) and a heterozygous green mutant plant (Yy). Segregating F2 population was scored for the phenotype; 75% of the plants were green and 25% were yellow, suggesting monogenic inheritance of the trait. We utilized bulked segregation analysis to locate the mutant gene on soybean chromosome. Green and yellow bulks were constituted using 10 homozygous green individuals and 10 homozygous yellow individuals, respectively. A total of 700 simple sequence repeat (SSR) markers were used on the bulks. We have identified some putative positive markers that are closely associated with the gene. Currently, we are confirming the association. All the markers in the region of the associated marker will be run whole F2 population to make genetic linkage map for the gene.

Has Babesia microti Spread to Central Wisconsin by Ixodid Ticks Within the Last Six Years?

Nyssa Maki, Ikumi Nishi
Faculty Mentor: Diane Caporale

Babesiosis is an infection of red blood cells by a parasitic piroplasm called Babesia microti. This and a few other diseases, such as Lyme disease, are caused by different pathogens residing in the salivary glands of a deer tick host. Transference of the pathogen to small mammals and humans is most commonly by a tick puncturing the skin by a bite. In 1999, one study from Wisconsin reported only two ticks that were positive for B. microti from Colfax. From 2000 to 2005, previous studies showed no B. microti infection in close to 1000 ticks collected in Central Wisconsin. While this disease is not nearly as prevalent as Lyme disease, increasing reported cases of Babesiosis in the United States and across Europe have given cause for further investigation of any increased infection in ticks in Central Wisconsin. Therefore, DNA isolated from deer ticks collected in 2006-2011 were screened for Babesia species. Using PCR, gel electrophoresis, and automated sequencing techniques, 4 out of 129 ticks sampled in 2010 from the Stockton area and 1 out of 135 ticks sampled in 2011 from Schmeekle Reserve were positively identified to carry the piroplasm. The Babesia species from several other samples positive by gel electrophoresis will be verified by DNA sequencing and coinfection with other pathogens will be reported.

Intensity of Ectoparasites on White-tailed Deer (*Odocoileus virginianus*) in two sites in Wisconsin

Alyce Kacena, Marcus Mueller
Faculty Mentors: Shelli Dubay, CNR and Todd Huspeni, Biology

White-tailed deer (*Odocoileus virginianus*) are the most economically and culturally important game species in Wisconsin. The Wisconsin Department of Natural Resources is conducting research to determine causes of mortality in fawn and adult male deer from 2011-2014. To fit deer with radio-collars for mortality investigations, DNR biologists captured deer in box and Clover traps and drop-nets near Winter and Shiocton, WI. We collected ectoparasites to: 1) determine if non-native lice (*Damalinia* sp.) that cause hair-loss syndrome in black-tailed deer (*O. hemionus columbianus*) and mule deer (*O. hemionus*) occur on deer in Wisconsin and 2) determine if the number of ticks and lice on deer differ by gender, study area or field season. We combed the ears of deer with flea combs and parasite specimens were placed in vials containing 70% alcohol until identification. We sampled 110 deer in 2010-2011 and, we have collected parasites from 51deer so far this year. We have identified chewing lice (Mallophaga) and/or deer ticks (*Ixodes scapularis)* on numerous deer. *Damalinia* sp. have not been found. Last year, parasite loads did not differ by study area or gender. Analyses are ongoing, but we hypothesize that the 2011-2012 field season will exhibit greater parasite intensity on white-tailed deer compared to the 2010-2011 field season because this winter has been warmer than last year. Our results will contribute to the overall study because some parasites transmit diseases to deer and could affect overall body condition in deer.

Isolation and effects of pH on Human Probiotics, the growth of Nitrobacter and Nitrosomonas and Quality Assurance of an Aquaponic System

Kyle Soyk
Faculty Mentors: Richard Crowther, Edward Gasque, Moua Yang

Probiotics are live microorganisms which, when administered in adequate amounts, are reported to confer a health benefit on the host (FAO/WHO). These microorganisms are naturally found in the intestines and stomach of humans. Lactobacillus acidophilus and Bifidobacterium lactis are two of the most common strains, and are found in most supplements. These were isolated using Brain Heart Infusion (BHI) medium in both agar and broth from probiotic pills called Super Probiotics (Walgreens). After isolation the two different bacteria were grown in media with different hydrogen ion concentrations (pH). This was to test their ability to survive in the acidic stomach environment. After establishing that the bacteria could survive in the low pH environment an additional project looked at the interaction of other reported probiotic benefits in the field of Aquaponics. Aquaponics is a symbiotic cultivation of plants and aquatic animals in a recirculating environment. It is combining the processes of aquaculture (raising aquatic animals) and hydroponics (cultivating plants in only water) into one unified system. Nitrobacter and Nitrosomonas are nitrogen fixing bacteria and they are vital to the Aquaponics system. Together these bacteria convert poisonous ammonia to nitrate which is a very important nutrient for plants. This project involved isolation and propagation of these two organisms.

Both of the species grow on complex medium and many different recipes were tested for growth including the American Type Culture Collection's (ATCC) medium specific for each bacteria. We also developed a Quality Assurance test for the water used and the food grown. With any food product, controls must be in place to assure the quality and safety of the food source.

Just Wheat a minute! Hormonal analysis in tall and short Wheat lines
Alexandrea Ollhoff, Benjamin Speth, Justin Klesmith
Faculty Mentors: Devinder Sandhu and Eric Singsaas

Genes influencing plant height revolutionized agriculture in the late 1960s by almost doubling wheat production. The so-called 'green revolution' genes in wheat encode proteins that either regulate synthesis of plant growth hormone gibberellins (GA) or modulate its signaling pathway. Although 16 dwarfing (rht) mutants currently exist in wheat, mainly two (Rht1 & Rht2) have been used in more than 95% of the cultivars grown worldwide. Although, under normal water condition rht1 and rht2 mutants perform better than tall lines, but under limited soil-water conditions they exhibit adverse effect on germination. About 86% of the US wheat and 50% of wheat producing areas of the world are drought prone. Due to unavailability of methodology, limited data is available for the other 14 mutants with respect to their hormonal profiles. Objective of this investigation were to develop methodology for hormonal analysis, and use the methodology to compare Indian and the sixteen dwarf mutants. Using High Performance Liquid Chromatography tandem Mass Spectrometry (HPLC/MS), methodology has been developed to analyze the hormonal content in wheat. Methodology developed includes: uniformity in plant growth environments, extraction of hormones from plant tissues, and creating optimal chromatography conditions. Thus far, we have standardized protocols for analysis of hormones, gibberellins (GA), indolacetic acid (IAA), and indolbuteric acid (IBA). We have used a deuterated compound as an internal standard, and a methylated compound as a surrogate standard. Using this process, we are analyzing differences between tall wheat Indian and the 16 dwarf mutants.

Measuring feed conversion and growth rates in Red-bellied Pacu (Colossoma macropomum) in a greenhouse aquaponics system
Joshua Wied, Emily Fleischauer, Forrest Fleishauer, John Grosch
Faculty Mentors: Justin Sipiorski, Biology, John Hardy, Biology and Robert Michitsch, CNR

The combination of growing fish and using the water with excess nutrients to grow plants in aquaponics systems is a very efficient way of reusing waste water from fish production. A small re-circulating aquaponics system growing lettuce was set up in the UWSP greenhouse simulating a Wisconsin summer. Red-bellied Pacu (Colossoma macropomum) were selected as the fish to use in the system due to their large size, eating habits, fast growth rates, and tolerance of poor water quality. The fish were fed daily a commercial fish feed with known protein composition. The amount of food was adjusted weekly to equal ten percent of total mass of all the fish in the system. The fish lengths in millimeters and weights in grams were measured weekly. Specific growth rate, protein efficiency

ratio, and feed conversion ratios were calculated for the Pacu in the system. These rates were compared to published rates for Pacu species in commercial aquaculture systems to determine if Red-bellied Pacu were a good candidate for simple aquaponic systems that could be easily constructed by Wisconsin farmers, gardeners, or hobbyists.

Modeling fish biodiversity and species distribution in the Yellow River watershed through the 20th century
Nathaniel Stewart
Faculty Mentor: Justin Sipiorski

Species exist within a habitat containing a unique set of biotic and abiotic factors. These factors allow the species to exist in that particular habitat and influence the success of the species. When the habitat changes, the species composition of that habitat is impacted. By monitoring species through time, changes in the habitat can also be monitored. The habitat within which fish live are bodies of water but the conditions of a body of water are determined by the conditions within the watershed. By monitoring fish populations through time it is possible to evaluate historical changes within the watershed. We set out to determine how the fish community in the Yellow River in central Wisconsin has changed throughout the twentieth century. To do this data was compiled from the Dr. George Becker fish collection and from fish surveys conducted by natural resource professionals and ichthyologists throughout the twentieth century. Using this data, a GIS database was constructed of the watershed in an attempt to model how the fish community may have changed throughout the twentieth century.

New Species of Liverworts Collected in Chequamegon Nicolet National Forest, Price County, WI
Katie Kloth, Kaylie Lukas
Faculty Mentor: Virginia Freire

Liverworts, Marchantiophyta, are the second most understudied group of bryophytes after hornworts. A complete and comprehensive catalog of liverworts in Wisconsin has yet to be obtained for each county, according to the Freckmann Herbarium map of documented bryophytes in WI. In Price County WI, Ptilidium pulche rrimum and Jamesoniella autumnalis are currently the only two recorded liverwort species for the entire county. Considering the presence of a largely untouched national forest, as well as the findings of Ashland County, adjacent north to Price County, who has documented 57 liverwort species thus far, it is predicted that there are many undocumented species of liverwort in Price County. This research project focuses on the Chequamegon Nicolet National Forest in Price County, including two ten-foot square parcels of land from which the liverworts were collected. The liverwort findings of this study will shed light on the Marchantiophyta of northern WI flora that is still largely undocumented, and build a more comprehensive understanding of plant communities in WI, thus increasing our knowledge of eco-system constituents throughout the state of WI. Liverworts of this study will be documented photographically, cataloged on the UWSP Freckmann Herbarium Bryophytes web pages for Price County, and

specimens will also be gathered for reference to be housed within the Freckmann Herbarium, located on the UWSP campus.

