

University of Wisconsin – Stevens Point
College of Letters & Science

7th Annual
Undergraduate
Research Symposium

Program



Saturday
April 29, 2006

Science Building
UWSP Campus

◆ Dean's Welcome ◆
Room A121, Science Building
8:45 AM

◆ Oral Presentations ◆
See Program for Individual Room Locations
9:00 AM – 10:00 AM
11:00 AM – 12:00 PM

◆ Poster Presentations ◆
1st Floor, Wings A & B
Science Building
10:00 AM– 11:00 AM



SESSION I 9:00 – 10:00

Department of Biology

Science Building A201

Session Moderator: Prof. Chris Yahnke

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

Presentations will begin at the top of the hour, ending at 25 minutes past and beginning again at 35 minutes past, ending at the top of the next hour, i.e., 9:00 until 9:25 and 9:35 until 10:00 for Session I and 11:00 until 11:25 and 11:35 until 12:00 for Session II. Note that the Business & Economics group in Session II may run past 12:00 due to the number of presentations.

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

- ▶ **Social Hierarchy in Northern Grasshopper Mice, *Onychomys leucogaster***
Leah Kozlowski
Faculty Mentor: Isabelle Girard

Grasshopper mice are unusual rodents because they are carnivorous, highly social, and are said to pair monogamously. Upon observation of grasshopper mice during food-aggression trials, it appeared that female mice were allowed to consume preferred prey before male and juvenile mice had access to the food. Moderate to severe aggression was observed between groups of male mice during feeding of a preferred food, and also between males and females housed in the same enclosure. Dams (mothers) demonstrated moderate to severe aggression toward their pups when pups attempted to eat the food before their mother; however, little to no aggression was noted between groups of like-aged adult females. Hence, we hypothesized that *Onychomys leucogaster* have a matriarchal society in which females are dominant. To assess one aspect of this hypothesis, we introduced a hormonally intact, non-reproductive female (intruder) into the cage of a solitary resident male. We observed (and videotaped) the interaction of each pair ($n = 14$ pairs) for up to 60 minutes following introduction. During introductions, females appeared dominant, accepting or rejecting contact with the male even when she was the intruding animal. In the second stage of the experiment, a male intruder was introduced into the cage of the established pair. When the male mate was not present at the time of intrusion, the female generally demonstrated no aggression to the intruder. Intruder-aggression trials with both female and male mates present, and trials with pups present, were ongoing at the time of submission. This work is supported by grants from the University Personnel Development Committee and the Undergraduate Education Initiative. All procedures were approved by the Institutional Animal Care and Use Committee.

► Techniques and Training in a Small Animal Surgery

Chris Malinowski and Jennifer McMonagle

Faculty Mentor: Isabelle Girard

We are part of a large team of animal physiology students working to improve the health and welfare of our captive animals at UWSP. Following an introduction to basic surgical techniques in coursework, we collaborated with Dr. Pope, a well-respected area veterinarian, to receive continued training. We are now proficient in small animal surgeries, including ovariectomies, tubal ligations, neuters, and vasectomies. Through these surgeries, we are able to control reproduction in our captive colonies of laboratory mice (*Mus musculus domesticus*), laboratory rats (*Rattus norvegicus*), and grasshopper mice (*Onychomys leucogaster*) by means other than euthanasia. This allows the animals to be housed in mixed-sex social groups, which is an important source of enrichment, and provides animals suitable for inclusion in several parallel studies. Studies that require non-reproductive but hormonally intact animals include studies of paternal aggression in post-weaning families, investigations of mate-choice in monogamous pairs, and tests of responses to predator cues. Additionally, we have performed tumor removals and have been successful in infection control of wounded animals. Our surgical techniques parallel those used by veterinarians and other surgical professions. To date, we have a 96% survival rate for all rats and mice. As part of our continuing effort, we train new small-animal surgeons and researchers in pre-operative, operative, and post-operative care, blood collection, ear-tagging, and anesthesia. In the current semester, for example, we are training ten new individuals as surgeons, assisting in three research projects mentored by other faculty colleagues, and continuing to provide care for our captive animals. This work has been supported by an Undergraduate Education Initiative grant for anesthesia equipment. All procedures were approved by the Institutional Animal Care and Use Committee.

Science Building A202

Session Moderator: Prof. Todd Huspeni

► Indoor Culturing of Freshwater Prawns in a Recirculating Culture System

Steven Rood

Faculty Mentor: Chris Hartleb

Freshwater prawns (*Machrobrachium rosenbergii*) originate from Southeast Asia and were brought to the United States in the early 1970's for commercial production. In their native habitat, *Machrobrachium rosenbergii* live in freshwater and move into estuaries, with a salinity of 9-19 ppt, to reproduce. Prawns go through three stages in their lifecycle: larval, post-larval, and adult. Freshwater prawn production has been increasing in the U.S. because of a high market value (\$10/pound for tails) and demand for a premium niche product. To culture prawns in a northern climate, a combined tank-pond approach needs to be used since prawns can only survive in water with a temperature >60°F. This project examined the culture requirements of raising prawns from the juvenile to adult stage in an indoor recirculating culture system. We began with 2,000 post-larval prawns in a nursery tank system and, once they became juveniles, they were transferred to two 760 gallon re-circulating culture tanks. In these grow-out tanks they were raised to adults ranging in size from 0.3g to 64.4g. Length and weight measurements were recorded three times during grow-out and the gender ratio of individuals over 7 cm was determined. Six months after they were put into the tanks they were sorted by size (small 0.0-6.9, medium 7.0-9.9, large >10cm) into three tanks to reduce cannibalism. When the prawns were moved to the recirculating tanks from the hatchery system 978 out of 2,000 had survived. Six months later 522 prawns had survived with 84 reaching market size. Growth rates, survival, and gender ratio were determined at harvest to compare the effects of sorting on production and grow-out.

► Genetic Analysis of North American Yellow Perch Strains

Rachel A. Koehler

Faculty Mentors: Chris Hartleb and Brian Sloss

The North American yellow perch (*Perca flavescens*) has a wide distribution across the United States and is a commercially valuable species that is common in aquaculture settings. Within the aquaculture community it is believed that there are northern and southern strains of perch. Southern perch tend to grow larger, but it is unknown if this difference in growth is due to a longer growing season in the southern U.S. or to genetic differences between northern and southern fish. To determine if different strains of perch exist, DNA samples from a northern farm-raised population (Wisconsin), a southern farm-raised population (South Carolina), an eastern farm-raised population (Delaware), wild populations from Green Bay (WI), central Wisconsin, Delaware, and three wild populations from Maine were collected. Genetic variability was examined at several microsatellite loci for the different populations. Allelic diversity was significantly different between yellow perch populations from different geographic regions with southern yellow perch having significantly greater diversity. Measures of genetic differentiation between the populations suggest significant divergence between the northern populations and southern populations.

Departments of Mathematics & Computing and Sociology

Science Building A208

Session Moderator: Prof. Andrew Felt

► A Better Way to Assign New Students to Elementary Schools

Alexander W. Richter and Ryan J. Koelemay

Faculty Mentor: Andrew Felt

The Stevens Point Area Public School District has recently established target ranges for student/teacher ratios in its nine elementary schools. Meeting the target ranges has proven to be

difficult, given that students entering the district are assigned to elementary schools based on rigid geographic boundaries. We present a more flexible way of assigning students to schools and results from an ongoing study, the goal of which is to determine the extent to which the target ranges can be met by the new method, and to evaluate its practicality.

