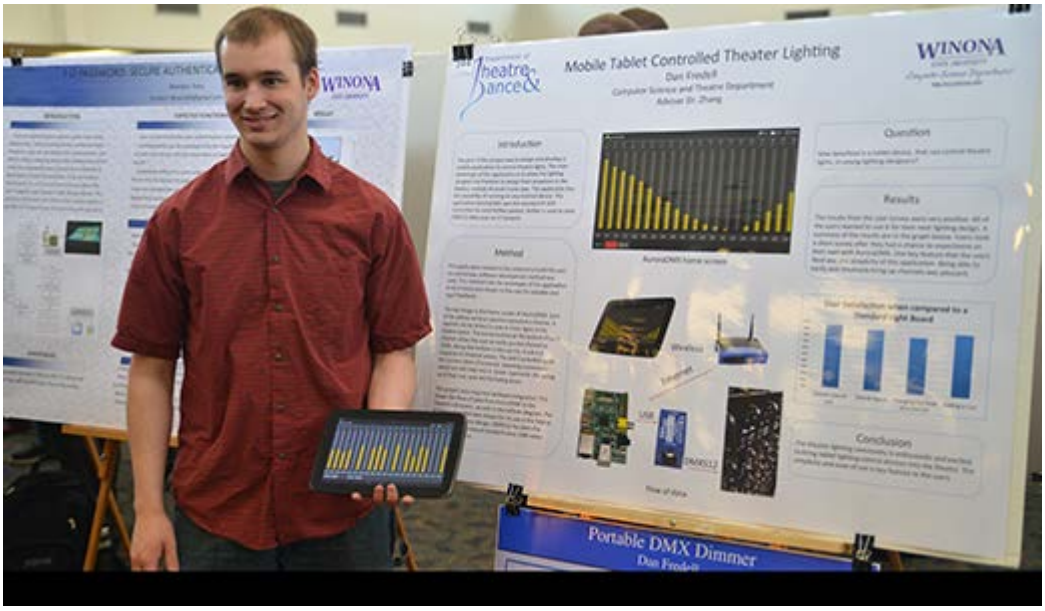
2018 Ramaley Research Celebration

Program and Book of Abstracts



1:00 to 5:00 PM
April 11, 2018
East Hall of Kryzsko Commons
Poster Session I – 1:00 to 3:00 PM
Poster Session II – 3:00 to 5:00 PM

Note: Instructions for student presenters can be found on page 3 of this program.

Welcome to the 2018 Ramaley Research Celebration!

The week of April 9, 2018 has been designated as Undergraduate Research Week and Winona State University is participating by hosting our 12th annual Ramaley Research Celebration on Wednesday, April 11. The Ramaley Celebration is a highly anticipated event that features student presentations of their research accomplishments. At Winona State, undergraduate research is highly valued as an integral part of the educational process and the Ramaley Celebration is one way we recognize and affirm this. Furthermore, the wonderful diversity of the student presenters, the research projects, and the disciplines represented all provide a strong reminder of the distinctiveness and breadth of research across the entire WSU community.

For our purposes, we define "research" very broadly as "an inquiry or investigation that makes an original intellectual or creative contribution to the discipline" (Council on Undergraduate Research). Thus, we are pleased to note that in addition to the Research Celebration on April 11, numerous other presentations of students' creative scholarship are scheduled throughout the week. These include senior shows for Studio Art/Art Teaching/Design students, Music Department hosted performances and recitals, and the Theatre and Dance Department's production of "Hot L Baltimore". Please see the WSU Events Calendar to more information.

The Organizing Committee wishes to thank Facilities Services for setup and breakdown of the poster session. We also thank Stephanie Smidt, Toni Zaborowski, and the Student Union staff for all of their help with logistics in Kryzsko Commons. The Celebration is made possible by funding provided by the WSU Office of Academic Affairs and we also thank the WSU Administration for its continuing support of student/faculty research through Research and Creative Projects grants to our students.

This year the newly inaugurated WSU Women in Science and Engineering (WISE) Club is co-sponsoring and assisting with the logistics for the Celebration and actively encouraging its members to participate. We thank them very much for their interest and support!

To all of our student presenters, thank you very much for presenting at this year's celebration and congratulations on your accomplishments!

To the faculty mentors, thank you for including students in your continuing research and creative scholarship.

To the rest of the WSU Community, please come and examine the work of our student/faculty research teams and help us acknowledge and celebrate their accomplishments!