Phenology of spawning activities for two Wisconsin darters
Benjamin Ewoldt
Faculty Mentors: Justin Sipiorski, Biology and Daniel Isermann, CNR

The life history of two Wisconsin darter species were studied--a common species, the Blackside Darter (Percina maculata), and a species of special concern the Least Darter (Ethostoma microperca). Length (mm), preserved weight (g), and gonad weight (g) were taken for each individual specimen in the Becker Memorial Ichthyology Collection of the COLS Museum of Natural History. Age was estimated from scale annuli. Length-weight regression, and length-at-age analyses were performed to determine the size and age structure of the past and present darter communities represented in the preserved specimens. Monthly gonadal somatic index (GSI) was determined across all time periods to estimate the average time of spawning activity in both darter species over the past 45 years. High GSI in blackside darter specimens collected in the month of May indicated spawning was historically about to occur. Data collection is not yet complete for Least Darters. We will compare historical spawning dates phenologically to spawning activities of present populations. Perhaps recent, relatively warmer springs have allowed local darters to spawn earlier than historically.

Prevalence of Anaplasma Bacteria in Deer Ticks from Central Wisconsin
Katherine Arnold
Faculty Mentor: Diane Caporale

Human Granulocytic Anaplasmosis (HGA) is an infection that is transmitted though deer ticks to humans by the bacterium Anaplasma phagocytophilum. If left untreated, this infection can cause lifelong damage but is easily treated with antibiotics if caught early. For the last decade, the prevalence of the HGA agent has been increasing in Central Wisconsin. This increase corresponds to an increasing number of ticks located in Stockton and Schmeeckle Reserve, along with an increase in the prevalence of Borrelia burgdorferi, the agent for Lyme disease. Because of these steady increases, the prevalence of Anaplasma was reevaluated using deer tick DNA samples collected in 2011 from Stockton and Schmeeckle by students in the 'Techniques in Molecular Biology' course. These samples were previously tested for the presence of B. burgdorferi and again tested for the presence of Anaplasma using nested PCR and DNA sequencing techniques. In addition, over 100 samples of tick DNA collected in 2010 from Stockton and Schmeeckle were also tested for another pathogen, Bartonella henselae, the agent known to cause cat-scratch disease. These samples were all negative for this bacterium indicating that Bartonella may not be present at this time in Central Wisconsin. However, 2011 HGA results indicated an A. phagocytophilum infection rate of 18.2% (4/22) from Stockton, which was a marked increase from the previous year that was 12.2%. In contrast, only 5.4 % (6/111) of ticks from Schmeeckle Reserve were harboring Anaplasma in 2011, which was a dramatic decline from the previous year that was 19.6%. Overall, a

slight decline in the coinfection rate in deer ticks from Central Wisconsin was revealed, which was 4.5% (6/133). Reasons for these yearly fluctuations will be discussed.

Species-specificity of relationships between Belloid rotifers and bryophytes
Kevin Carlson
Faculty Mentor: Tracy Feldman

Organisms may live in close association (symbiosis), and each symbiotic partner may interact with few or many species. In this study we are asking if there is a species-specific relationship between microscopic animals called rotifers and plants called bryophytes. We collected one moss, one liverwort, and one bark sample from each of three trees in two sites in Central Wisconsin. We found many rotifers in all of our samples. To identify rotifers we collected, we extracted DNA and used DNA sequences from one genetic region of individual rotifers, comparing genes from our samples with those from other species in a DNA sequence database (GenBank). The DNA analyses are still underway. This study may help us understand the relationship between organisms living in symbiosis, and the conditions under which species become more specialized.

Survey of Blood Parasites from Red-Tailed Hawks Admitted to a Rehabilitation Center in Illinois
Lenora Dombro
Faculty Mentors: Shelli Dubay, CNR and Todd Huspeni, Biology

As top predators, raptors impact the dynamics of ecosystems and can affect prey abundance and maintain overall health of a community. Many rehabilitation programs accept injured birds and address their maladies in the hope that the birds will recover and can be released. However, the immunocompromised status of injured birds often predisposes them to parasitic infections. A large number of parasites can affect overall health and significantly slow recovery. Additionally, birds may not be as fit to survive post-release.We collected blood samples from red-tailed hawks (*Buteo jamaicensis*) admitted toWillowbrook Wildlife Center in Illinois to evaluate blood parasite loads of raptors admitted to the facility. We expect that red-tailed hawks will have large numbers of parasites given their immunocompromised status. We will compare our results to those reported in the literature for free-ranging red-tailed hawks.

Testing the Lepisosteus oculatus and L. platyrhincus species boundary in the Florida Panhandle using molecular techniques.
Heidi Hargarten, Megan Malovec
Faculty Mentor: Justin Sipiorski

The Spotted Gar (Lepisosteus oculatus) and the Florida Gar (Lepisosteus platyrhincus) have potentially overlapping distributions in the panhandle of Florida. Previous studies (Swift et al. 1977) defined that the respective ranges met at the watershed boundary between the Apalachicola and Ochlockonee Rivers. Florida and Spotted gar are sister species (Grande 2010, Sipiorski 2011) and display remarkably similar morphologies. Until recently, it has been

assumed that there has been no genetic mixing between these two species at the contact zone and that there is no overlap to the species' ranges. However, each species has similar habitat and feeding preferences and there is no fundamental observable break in the type of habitat found there. Recently, studies based on mitochondrial DNA haplotypes show that there may be evidence of ongoing migration across the contact zone and/or that the two species may hybridize in the vicinity (Sipiorski 2011). By including DNA from more individual gars of both species we expand upon previous results to preliminarily test both the proposed migration and hybridization hypotheses.

The effect of culture conditions on the bioluminescence of *Armillaria mellea*
Mara Sanders
Faculty Mentor: Terese Barta

The use of bioluminescent fungi as biosensors is a relatively new technique. Traditional methods have utilized bioluminescent bacteria for toxicity testing. The goal of this research is to develop a bioluminescence-based toxicity assay using *Armillaria mellea*. The mycelium of *A. mellea* is bioluminescent, although the mushrooms it produces are not. Experiments were conducted to determine the best medium and time period for bioluminescence of *A. mellea*. Cultures of *A. mellea* were maintained on bread crumb agar medium. Small plugs were removed from the edge of a four week old colony with a 5 mm sterile cork borer and used to inoculate flasks of potato dextrose broth (PDB) or yeast mold broth (YMB). Cultures were incubated at room temperature on a shaker at 150 rpm. Bioluminescenee was measured at days 3, 5, 7, 10, and 12 using a Modulus luminometer (Turner Biosystems). Three plugs from each broth were measured separately in tubes containing 700 ml of Ringer's solution. Preliminary results showed higher relative light units in YMB, but a more rapid peak in light output in PDB. The effect of broth pH is currently being investigated.

The Occurrence of Batrachochytrium dendrobatidis among Populations of Lithobates pipiens and L. clamitans in Wisconsin, USA
Spencer Siddons, Jaimie L. Klemish, Brooke L. Johnson
Faculty Mentors: Tracy Feldman and Erik Wild

Despite the global concern regarding the spread of Batrachochytrium dendrobatidis, the fungus that causes the amphibian disease, chydtridiomycosis, and the increasing number of studies documenting its presence and distribution, very little has been reported from the state of Wisconsin. Herein we report the results of a survey for B. dendrobatidis performed throughout Wisconsin during September 2009 and June and July 2010. Swab sampling of Lithobates clamitans and L. pipiens, two species known to be susceptible to infection by B. dendrobatidis, occurred at 50 sites representing all 24 of Wisconsin's water management units. PCR analysis of swab samples revealed B. dendrobatidis to be widely distributed in Wisconsin, infecting both Lithobates clamitans and Lithobates pipiens. Proportions of water management units, individual sites, and individual species testing positive for B. dendrobatidis will be discussed. With B. dendrobatidis being apparently widespread and common in Wisconsin, none of the frogs sampled exhibited visible evidence of chytridiomycosis, nor could any

such reports be found in the literature for the area studied in this project. The potential significance of these findings, suggestions for future research, and conservation implications will be discussed.

Chemistry

"Green" Synthesis and COSY 2D NMR Characterization of Bis(hydroxyalkyl)mercaptosuccinates Containing Varying Crosslink Densities
Garrett L. Sternhagen
Faculty Mentor: John P. Droske

Using a solventless, "green" synthesis, a series of very low molecular weight oligomers of bis(hydroxyalkyl)mercaptosuccinate were synthesized from 1,5-pentanediol, mercaptosuccinic acid, and succinic acid. The syntheses were conducted at 155ºC under an inert atmosphere using zinc chloride as catalyst. The crosslink density in cured films was determined by varying the mercaptosuccinic acid to succinic acid ratio. Prior to crosslinking, the oligomers were characterized by COSY 2D NMR to elucidate the structures of the copolymers. Excellent agreement between starting monomer concentrations and incorporated values was found. The oligomers also were characterized by FT-IR and Gel Permeation Chromatography (GPC). Oligomers were then chain extended at 155ºC and 0.100 torr to afford viscous materials that were characterized by 1H-NMR, FT-IR, and GPC. The viscous polymers were cast onto plates and cured in an oven at 110ºC in air to afford transparent to translucent films.

A novel molybdenum complex: Potential photovoltaic material?
Drew W Cunningham, Albert J. Webster, Yang Yang, Kyle Spielvogel
Faculty Mentor: Jason D'Acchioli

Photovoltaic cells hold tremendous promise as alternative energy sources—that is, of course, if we can make them. We are currently exploring the synthesis and characterization of a molybdenum(III) coordination complex, [Mo(pyridine)4F2]+, as a building block for photovoltaic materials. This presentation will highlight chemistry and spectroscopic properties of the complex, as well as its potential incorporation in organic photovoltaic frameworks.

Conformational Control of Conjugated, Organic Molecules
Qianwei Ren
Faculty Mentor: Nathan Bowling

The ultimate goal of our research is to produce conductive organic molecules. The advantage of conductive conjugated molecules as opposed to current metal conductors is that organic materials are less expensive and more flexible than the metals or silicon in use today. Moreover, organic materials can be generated from renewable resources while the world's supply of precious metals is finite.

The primary focus of our research is to generate molecules that could function as conductors and semiconductors that would be used in the manufacturing of popular electronic devices such as transistors, solar cells, and light-emitting diodes.