► Victimization in the Education Arena

Rachel Kressel

Faculty Mentor: Dorothy De Boer

The research is a library research paper based on literature found on the victimization of children in and around the school environment and the children's subsequent risk factors. Research conducted includes peer-to-peer victimization, bullying, and those children that are victims, or witnesses to direct or indirect crimes either within school related activities or on school premises, or outside of school and non-school related environments. Findings of such research show trends at intervention and prevention, as well as accountability, due to the high probability that children who are victims or offenders tend to become repeat victims or victimizers. Evidence suggests that children who experience victimization show consequences of such crimes within their academic performance or social interaction, including academic failure, behavioral problems, delinquency and adult criminal behavior. Further research suggests that crimes committed against children happen during the school day or early evening hours and commonly go unreported to the police. Because teachers are professionals having contact with both families and children, and may encounter such victimization, they are mandated reporters. Educators are getting proper training and technical assistance to help foster a more successful social environment for students. Schools have begun to institute bullying and harassment programs to curtail such issues within the classroom, playground, and lunchrooms. Juveniles reported the greater support from important people in their lives, such as teachers, were less likely to commit offenses and consequently more likely that they will make a successful transition into adulthood.

Department History; Anthropology Program

Science Building A207
 Session Moderator: Prof. Susan Brewer

Scott Butterfield
Faculty Mentor: Susan Brewer

Following the terrorist attack on the World Trade Center, Pat Tillman, a football player with the Arizona Cardinals, abruptly left his lucrative profession and turned down a \$3.6 million dollar contract to join the elite Army Rangers. He was sent to Afghanistan, and on April 22nd 2004, he was killed in action. The Department of Defense generated a story designed to convince the American public that Tillman died a heroic death while fighting enemy forces. However, no such enemy forces actually existed, and it wasn't until a month later that the Pentagon informed Tillman's family that he had been killed by friendly fire, despite the fact that top army officials knew of the fratricide within twenty-four hours of its occurrence. Wartime propaganda in the United States since World War I is practiced with the aim of influencing the opinion of the general population in favor of war. This is often done by glorifying the actions of the State against its enemy while simultaneously absolving the State of any wrongdoing. The purpose of propaganda in the present Iraqi War is to deflect criticism away from the legitimacy of the war itself, to generate more support for the war on the home front, and to package specific events of the war into readily marketable images and slogans designed to praise the righteousness of the American cause. The case of Pat Tillman typifies the workings of propaganda in the 21st Century as the Army, the government, and the media use Tillman to advance their own specific agendas, different among each of them, but containing the same overriding goal: to convince the general public of the righteousness of the American cause through the manipulation of facts and boldface lies.

► **The Dispute over Powers Bluff**

Shane Heinrich
Faculty Mentor: Thomas Johnson

SESSION II 11:00 – 12:00**Departments of Biology and Chemistry**

Science Building A201
 Session Moderator: Prof. Kama Almasi

► **Water Relations in Four Species of Fresh-cut Conifers**

Nick Jensen and Andrew Koeser
Faculty Mentors: Eric Singsaas and Les Werner

We examined the effects of Christmas tree watering on needle moisture content and needle retention. Most living trees have extensive root systems that replenish water lost through evapotranspiration. Yet, when a Christmas tree is placed in a stand its root system has been completely removed. Any water that may be taken up through its conductive tissues may not be able to compensate for the water being lost by the foliage. Fifty-six conifers equally comprised of balsam fir (*Abies balsamea*), Fraser fir (*Abies fraseri*), Scots pine (*Pinus sylvestris*), and Black Hills spruce (*Picea glauca* 'Densata'), were studied over a four-week period. Seven trees of each species received daily treatments of water, while the remaining trees served as controls. Water uptake was compared to needle retention rates and foliar moisture levels. Sap flux, transpiration, and photosynthesis rates were also measured in a 10-tree sub-sample. A total of 20 trees (4 fresh trees at time 0, 4 treated and 4 control trees at week 2 and week 4) were randomly selected in order to quantify treatment differences in percent moisture for stem and branch tissues. The intensive sampling associated with the 10-tree subset has led to a greater understanding of the water balance of cut Christmas trees. Water use data indicate a direct correlation between water uptake and needle moisture content, while needle retention appears controlled by some other physiological means. These results provide an important foundation for further investigations into the physiology of needle retention and Christmas tree storage and handling practices.

► **Hemlock Woolly Adelgid: Implications for Urban Forestry and Arboriculture in the Midwest**

Andrew Koeser

Faculty Mentors: Jamee Hubbard

The hemlock woolly adelgid, *Adelges tsugae* Annand (Homoptera: Adelgidae), poses a serious threat to Eastern hemlock *Tsuga canadensis* L. both in a natural forest setting and in the urban environment. Originally from Japan, this invasive insect is believed to have been introduced to North America in the mid-1920s. While climate and weather patterns have limited the spread of the hemlock woolly adelgid to some degree, a combination of an increased cold hardiness and mild winter temperatures have lead many to believe that Eastern hemlock are in danger throughout its native range.

Controlling adelgid outbreaks in a forest setting has proven to be extremely difficult, if not impossible. Still, through constant monitoring and a combination of management practices, Eastern hemlock may still remain viable in the urban forest. Many studies have examined specific mortality agents and chemical controls that can be used to combat adelgid infestations. It is critical that urban foresters and professional arborists understand these controls and how to employ them effectively. It is also important to realize that all treatments have limitations and that preventing the spread of hemlock woolly adelgid is the most effective means of control.

This review is a comprehensive examination of the most recent scientific literature addressing the hemlock woolly adelgid, its spread throughout the Eastern United States, and biotic and abiotic controls. Effective management strategies described by the researchers will be assembled into an informational pamphlet to be posted on a website and also for distribution to regional arborists and nursery operators.

Science Building A202

Session Moderator: Prof. Terese Barta

► **Sensitivity of *Penicillium* Species to Potassium Sorbate**

Bradley Jordan

Faculty Mentor: Terese Barta

In this study, species of *Penicillium*, a common mold, was grown on media containing potassium sorbate in order to test the sensitivity of this fungus to the compound. Potassium sorbate (the potassium salt of 2,4-hexadienoic acid) is used to inhibit microbial growth in many foods and even non-food products such as shampoos. The species used in the experiments were *Penicillium vermiculatum* and *Penicillium chrysogenum*. Potassium sorbate was added to Malt Extract Agar (MEA) and Mineral Salts plus glucose medium (MSG) in concentrations ranging from 0 to 0.5%. Overall, as the concentration of potassium sorbate increased, the overall growth and growth rates of the fungi decreased. Growth was completely inhibited by 0.2% potassium sorbate in MEA. In contrast, even 0.5% potassium sorbate did not completely inhibit fungal growth on MSG. However, concentrations above 0.10% reduced growth to a greater extent than those below 0.10%. Further tests showed that the difference in sensitivities on MEA and MSG was due to the pH difference of the media. Malt Extract Agar medium was at pH 5, and MSG medium was pH 7. In experiments in which the pH of the two media was switched, potassium sorbate was found to be more effective at pH 5 than pH 7. Current work is focusing on testing additional fungi associated with paper products to determine the minimum inhibitory concentrations of potassium sorbate. These fungi are *Aspergillus terreus*, *Penicillium funiculosum*, *Chaetomium globosum*, and *Trichoderma viride*. It is hoped this research could be applied to preventing mold growth on paper products.

► **Poly(propylene fumarate-co-lactic acid) for Biodegradable Orthopedic Adhesives**

Heather L. Wallner and Jonathan T. Huebner

Faculty Mentors: John P. Droske

Poly(propylene fumarate) (PPF) and poly(L-lactic acid) (PLLA) are desirable candidates for use as biodegradable orthopedic adhesives. PLLA has been used extensively in the biomedical field, while PPF has become attractive due to latent double bonds in the fumarate moiety that can be cross-linked *in vivo* to provide additional strength to a bone adhesive scaffolding.

Recently, copolymers of PPF with caprolactone, and also PLLA with ricinoleic acid, were reported by research groups at Mayo Clinic and MIT, respectively. These copolymers were reported to show enhanced properties for orthopedic applications over the parent homopolymers.