Sincerely,

The Celebration Organizing Committee:
Alexander Jorgensen, Amanda Brouwer, Huh-Jung Hahn, Jing Han, John Holden, Barbara Holmes, Kendall Larson, Thomas Nalli, James Schul, Amy Koehler, Laura Koenig

Instructions for Student Presenters for the Ramaley Research Celebration

Poster Printing

You will need to have your poster ready for submission to the Digital Learning Commons in Krueger Library 105 *at least* 24 hours before the day of the celebration for them to complete print jobs during busy times. However, we *strongly encourage you to submit it earlier* so as not to cause a traffic jam in DLC. Submitting your print job after that 24-hour period could result in the failure to get it printed in time. Please submit your poster (in pdf format) for printing by emailing it to mediaprojects@winona.edu or by bringing it to Digital Learning Commons on a flash drive. For more information see http://www.winona.edu/technology/campus-printing.asp.

Please note that the area allowed for posters is 36" high by 48" wide. You can set the size of your poster in MS PowerPoint or MS Publisher (ideally before adding any text or images) by entering the desired dimensions under "Page Setup" under the Design tab. The completed poster needs to be saved as a PDF (use the "save as" option) before submitting it for printing. Make sure the pdf is saved to the correct size you wish the poster to be because Digital Learning Commons prints exactly what they get. You should consult with your research mentor on how to pay for the poster. You will need to provide your Winona ID number or an academic department cost center number to get it printed.

Poster Presentations

You have been assigned a poster number in the program which indicates the location to set up your poster. There will also be information sheets and people to assist you once you arrive at East Hall in Kryzsko Commons. Clips, poster boards, and easels will be provided. Posters can be set up any time after 11 am on the day of the celebration and should be set up before the event starts at 1 pm. Posters can be taken down after 5 pm and should be down by 5:30. All posters should be set up and available for viewing for the full 4 hours of the event. You have also been assigned to either Session 1 at 1-3 pm or Session 2 at 3-5 pm. You are expected to be with your poster the entire two hours during your assigned sessions. This event is usually well attended so plan on a lot of great interactions with other students and faculty.

Other

We strongly encourage you to check out other students' posters when you are not assigned to be presenting yours. Thank you for your participation and we look forward to seeing you at the Celebration!

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A journey of revelations on the importance of biodiversity in humanity's food supply and the difference one student can make

Presenting Student Author: Alison Bettin

Faculty Mentor: Robin DeVinney

As the WSU Seed Bank and Library became a reality, certain truths emerged illuminating the path to understanding of the importance of biodiversity in humanity's food supply. In the past century, over ninety percent of the world's seed stock biodiversity has disappeared. In response, preservation programs at a variety of levels, from international to local, have been established to avert further irretrievable losses. This story describes a personal intellectual expedition beginning from an interest in seeds building to a better understanding of the importance biodiversity plays within humanity's future and within the author's own. Taking on a life of its own, the project, has incorporated numerous stakeholders from a variety of community sectors. This journey demonstrates the ripple effect one person's passion can create, and how it changes and engages a community around a topic.

Click-Drag-Box to Differentiate Between Chemical, Trade, & Food Names

Presenting Student Authors: Tamara Price and Denzel Atherton,

Other Student Authors: Grace Chamberlin, Breanna Murray, Miranda Saathoff, Lee Schmalz,

Faculty Mentor: Ted Wilson

Non-Nutritive Sweeteners (NNS) knowledge; also called artificial sweeteners, low calorie sweeteners, is helpful for consumers to make informed decisions about their diet, and improve transparency in food label understanding. An NNS is an ingredient or chemical that gives a sweet taste to food and lacks nutritional benefits. NNS contains few to no calories, making them a popular alternative to caloric sweeteners. NNS can be identified by their Trade Names (TN), typically for advertisement and marketing or Chemical Names (CN), which is used for food labeling. NNS knowledge was evaluated with a survey delivered to 1,248 WSU students, in which 493 respondents (19±2 *yrs*) completed. Evaluation of 30 items; 12 paired NNS (CN and TN), 6 decoy NNS (not-real, fake NNS), 6 caloric sweeteners, and 6 food items. Respondents were asked to correctly identify these items as Non-NNS or NNS. A compiled list of 6 paired NNS (CN and TN), 6 decoy NNS, 6 caloric sweeteners and 6 food items were to be correctly identified. Tukey's HSD method was used as a post hoc test to find significance between these six groups. TN were identified as NNS 4.92±0.98 times while CN were only identified as NNS 3.89±1.87 times. Decoy Names were identified as NNS 4.7±0.98 times. There was a significant difference ($P < 0.0001$) between TN > CN, TN > Decoy name, and decoy name > CN. These results document WSU students' knowledge of NNS that are presented on food labels. This could lead to confusion or

misunderstanding to what we are consuming. Without knowing what one is consuming, one does not know the possible health side effects.