Collaborative Center for Chemical and Biological Mass Spectrometry
Jon Sauer
Faculty Mentor: Jim Lawrence

Chemical and biological investigators increasingly depend on data from mass spectrometers to answer complex questions in their research. However, high resolution mass spectrometers are difficult to obtain and operate. Alternatively, access to high resolution mass spectrometers can be obtained through academic core facilities, but this involves other obstacles. We have an Agilent Technologies 6520 QTOF LC MS/MS mass spectrometer capable of producing high resolution MS/MS data and providing this data to outside research groups. We use these collaborative opportunities to develop and improve our methods for sample analysis as well as train undergraduate students in sample handling, MS/MS operation and data analysis methods. Currently we are capable of identifying small organic molecules as well as the identification of proteins from SDS-PAGE gels. We are in the initial phases of experimentation with ITRAQ isobaric peptide labeling procedures coupled with 2-D liquid chromatography. By forming collaborative projects with other research groups we provide our collaborators with MS/MS data that they would be unlikely to otherwise obtain, we educate the next generation of MS/MS scientists and we have the opportunity to further develop methods for unique samples in a collaborative environment. This work was supported by the National Institutes of Health and the National Science Foundation.

Deposition of Bronze Microwires on Ultrananocrystalline Diamond (UNCD) Electrodes
Corina Grodek
Faculty Mentors: Michael Zach, Lori Lepak

Electroplate and Lift (E&L) Lithography is a new, enabling technology for electrochemically manufacturing micro- and nanowire circuit components, using simple tools. E&L is the only known technology capable of producing large quantities of patterned nanowires without requiring multiple processes in a clean room. Thus, E&L has the potential to produce significant savings, in both time and expensive chemicals. The nanowires have potential applications in sensors, medical devices, electronics, and as building blocks for novel materials that have properties that differ from traditional bulk materials.
The E&L electrode is a reusable, permanent template made of ultrananocrystalline diamond (UNCD)TM, which has been patterned by photolithography into the shape of the wires. A very thin (~ 80 nm), conductive layer of nitrogen-doped UNCD (NUNCD) is sandwiched between two insulating layers of UNCD, to use the exposed edges of the NUNCD layer as the working electrode. Although most materials deposited to date by E&L have been single elements, most engineered materials are alloys. We report the synthesis of

micro- and nanowires of controlled compositions of bronze (an alloy of copper and tin) via the E&L process. The deposition time determines the average diameter of the wires, but not their smoothness or their alloy composition. The smoothness of bronze wires depends on the deposition voltage. The effect of the relative concentrations of tin and copper in solution, upon the elemental composition of wires, is investigated using energy-dispersive spectroscopy (EDS). At copper concentrations in solution above 20%, the resulting wires are composed of over 90% copper. Over the solution composition range of 0-10% copper, wires have been produced over the range of 0-80% copper

Determination of the Compostability of Polymer Samples by Plant Analysis: Seedling Emergence, Seed Germination, and Dry Tissue Plant Analysis
Ashley Orozco
Faculty Mentors: Robert Michitsch, John Droske

Over the years, growing media (or soil for plant growth) has been contaminated with various plastics and polymers that contain phytotoxins which cannot break down over time. A research group at UWSP has been able to synthesize a polymer that can degrade over time if subjected to appropriate composting conditions. However, it is uncertain how this polymer-containing compost affects plant seedling emergence, seed germination, and nutrient uptake. Based on the literature and other studies, there seems to be no set standard way of performing plant, soil media, and mixture concentration analyses to assess to the compost. In this research, several known standards were 'hybridized' to consolidate all the information into one concise method. Qualitative analysis of morphological appearances was added, as well as future quantitative analysis of nutrient content in dry plant tissues. This research is currently being conducted, but some significant observations have been made over the past couple of months. The polymer-containing compost may not have been fully matured, for there were some mold issues within the growing media for the seedling emergence test and the seed germination trial. Also, the timing of observations for both the seedling emergence and seed germination tests should have been taken earlier than the standards suggested, which may also be dependent on plant species. To date, the polymer-containing compost samples have been affecting plant growth negatively compared to their controls. However, the data gathered will be used to establish a modified standard method for determining the compostability of polymer samples.

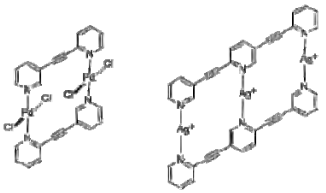
Electrochemical Deposition of Patterned Micro- and Nanowires on Prototype Templates
Anne Llinas
Faculty Mentors: Michael Zach, Lori Lepak

Electroplate-and-Lift (E&L) lithography has been developed as fast, simple, scalable technique for the controlled, solution-based, electrochemical synthesis of patterned metallic and semiconducting nanowires. E&L is the only known method for quickly mass-producing patterned nanowires, which requires vacuum and clean room processing only during the initial fabrication of the template. In this work, we report a new process for fabricating templates which are

functionally similar to the original E&L diamond substrates, but are made entirely outside of a clean room.
As in the standard E&L templates, the simplified templates use a lithographically patterned insulating/conductive/insulating film structure to control the diameter of electroplated wires, by confining wire nucleation to the edge of a thin conductive layer. Classic E&L templates alternated insulating ultrananocrystalline diamond (UNCD) with conductive nitrogen-incorporated UNCD (NUNCD). Production of the UNCD template required three days of cleanroom work, two of them depositing UNCD using a high-temperature, high-vacuum, energy-intensive process.
The non-UNCD substrates, although lacking the extreme physical and electrochemical stability of UNCD, may be made in a single day, without the clean room process -- far more quickly and energy-efficiently than UNCD templates. In the non-UNCD templates, the base insulating layer was made of SU-8, a spin-deposited plastic. The conductive layer was made of copper, and capped with another spin-deposited plastic, Shipley 1805 photoresist. Patterns were defined lithographically, and wet-etched to expose edges of the copper layer. As a proof of concept, lead microwires were electroplated from aqueous solution.

Generation of Pyridine-Containing, Conjugated Oligomers
Casey Biebel, Alyce Ruhoff
Faculty Mentor: Nathan Bowling

The goal of our project is to create conjugated organic molecules that could be used in functional materials. Conjugated systems of two and three pyridine rings, prepared primarily by Sonogashira coupling reactions, offer the possibility of ladder-like conjugated structures. Metals that bind to pyridine rings on two different unsaturated backbones a) function as bridges that allow electronic communication between conjugated chains, and b) create pores that could be used in nano-filtration applications.



Germanium Catalyzed Polymerization of Lactide to PolyLactic Acid
Syngen Grede, Amanda Nevins
Faculty Mentor: Robin Tanke

The synthesis of new Germanium IV and II catalysts for catalyzing lactide to polylactic acid (PLA) will be described. Lactide, 3,6-Dimethyl-1,4-diaxone-2,5 dione, is polymerized with the Germanium catalysts in dry degased toluene is using ethanol to help promote the reaction. Our best conversion to polymer was

obtained with 0.03 equivalents of catalyst and ethanol to 1 equivalent of lactide and heating at 93 0 C for in toluene for 15 days.

Hydrogen Production from Group VIII Transition Metal Complexes
Brittany Schreiber, Greyson Waldhart
Faculty Mentor: Jason D'Acchioli

As the world's petroleum resources continue to be depleted, researchers are charged with the task of making efficient use of those resources. One efficient use of petroleum feedstocks is the synthesis of homogeneous organometallic catalysts. We propose the investigation of several complexes of the form RMLn (R=η5-cyclopentadienyl, η5-indenyl; M=Fe, Ru, Os; Ln=(CO)3) for use as water-gas-shift reaction catalysts. Prior investigations from our laboratory show the complex [(η5-indenyl)Ru(CO)3]+ is active in a water-gas-shift cycle. We propose exploring the catalytic role of the aforementioned RMLn complexes in a quantitative way through gas chromatography-mass spectrometry; the Os analogues have not been previously isolated. If successful, our investigation will have revealed a new generation of water-gas-shift reaction catalysts; in the case of [(η5-indenyl)Ru(CO)3]+, the catalyst is active at ambient conditions, even in the presence of air.

On the Nature of the Electronic Structure of π-allyl complexes
Greyson W. Waldhart, Brittany M. Schrieber, Albert J. Webster
Faculty Mentor: Jason D'Acchioli

The natural electronic charge of metals and the η3-π-allyl ligand are discussed for a sampling of transition metal complexes coordinated with a η3-allyl group. Density functional theory calculations utilizing a variety of popular exchange-correlation functionals and basis sets, coupled with the Natural Population Analysis method of Landis and Weinhold, reveal the allyl moiety to carry more negative charge than the metal. This was found through a series of averages due to the extreme amount of data collected. Our results from this computational experiment find a solution to a problem with the so-called 18-electron rule. The problem exists in which charge to assign the η3-allyl ligand: negative, positive, or neutral. Due to our data showing that the allyl moiety natural charge is more negative than the coordinated transition metal, we suggest that the proper way to account for the η3-allyl ligand when counting electrons is to give it a charge of negative one.

Synthesis of Biodegradable Crosslinked Copolymers
Timothy J. Rushmer
Faculty Mentor: John P. Droske

Polylactic acid is a biodegradable plastic that is finding increasing use in applications from disposable cups and clear plastic food containers to arterial stents and bone scaffolds. Polylactic acid has a relatively low glass temperature which limits its use compared to polyethylene terephthalate (PET, recycling code #1), a widely used polyester that is not biodegradable. In an effort to raise the use temperatures of biodegradable polymers, work in our research group has focused

on the synthesis of aliphatic polyesters that contain crosslinking groups. Crosslinking typically results in increased thermal transition temperatures and improved mechanical properties due to the formation of stable carbon-carbon bonds, but these bonds also complicate and can interfere with biodegradation. To affect crosslinking while maintaining the possibility of biodegradation, we have employed disulfide linkages, the crosslinking groups found in proteins. This poster will present our efforts to prepare copolymers of mercaptosuccinic acid (MSA) and diols with other comonomers. The copolymers were characterized before and after crosslinking by Differential Scanning Calorimetry (DSC), Gel Permeation Chromatography (GPC), FTIR, and HNMR, and all were consistent with the formation of the desired copolymers.