We have synthesized and characterized a series of copolymers of PPF and PLLA, poly(propylene fumarate-co-L-lactic acid). These copolymers were prepared by zinc chloride-catalyzed transesterification and afforded copolymers with a range of desirable properties, including potential for use as injectable biodegradable adhesives. Differential scanning calorimetry (DSC) showed that the glass transition temperatures were lower for all of the copolymers compared to the parent homopolymers and exhibited a minima at equal incorporation of the two monomers. Additional characterization of the copolymers by ¹HNMR and thermogravimetry (TGA) also will be reported.

Division of Business & Economics

Science Building A207

Session Moderator: Prof. Elizabeth Martin

► **A Market Research Study: Bringing Technology into the Coffee Shop**

Jenna Gilbertson and Chris Hoffman

Faculty Mentor: Elizabeth Martin

The research analysis consisted of a pilot study of creating a new business that could succeed in Stevens Point. Many ideas were suggested, but ultimately a café that included internet access was chosen. The plan started with exploratory research into similar internet cafes to gauge the cause of success or failure. Based on that information it was decided that college students would be the most likely customers. Next, a group of college students were questioned to gather unique suggestions that may have been missed in the developmental stages. Based upon those ideas it was then decided that a music trial service might help to set the business apart. Finally, a survey was drafted focusing on the new data gained from the interviews. Those surveys were then tested in order to assemble additional details and finish the preliminary stages of launching a new company.

► **Market Research for a New Business: The Leisure Lounge**

Wendy Danielski, Jason Redlin, Alisha Schulke, Annie Eagon and Meagan Gritzmacher

Faculty Mentor: Elizabeth Martin

Given the task to create a new business in the Stevens Point area that had a primary focus on serving the students of UW-Stevens Point, we used three specific research techniques to develop the "Leisure Lounge". Initially using exploratory research techniques, our team developed the concept of creating an environment where college students 18 and older can meet with their friends to have a good time and relax. We also determined the main services we would provide, the location needed, and the target customer market. After the concept was determined, further research was conducted

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reviewing local demographics, interviewing two potential customers and a business contractor.

After finishing our exploratory research, we continued with qualitative research that involved gathering background information on how to conduct a successful focus group session. We then were able to hold a focus group session with future customers. The focus group verified our initial location and atmosphere concepts and provided feedback on the services we should offer at the Leisure Lounge.

Our final stage of research involved quantitative techniques including the survey method. To accomplish this, we designed a survey and administered it to a small number of potential customers. After receiving the critiques from the initial survey, the survey was revised and distributed to a larger group. The feedback from the large survey group confirmed our initial business idea as a desirable addition to the Stevens Point community. In addition, the feedback gave us more direction as to the activities and times the Leisure Lounge should provide.

The research that is being presented is preliminary. The sample and population of students used in our research consisted only of our Business 331-Marketing Research summer classmates. Further research does need to be conducted to obtain precise and accurate results regarding the Leisure Lounge.

► **The 401(K) and the Threat to Baby Boomers' Retirements**

Eric Becker

Faculty Mentor: Kevin Neuman

Starting the year 2008 the first of the Baby Boom cohort will retire from the labor force. A large portion of these new retirees will have to answer the same question of how they will replace their labor income with non-labor income. While the Social Security debate has received considerable attention through political means, one debate commonly not heard is if defined contribution (DC) pension plans will be sufficiently funded to provide adequate income during retirement. Since the inception of the Employee Retirement Income Security Act (ERISA), the responsibility of funding a worker's retirement has shifted from the employer to the employee. While the Internal Revenue Service recognizes several retirement plans, the 401(k) is the one most commonly offered by employers. Employees and often

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employers contribute to these types of accounts in which the principal purchases various investment options predominantly equity ones. Over the course of an individual's lifetime, this money accrues interest which is reinvested. This relies on the basic principle of supply and demand. Since there are more laborers in the workforce than retirees, individuals are increasing their investment in their financial portfolios inflating the value of financial assets. However, between 2008 and 2030 the labor force will shrink as the Baby Boom cohort retires. These retirees will replace their labor income by divesting their investments held in their retirement portfolio. Yet, with more retirees than laborers, these assets will decrease in price since the supply exceeds the demand. This will decrease the assets remaining in retirement accounts. I will examine the effect a decrease in investment assets will have on non-labor income retirees as a result of the Baby Boom cohort divesting their investments to finance their retirement by simulating a three year bear market during different periods in the next forty years.

Department Philosophy & Religion

Science Building A203

Session Moderator: Prof. Alice Keefe

► **The Pluralistic Problems of Pascal's Wager**

Nathan Bell

Faculty Mentor: Dona Warren

Pascal's Wager begins with a claim that God cannot be known, thus denying the effectiveness of arguments trying to prove the existence of God and motivating the need to choose, or wager, to believe or not believe in God.

However, careful inspection of the Wager shows it to be dependent upon implicit, yet fairly specific, claims about God's existence. The religious pluralism apparent in today's world shows the necessity of these presuppositions to the Wager's validity. These presuppositions of God's nature are not only at odds with Pascal's prior claim about the impossibility of knowledge about

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God, but are also clearly indefensible without the support of a specific religious system.

Further research considers work by Geoffrey Brown, who attempts to defend Pascal's Wager. Evaluation of this work will show that Brown's attempted defense is ineffective, as it fails to consider the full nature of major religious systems, as well as being contradicted by Pascal's own logic.

Ultimately, Pascal's Wager does not achieve its goal: attempting to give philosophically valid reasoning to support that one is better off believing in God than not.

► **Pentecostalism, Liberation Theology, and Christology**

Brent Sirvio

Faculty Mentor: Alice Keefe

In analyzing historical and sociological precursors of Pentecostalism, one finds that its roots are markedly similar to Latin American liberation theology. Through investigating the works of historians, religious studies experts, theologians and insiders within both Pentecostalism and liberation movements, we find not that the two movements are so different, but they are more similar than either side would care to admit.

Christology, a theological perspective taken in regard to Jesus' dual nature, is the locus for both movements. What can Pentecostalism gain from low Christology? Liberation theology from high? The answer may be exactly what both seek: justice.

Liberation theology addresses temporal injustice utilizing a prophetic tone: God is the God of the poor, and Jesus, being poor, stands against wealth and decadence. It emphasizes low Christology—Jesus as man—focusing on the needs of those marginalized and oppressed, giving a sense of identity to those subjugated by outside political or economic interests.

Pentecostal Christianity addresses cosmic injustice via millenarian overtones: God is a God of mercy by offering us an opportunity to repent of our sins and accept Jesus Christ as our savior. But God is

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also just, and his justice will come when Jesus appears in the clouds to take his elect people away from the forthcoming tribulation. As a sign of Jesus' imminent return, God has poured out his Holy Spirit on those who are faithful, baptizing and empowering them to missionize the world with signs and wonders following. Pentecostals favor high Christology—Jesus as God—to place the emphasis squarely on repentance.

Pentecostalism is a distinctly American liberation theology of sorts, and a Christology in the middle might better address the issues both Pentecostal and Liberation theologians approach from opposite ends of the spectrum.

Department of English

Science Building A208

Session Moderator: Prof. Sarah Pogell

► **Destruction as Creation in Graham Greene's "The Destroyers"**

Mike Herndon

Faculty Mentor: Christopher Williams

Graham Greene's "The Destroyers" contains, as the title suggests, a strong theme of destruction and while on the surface the story may seem to suggest that a destructive environment breeds destruction, when examining the nihilistic actions of the main character Trevor and the behavior of the gang of boys he leads it becomes apparent that just the opposite is true. By applying the scholarly apparatus of Georg Simmel, J. Gorecki and Philip C. Kolin, as well as examining the philosophical standpoints of existentialism, absurdism and nihilism, the boys' activities are revealed as not destructive, but as a force of creation. Through destroying the house the boys create a sense of purpose, individualism and order. Furthermore, the boys destroy the social structure of their gang, creating free-willed individuals.