Comparing Asymmetry in Different Fish Species from a Polluted Stream

Presenting Student Author: Synthia McBrayer

Faculty Mentor: Neal Mundahl

Many factors, including tolerance levels to environmental stressors, can cause developmental disparities in fish, specifically left side-right side asymmetry of the body. Creek Chub, Central Stoneroller, Blacknose Dace, Southern Redbelly Dace, and Brook Stickleback, which vary in their tolerance to environmental stress, were collected via electrofishing on the South Fork of the Whitewater River, in Eyota, Minnesota. Head length, jaw length, eye diameter, pectoral fin length, and pelvic fin length were measured on both left and right sides of each fish, and differences between sides (expressed as a percentage of structure size) were used to analyze the degree of asymmetry exhibited by each species. I hypothesized that the less tolerant species (e.g., Brook Stickleback, Southern Redbelly Dace) would exhibit greater asymmetry than the other, more tolerant species. Brook Stickleback had the highest composite score (sum of all structure size percentages) at 40.02%, followed by Creek Chub at 17.35%, and Central Stoneroller at 11.50%. Blacknose Dace and Southern Redbelly Dace are still being analyzed. Fish species that have lower tolerances to environmental stressors, in general, have more left side-right side asymmetry, suggesting that their development may be affected negatively by something (e.g., chemical pollutants) in their environment.

Consumer Knowledge of Non-Nutritive Sweeteners Based on Ability to Identify by Chemical of Trade Name

Presenting Student Authors: Breanna Murray and Miranda Saathoff

Faculty Mentor: Ted Wilson

This study aimed to emphasize that consumers have little to no knowledge of non-nutritive (artificial) sweeteners in general, and thus cannot make educated consumption decisions. The hypothesis was that more education amongst other factors would be indicative of an increased ability of the participant to provide, from memory, more correct examples of non-nutritive sweeteners (NNS). A qualtrics survey was administered to 1248 students of which 592 responses were collected and 493 of these were complete responses. Survey recipients were students in introductory level courses in the college of science. The aim of this survey was to determine consumer knowledge of NNS based on ability to correctly identify NNS by chemical (CN) or trade name (TN). Participants were chosen from introductory level courses to reduce the influence of prior education. To further reduce bias, respondents were asked to provide their education background regarding the topic. Participants were then asked from memory to type as many examples of NNS as possible into the qualtrics survey and results were scored; both CN and TN were accepted, as well as terms that were phonetically similar, for example, “Aspertame” instead of “Aspartame”. Juniors (1.42±1.56) and seniors

(1.44±1.34) were able to provide more examples of NNS on average than freshman (0.87±0.95) and sophomores (1.18±1.07). Respondents who “consume NNS once or more each month” were able to name 1.41±1.22 NNS on average. This decreased to 1.03±1.08 if consumption fell into the category “consumes NNS once or more each week”, which was significant ($P < 0.05$). Paradoxically, this indicates that consumers who think they consume NNS more frequently may know less about them. Another significant finding was that respondents who looked at food ingredient labels were able to name 0.35 more NNS than those who did not. Lastly, respondents currently trying to lose weight were able to name 1.20±1.07 NNS which was greater than respondents who had never tried to lose weight or those with past weight loss attempts. The present study suggests that more formal education and a greater general concern for nutrition, leads to an increased knowledge of NNS.

Development and implementation of the WSU Seed Bank and Library

Presenting Student Author: Alison Bettin

Other Student Authors: Jacki Gustavson, Ellie Schmidt, Brea Tobako, Nicole Villaruz

Faculty Mentor: Robin DeVinney

The WSU Seed Bank and Library was established in 2017 as a joint effort between the WSU Office of Sustainability, the WSU Biology department, and the City of Winona Park and Recreation Department at the East End Recreation Center. The WSU Seed Bank and Library has two main goals: 1) to educate the Winona community on the exchange and preservation seeds, and 2) to inspire awareness and action on food equity, food insecurity, and biodiversity. These efforts have connected with hundreds of individuals in the greater Winona community over the past year through workshops, lectures, and giveaways. The project has received over $16,000 in grants from local, state, and national organizations to enable this important work. The community’s response has demonstrated there is an appetite for more programs like it that get people thinking about their relationships with food. The future is bright as the Seed Bank moves from its initiation phase and begins to thrive as an important element of the community’s conversation how we feed ourselves and how that represents our values.