Computing and New Media Technologies

Project Orion: Using distributed computing for education
Ambud Sharma
Faculty Mentors: Quan Yuan, Trudi Miller

IT infrastructure is expensive especially hosting servers and datacenters, also failure of servers in datacenter leads to downtime, interruption in work and loss of productivity. In a high education framework like university or college, the requirement of computing resources and central computing facilities like file-store, e-Learning solutions, and compute requirements for applications like rendering etc. is very high. This research presents our experience on designing and implementing a commodity cluster based distributed system using existing university infrastructure and resources. Our research focuses on a scenario for use of commodity hardware based computer cluster for file storage and sharing for e-Learning in classrooms. We utilize Apache Hadoop to provide a scalable distributed redundant storage as well as distributed processing framework running on unused lab machines. Our system provides roles based access to the file store using Kerberos authentication and a Java based client along with ability to share files with other users. The system also incorporates a web based cluster monitoring utility tailored for Apache Hadoop for administrators to monitor system usage and performance. Implementing this system we found that such a system is really helpful as an e-Learning solution and is capable of replacing centralized data-stores with highly distributed data storage system that is highly fault tolerant and offers high bandwidth.

English

"A Unique and Valuable Educational Model": Cornerstone Press, a Student-Staffed Publishing House
Jenna Hulke, students in English 349
Faculty Mentor: Per Henningsgaard

Cornerstone Press is a publishing house that was established at UWSP in 1984. This small business acts as a stepping stone for aspiring authors and has produced books from almost every genre including but not limited to: fiction, nonfiction, guidebooks, poetry, young adult, and a new historical fiction. This publishing house is staffed by students who are elected into positions within the publishing house. Within 16 weeks they select a manuscript out of many submissions and edit, design, produce, and market the finished product. This extensive process is accomplished through student involvement, allowing Cornerstone Press to be self-sustaining with a small profit. Cornerstone Press, to date, has published 32 titles, and each book produced has approximately 1,000 copies made and distributed. This small publishing house is unique due to its student dependence, small staff size, and high quality of material. Cornerstone Press provides valuable experience to both aspiring writers and the students who participate in publishing its titles. It represents a unique and valuable educational model that could be adapted by other educational institutions.

Foreign Languages

A Comparison of National Water Management Frameworks: United States and Germany (European Union)
Aaron Marti
Faculty Mentors: Tobias Barske, Richard Ruppel

This project is part of research completed during two weeks of participation in the Transatlantic Program: Youth Technology Leaders- Water Management (TAP-YTL) coordinated by the German-American Chamber of Commerce in Fall 2011. This program brought together twelve young scientists and professionals from across the United States to meet with leading experts in water management throughout Germany. This study sought to compare the fundamental national policies of the United States and Germany related to water management. Water policy is important in guiding the management actions of field professionals in managing lakes, rivers, and streams around the world. These policies are often determined by political structures and define the goals and desired outcomes of management. The European Water Framework Directive (EWFD) functions as the fundamental basis of German water management policy, whereas United States water management is guided through the provisions of the Clean Water Act. Both systems were compared through a literature review for this study, as well as discussions held during TAP-YTL . EWFD standards placed emphasis on the ecological integrity of aquatic ecosystems based on biotic, physical, and chemical factors. These standards differ from water quality standards in the

United States which focused on an anthropocentric-based designated use for the water body, with namely chemical and physical water quality criteria needed to be met for the use. These and other comparisons presented in this study will allow water managers as well as political leaders from both nations to consider strengths and weaknesses of their current approaches and apply this knowledge to improve their own ecological management and protection of this important natural resource.

Geography and Geology

A diagnostic key for the identification of common Paleocene fossil plants based on leaf morphology from the Sentinel Butte Formation, Almont, North Dakota locale

Rebecca Eiden, Paul Fix, Chelsea Schuett, Kelli Sutherland
Faculty Mentors: Ray Reser, Pat Zellmer

The University of Wisconsin-Stevens Point holds a vast collection of plant, fruit, and nut fossils from the Sentinel Butte Formation near Almont, North Dakota. The Almont Site has yielded one of the World's most ecologically diverse and well-preserved collections of fossils from the late Paleocene Epoch, c. 65 million years ago. This site has now been completely exhausted, making the UWSP collection unique. The plant fossils were preserved within an oxbow lake in siliceous non-marine shale. Exceptional leaf specimens from the UWSP collection exhibiting clear anatomical structure were photographed for this poster and for inclusion in an online world-wide Paleocene botany project. This dichotomous key for twelve reoccurring plant species found in the UWSP collection was created using distinguishable diagnostic botanical traits. Because many of the leaf fossils from the Almont Site are fragments, attributes such as the leaf shape, margin, venation, and leaf arrangement evident in the fossils were used when possible. The key is intended for lab use, and as a valuable accessioning tool. The key and poster will be included as informational signage in a new Almont fossil exhibit within the UWSP Museum of Natural History.

Aspen regeneration in Yellowstone National Park 2001-2010

Daniel Teeters
Faculty Mentor: Eric Larsen

The status of aspen (Populus Tremuloides) on Yellowstone National Park's northern range has been a resource issue of concern to scientists and park managers since the 1930's. A decline in overstory stem replacement has been noted since at least the 1930's, with various theories proposed for the loss of stems and canopy coverage. These theories include climate change, alterations to wildfire frequency and intensity, and the decline of elk browse pressure on aspen caused by the 1995 reintroduction of the timber wolf (Canis lupus) into the YNP ecosystem. For 13 years we have measured 113 aspen stands on Yellowstone's northern range, focusing on ramet density, height, and browse pressure. At the aspen stand level, we have observed a variety of aspen responses over the 2001-

2010 period, with some stands generating replacement overstory stems for the first time in decades while other stands continued to be heavily browsed on an annual basis. The relationship between browsing pressure and aspen overstory stem recruitment forms the basis of this study, and the research is significant since it is the longest running and most spatially diverse aspen study in the post-wolf reintroduction era for Yellowstone National Park.

Identification of Future Residential Land Use Areas in Marshfield, Wisconsin

Daniel Gilbert, Randy Ebbe, Bryant Long
Faculty Mentor: Ismaila Odogba

Land uses are a major factor in urban economic growth and development given that land use patterns contribute to the desirability and productivity of urban areas. This project involves identifying future residential land use areas within the city of Marshfield, Wisconsin. Adopting the basic suitability analysis approach used by planners (i.e., the process of determining the fitness of appropriateness of a given tract of land for a specified use), we use Geographic Information System (GIS) to create a Residential Land Use model that simulates the workings of the housing market. The model uses criteria such as development cost, land cover, spatial proximity to urban infrastructure, and site quality to provide a set of decision criteria which can be used to assign residential land uses to particular locations within the city of Marshfield, WI. Based on the allocation model, the identified areas are the most suitable locations for residential land uses that will positively influence the quality of life and the overall growth of the city of Marshfield.

Key for identifying common fossil seeds, nuts, catkins, fruits, and flowers from the Almont, North Dakota, collection site

Brandon Cope, Jessica Frankulin, Cassidy Kohlhagen, Audra Neumann
Faculty Mentors: Ray Reser, Pat Zellmer

Reproductive structures may be the only remnant of a plant that fossilizes. It may take centuries for researchers to associate seeds or flowers with leaves of the same plant. The UWSP Almont Paleofossil Collection contains the most comprehensive assemblage of plant fossils from Almont, North Dakota. This collection includes some of the oldest records of maples, dogwoods, members of the buttercup family, and some of the earliest angiosperm reproductive structures (flowers, catkins, fruits, seeds, and nuts). The site and its associated collection comprises one of the world's most extensive taxonomic representations of Paleocene life, and is crucial in piecing together the evolutionary history of plants and trees. The value and significance of fossils collected from this small site, part of the Sentinel Butte Formation (Fort Union Group), is heightened because the site has recently been exhausted through quarrying and looting. As a work-in-progress, students in the Paleofossil Lab who are currently accessioning Almont specimens have developed this key as an aid for recognizing the various reproductive structures within the collection (seeds, nuts, catkins, fruiting bodies, and flowers), identifying the common species by the reproductive structures

found in the some of the Almont specimens, and as a means of discovering potential botanical holotypes within the collection.

The City of Marshfield, Wisconsin: Future Commercial Land Use Areas
Sam Schroeder, Jacob Halliday, Eric Vanbeck
Faculty Mentor: Ismaila Odogba

The desirability or productivity of urban areas to a large extent is determined by land use patterns. For this project, we identified future commercial land use locations within the city of Marshfield, Wisconsin. Based on criteria such as development cost and site accessibility which influence commercial development, we used Geographic Information System (GIS) to development a Commercial Land Use Model that allocates commercial uses to particular locations. Next, we carried out a qualitative assessment of the locations generated by the model to determine compatibility with land use regulations, the future land use map, and adjacent land uses. Based on qualitative analysis, the selected locations will maximize the economic and productivity potential of commercial uses within the city Marshfield, WI.

History

Making Up Whiteness: Cosmopolitan Cosmetics in the U.S. and Japan 1920-1939
Jacquelynn Boeck
Faculty Mentor: Valerie Barske

"Make up" became a popularly accepted phrase to describe cosmetics by 1920. The phrase proves especially poignant when used in global marketing of "whiteness." I propose a poster presentation that will examine advertising images by cosmetics companies through the lens of "whiteness" as constructed in the trans-imperial context between the United States and Japan 1920 to 1939. In this comparative project, I employ a working definition of "whiteness" as a theoretical and racialized construct negotiated by imperial powers and thus intrinsically linked to ideals of modernity and dominant trends of progress. Drawing from this theoretical framework of "whiteness," I will explore advertisements published in popular venues including The New York Times, Vogue and Shiseido Graph by international cosmetics companies such as Ponds and Shiseido. The complexities of a globally marketed definition of beauty must be understood within the dimension of race. This study attempts to examine critically the category of "whiteness" as a racial construct sold as attainable by everyone through the use of cosmetics. White, soft skin became a beauty ideal with appeal worldwide. The skin became less a part of the human body and more an extension of the self, like an accessory. However, racially non-white women could never overcome their racialized category to become fully white and consequently "modern." In Japan, Shiseido grappled with the global discourse of beauty in connection to larger imperial goals by deploying beauty experts to Japan's colonies in much the same way troops were deployed by the military. In

both the U.S. and Japan, women were especially targeted to embody beauty and modernity for their respective imperial nations.