► **Postmodern Theory in Contemporary Music and Literature**

Matt Grosjean

Faculty Mentor: Sarah Pogell

“Postmodern” is a term that has been applied, somewhat exhaustively, to a variety of art forms in today’s culture. In my research I have selected a number of prominent postmodern trends and will discuss them in relation to contemporary literature and music. In these works I will address the use of metafiction, the so called “self aware fiction”; ambiguity and nonsense; and bricolage, pastiche, kitsch, nostalgia, and parody. I will also explore postmodern themes, such as the conflicting identities of the persona constructed within the work of art and the person behind the work; critiques of late capitalism, including the effects of hedonistic saturation; the dissolving boundaries among all of the arts; and the blurring of art and reality. I will present passages from key postmodern literary texts, such as John Barth’s “Lost in the Funhouse,” and samples of contemporary music by Cursive (cello rock), DJ Shadow (instrumental hip hop), Tom Waits (folk), Eyedea (hip hop), The Mars Volta (experimental rock), and others.

Department of English

Science Building A210

Session Moderator: Prof. John Coletta

► **“Amber Waves of Pain”: Migrant Farm Workers and the Not-so-natural History of where Our Food Comes From**

Aquila Ayala-May

Faculty Mentor: John Coletta

Farmers from all over the United States rely on immigrant labor, mostly Mexican, to do their field work. From orange groves to cherry and apple orchards to poultry-processing plants and Christmas tree farms, there is no agricultural setting that is not linked to immigrant labor. These invisible workers have been “environmentally segregated,” performing labor that most folks do not even really know exists in often toxic environments that are hidden from the common view and often glamorized, and if most folks do know something about the work and about the places in which it takes place, most

really prefer cheap vegetables, eggs, etc. to the uncomfortable reality of knowing how their food gets to the table.

“Environmental segregation” is preferable to “environmental racism” as a sociological term because people from all ethnic groups may be marginalized and subjected to unhealthy working conditions. Environmental segregation occurs, for example, when a farmer hires workers to inflict the damage of pesticides and water contamination on both crops and themselves, but then the farmer is not willing to be accountable for the damage caused, not just to the physical environment, which to passersby may look like a garden paradise, but to the people working in those dangerous and unhealthy places. Then, to make matters worse, growers may vote against health insurance and services for their migrant workers. Thus they take with both hands. This is environmental injustice.

In this paper, I discuss the nature of environmental segregation and injustice in such a way as to show how many working people from all ethnic groups in both rural and urban settings are invisible inhabitants of a landscape that, underneath the “amber waves of gold,” is a toxic wasteland.

► **Making the Transition: Adjusting to University-level Work by Writing in Response to Reading**

Anna Hensley

Faculty Mentor: Dan Dieterich

The reading skills required for academic success in a high school setting are much different from those required at a university, and this difference can result in a difficult transition period for incoming university students (Association of American Universities & Pew Charitable Trusts, 2003). Ideas concerning the construction of knowledge as advanced by Dickson (1995), as well as Pearson and Tierney (1983), point to the positive effects that writing in response to reading can have on students’ abilities to make this transition. This study analyzes the impact of writing in response to reading in one-credit Reading in the Disciplines discussion courses attached to parent courses in the humanities. In this program, students must engage with parent course texts through prompted, written responses and complete a final self-assessment essay.

Final essays from students enrolled in the program for classes within a social sciences discipline were used in this study; the papers are student reflections on the academic skills acquired during participation in the program. This study examines the language found in these reflections using textual analysis and cultural models (Gee, 1993) and explores the link between writing in response to reading and the construction of knowledge. Student data was analyzed in conjunction with scholarship on writing prompts and writing in response to reading (Dickson, 1995; Arnett, 1992). Students expressed increased awareness of the demands of academic reading and the development of strategies to meet these demands. In addition, most achieved a grade at least one point higher than the parent class average. If the positive impact of writing in response to discipline-specific reading can be determined, the recommendation to integrate this kind of writing in high school curriculum might prove useful in preparing students for the kind of reading, writing, and critical thinking required at the university level.



Poster Presentations

Department of Biology

► **Genetic Relatedness and Social Structure in the Eastern Mole, *Scalopus aquaticus***

Kate Johnson and Jennifer Andriga

Faculty Mentor: Chris Yahnke

Eastern moles, *Scalopus aquaticus*, are usually solitary, coming together to breed in March and April. While exterminating moles during the summer of 2005 we observed locations where multiple moles were living in the same yard with other moles, and sometimes sharing the same burrow. We decided to investigate the relatedness and social structure of moles found in common burrows. We collected data on sex, mass, and total length of each mole.

We used spleen tissues from *S. aquaticus* to extract DNA. We will use the RAPD (Randomly Amplified Polymorphic DNA) technique to generate a series of DNA fragments that can be used to compare moles from various locations. We predict that moles from the same burrow will be closely related, and will have more similarity in banding pattern than moles captured from more distant locations.

► **Isolation and Differentiation of *Salmonella* spp. from Stevens Point Area Pet Stores**

Jennifer Vancuyk and Jeff Westensee

Faculty Mentor: Richard Crowther

Salmonella exists as normal flora in reptiles and other caged animals. Samples were obtained from various pet stores in the Stevens Point area to determine prevalence of different *Salmonella* species. The samples were incubated in Selenite Enrichment Broth prior to differentiation. The bacteria were differentiated using Salmonella-Shigella agar (SS), Hektoen agar, Triple Sugar Ion agar (TSI), SIM agar in conjunction with Kovac's reagent, and Lysine Iron agar (LIA). Once isolated, further testing was done to determine plasmid presence, antibiotic resistance, and serotype.

► **Examination of Maxillary Dentition using Clearing and Staining Method**

Adam T. Hinkle

Faculty Mentor: Erik Wild

The purpose of this project is to examine the different patterns of snake maxillary dentition and the viability of the clearing and staining method for observation of these different classifications. There are four recognized patterns of maxillary dentition within the clade Serpentes: aglyph = no pronounced differentiation of dentition; opisthoglyph = maxilla supports a pair of posterior positioned enlarged teeth; proteroglyph = comparatively long maxilla sports a single large hollow tooth; and solenoglyph = contains a reduced maxilla with a movable, hollow and enlarged tooth. These four categories are represented by the following species respectively: *Nerodia sp* (Colubridae), *Heterodon platyrhinos* (Colubridae), *Micrurus nigrocinctus* (Elapidae), and *Agkistodon contortrix* (Viperidae). Following standard protocols the skulls and a portion of the neck was removed from the body, skinned and then eviscerated. The specimens were then dehydrated by increasing concentrations of ethanol and then subjected to Alcian Blue biological stain to illuminate cartilage. Specimens were then re-hydrated and subjected to tissue digestion using pancreatin or trypsin enzyme. Specimens were then transferred to 2% potassium hydroxide solution for tissue bleaching/clearing and then placed in a solution of Alizarin Red S stain for illuminating the calciferous elements. Photographs were taken of the different dentitions and archived. The process proved effective for research and specimen display. Some modifications to the staining protocol have been suggested by this work and are discussed.

► **A Possible New Species of *Synapturanus* Carvalho, 1954 (Anura, Mircohyllidae) from Peru**

Sarah A. Orlofske

Faculty Mentor: Erik Wild

The genus *Synapturanus* currently contains three species of small, terrestrial, burrowing frogs: *Synapturanus mirandaribeiroi*, *S. salseri* and *S. rabus*. All the species inhabit the leaf litter on the rainforest floor of northern regions of South America. Specimens were collected

by W.W. Lamar in a montane region of Peru, outside the known range of any of the species previously described in this genus. The habitat also differs considerably from the other species in the genus, which are all known from lowland rainforest habitats. This species is a member of the genus *Synapturanus* based on the combination of the following characters: diplasiocoelous vertebrae; clavicles and procoracoids absent; ethmoid fused to parasphenoid; subarticular tubercles absent; toes without webs; snout acuminate, elongate, extending well beyond lower jaw. All measurements are in millimeters and were taken with an ocular micrometer in a stereomicroscope or measured with dial calipers to the nearest 0.1 mm. Osteological observations were made from two cleared and stained specimens. Drawings were executed with a stereomicroscope with a drawing tube. A more detailed investigation is currently underway to determine the species status and phylogenetic relationships of these specimens.