Development of a PCR for Simultaneous Amplification of Borrelia burgdorferi and Ixodes Tick DNA

Presenting Student Authors: Shaynee Studer and Alina Yevsina

Faculty Mentor: Kimberly Bates

The high prevalence of Ixodes ticks in Southeast Minnesota has serious implications as they are often vectors for infectious tick-borne agents, such as Borrelia burgdorferi, the causative agent of Lyme Disease (LD). Currently, our lab has developed a PCR that can amplify Borrelia DNA in infected ticks, however, when ticks fail to amplify it is unclear whether this is from lack of the bacterial agent or if the DNA is corrupted. A possible solution to this problem is to concurrently amplify a gene within the Ixodes tick in order to assess the quality of the DNA. The goal of this study was to efficiently

develop a PCR that will simultaneously test for Ixodes and Borrelia burgdorferi DNA. This would allow our lab to test almost 3000 tick samples collected between 2005-2012 to be tested for Borrelia with the internal Ixodes control confirming the DNA was intact. Varying combinations of Ixodes/Borrelia burgdorferi DNA, primers specific for 16S rRNA in Ixodes and 23S rDNA in Borrelia burgdorferi, and salts for efficient binding of DNA were prepared for PCR application and run on a 50mL 2% agarose gel. Currently, amplification of each of the genes has been successful when the organisms are amplified independently but co-amplification has resulted in only Borrelia being successfully amplified. Future research using these methods may include mapping of the prevalence of Borrelia burgdorferi infected Ixodid ticks in Southeast Minnesota and West Central Wisconsin.

Effect of a pre-dinner walnut snack on caloric intake among university students

Presenting Student Authors: Lauren DeVaan and Gabrielle Schnellman

Other Student Authors: Michelle LaCasse, Mackenzie Weis, Elizabeth Gile, Molly Ahmann

Faculty Mentor: Ted Wilson

Objective: Freshman-15 is a phenomenon commonly observed among students enrolled in cafeteria meal plans resulting in weight gain due to new eating patterns. Eating habits established by young people tend to continue into later adulthood and may contribute to obesity. Walnuts are a nutrient dense snack that can improve nutritional health. Consumption of walnuts prior to dinner could alter caloric intake during the subsequent meal.

Methods: Healthy students (n=36; age 18-20) received a standard dinner (1760 Calories) with three treatments (90 minutes pre-meal) in a randomized single crossover design: 1) 190 Cal of California Walnuts (CW) 2) 190 Cal of gummi candy (GC), or 3) no snack (NS; control),) on three consecutive nights, followed by analysis of total caloric ingestion (LSM ± SE).

Results: Total dinner calories after CW, GC, and NS were 861 ± 40, 931 ± 40, and 956 ± 40 with CW<NS ($p = 0.02$) and CW<GC ($p = 0.10$). Total dinner calories with snack included were CW, GC, and NS were 1020 ± 48, 1065 ± 48, and 942 ± 48 (treatment difference $p = 0.08$). Percent of total dinner calories after CW, GC, and NS were 47 ± 3, 50 ± 3 and 53 ± 3. Percent of total calories with snack after CW, GC and NS were 52 ± 3, 55 ± 3 and 54 ± 2.

Conclusion: Consumption of a CW snack prior to a dinner reduced meal time caloric intake. By reducing caloric intake during a standardized dinner, long term walnut consumption may lead to improvements in body weight management among university students and reductions in subsequent obesity during later adulthood.

Effect of a pre-dinner walnut snack on nutrient intake among university students

Presenting Student Authors: Michelle LaCasse and Mackenzie Weis

Other Student Authors: Lauren DeVaan, Gabrielle Schnellman, Elizabeth Gile, and Molly Ahmann

Faculty Mentors: Ted Wilson and Tisha Hooks.

Objective: Freshman-15 is a phenomenon commonly observed among students enrolled in cafeteria meal plans resulting in weight gain due to new eating patterns. Eating habits established by young people tend to continue into later adulthood and may contribute to obesity. Walnuts are a nutrient dense snack that can improve nutritional health. Consumption of walnuts prior to a meal could improve the nutritional quality of the subsequent meal.

Methods: Healthy students (n=36; age 18-20) received a standard dinner (1760 Calories) with three treatments (90 minutes pre-meal) in a randomized single crossover design: 1) 190 Cal of California Walnuts (CW), 2) 190 Cal of gummi candy (GC), or 3) no snack (NS; control) on three consecutive nights, followed by analysis of meal nutrient ingestion. (LSM ± SE).

Results: Total fat intake (g) after CW snack (36.8 ± 1.9) was less (p=0.01) than after GC (40.7 ± 1.9) and NS (41.5 ± 1.9). Saturated fat intake (g) after CW (13.4 ± 0.79) was less (p=0.03) than after NS (15.1 ± 0.79). Dietary fiber intake (g) after CW (3.1 ± 0.18) was less (p=0.01) than after GC (3.6 ± 0.18) and NS (3.6 ± 0.18). Protein intake (g) after CW (31.9 ± 1.9) was less (p=0.02) than after NS (36.0 ± 1.9). Cholesterol intake (mg) after CW (92.4 ± 5.7) was less (p=0.03) than after NS (103.6 ± 5.6). Sodium intake (mg) after CW (1723.1 ± 99.0) was less (p=0.02) than after NS (1908.5 ± 98.4). Consumption of snacks prior to the standard dinner had no effect on total carbohydrate and sugar ingestion.