Physics and Astronomy

A novel approach to measuring the tension of freestanding liquid-crystal films
Tim Twohig, Logan Besaw
Faculty Mentor: Mick Veum

Our research involves studying the surface properties of smectic liquid-crystals as a function temperature. Liquid crystals are compounds with fluid-like properties similar to liquids, but whose molecules organize in a crystal-like fashion. The particular substances we study can be prepared as stable films without the support of a substrate (reminiscent of a soap bubble on a ring). The films, which can be as thin as two molecular layers, provide great systems in which to study the properties of fluid surfaces. We are in the final stages of developing an experiment to study film tension as a function of temperature. The tension properties of such a film can be probed by monitoring the pressure difference necessary to inflate a film to a given radius (like a soap bubble). We are currently developing a feedback system that will use the position of a reflected laser beam to hold the radius of the bubble at a constant value. Doing so, while varying the temperature, will allow us to monitor the tension as a function of temperature. We will present the details of the instrument, the state of our progress in building the instrument, and our overall research goals.

An Ultrasensitive Laser Interferometer for Detecting Motion with Picometer Resolution
Edward Lynch
Faculty Mentor: Palash Banerjee

We report on the development and calibration of an ultrasensitive laser interferometer designed to detect the vibrations of a mechanical oscillator with picometer resolution. This work has important implications in detecting motion in micrometer scale mechanical oscillator systems, such as thin membranes or cantilevers which are used as nanoscale force sensors. The interferometer is calibrated using the motion of a piezoelectric membrane, which acts like a moveable mirror. The intensity of laser light at the output of the interferometer is a sensitive function of the membrane position. We have developed a simple theoretical model to explain the interferometer output as a function of membrane position. Initial experiments show that our interferometer can track changes in the membrane position with a resolution of ten picometers which is ten times better than typical atomic dimensions. We will present results from both our experiments and the theoretical model, show the position resolution of our interferometer is fundamentally limited by photon shot noise, and discuss ways to improve on this limit.

Calibration of Instruments to Measure the Surface Tension of Liquid Crystals
Chris Woitula
Faculty Mentor: Brad Hinaus

An experimental apparatus has been built to blow a liquid crystal bubble and measure its surface tension. The surface tension can be determined by a measurement of the bubble's radius and the pressure difference between the inside and the outside of the bubble. The radius is determined from a digital image by fitting a circle to the bubble's edge and comparing its fit to an object of known size. Measuring the radius of a liquid crystal bubble with a known surface tension allows for a calibration of the instrument's output voltage to the actual pressure difference. From our calibrations, we can measure pressure differences as small as 1 mtorr and measure the radius of the bubble to an accuracy of 10 microns.

Computer Simulations of "Backward" Optical Electromagnetic Waves in Negative Index Materials
Kyle Leaf, Edward Lynch, Orry Griffin, Justin Flasch
Faculty Mentors: Chris Verzani, Alexander Popov

The objectives of this effort are to improve the fundamental understanding and numerically simulate properties and potential capabilities of novel electromagnetic materials. This research provides a venue to study the theory of Negative Index Materials (NIM's), and backwardness of optical electromagnetic waves. Three and four wave mixing techniques have been considered to compensate for energy losses in NIM's. The educational component of this project introduces nano and device technologies to our students. Special focus is placed on incorporating students into comprehensive computer-enhanced research. We present results from computer simulations of theoretical optical models using Matlab 7.3. Using source code from Matlab, we have generated movies illustrating how the transmission factor for a backward wave and output idler change as parameters in the source code are varied. Also, graphical user interfaces (GUI's) have been constructed, which allow parameter values to be entered into a GUI, and view a graph showing how the transmission factors change as parameters are changed.

Exploration of Oxide Semiconductors for Photoelectrochemical Water Splitting
Skylor Schermer
Faculty Mentor: Ken Menningen

Photoelectrochemical (PEC) water splitting is a process by which water is split into hydrogen and oxygen by means of electrons that are energized by light absorption in a semiconductor. The hydrogen gas is a valuable and clean fuel for either combustion or conversion to electricity via a fuel cell. We present findings on the viability of several iron-tungsten oxide semiconductors for PEC hydrogen production. Samples of Fe_(2-2x) W_x O_3 were prepared for x={0, 0.33, 0.5, 0.67, 1} by sintering pellets made from powder mixtures. The semiconductor

band gap and positions were estimated by using photocurrent spectroscopy and Mott-Schottky analysis, respectively. Preliminary results will be presented and evaluated in the context of competing PEC water splitting efforts.

Feedback system to control the dynamics of a microscopic mechanical oscillator
Alex Kent
Faculty Mentor: Palash Banerjee

We are building a torque magnetometer that will use small micrometer sized mechanical oscillators to measure the magnetic properties of microscopic structures. Changes in the magnetization lead to slight changes in the frequency of vibration of the mechanical oscillator. To keep track of these changes, we are designed a feedback system to control the dynamics of the oscillator. The feedback control system is based on treating the oscillator as being equivalent to a mass-on-a-spring. In this approach, the behavior of the oscillator is entirely determined by its resonant frequency, its stiffness and the damping in the system. The oscillator is driven at its resonant frequency by applying a series of carefully timed pulses. By adjusting both the width and duration of these pulses, we are able to precisely control the dynamics of the oscillator. We will discuss a practical implementation of this feedback scheme, present some of the experimental challenges and show preliminary data that indicates that our feedback scheme works well to control the dynamics of a thin membrane.

Hα Reduction of Large MOSAIC Images of Galaxy Groups
Benjamin Hendrickson
Faculty Mentor: Adriana Durbala

We outline a reduction process for images taken in Hα and R/r (red) filters at Kitt Peak National Observatory with the WIYN 0.9m telescope using a MOSAIC CCD camera. The work is developed in the context of the project entitled ”An Hα Survey of Star Formation in the Undergraduate ALFALFA Team Groups and Clusters”, which involves several universities. Rigorous notes were taken throughout the reduction process and were ultimately turned into a “cookbook” for Hα reduction of large MOSAIC images. The “cookbook” will serve as a guide to other ALFALFA undergraduate students dealing with Hα images of galaxies, groups and clusters of galaxies. Our visual band observations will complement a radio survey of the same groups (done with the Arecibo telescope in Puerto Rico).

Long-Term Perturbations in Earth’s Orbit
Logan Besaw, Adam Buck
Faculty Mentor: David Tamres

Newton's Law of Universal Gravitation, applied to the Sun/Earth system, predicts a constant elliptical orbit for the Earth. However, the Earth is subjected not only to the gravitational pull of the Sun but also to the gravitational pull of the other planets in the solar system. Our goal is to examine the perturbative effects of the larger planets on Earth's orbit by means of long-term numerical calculations. We

have found evidence of periodic variations in certain orbital elements of the Earth.

No evidence for a systematic FEII emission line redshift in type 1 AGN
Zachary Meadows
Faculty Mentors: Sebastian Zamfir, Jack W. Sulentic, Instituto de Astrofisica de Andalucia, Granada, Spain, Paola Marziani, Osservatorio Astronomico di Padova, Italy

We test a recent claim by Hu et al. (2008) that the broad FeII emission in Active Galactic Nuclei shows a systematic redshift relative to the local source rest frame and broad-line Hβ. We compile high s/n median composites using Sloan Digital Sky Survey (SDSS) spectra from both the Hu et al. sample and our own sample of the 469 brightest SDSS (Data Release 5) spectra. Our composites are generated in bins of FWHM Hβ and FeII strength as defined in the 4D Eigenvector 1 (4DE1) formalism. We find no evidence for a systematic FeII redshift and consistency with previous assumptions that FeII shift and width (FWHM) follow Hβ shift and FWHM in virtually all sources. This result is consistent with the hypothesis that FeII emission arises from a broad-line region with geometry and kinematics the same as that producing the Balmer lines.

Simulating the Critical Current of Superconducting Junctions
Sean Madderom
Faculty Mentor: Brad Hinaus

The region where two superconducting crystals make contact with one another is called a superconducting junction. The current that can flow through the junction without energy loss, called the critical current, is especially sensitive to the size of the magnetic field and the distribution of magnetic field along the junction and within the crystals. In an attempt to model experimental results, we use numerical simulations to calculate the critical current across the junction when there is a uniform field in the junction and a non-uniform field trapped in the crystals as magnetic vortices with a distribution determined by the Bean critical state. We find that as the vortices move further into the crystals, the maximum critical current decreases which matches the general trend of the experiments.

Psychology

Counseling Psychologists' Use of Positive Psychology At Work: A Survey
Nancy Eriksson, Jada Butler, Sheng Lor, Ashley Majewski, Angelica Ransom
Faculty Mentor: Jeana Magyar-Moe

A hallmark of the counseling psychology profession is focusing upon the positive in psychology. Indeed, a distinctive feature and unifying theme of the work of counseling psychologists is a focus on client strengths, assets, and potentialities regardless of degree of psychopathology (Gelso & Fretz, 2001). A content analysis of 4 major outlets of counseling psychology scholarship aimed at

identifying the amount of research devoted to the study of human strengths, positive processes, and positive outcomes over the past 50 years revealed that 29% of the research in counseling psychology guild and theme journals was positive-focused, indicating that counseling psychology's philosophical commitment to studying the best in people has resulted in a large scholarly base fairly consistent throughout the decades (Lopez et al., 2006. The current study was developed in order to further elucidate the role of positive psychology in the work being done by counseling psychologists in areas beyond the research domain. More specifically, 480 members of the Society of Counseling Psychology of the American Psychological Association completed a survey which assessed their perceptions of positive psychology and the ways in which these professionals apply (or fail to apply) positive psychology in their work as scholars, teachers, and clinicians. Results indicated that 47% - 77% of the counseling psychologists who completed the survey are using positive psychology in their various work roles about half of the time or more. More specifically, research in positive psychology was endorsed at the lowest rate (47%) and positive psychology applied to vocational assessment was endorsed at the highest rate (77%). Additional findings and the implications of these findings are also addressed.