► **Ecology and Natural History of the Mudpuppy (*Necturus maculosus*) on Adams Lake**

Luke Breitenbach

Faculty Mentors: Erik Wild

During fall 2005, an ongoing investigation on ecology and natural history of a population of Mudpuppies (*Necturus maculosus*) in Adams Lake, WI was continued. Adams Lake is small, approximately 30 acres, with a maximum depth nearly 50 feet and dense submergent vegetation found in shallow shorelines. Adam's lake is unique in that it contains thick weeds throughout most of the lake, is very deep, clear, and spring-fed which may be a success factor of this mudpuppy population. Mudpuppies typically breed in rocks and rubble habitats found in cold, fast moving, streams, unlike the habitat of Adams Lake. In order to investigate this unique population of mudpuppies, population size and habitat use were studied using mini-fyke nets. Specimens were individually marked with a fluorescent polymer and released back into the lake near the point of capture. Observations recorded include: location of captures throughout the lake, and length and weight of specimens. Approximately 50 individuals were captured, marked, and released over a two-month sampling period (early Sept.-Nov. 17th), with an average weight of 77g and length of

250mm. Three marked individuals were recaptured once. There were no re-captures of individual mudpuppies marked in fall 2003. Although preliminary, population size estimates will be made using these data. Most individuals were caught in nets near shorelines adjacent to steep weedy drop-offs, and few in habitats lacking dense weedy cover and large flats of shallow water. In the future, the study will continue to gather data regarding specific habitat use. Hopefully more recapture studies will be conducted this spring and next fall to observe the recapture rate and to confirm whether or not the mudpuppies have a certain homing range. Radio-transmitters, telemetry equipment, and scuba diving may also be employed for observing mudpuppies and natural history.

► **Experimental Life Cycle Completion and Identification of *Echinostoma revolutum* (Platyhelminthes: Trematoda) from *Helisoma trivolvis* Snails**

Lois E. Kramer

Faculty Mentor: Todd Huspeni

Trematodes are a diverse group of parasitic flatworms with complex life cycles. Sexually reproducing adult worms live inside a vertebrate host and release eggs which are usually carried out in the host feces. These eggs contain a larval stage which infects a species of mollusk. Once inside the mollusk host, the larval trematode asexually reproduces, and ultimately produces tailed swimming stages called cercariae. Cercariae are released from the snail, and depending on the trematode species, cercariae encyst as metacercariae in or on other snails or a variety of other hosts. The life cycle is completed when a host infected with encysted metacercariae is eaten by an appropriate vertebrate host and adult worms develop in the predator. Adult worms are required for a definitive identification or species description, because descriptions of worms are based on adult features (e.g., position and number of collar spines, body spines, and reproductive features). To identify a locally occurring larval trematode, I infected mice with encysted metacercarial stages obtained from *Helisoma trivolvis* snails collected at McDill Pond (Portage County, WI). Mice were infected by oral gavage and then euthanized and dissected at 14 or 21 days postexposure. Adult worms were collected, preserved, stained and mounted for microscopic examination. Additional specimens were preserved and prepared for Scanning Electron

Microscopy (SEM) examination of ultrastructural surface details. I recovered over 150 total worms from five mice infected for 14 days. No worms were recovered from two mice infected for 21 days. Recovered worms were determined to have 37 collar spines, and available taxonomic keys identify these worms as members of the *Echinostoma revolutum* species complex. This species complex is believed to comprise several subspecies, and I will use genetic techniques to examine mitochondrial and nuclear genes to compare to sequences available for described subspecies in this complex. *Echinostoma* species are routinely used as experimental organisms in parasitology labs, and this work demonstrates their local availability for future research projects.

► **Effects of Commercial and Organic Milk on Growth and Reproduction in Mice**

Ashley M. Filtz

Faculty Mentor: Isabelle Girard

Concerns about the use of recombinant Bovine Growth Hormone (rBGH; also called bovine somatotropin, bST) in dairy cows has led to widespread speculation, and relatively little science, about the effects of commercially produced milk on growth and development of children. Some scientists have suggested that the increased growth rates, the rise in obesity, and the accelerated rate of puberty in children might be related to bST-treated milk. We undertook a study of the gross effects of drinking milk from hormone-treated cows, using laboratory mice (*Mus domesticus*) as a model for humans. We monitored the indirect effects of consuming milk from cows treated with synthetic bovine growth hormone as compared with consuming milk from organic farms with untreated cows and consuming only water. In following the three generations of female mice ($n = 57$) undergoing treatment from their birth through weaning of their own litters, we have been able to examine if energy metabolism, body composition, growth rate, reproduction rate, and prolactin expression differ among the three groups. At the time of submission, statistical analysis and hormone assays were ongoing. Preliminary analyses indicate that females receiving the milk treatments had lower mass at parturition than the water group and gave birth to larger litters relative to body size. Females drinking commercial milk maintained high body mass during

lactation as compared with organic and water groups and commercial-milk pups grew at faster rates. No evidence of altered fertility in mothers or offspring was found. This information will help consumers make informed decisions about use of growth hormones in dairy cows. This study was generously supported by a grant from the Undergraduate Education Initiative Summer Research Program.

► **Characterization of *Leyogonimus polyoon* (Platyhelminthes: Trematoda) Larvae within the Snail, *Bithynia tentaculata***

Ashley Freyre and Dominique Freyre

Faculty Mentor: Stephen Taft and Todd Huspeni

Leyogonimus polyoon is a flatworm trematode parasite that causes the death of thousands of American Coots (*Fulica americana*) in Wisconsin each fall. The life cycle of *Leyogonimus polyoon* begins within the intestines of American Coots. Within the coot, adult *L. polyoon* worms produce eggs which are expelled in the feces. These eggs are ingested by the snail intermediate host, *Bithynia tentaculata*. Inside the snail, *L. polyoon* larvae produce sporocysts, which in turn, produce cercariae. The sporocysts each produce 2-3 germinal masses which develop into tailed cercariae. The cercariae leave the snail, encyst in a variety of aquatic insects, and after encystment become metacercariae. Thus, when coots ingest insects infected with metacercariae, the life cycle is completed. Our study concentrates on intramolluscan development and histochemistry of *L. polyoon* stages within *B. tentaculata*. Infected *B. tentaculata* are typically castrated by *L. polyoon*, and the small sporocyst stages eventually replace much of the snail's gonad. Cercariae possess a mouth, oral sucker, stylet, esophagus, pharynx, intestine ending in ceca, acetabulum, and a tail. Within the cercarial body are distinct sets of cystogenous glands that we have partially characterized using histochemical methods (Alcian blue pH 2.5, Mercuric bromphenol blue, and PAS with a salivary amylase control). In our study, we have documented aspects of the intramolluscan infection process, and our work is providing insight into the development of an important parasite in its intermediate host.

► **Determination of the Pathogenic Capabilities of *Borrelia burgdorferi* s. l. Isolate W97F51 using a Mouse Model**

Erin Flood and Deanna Bublitz

Faculty Mentor: Diane Caporale

In the U.S., Lyme disease is caused by the spirochete bacterium, *Borrelia burgdorferi* sensu stricto. Genotypic differences in infecting spirochetes play a key role in the pathogenesis and development of clinical disease. A novel *Borrelia* strain (W97F51) isolated from a blacklegged tick from Wisconsin is up to 14% genetically different from *B. burgdorferi* sensu stricto, and may be a novel etiologic agent of Lyme disease. Since the genotype of the infecting spirochete can affect the development of clinical disease, it is important to understand the phenotypic expression of the W97F51 strain. Mice are commonly used to pattern the effect of pathogens in humans. Researchers in the past used the laboratory mouse as a model to compare the common form of Lyme borreliosis in humans with various subtypes (strains) and demonstrated differences in the kinetics of spirochete dissemination and disease severity, which included varied degrees of joint inflammation and arthritis, and the infiltration of spirochetes in the bladder, heart, brain and joint tissue. To assess the pathogenicity of isolate W97F51, a mouse model is being used to emulate potential health risks created by the spirochete to Wisconsin residents. Three experimental groups of 12 C3H/HeJ mice were studied. Group 1 was inoculated with *Borrelia* strain W97F51, group 2 was inoculated with a *B. burgdorferi* pathogenic strain as the positive control, and group 3 was inoculated with saline solution as the negative control. Every three weeks, three mice from each group were sacrificed and blood, ear, heart, bladder, spleen, brain and joint tissue were preserved. We plan to report any differences in spirochete load in these various tissues, using histologic and PCR methods, among the three study groups. Projected findings may be employed to abet predictable associations in distinct clinical syndromes in Lyme disease patients.