Conclusion: Consumption of a CW snack prior to a dinner resulted in differences in nutrient intake. Understanding how walnut consumption impacts nutrient intake during a subsequent dinner could lead to improvements in weight management among students and improved health habits that carry forward into adulthood for obesity benefits.

Effect of A Pre-Dinner Walnut Snack on Sense of Hunger Among University Students

Presenting Student Authors: Elizabeth Gile, Molly Ahmann

Other Student Authors: Michelle LaCasse, Mackenzie Weis, Gabrielle

Schnellman, Lauren DeVaan

Faculty Mentors: Ted Wilson and Tisha Hooks

Objective: Freshman-15 is a phenomenon commonly observed among students enrolled in cafeteria meal plans resulting in weight gain due to new eating patterns. Eating habits established by young people tend to continue into later adulthood and may contribute to obesity and CVD in adults. Walnuts are a nutrient dense snack that

can improve nutritional health. This study determined if a walnut snack could alter sense of hunger and satiety before and after a subsequent meal.

Methods: Healthy students (n=36; age 18-20) received a standard dinner (1760 Calories) with 3 treatments (90 minutes pre-meal) in a randomized single crossover design: 1) no snack (NS; control), 2) 190 Cal of gummi candy (GC), or 3) 190 Cal of California Walnuts (CW) on three consecutive nights. Visual analog scale (VAS) surveys were administered just before and just after dinner. Surveys measured sense of hunger, desire to eat, fullness, and intent to eat 30 minutes after study completion.

Results: Pre-meal hunger VAS across treatments was significant ($p = 0.0174$); CW, GC, and NS were, 7.1 ± 0.3, 7.1 ± 0.3, and 8.1 ± 0.3 (CW<NS; GC<NS). Post-meal hunger was not significant across treatments for CW, GC, and NS, 1.5 ± 0.2, 1.3 ± 0.2, and 1.4 ± 0.2. Pre-meal desire to eat VAS across treatment was significant ($p = 0.0101$); CW, GC, and NS were, 7.5 ± 0.3, 7.6 ± 0.3, and 8.7 ± 0.3 (CW<NS; GC<NS). Post-meal desire to eat was not significant across treatments for CW, GC, and NS, 1.6 ± 0.2, 1.4 ± 0.2, and 1.5 ± 0.2. Pre-meal fullness VAS across treatment showed significance ($p = 0.0002$); CW, GC, and NS were, 2.6 ± 0.2, 2.3 ± 0.2, and 1.4 ± 0.2 (CW>NS; GC>NS). Post-meal fullness was not significant across treatments for CW, GC, and NS, 8.3 ± 0.3, 9.0 ± 0.3, and 8.9 ± 0.3. Sense of intent to eat 30 minutes after study completion was not significantly affected by treatment.

Conclusion: Consumption of CW reduced acute perceptions of hunger, desire to eat, and increased sense of fullness, surprisingly GC had similar acute effects in this study. Walnut dependent perceptions of hunger and satiety may influence long term food consumption patterns and could promote improvements in weight management among students that carry forward into adult obesity.

Effects of *Stevia rebaudiana* extract on glycemic responses in a potential mouse model of diabetes

Presenting Student Authors: Tracy Her, Jesse Frank, Eileen DeBoer, Mikaella Sabinash, Jourdan Valkner, Amber Weber

Faculty Mentor: Mark Garbrecht

Extracts of the South American plant, *Stevia rebaudiana (stevia),* have increasingly been used as a non-caloric sweetener over the past decade in the United States. Its reputation as a “natural” sweetener and lack of bitter aftertaste has resulted in stevia becoming a preferred sweetener over synthetic sweeteners such as saccharin or aspartame. Recent research has suggested that bioactive compounds in stevia extracts possess several anti-diabetic properties including stimulation of glucose transport, increased insulin sensitivity, and promotion of glucose-dependent insulin secretion from the pancreas. The goal of the current study was to examine the effects of stevia supplementation on glycemic responses in control mice (C57BL/6J) and a potential mouse model of diabetes (C57BL/6-*Ins2*^{Akita}/J; a.k.a, Akita mice). Briefly, 15-20-week-old control and Akita mice were subjected to glucose tolerance testing prior to administration of stevia (baseline) and also after consuming stevia-supplemented drinking water (0.1% w/v) for two and four weeks.