Do women's feelings of attractiveness and clothing choices change over the menstrual cycle?
Jamie Linberg, Stacie Ferg, Elly Keily
Faculty Mentors: Jody Lewis, Karin Bodensteiner

Durante, Li, and Haselton (2008) had women draw outfits of what they would wear to a social event, once during a low fertility day and then once on a high fertility day, and took a photograph of what they actually wore to both sessions. They discovered that when women were close to ovulation they wore and drew more revealing outfits. Inspired by this research, we wanted to investigate how women dress during ovulation, compared to the rest of their cycle by asking participants to choose an outfit using an online avatar program. The participants were University of Wisconsin-Stevens Point women who are enrolled in Psychology 110 and completing the study for their required research credit(s). Participants were asked to choose an outfit as "if they were going to attend a party at a friend's apartment with lots of single attractive people" for 35 days. After creating the avatar, the women were asked to email the avatar picture and the answers to a 4 question survey. Our hypothesis was that women (who are not on birth control) will have a higher amount of exposed skin in their outfit selections, and will report higher levels of attractiveness, when ovulating versus other times during their menstrual cycle.

Effects of Recruitment Language in Video Game Research Outcomes
Jonathon Wutke, Denise Calhoun
Faculty Mentor: Patrick Conley

Recently, video game and cognition research methodology has come under criticism as either explicitly or tacitly having sought out video gamers for their studies and thus skewing the results (Boot, Blakely, & Simons, 2011). We

attempted to address this issue by recruiting two separate groups of experimental participants. The first group was solicited, as in previous studies in our lab, to participate in a "Video Game and Visual Search Study." The second group was recruited, in a later term, to participate in a study titled, "The Effect of Prior Experience on Visual Attention." Both groups were presented with identical questionnaires and experimental stimuli. The results supported Boot et al.'s (2011) contention that explicitly recruiting for "video game" studies has the potential to bias the sample. Specifically, not mentioning video games in the experimental advertisement resulted in a sample that was less experienced in video gaming. While this lessened experience did not change the most important variable effects in our study, many lesser effects disappeared with the less experienced sample. Our results clearly demonstrate that recruitment for this type of study must be handled carefully in order to minimize potential biasing of the research sample.

Evaluation of a Decision Aid for Bariatric Surgery
Brittany Iczkowski, Alissa Nicolaison, Shirley Smith, Ashley LaFond
Faculty Mentor: Angela Lowery

Decision aids are resources that enhance decision-making by reducing decisional conflict, increasing decision satisfaction, and increasing knowledge. The purpose of this study was to evaluate the effectiveness of a decision aid for bariatric surgery. Participants of the study were undergraduate students at the University of Wisconsin-Stevens Point. Participants were asked to make a treatment decision as if they were a patient considering bariatric surgery using either the decision aid or a comparison pamphlet. Decision aid effectiveness was determined by questionnaires that assessed decisional conflict, satisfaction with decision, and knowledge of bariatric surgery. Results of the study showed the decision aid to be an effective decision-making tool, though not significantly more effective than a standard pamphlet. The decision aid significantly decreased decisional conflict, increased decision satisfaction, and increased knowledge of bariatric surgery options.

Let's do it for us! High-identifiers support counter-normative behavior to improve the future ingroup's environmental prospects
Morgan Schmelter, Rebecca Wood, Chelsey DeSantos
Faculty Mentor: Mark Ferguson

The social norms approach to sustainable behavior (e.g., Cialdini, 2012) suggests that increasing the salience of pro-environmental norms increases willingness to perform sustainable behavior. This approach is based on two key assumptions: 1) that ingroup members will generally conform to norms regardless of group identification; and 2) that present-day ingroup norms matter more than future norms for encouraging sustainable behavior. The present study examines the possibility that high-identifiers will be more willing to perform sustainable behavior when learning that future ingroup norms will be unsustainable than when they learn that future norms will be sustainable. Ninety-eight UWSP students participated in the study. We measured ingroup identification and then randomly-assigned participants to one-of-two conditions. Participants learned

that, in five years, UWSP students' daily activities would generate either a low or high degree of carbon emissions. We then measured willingness to perform five types of sustainable behavior. The findings show that high-identifiers are sometimes more willing to perform sustainable behavior, particularly when they learn about the future UWSP students will emit high levels of carbon emissions. No differences emerged for low-identifiers. These findings suggest that high-identifiers can be motivated to engage in counter-normative behavior when doing so would improve the future ingroup's environmental prospects.

Persuading college students to adopt a flexible view of intelligence
Michelle Hayden, Alissa Nicolaison, Katelynn Kinas
Faculty Mentor: Jody Lewis

College students can have one of two main theories of intelligence, fixed or flexible. Fixed intelligence suggests that people are born with certain abilities and limits to those abilities. Flexible intelligence, however, proposes that intelligence is a lot like a muscle—the more you work at it the stronger it becomes. In other words, flexible intelligence states people can change/better their level of intelligence by taking the time to work at it. In this study we used articles on topics in psychology and group discussion to manipulate college students' views on the nature of intelligence. This study had three groups; two control groups (discussion control group, and no-discussion control group) and one experimental group. Students in the experimental group were asked to read an article which discussed the flexible nature of intelligence. Our hope was that after reading the article students would be persuaded to take on a flexible view of intelligence. The discussion control group was identical to the experimental group except they read an article about the idea of multiple intelligences. The no-discussion control group was asked to complete a lengthy packet of psychological assessments and a demographic survey. We hypothesized that our experimental group would have a more flexible view of intelligence, and therefore increased levels of grit and self-efficacy. We also explored which psychological assessments correlated with a student's desire to finish college.

Religiosity and Eating Behavior
Ashley Majewski, Lauren Golla
Faculty Mentor: Angela Lowery

The purpose of this study was to determine if the presence or absence of religious beliefs and practices influenced eating behaviors. To determine this we collected survey responses from 174 students at the University of Wisconsin-Stevens Point. Each student participant was asked to complete 4 separate measures that examined the participant's faith, belief in God, Religiousness, and eating behavior. We used the Religiosity Measure Questionnaire, the Religiousness Measure, the Dutch Eating Behavior Questionnaire, and the EAT-26 Questionnaire. Each survey was scored and entered into SPSS for analysis. Using a One-Way ANOVA we found that those who believed in God reported significantly less frequent vomiting than those who did not believe in God [$F(1,172)= 14.068$, $p<.01$]. We also found that those who believed in God reported consuming fewer pills for dieting purposes than those who did not believe in God

[F (1, 172)= 22.545, p<.01]. We also performed a One-Way ANOVA and found that those who reported their faith as Christian or Non-Christian reported significantly less frequent vomiting [F (2,171)= 3.395, p<.05] and consumed fewer pills for dieting purposes [F (2, 171)= 5.118 , p<.01] than those who answered "not applicable" for their religious belief. This study had limitations that may have had an effect on the outcome of the results. These limitations include a small group size and a lack of diversity in regards to age and demographics. Aside from these limitations, the results of this study do suggest that there is a relationship between no faith or no belief in God and increased incidents of vomiting and pill taking. Further research should look more closely at these relationships with a larger, more diverse population.

What do we feel guilty about? The unique effects of carbon feedback on personal and collective guilt

Victoria Flanagan
Faculty Mentor: Mark Ferguson

Previous research shows that carbon feedback can motivate people to reduce carbon emissions. The present research examines two possible mediators of this effect: guilt about one's personal emissions or guilt about an ingroup's collective emissions. In two studies, 345 participants completed a carbon calculator and received false feedback about their personal (low, high) and collective (low, high) carbon emissions. They then completed measures of personal and collective guilt, as well as willingness to perform sustainable behavior. In both studies, carbon feedback did not influence willingness to perform sustainable behavior. However, feedback did influence collective guilt—participants who learned that fellow university students emitted more than themselves reported the highest levels of collective guilt. A complex pattern emerged for personal guilt. Moderated mediation analyses suggest that feedback influences willingness to perform sustainable behavior indirectly, by eliciting personal or collective guilt.

Oral Presentations 4:00–4:50pm

Science Building (A-wing) 1st and 2nd floor

Group 9 – Room A106, 4:00-4:50pm

Moderator: Rob Harper

Nicaragua in the American Mind
Scott Helgeson,
Faculty Mentor: Rob Harper, History

The writings of nineteenth-century anthropologist Ephraim George Squier stripped the Miskito of their indigenous identity, emphasizing instead their African heritage and "blackness." Squier's descriptions shaped outsiders' perceptions of the Miskito for over a century. Recent scholarship has questioned the credibility of Squier's other work, but has largely neglected his writings on Nicaragua and the Miskito. This paper will address two interconnected research questions. First, how did Squier's descriptions of the Miskito compare to popular thought and the political rhetoric of his contemporaries? Second, how did Squier's writings influence subsequent U.S. foreign policy in Nicaragua?

Freemasonry and African American Inclusion in the Revolutionary America
Tammy Hanson
Faculty Mentor: Rob Harper

Prince Hall's charter to establish the first all-African Freemasonry Lodge in America created a gateway for talented and intelligent African Americans to develop a strong fraternal alliance that allowed their inclusion into many arenas of American life that were originally restricted to whites. Through the adoption and practice of their own set of Freemasonry laws and customs, African Americans were able to better understand U.S. policies and politics, which allowed them to share a sense of American Nationalism with their white Masonic brothers. Directly before and for 50 years after the Revolutionary War, African Americans who were literate and loyal to the credo of a free and "just" republic were largely welcomed as a part of Freemasonry. Only in the late 1800s did white Freemasons begin to challenge the legitimacy of the African American lodges.

Group 10 – Room A207, 4:00-4:50pm

Moderator: John Droske

Aulonemia rubraligulata and A. david-smithii: Two new bamboo (Poaceae: Bambusoideae) species from Peru

Eric Geisthardt, Christine M. Waas
Faculty Mentor: Emmet Judziewicz, Biology

Aulonemia rubraligulata and A. david-smithii, two related new bamboo species collected from Peru, will be both described and illustrated. For both species, several spikelets were dissected and morphological characteristics were measured and documented. The abaxial leaf surfaces was examined using a Hitachi S3400 scanning electron microscope (SEM); the SEM images of both species showed four prominent branched papillae overarching sunken stomates and similar conical prickles. Aulonemia rubraligulata is known from four collections made at elevations of 1800-2200 meters, in grassland to primary forest. It is distinguished from its congeners by its extremely narrow culms (8 m long, 3 mm in diameter), large red inner ligules (20-45 mm long), numerous small spikelets (14-24 mm long, 1-2 mm wide) each with 5-8 florets, and small narrow foliage leaves (15-20 cm long, 1.2-2.3 cm wide). Aulonemia parviflora, a possibly related species, also has a slight red/brown color to its ligules. However its ligules are larger (40-80 mm long), it has larger leaves (up to 52 cm long, 5.8 cm wide), and its spikelets are much longer as well (25-45 mm long). Aulonemia david-smithii, also from Peru, is known from one collection from a cloud forests in the Province of Oxapampa at an elevation of 910 m. A unique feature of this bamboo is the conspicuous marginal fimbriae which are an orange-brown mat of short dense fibers that are fused at the base and curl at separation. Its leaves are 25-38 cm long and 2.7-3.6 cm wide. The spikelets are immature and only 10.4-13.1 mm long and 1-2 mm wide; they are linear and consist of two glumes 1.7-2.5 mm long and less than 1 mm wide, and 2-4 awnless florets, the lowest floret sterile; the lemmas are 3.7-6.1 mm long, while the paleas are 1.8-3 mm long.