► **Genetic Diversity and Population Structure of *Borrelia burgdorferi* in Areas of Wisconsin**

Evi Lim and Deanna Bublitz

Faculty Mentor: Diane Caporale

Lyme disease is caused by the bacterium *Borrelia burgdorferi* that is transmitted by a blacklegged tick. A spatial analysis of the distribution of Lyme disease in Wisconsin revealed a direct correlation between the distributions by county of Lyme disease exposure with tick distribution. Wisconsin state parks with well-established deer populations have high abundance of blacklegged ticks with *B. burgdorferi* infection rates of about 10 percent. With increasing deer and blacklegged tick populations, this could potentially create a greater spread of tick-borne diseases already existing in the state. In a previous study, blacklegged tick populations from the Northwest, Central and Northeast regions were found distinct with local genetic variation. However, there was an abundance of a few shared common types, suggesting some dispersal of blacklegged ticks with moderate amounts of gene flow between regions. This may also suggest a moderate spread of tick-borne pathogens, including *B. burgdorferi*. To test this hypothesis, we are assessing the distribution and abundance of *B. burgdorferi* strains among these regions. About 50 blacklegged ticks harboring *B. burgdorferi* are being studied from each study site. The *ospB* gene of the bacterium was sequenced and is being compared among isolates to identify strains. The strain distribution will be determined to assess the spread of *B. burgdorferi* in Wisconsin. Since *B. burgdorferi* is mainly clonal and very little recombination occurs between genes, it would take thousands of years to accumulate a large number of mutations within a gene. Therefore, if high levels of geographic diversity were observed within the study sites, this would suggest high levels of gene flow, meaning high spirochete dispersal. However, if the dispersal of *Borrelia* were low, then one would expect little genetic variation within each site. With distinct populations of ticks existing in Wisconsin, one may suspect the same population structure of *Borrelia* strains.

► **Potassium Sorbate Inhibition of *Aspergillus* Species on Paper**

Casie Roesler

Faculty Mentor: Terese Barta

In this study, *Aspergillus*, a common mold, was grown on media containing potassium sorbate in order to test the sensitivity of this fungus to the compound. Potassium sorbate (2,4-hexadienoic acid, potassium salt) is used to inhibit microbial growth in many food products and personal care products (such as soaps, shampoos, and antibacterial towelettes). The species used in the experiments were *Aspergillus niger* and *Aspergillus ornatus*. Potassium sorbate was added to Malt Extract Agar (MEA) and Mineral Salts plus glucose medium (MSG) in concentrations ranging from 0 to 0.5%. The MEA medium had a pH of 5 and the MSG medium was pH 7. Fungal growth was completely inhibited by 0.2% potassium sorbate in MEA. However, even 0.5% potassium sorbate did not completely inhibit fungal growth on MSG. However, concentrations above 0.10% reduced growth more than those below 0.10%. Further experiments showed that sensitivity to potassium sorbate was affected by the pH of the medium. Potassium sorbate was more effective at pH 5 than pH 7. Experiments are currently underway to determine if potassium sorbate will inhibit growth on filter paper placed onto plates of MSG (pH 5). The mold species being tested are *Aspergillus terreus*, a mold associated with paper products, as well as *Aspergillus niger* and *Aspergillus ornatus*. The goal of this research is to determine if potassium sorbate can be used to preventing mold growth on paper products.

► **Sucrose Feedback on the Supply and Demand Characteristics of Photosynthesis**

Tyler Fuhrman and Jon Ciatti

Faculty Mentor: Eric Singaas

We measured the supply and demand relationship between sucrose and the photosystem II (PSII) region of photosynthesis. When sucrose builds up from photosynthesis it causes a feedback that reduces the rate of photosynthesis in the leaf. This feedback then forces the leaf to adjust demand for the PSII receptor site or

light supply. This alters total photosynthesis rate. Using sunflowers and clones of Aspen trees, measurements of photosynthetic CO₂ assimilation and PSII activity were made using the Li-Cor 6400 portable photosynthesis system. These data were used to develop a mathematical model that can be used to demonstrate the control of photosynthesis by supply or demand. Our results show how sucrose, the product of photosynthesis, feeds back on its own synthesis in living plant leaves. We will use this model to determine how global CO₂ levels alter the supply-demand relationships of plant photosynthesis. These data also yield important information as to how and what drives the rate of whole-plant CO₂ assimilation. This will help us develop new models and ways to determine whether these limitations affect plant productivity in an elevated CO₂ environment.

► **A Two-year Study of the Relationship between the Stem Count of Nine Potato Cultivars and their Yield**

Carol S. Kropidowski

Faculty Mentor: Kama Almasi

Potato varieties each have their own unique characteristics; in particular, I examined variability for stem number among and within varieties. I examined the relationship between the number of stems per plant and the size and set for the tuber yield. I also found the predominant number of stems for a given variety and the optimal number of stems for greatest yield. In 2004, I selected nine varieties within twenty rows of a fifty row organic field, each of which had three replicates of ten plants each. At least one plot of each cultivar had a mode of at least 5 stems per plant; and the range in number of stems was at least six. I repeated the study in 2005 using the same cultivars. Multi-Way ANOVA showed that tuber set and weight varied: between cultivars; for different stem numbers; for different weight categories and total weight; and for year (tuber size only, not tuber set). Each variety has its own characteristics; however, in general, the greater the number of stems, the greater the set and yield (for each size category of potato). Varieties more often have a majority of plants with fewer stems. The optimal number of stems for yield was found at or near the largest stem number, but the number of plants having that number was small. In addition, results showed that B-sized (medium) potatoes contributed the largest number of potatoes both years, whereas A-sized (large) potatoes contributed the largest

mean weight. This research may be especially useful for potato farmers wishing to maximize yield and/or understand the relationships between stem number and yield for different potato varieties.

► **Do Different *Rhizobium lupini* Application Methods affect the Nitrogen Fixation of *Lupinus rivularis*?**

Veronique Van Gheem

Faculty Mentor: Kama Almasi

Nitrogen is an essential plant nutrient. It is the nutrient that is most commonly deficient, contributing to reduced agricultural yields throughout the world. Molecular nitrogen (N₂) makes up four-fifths of the atmosphere but is metabolically unavailable to higher plants and animals. Certain bacterial species, including Rhizobia, are able to convert atmospheric nitrogen to organic forms that may be absorbed by plants. Many legume species form symbioses with nitrogen-fixing Rhizobia in which the plant supplies carbon and the bacteria fixes nitrogen. I asked if the method of *Rhizobium* inoculation will affect the growth of the legume *Lupinus rivularis* (Riverside Lupine). I also asked whether inoculated lupines are still nitrogen limited. To test these questions I devised a greenhouse experiment with 20 replicates each of seven treatments: 1) Control – Lupine grown without its specific symbiotic bacteria, *Rhizobium lupini*; 2) Nitrogen control – Lupine grown with nitrogen addition; 3) *R. lupini* application to soil prior to transplantation; 4) *R. lupini* application to the root prior to transplantation; 5) *R. lupini* application to the seed prior to planting; a wet application; 6) *R. lupini* application to the seeds prior to planting; a dry application; 7) *R. lupini* application to the root and then nitrogen addition. The lupines were placed in a randomized block design in the greenhouse in Wisconsin summer conditions. I added 1.03 milligrams of Nitrogen per week to treatments 2 and 7. I measured nitrogen fixation using a gas chromatographer and by measuring nodule biomass. Growth was measured as plant biomass. Preliminary analysis suggests that direct application to seedling root may produce the most nodules.