Effects of Stream Habitat Improvements on Brown Trout Size and Abundance in Garvin Brook

Presenting Student Author: Dylan Lewis

Faculty Mentor: Neal Mundahl

Different approaches to stream habitat improvement (traditional with artificial overhead cover and plunge pools, Rosgen with varying artificial and natural cover and depths) are used to rehabilitate degraded trout streams in southeastern Minnesota. I evaluated Brown Trout abundance and size and various physical variables of pool habitats in Garvin Brook, where traditional and Rosgen restored sections and an unimproved natural section all occur within a short (5 km) reach. Six pools from each section were assessed for various habitat variables, including depth, current velocity, substrate type, water temperature, cover area, vegetation, and pool volume. Brown Trout abundance and size within each pool was used for comparison of the three sections. Habitat comparisons indicated that unimproved and traditional restored pools varied greatly from each other, and that Rosgen restored pools were intermediate in habitat, overlapping the other two types. Brown Trout abundance was positively related to vegetation abundance, log cover, bank cover, and total pool volume, and inversely related to percent fine substrates. Maximum Brown Trout size was positively correlated with bank cover, log cover, and volume, and inversely correlated with percent gravel. Brown Trout abundance was not significantly different between restored and unimproved sections, but Brown Trout size was greater in restored sections than in unimproved reaches. Future stream restorations could focus on traditional restorations, with greater bank cover and increased pool volume, if the goal is to provide more habitat for more and larger fish.

Genetic Diversity of Lungworm (*Dictyocaulus spp.*) species within: Cattle, Red Deer, and Whitetail deer

Presenting Student Authors: Erin Freemyer, Robin Her, Madison Miller, Trisha Nganteh

Faculty Mentor: Kimberly Bates

Lungworm (*Dictyocaulus spp.*) cause serious bronchial disease in the animals they infect. It was widely believed that cattle (*Bos taurus*) and deer species that live in the same geographic range share lungworm through infected pastures. However, cross-transmission studies1 and recent molecular research2 has determined that the lungworm that infect cattle (*D. viviparus*) are different than what infects cervids in Europe. Molecular studies on lungworm have yet to be published in the U.S. The purpose of this research was to sequence DNA isolated from lungworms harvested from U.S. cattle, U.S. white-tailed deer (*Odocoileus virginianus*), New Zealand cattle and New Zealand red deer (*Cervus elaphus*). Past research in our lab using restriction length polymorphism (RFLP) indicated that the lungworm harvested from cattle were different from what was harvested from red deer and white-tailed deer, and that it was also different between red deer and white-tailed deer. DNA from individual samples was amplified using a PCR protocol that amplifies the ITS2 from (I think it is either ribosomal

RNA or ribosomal DNA, need to look that up) sequence and visualized using gel electrophoresis. This gene was used because it is conserved within a species. Currently research is focusing on achieving DNA amplification. DNA amplification has been successful in New Zealand cattle. Data collection of red deer and white-tailed deer is underway. Further research will include sequencing the genes of each species in each geographic range to identify or determine relatedness of each lungworm species.

Habitat Restoration Effects on Small Mammal Populations

Presenting Student Authors: Rosa Viegas and Drew Rindflesch

Faculty Mentors: Neal Mundahl and Amy Runck

Small mammal biodiversity is important in proper ecological functioning of savannah and prairie habitats. The Garvin Heights Natural Area is being restored to its native habitats of bur oak savannah and dry bluff prairies by using goat browsing, prescribed fire, selective cutting, and chemical treatment of invasive plants. In order to understand the effects of this restoration effort on small mammal communities, we used a mark-recapture method to document the diversity and abundance of small mammals. During Fall 2017, we had four transects (total of 360 trap-nights) through the treated and untreated dry bluff prairie and treated and untreated bur oak savannah habitats. Small mammal diversity was low in all habitats surveyed, as we only observed deer mice (*Peromyscus spp*) and the northern short-tailed shrew (*Blarina brevicauda*). The population estimate in the treated prairie was on average four times higher than the other three habitats, which was due to the abundance of *Peromyscus spp*. These preliminary results indicate that the habitats are not supporting the species diversity expected in bur oak savannah and dry bluff prairies. This initial study will provide a baseline data as these habitats are continued to be treated.