Development of Immunogold Transmission Electron Microscopy Technique in Studying Cell Wall Compositions of Grapevines

Joseph Gorzek, Yuliang Sun, Christopher Hassan
Faculty Mentors: Qiang Sun and Robert Schmitz, Biology

Pierce's disease (PD) caused by the bacterial pathogen, Xylella fastidiosa, is jeopardizing the grape and wine industries in the US. Xylella cells achieve their systemic spread in an infected vine by passing through intervessel pit membranes (PMs--porous cell wall regions without secondary cell walls) where two vessels contact one another. Vessel-parenchyma PMs are involved in the formation of vascular occlusions, contributing to the vine's PD symptom development or resistance. Despite their important role, information about the structure and chemical composition of PMs is still incomplete. An immunogold transmission electron microscopy (immunogold-TEM) technique was developed to investigate the ultrastructure and cell wall polysaccharide composition of grapevine PMs. Our data indicate that three types of PMs (i.e., intervessel, interfiber and vessel-parenchyma PMs) have structural differences. Intervessel PMs may become

swollen or appear loose in addition to being compact as their extended wall regions covered by secondary walls. Interfiber PMs are as compact as and thinner than their extended wall regions under the secondary walls. Vessel-parenchyma PMs have a thinner and loose-appearing region facing the vessel lumen, but a compact region toward the parenchyma cell side. With the immunogold-TEM technique, we found that the three PM types in grapevines also differed in the distribution and quantity of several polysaccharides. This method revealed differences in the intervessel PM polysaccharide composition of various grape genotypes, which hold viable explanations for observed differences in their PD susceptibility. These results demonstrate the immunogold-TEM technique's effectiveness for analysis of the composition and distribution of cell wall polysaccharides.

Group 11 – Room A202, 4:00-4:50pm

Moderator: Andy Felt

Using mixed integer linear programming to create a multi-sport, multi-year athletic schedule for the Ohio Athletic Conference

Abram Towle
Faculty Mentor: Andy Felt, Mathematical Science

Using technology to schedule athletics is a relatively new concept. Until computers became widely used for personal and commercial reasons, the majority of sports schedules were generated by hand; this is a time-consuming process that is widely susceptible to human error. Quantifying the constraints of the schedule can assist in the scheduling process by simplifying the problem into a more manageable format. Using AMPL, a mathematical programming language, an individual can develop a detailed set of files that can be read by optimization software in order to develop an optimal schedule to meet a specific list of constraints. Mixed-integer linear programming ensures that no constraint is overlooked in the creation of the most optimal schedule.
The UWSP Center for Athletic Scheduling generates a mixed-integer linear program (MILP) model, which is used to construct a four-year schedule for the Ohio Athletic Conference (OAC), involving their football, volleyball, and men's and women's soccer teams. Communication with the Executive Director of the conference ensured that the schedule met specific parameters that would remain consistent for each season for the years 2014-2017. The results of the model indicate that each of the constraints listed by the conference could be met, and the schedule generated is optimal and fair for all teams in the conference.

Group 12 – Room A210, 4:00-4:50pm

Moderator: Ismaila Odogba

Complete map of the genes involved in fertility pathway in soybean
Joshua Rogers, Jordan Baumbach, Alina Ott, Jerott Moore, Shane Dillman, David Schreiner
Faculty Mentor: Devinder Sandhu, Biology

Understanding reproductive system in plants is very critical for plant breeding and can improve agronomical development. Reproductive biology of soybean may enable us to manipulate it for commercial applications such as hybrid seed production. There are 6 sterility mutants (st2, st3, st4, st5, st6, and st7) known in soybeans, however they are not molecularly characterized. In previous investigations our lab has identified 7 additional sterile mutants and mapped those to soybean chromosomes. The objective of this investigation was to create a comprehensive genetic map of all 13 known male-sterility, female-sterility (MSFS) genes in soybean that can be used for cloning and characterizing these genes. F2 populations were generated for all the genes and DNA was isolated from 1800 leaf samples. Fertile and sterile bulks were generated by pooling DNA of 10 fertile or 10 sterile plants. Bulked segregant analyses were conducted using 700 simple sequence repeat (SSR) markers on the bulks for each gene to identify the chromosome containing the gene. Of the six uncharacterized sterility genes, five have been located on soybean chromosomes. The st2 gene has been located on chromosome 11 (Sat_270), st4 on chromosome chromosome 1 (Satt198), st5 on chromosome 13 (Satt146), st6 on chromosome 14 (Sat_264), and st7 on chromosome 1 (Satt531). Molecular markers in the chromosomal region of interest were run on complete F2 populations. Genetic linkage maps were created using software program Mapmaker. The purpose of mapping these genes will allow us to name all new unique genes and will become a comprehensive source of the mapping information for all the MSFS genes in soybean.

Development of Environmental DNA (eDNA) Methods for Identification of Plankton in Wisconsin
Kate Dixon
Faculty Mentor: Brian Sloss, Biology

Biotic impacts of climate change should initially appear at the planktonic and microscopic level and result in food-web shifts on fish communities. Traditional methods of plankton identification are labor intensive and often have a significant turn-around time. Environmental DNA (eDNA) technology may provide a cost and time effective alternative for the identification of planktonic species in both the overall aquatic environment and fish diets. Our objective was to determine if eDNA techniques would provide an efficient estimate of phytoplankton and zooplankton species identity in lake water samples. We tested several DNA extraction methods and PCR primers for effectiveness in detecting plankton from aquatic samples. Water samples were collected from Lake Joanis in Fall 2011 and vacuum filtered through Whatman 45 micron filters. DNA was isolated from the filter using two commercially available DNA isolation kits and two home brew systems. Multiple primer sets were tested against successful extractions to

amplify the mitochondrial DNA cytochrome oxidase I gene. Amplified DNA was cloned into E. coli and sequenced. DNA sequences were compared to reference data in GenBank using the nBLAST algorithm to identify likely genus and/or species. Two DNA extraction methods successfully extracted DNA from the filters (SDS and MOBIO). One primer set successfully amplified the expected size DNA fragment. The DNA sequence data indicated several potential matches of known plankton genera. Future research will focus on refining primer choices and expanding to sample more lakes. We will also employ paired studies where the evenness and diversity of the plankton species will be measured using eDNA and traditional methods.

Group 13 – Room A111, 4:00-4:50pm

Moderator: Per Henningsgaard

Social Media and Book Publishing
Steven Zahurones
Faculty Mentor: Per Henningsgaard, English

Social media can be defined as the transformation of information dissemination from a one-to-many model to a many-to-many model that is rooted in interaction and conversation between people. Book publishing is an industry that has unique opportunities to use social media to adapt their business to better suit an increasingly paperless world, as well as suit the way markets and consumers' tastes are changing. I performed a literature review on the available literature pertaining to how social media is used by companies, with a specific focus on book publishers. Finding only a small amount of research on the topic during the literature review, I quantified the Twitter and Facebook use of a variety of book publishers, including UWSP's publishing house Cornerstone Press, over the course of one week. I looked at how book publishers are using social media capabilities to promote their industry, their own products, as well as just posting miscellaneous information in an attempt to appear more human and build relationships with their customer base. The results showed an industry standard across larger publishing houses and smaller publishers with regard to certain aspects of social media use, while there was a substantial disparity in other aspects of their use. This presentation will discuss both similarities and differences in an effort to better understand how different publishers are using social media and suggest some useful models for thinking about effective social media use.

The Scientific Writing Process: An Evaluation of Learning Objectives and Conversational Drafting
Emiline Buhler
Faculty Mentor: Lynn Ludwig, English

The Mary K. Croft Tutoring Learning Center (TLC) is an innovative, multi-disciplinary writing lab located at University of Wisconsin-Stevens Point. The TLC is staffed by undergraduate students from a variety of majors who all undergo semester-long training on the theory and practice of collaborative

consultation--a learning method wherein students help their peers by providing introspective study and writing skills. The effect of collaborative consultation on literary analysis has been extensively evaluated, but its impact on scientific writing has yet to be explored. In this study, we will evaluate the Learning Objectives currently in place at the TLC as a model for Writing Center Theory. The three objectives that will be reviewed are as follows: 1) Student identifies improvement in the quality of his/her writing/reading as a result of working with a peer tutor. 2) Student experiences and recognizes stages in the writing process or reading process. 3) Student recognizes that talking about undergraduate writing or reading improves papers, assignments, notes, and comprehension. Currently, writing center theory revolves around the humanities' writing and drafting processes. There is an observed tension that occurs when adapting these methods to scientific and technical writing. Science professors at University of Wisconsin Stevens-Point will be interviewed regarding their perception of learner objectives for scientific writing. This study will be used to identify any areas where expectations differ. Improvement initiatives will be proposed to increase the effectiveness of science-focused consultations, in accordance with the TLC's efforts to be an all encompassing multi-disciplinary writing center.