► **Isolation and Characterization of Methylbutenol Synthase from Ponderosa Pine (*Pinus ponderosa*)**

Kathryn Amerell

Faculty Mentor: Eric Singaas

The purpose of this project was to identify, isolate, and sequence the gene in Ponderosa pine trees (*Pinus ponderosa*) responsible for making methyl butenol (2-methyl-3-buten-2-ol). This lays groundwork for transforming the methyl butenol gene into *E. coli* bacteria for production of an alcohol-based biofuel. We used a combination 2-D gel electrophoresis and PCR to identify the targeted gene. For the 2-D gel electrophoresis, we induced methyl butenol synthesis in cut branches of *Pinus ponderosa* by exposing them to a mild heat treatment of 31°C and detected methyl butenol production using gas chromatography. Protein sequencing by mass spectrometry will be done at the University of Wisconsin-Madison Biotechnology Center. In parallel with the protein expression work we screened applicable primer sequences for PCR amplification of methyl butenol genes. The protein sequence will allow us to determine species-specific primer sequences for PCR. The expected outcome of this project is the specific DNA sequence responsible for methyl butenol production in *Pinus ponderosa*.

► **Abundance and Nurse Plant Preferences of the Endangered Chisos Hedgehog Cactus, *Echinocereus chisoensis* in Big Bend National Park, Texas**

Helen Cold, Denise Krentz, Aaron Nolan, Adam Kehoe, and Joseph Flood

Faculty Mentors: Emmet Judziewicz and Isabelle Girard

The purpose of our study was to determine distribution and nurse plant preferences of the endangered Chisos hedgehog cactus (*Echinocereus chisoensis*, abbreviated CHC). The CHC is found in only a small section of Brewster County, Texas, within an area of about 80 sq. km between elevations of 600 and 700 meters in the southwestern part of Big Bend National Park. Studies have suggested that the cactus is declining. During two days of research, we surveyed a total of 5 km of transects and discovered 60 previously unidentified individuals in addition to the previously known 600 plants, thus increasing the known population by 10%. The majority of new

individuals are associated with nurse plants, most commonly dog cholla (*Opuntia aggeria*) or creosote bush (*Larrea tridentata*), although other nurse plants were also associated with the cactus. Our statistical analyses show no correlation between the number of stems of CHC and the areal extent of its dog cholla nurse plants. However, our data do show that a large percentage of cacti grow under a combination of nurse plants, usually *Opuntia aggeria* and *Larrea tridentata*. Other nurse plants noted were *Fouquieria splendens*, *Krameria grayi*, *Viguiera stenoloba*, *Jatropha dioica*, and other species of *Opuntia* such as *O. rufida*. The percentages of CHC growing under observed nurse plants was: *Opuntia aggeria* 83%, *Larrea tridentata* 45%, *Opuntia spp.* 10% *Krameria grayi* 8%, *Fouquieria splendens* 2%, *Viguiera stenoloba* 2%, and *Jatropha dioica* 2%. 38% of CHC were found growing under at least 2 nurse plant species, and 7% were found growing under at least 3 nurse plants.

Department of Chemistry

► **Germanium Nanoclusters**

Chad Weisbrod

Faculty Mentor: Robin Tanke

The research I have been conducting, under the mentorship of Professor Robin Tanke, has been a dynamic approach at synthesizing germanium metal nanoclusters. The research began with a complicated synthesis of a compound called triphenylphosphine dichlorogermanide. The reactants and intermediates generated in this synthesis are extremely sensitive to air and water. As a result, techniques such as working under inert argon environments, using high vacuum equipment, and recrystallizing in liquid nitrogen temperature baths had to be employed to shelter the delicate product and intermediates from the normal environmental conditions of the lab. The next logical step was to react the newly formed product with another germanium containing compound, all the while keeping a novel germanium core structure in mind. The chosen compound to react with the divalent triphenylphosphine dichlorogermanide was a readily available germanium salt known as magnesium germanide. The past year's research endeavor has been primarily to solubilize this rather robustly stable salt.

Department of Geography & Geology

► Ichnofossils on Irma Hill, Lincoln County, Wisconsin

Abigail Wix

Faculty Mentor: Kevin Hefferan

Preservation of soft tissue organisms is exceptionally rare in sandy, coarse-grained sediment. The lack of hard body parts, as well as susceptibility to decay and sediment reworking all contribute to low fossil preservation potential. Despite these limiting factors, some of the world's best known soft-bodied fossils and trace fossils have been discovered in central Wisconsin. Exceptional soft body fossils occur at Krukowski Quarry, located on County Road C in Mosinee in Marathon County. At Krukowski Quarry, Upper Cambrian (~510 million years old) Mt. Simon-Wonewoc quartz arenite sandstone contains at least seven horizons of fossilized impressions including Medusae (jellyfish), Climactichnites, unknown ichnofossils and Protichnites. These fossil organisms inhabited a sandy, equatorial beach (Hagadorn et al, 2002; Hefferan, 2005). Similar, soft tissue fossils including jellyfish, Climactichnites and Ichnofossils occur at Irma Hill on County Road J in Irma in Lincoln County. These fossils are also embedded within the Cambrian Mt. Simon-Wonewoc marine sandstones (Hagadorn et al, 2002). While the Irma Hill fossils are far less numerous and pronounced than those found at the Krukowski Quarry, their preservation is perhaps more notable. Irma Hill fossils were preserved in strongly cemented, quartz arenite sandstone that was exposed during multiple Cenozoic glaciations. This study explores the occurrence and significance of these rare, trace fossils at Irma Hill. The Irma Hill soft-bodied organisms represent among the world's oldest multicellular life forms preserved in beach deposits. Fossils from the shores of ancient, tropical Cambrian seas in Wisconsin provide critical evidence of the history of life and have made Central Wisconsin a world renowned fossil locality (Hagadorn et al, 2002).

A poster presentation at the UWSP Undergraduate Research Symposium April 29 would show these ichnofossils in photographs and explain their origin with dialogue, geologic column and maps. Rock samples with these trace fossils also would be available.

► Fire Ecology of the Cottonville Fire

Jonathan Hanes and Anders Huseth

Faculty Mentor: Neil Heywood

The Cottonville Fire occurred on May 5, 2005 in Adams County, Wisconsin, and damaged 3,410 total acres of forested land. Our research investigated variations in the correspondence between fire severity, canopy alteration, and regeneration in the Cottonville area and addressed the following question: How did variation in the severity of the Cottonville Fire affect the spatial pattern(s) of regeneration of woody herbaceous vegetation? This research question focused on the severity of the fire at specific locations to project spatial patterns of understory vegetation. We hypothesized that there was a significant correlation between variation in fire severity and regeneration of woody herbaceous species, and between the percent change in coniferous canopy cover and regeneration of woody herbaceous species.

Department of Physics & Astronomy

► Dynamic Reflectivity of Vanadium Pentoxide

Matthew Newby

Faculty Mentor: Greg Taft

The experiment uses a standard pump-probe laser setup, in which a single laser beam is split into two separate beams, with the stronger "pump" beam hitting the sample (in this case, vanadium pentoxide) and energizing the atoms in the sample, and then the weaker "probe" beam measures the effects. The equipment used for this experiment is capable of detecting changes on a femtosecond (millionth of a billionth of a second) timescale. This setup was used to study the vibrations of the atoms of vanadium pentoxide, a material that may have applications in electronics and as a gas sensor. Currently, the experiment is undergoing modification with the goal of increasing the pump to probe beam power ratio. It is hoped that this change will allow the experiment to induce and study a suspected phase change in the vanadium pentoxide.