Identification of axon-oligodendrocyte preferential interaction sites preceding initial myelin

Presenting Student Authors: Taryn Mallon and Rachael Sawyer

Faculty Mentor: Jacob Hines

Oligodendrocytes are matured oligodendrocyte progenitor cells that serve to myelinate axons within the central nervous system. The myelination process is complex and is orchestrated by many unknown mechanisms, of particular interest, the causal relationship between axon diameter and myelination. Previous studies suggest that oligodendrocytes preferentially myelinate axons with larger diameters. Due to the variation in axon diameter along the length of individual axons, we first hypothesized that oligodendrocytes interact with and initiate myelination at thicker domains of axons known as varicosities. To test this hypothesis, we performed in vivo time-lapse in zebrafish larvae to determine if oligodendrocytes preferentially interact with and sustain interactions at varicosities compared to intervening, thin axonal segments. These larvae expressed green and red fluorescent proteins in each cell type, enabling direct observation of oligodendrocyte-axon interaction over several hours. Oligodendrocytes more frequently interacted with varicosities as compared to intervening axonal

segments. In addition, oligodendrocytes interacted with varicosity domains for more sustained periods of time as compared to intervening segments. Because varicosities serve as sites of enriched synaptic vesicle release, this is instrumental in oligodendrocyte and axonal communication. Therefore, ongoing experiments are testing whether synaptic vesicle release is necessary to direct and stabilize oligodendrocyte interactions at these sites.

Identification of helminths isolated from Wisconsin bobcats using morphological and molecular techniques

Presenting Student Authors: Collin Barry, Trevor Johnson, Kayla Oliver, Bailey Possehl, Blake Rowe, Kelsey Hoffman

Faculty Mentor: Kimberly Bates,

Bobcat (*Felis rufus*) populations have been declining in their traditional habitat of Northern Wisconsin but increasing in the central and southern part of the state according to the WI DNR. Our lab group was interested in determining if this movement was correlated to the presence of certain parasitic species. Bobcat populations are monitored in WI and all hunter/trappers are required to surrender their carcasses to the DNR for research. A total of one hundred and nine intestines were removed from legally harvested bobcats on March 5th, 2012 from Wisconsin's Department of Natural Resources (DNR) in Madison. Each intestine was placed in a Ziploc bag and frozen until ready to analyze. The intestines were dissected, and the digested material was separated through sieves. The contents were examined microscopically to look for species identification using the scolex for tapeworms and the entire worm for nematodes. All parasites were cleaned in distilled water and then stored in 70% ethanol. The nematodes *Toxocara cati* and *Toxascaris leonina* were identified using the anterior cervical alae. Many of the tapeworms were missing their scolex which necessitated using a molecular approach. DNA was harvested using several proglottids per parasite. The Folmer region of the COI gene was then amplified using polymerase chain reaction (PCR). Amplified DNA was submitted for sequencing. The tapeworm's genera were found to be *Diphyllobothrium* and *Taenia* using both molecular and morphological data. Future experiments will include amplifying different genes and sequencing them in order to identify the parasites to the species level.

Iridovirus Infectivity of Enveloped vs. Non-Enveloped Virus Particles

Presenting Student Authors: Karina Sandeen, Erica Moyes, and Kaitlin Wheeler

Faculty Mentor: Casey Finnerty

Iridoviruses are enveloped viruses by classification, but they are able to produce infectious virions that are both enveloped and non-enveloped. These virions exit their host cells via budding or lysis, respectively. The current understanding of virus infectivity is that enveloped virus particles express surface proteins that mediate the attachment and entry of the virus into host cells and are therefore necessary for virus particles to be infectious. Iridoviruses deviate from this model because they can produce infectious non-enveloped particles. We are investigating the ratio of enveloped versus non-

enveloped virus particles and their infectivity. Two model viruses are being used, largemouth bass virus (LMBV) and frog virus 3 (FV3), with corresponding cell lines bluegill fry (BF-2) and fat head minnow (FHM), respectively. The viral inoculum obtained from the infected cell cultures was purified through a 40% sucrose cushion and then through a 20-80% sucrose gradient. Initial results show that the purification yielded two separate bands for FV3, and one band for LMBV, indicating the presence and separation of enveloped and non-enveloped virus particles in FV3. For FV3, the band of non-enveloped virus particles was denser than the band of enveloped. The single band seen for LMBV is likely due to the effects of a late harvest of virus from the cell culture which can result in viral envelope degradation. Either TCID50 or plaque assays will be performed to determine the infectivity of each virion type in each cell type, and qPCR will be performed to quantify the genome equivalents for each fraction as well. Initial results of TCID50 assays for the FV3 and LMBV inoculums prior to purification show titers of 10^4 TCID50/mL and 10^4-10^5 TCID50/mL, respectively.

Laying Low in the Compost: Evidence of Aggregation in Isopods

Presenting Student Author: Lexi Hasleiet

Faculty Mentor: Robin DeVinney

Terrestrial isopods, sometimes referred to as “rollie pollies”, are common visitors in gardens. They are extremely numerous in the surface layers of the soil and are important in the development of soil fertility. They generally consume decomposing litter (such as dead plants, fungi or animals). Isopods may be found in aggregations (non-social) or they may be found in family groups (social). An aggregation is a gathering of organisms due to a condition in the environment (light, humidity, temperature).