Group 14 – Room A208, 4:00-4:50pm

Moderator: Christopher Yahnke

Bioacoustics Working Group: Fall Departure Sequence and Activity of Bat Species in Schmeeckle Reserve and Kemp Wildlife Station

Jennifer Gruettner, Steve Lasse, Rebecca Gregory
Faculty Mentor: Christopher Yahnke, Biology

Wisconsin has a relatively healthy population of bats. Cave-hibernating bats such as the Little brown bat and Big brown bat are threatened by an aggressive fungal infection known as White Nose Syndrome (WNS). The fungus was discovered in New England in 2006 and has been spreading west since. It may reach Wisconsin within a few years. WNS is an infection of the mucosal membranes that arouses the animals during hibernation causing starvation, exposure, and eventually death. Large numbers of bats have been infected by this fungus and it threatens some species with extinction. In addition, tree-dwelling bats are experiencing a high mortality rates due to wind farms. This research project is in an effort to contribute to baseline distribution, migration, and activity data being collected by the WDNR. It is important to collect this data before WNS moves into the state and begins to affect resident bat populations.
Bats preform a number of important ecosystem services, including consumption of insects such as mosquitos and moths that are normally regarded as pests. Data was collected from permanent bat detectors mounted by the WDNR in Schmeeckle Reserve and Kemp Natural Resources Station in Woodruff, WI. The Bioacoustic Working Group at UWSP analyzed echolocation calls collected from both sites in fall of 2008, 2009 and 2010 to determine fall departure sequence of individual species from both locations. Analook software was used to identify individual species of bats and to record time and date of activity. Knowledge of

bat activity is critical to develop an ecologically responsible approach towards wind energy in Wisconsin. In addition, this knowledge will be utilized to further understand the rate and spread of WNS, and the risk to resident bat populations.

Effects of Researcher Experience and Animal Disposition on Measurement Variation in Mus musculus
Krishun Karau
Faculty Mentors: Christopher Yahnke and Ryan Stephens, Biology

Morphological measurements are used to distinguish between cryptic species, assess the health of an animal, differentiate between sexes, and even monitor growth changes over time, both small scale and evolutionarily. However, it is generally reputed that measurements may vary depending on the experience of the researcher and the physical state of the animal, alive or post mortem. Yet there have been few studies to address this issue. We obtained a sample of 80 domestic mice, Mus musculus, and took external standard museum measurements among four researchers of varying experience. Metrics included total length, tail length, hind foot length, ear length, and weight and were performed when the mouse was alive, directly post mortem, 4 hours post mortem, and after it had been frozen and thawed. We compared replicated measurements for the different physical states of the same mice and inter-researcher measurement variation of all five measurements using one-way repeated measures analysis of variance. While analyses are ongoing, we expect to find statistical differences between the quantitative measurements of the mice during each measurement scenario i.e.; alive, post mortem, and frozen/thawed. We also expect that there will be statistically significant variation among the quantitative measurements of all four researchers of varying experience. This study is valuable to the scientific community because it will encourage researchers to consider potential bias of measurements more critically and ways to minimize these biases by choosing the "best" measurements to take and compare. This could also call into question past investigations of animal morphology research that incorporates different body states and multiple researchers.

Group 15 – Room A110, 4:00-4:50pm

Moderator: Amy Gervasio

Choreographing Stimuli for Understanding Emotion in Dance Performance
Cassandra A. Jenson, Olivia Crevier, Megan Cahill, Sarah Mielens
Faculty Mentor: Amy Gervasio, Psychology

The psychology of dance is an emerging area in psychology and aesthetics. Principles of visual form perception and theories of universals in emotion can be applied to understanding how an audience imbues meaning and interpersonal relationships to abstract dances. Videos, motion analysis programs, pictures of dancers, and point light displays have all been utilized but none of this research uses the same choreography. Secondly, there is almost no empirical research utilizing more than one dancer in the study of the attribution of emotion to dance. The purpose of our research was to choreograph dance stimuli with different

gender pairings and different numbers of dancers (i.e. solos, duets) that are meant to embody specific emotions of sadness, happiness, and anger. Previous research suggested that sadness might be evoked by downward arm movement, anger by jutting movement and forward weight transfer, and happiness by upward movement and leaps. About 45 stimuli, 15 seconds in length, were choreographed with either one or two dancers. Duets were for male-male pairings, female-female pairings and male-female pairings. Care was taken to equate height, costume, and background. Apart from the "typical" stimuli we filmed "atypical stimuli" in which the dance was the same as the original with the addition of uncharacteristic dynamics in order to understand at what point attribution of emotion changes. We also refined survey measures of audience responses so that these stimuli can be used in future research where dancers and non-dancers attribute emotion and relationships to the dances. Our presentation includes videos of the stimuli.

Psychological Mara: The Formative identity of Mara in 100 B.C.E to 600 C.E. Indian Mahayana Buddhism

Tarryl Janik
Faculty Mentor: Luke Whitmore, Philosophy

Central to the story of the Buddha's enlightenment is an antagonistic figure known as Mara. At the moment of the Buddha's enlightenment Mara appears and attacks the Buddha with sense pleasures and unsuccessfully tries to make the Buddha question whether or not he is truly enlightened. The scholar Michael David Nichols concludes Mara is merely a convenient figure that is used to demonize unorthodox Buddhist thought rather than a real living Buddhist phenomenon. Contrary to this I argue that Mara is not just a convenient symbol that is used to demonize untraditional Buddhist thought as Michaels suggests. Through an examination of early Indian Mahayana Buddhist sutras (or scriptures)—specifically the Prajnaparamita I will show that Mara is a very real physical and mental Buddhist phenomenon that exists to snare and seduce the bodhisattva into succumbing to his inner Mara nature—humanity's inherent capacity for evil.

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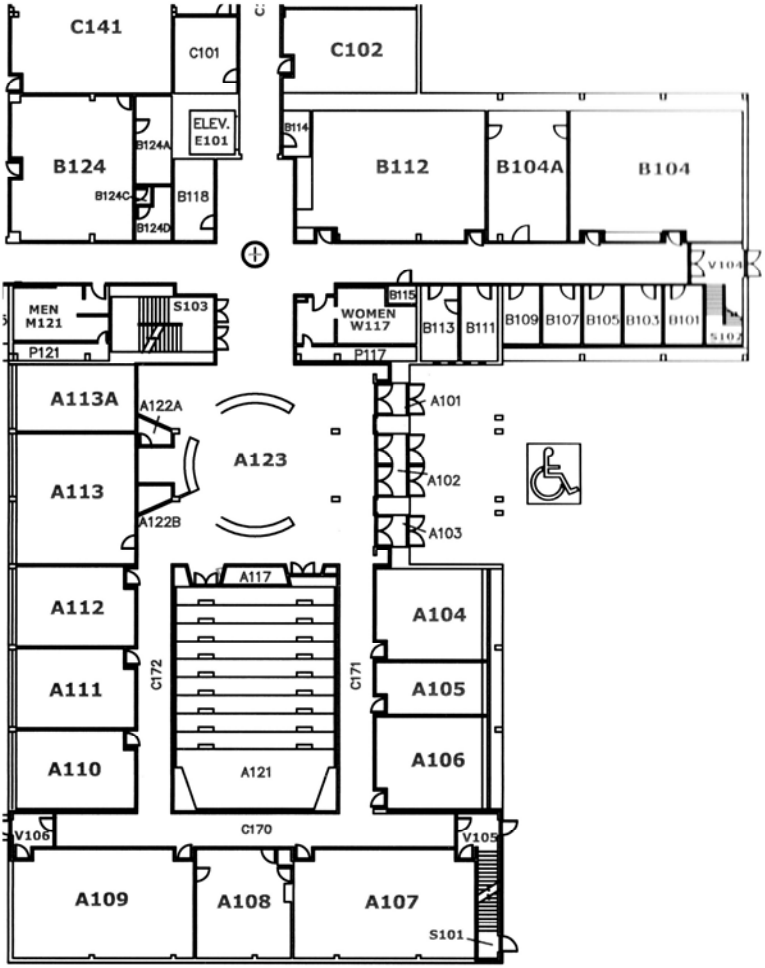

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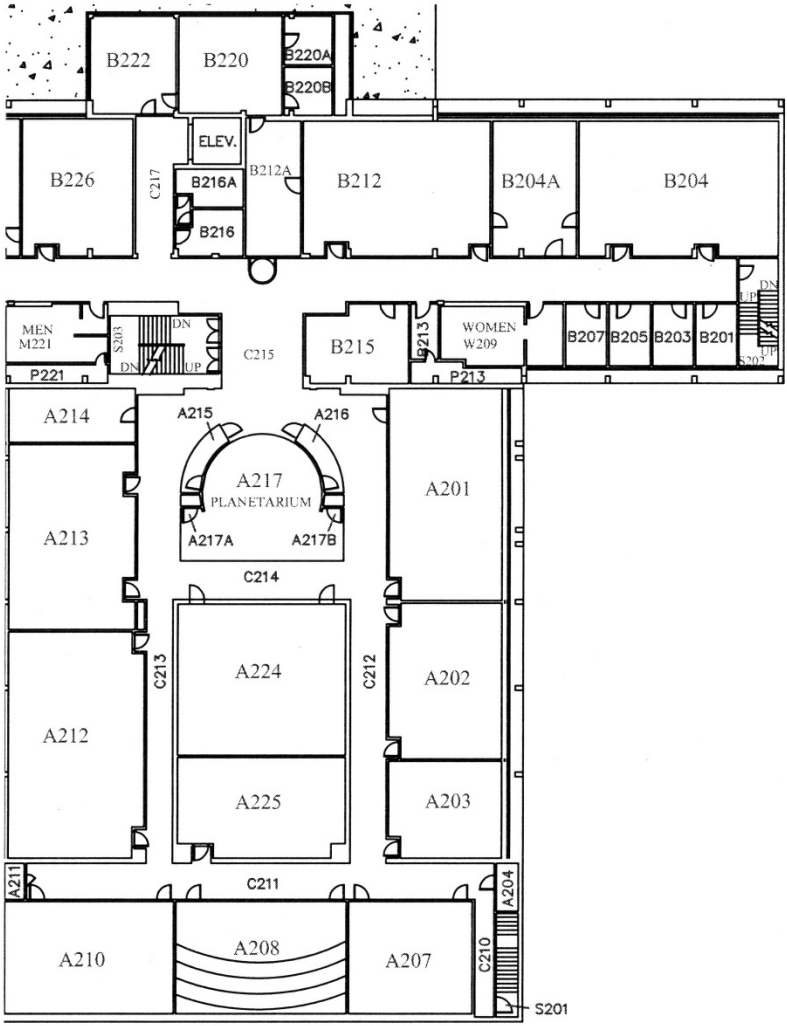

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