► **Construction of a New Instrument to Measure the Surface Tension of Freestanding Liquid-crystal Films**

Rob Behringer and Stephen Zielke

Faculty Mentor: Mick Veum

Our research group studies a class of liquid-crystal compounds that can be prepared as freestanding films. A freestanding film is simply a fluid film that is stable without a substrate to support it (like a soap bubble on a ring). These materials, called “smectics” from the Greek and meaning “soap-like,” allow us to study the surfaces of fluids without the complication of the fluid interacting with a substrate. In order to study the behavior of these materials in previously inaccessible temperature ranges, we are in the process of constructing a new tensiometer. The new tensiometer will inflate the films by applying a pressure difference in argon gas across the film. The pressure difference combined with a geometrical analysis of the bubble’s image will provide the surface tension of the material. We will present the details of the new instrument, the state of our progress in building the instrument, as well as our research goals.

► **The Effects of Trapped Magnetic Vortices on the Critical Current of Superconducting Junctions**

Matt Earleywine

Faculty Mentor: Brad Hinaus

We study how the critical current of a superconducting tunnel junction varies when magnetic vortices are trapped near the junction. Experimentally, we cool the superconductor in magnetic field to trap the vortices in a known pattern. At a specific temperature the critical current is measured as the field is reduced to zero. The critical current vs. magnetic field graph is then characterized by two main features: the maximum critical current and the magnetic field at which it occurs. This is repeated when cooling the sample in many different fields. We find that the maximum critical current decreases as more vortices are trapped near the junction and the field at which it occurs increases as the number of trapped vortices increases. The experiment is simulated in a FORTRAN program which spaces the trapped vortices according to theory and calculates the critical current. A comparison between the experiment and simulation will be made.

► **Introductory Physics Student’s Pre-instruction and Post-instruction Conceptions about Using Ray Diagrams to Determine Image Location**

Erin Kostuch

Faculty Mentor: Brad Hinaus

The goal of this research was to determine common preconceptions that students use before, during and after instruction, when using ray diagrams to explain optical phenomena. Students were given pre and post instruction quizzes in order to determine changes in the way light rays are used to find an object’s location when viewed through a refracting or reflecting surface. Each quiz question was graded using a rubric, which examined nine different aspects of their drawings. We found that on more standard and straightforward questions students have a large shift from their pre-instruction conceptions. However, when questions were unfamiliar and difficult, students reverted back to their pre-instruction conceptions.

► **Construction of a Wind Tunnel to Measure the Magnus Force of a Rotating Golf Ball**

Jeremy Hammond

Faculty Mentor: Brad Hinaus

Golf balls hit with backspin have a lift force acting on them which opposes the force due to gravity. The lift force is an example of the so called Magnus force which only occurs when the ball is rotating and moving through the air with some speed. To measure this force we have constructed a small wind tunnel using parts that are available from local hardware stores. We will present data that shows how the Magnus Force varies with the rotation speed and its velocity.

Department of Psychology

► **The Influence of Gender on Predicting Favorable Attitudes toward Physical Punishment**

Chelsea M. Lovejoy

Faculty Mentors: Craig Wendorf and Matthew Mulvaney

Previous research in the area of corporal punishment has neglected to analyze the effect gender may have on one's favorability toward the use of corporal punishment. Focusing on some of the major predictors of corporal punishment, the current study examines what influence gender may have on the variables of religious fundamentalism, amount of corporal punishment received, and authoritarian parenting styles.

Participants completed the following measures on their mental health and experiences with corporal punishment: Attitudes Toward Corporal Punishment Scale, Religious Fundamentalism Scale, the Conflict Tactics Scale, and the Parental Authority Questionnaire. It was found that religious fundamentalism and received average levels of corporal punishment were more predictive of females having a favorable attitude toward corporal punishment while only authoritative parenting seemed to be predictive for males.

Congruent with the findings by Simons, Beaman, Conger, and Chao (1992) it appears that males adopt a disciplinary style similar to their fathers, while females adopt their mothers. Males tend to favor more aggressive and enforcing roles causing them to be affected by authoritarian parenting styles. Females were more attentive to the supportive and nurturing aspects, commonly found in fundamentalist religious homes. This may explain why religious fundamentalism was more predictive for females. Day, Peterson, and McCracken (1998) found that girls receive less corporal punishment than males which may explain why average amounts of received corporal punishment was predictive of female attitudes. The infrequency of females receiving punishment may have instilled a stronger psychological reaction toward being punished, causing a belief in its effectiveness. Males, however, may be less inclined to perceive the discipline they received as a major factor in altering their behavior.

► **Survey of Learning Goals in Psychology**

Anne M. Peaslee, Sarah E. Teuscher, and Jessica E. Trost

Faculty Mentor: Amy Herstein Gervasio and Craig Wendorf

This study examines the goals and motivations of undergraduate students for learning in psychology. In a study of British undergraduates, Breen and Lindsay (2002) suggested that students in specific disciplines will have distinct learning goals and motivations for success. In our adaptation of their research, 99 students in Introductory Psychology completed a survey that contained three sections: goals satisfied through learning, enjoyment related to learning, and motivation for learning. Students rated each item on two 5-point Likert scales (ranging from strongly disagree to strongly agree) for learning "in psychology" and "school in general."

A preliminary factor analysis of 49 "goals you want to satisfy through learning" indicated the existence of four main goals for learning: the Acquisition of Relevant Knowledge and Skills, the Science of Practical Application, Career Aspirations, and Academic Performance Skills. The Acquisition of Relevant Knowledge and Skills illustrates the goal of attaining a comprehensive understanding of learning. "Learning how to better make predictions" and "systematically completing tasks" are characteristic of this factor. Goals related to improving social life summarize the Science of Practical Application. Examples include "solving problems through learning" and "using effective questioning." Financial stability, ensuring a secure career, and making a significant contribution to society constitutes the goal of Career Aspirations. Academic Performance Skills include the goals of "acquiring good writing skills," "constructing arguments," and "acquiring good presentation skills." These factors are conceptually stronger than the factors found by Breen and Lindsay using nonpsychology students.

Additional analyses indicated these factors were largely unrelated to demographic variables (e.g., ACT score, class standing, GPA, gender, etc.). However, students who were thinking about changing their major to psychology rated Career Aspirations and Academic Performance goals significantly higher than those who were not thinking about changing their major to psychology.

► Parental Involvement in UWSP Students' Academic Activities

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Children whose parents are more involved experience better academic performance (e.g., Brown, Mounts, Lamborn, & Steinberg, 1993; Grolnick, 2003). Beginning post-secondary education may entail similar, yet different, interactions between students and their parents, but no research has examined parental involvement in their college students' academic activities and associations with G.P.A. and family conflict, despite evidence of the need to do so (Giegerich, 2002).

In this ongoing study it is expected that 50 UWSP student participants, evenly divided among males and females, who are predominantly Caucasian, will complete a survey measuring parental involvement in academic activities. Based on the Social Contextual Model of Everyday Problem Solving (Berg, Meegan, & Deviney, 1998), which across diverse samples, ages, and contexts (Palmer et al., 2002; 2005) has illustrated the interdependent nature of dyadic interactions, it is predicted that a majority of participants will report that their parents are involved, to some degree, in their academic activities. We expect male and female participants will report similar levels of parental involvement, and participants will report more involvement on the part of their mothers than their fathers. Such findings are based on evidence showing during adolescence maternal educational goal appraisal and pursuit involvement is equal for daughters as sons (Palmer, 2002), and that across childhood mothers participate more in their children's academic activities than fathers (Grolnick & Slowiaczek, 1994). Participants reporting little or no parental involvement in their academic activities will have lower cumulative G.P.A. values than those whose parents are involved to some degree in academic activities. When participants state that their parents have too much involvement in their academic activities the highest degree of conflict is expected.

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