Recent research has shown that isopods in compost are able to break down plastic (material that was a nuisance in compost where it remained unchanged through compost development). The WSU composters house huge numbers of isopods and persons that donate organic waste for compost often inadvertently include plastic. It would benefit WSU compost to foster isopods and to be able to direct where in the compost groups gather.

For my research, I offered a choice of organic shelters (egg cartons) or inorganic shelters (petri dishes) to hundreds of isopods found in the WSU compost. My research shows isopods aggregate under shelters as quickly as 10 minutes. Over the course of many trials, isopods chose the egg carton shelter over the petri dish shelter in a 6:1 ratio. I followed the time trials with tests of aggregation patterns using two identical shelters in an arena separate from the compost. This test was imperative to determine if one shelter is preferred over another. The compost had many options for shelters besides those provided, allowing many of the isopods in the compost to aggregate on the side of the compost bin rather than choosing either of the shelters provided. Providing a test to mitigate the number of available shelters was very important in determining the patterns of the isopod groups.

Lidocaine and Conducted Forearm Arterial Vasodilation in Humans

Presenting Student Author: Jacey Tuura

Faculty Mentor: Ted Wilson

Rapid vasodilation of skeletal muscle vasculature occurs during contractions because there is an increase in metabolic demand, permitting more efficient delivery of oxygen and nutrients to the surrounding tissues. Vasodilation responses resulting from the action of muscle contractions can be conducted via the microcirculation, with vasodilation starting in the small arterioles close to the capillaries and ascending into upstream feed arteries. Currently, there are no known pharmacological tools that can dependably block or attenuate vascular conducted responses in humans; lidocaine is a common anesthetic agent used to block the flow of voltage-gated sodium channels and the action potentials created by open VGNaC. The aim of the study was to determine if lidocaine administration alters the vasodilator response to a brief forearm contraction. Three different doses of lidocaine at 1, 2, and 5 mg/100mL were infused and a single muscle contraction (SMC) at 40% of maximum voluntary contraction was performed. Doppler ultrasound was used to measure brachial arterial diameter, forearm blood flow (FBF), and the mean blood velocity (MBV).. Forearm vascular conductance (FVC), calculated from blood flow (ml/min) and blood pressure (mmHg), was compared to FBF utilizing the reduction in the total vasodilator response. Total vasodilator responses with and without lidocaine did not show any significant differences between the different doses. Change (D) in FVC with saline vs. 5 mg/100mL lidocaine infusion values (206 ± 33, 210 ± 27 $mL \times min^{-1} \times 100mmHg^{-1}$, respectively) suggests that there is little change even between the largest doses of drug infusion. In conclusion, rapid dilation cannot be blocked or attenuated by lidocaine in humans and further studies should continue the search for better regulation of skeletal muscle blood flow.

Molecular Identification of *Wolbachia sp.* in Isopod Crustaceans

Presenting Student Authors: Renee Fisher, Alexandria Krumrai, and Zachary Bailey

Faculty Mentor: Kim Evenson

Wolbachia is a symbiotic bacteria that infects the reproductive tracts of 40-70% of arthropods in addition to crustaceans, mites and nematodes. The natural form of Wolbachia found in female reproductive tracts, has no known role in insects. Wolbachia is currently a popular research subject because when present in insects, it increases resistance to infection by RNA viruses like Zika virus. This is due to cytoplasmic incompatibility: the male mosquitos with the Wolbachia virus mate with uninfected females and the female's eggs will hatch only if they are infected with Wolbachia. Once the female has mated with an uninfected male, she will continue to produce only offspring that are infected with Wolbachia. In this study, *Armadilidium vulgare* (Pill Bugs) were collected from compost in the Winona State University greenhouse, and tested for Wolbachia. After sampling and verifying Wolbachia's presence through the use of polymerase chain reaction and Wolbachia 16S rDNA primers, we determined the percentage of pill bugs infected with Wolbachia bacteria at different stages of development. The results of this study may provide insights into how the symbiotic Wolbachia in pill bugs can alter reproduction.

Neuronal Activity Promotes Nascent Myelin Sheath Stabilization and Growth

Presenting Student Author: Cassie Flachs

Faculty Mentor: Jacob Hines

Myelination of axons has profound effects on the central nervous system (CNS) function. In cases such as Multiple sclerosis, demyelination terminates the ability to conduct nerve signals to and from the brain. Therefore, deciphering molecular mechanisms mediating myelin sheath stabilization and formation could enable therapies to promote remyelination. Previous research indicates that stimulating neuronal activity positively regulates myelination, causing individual oligodendrocytes to possess more myelin sheaths. Whether neuronal activity enhances myelination by regulating sheath stabilization or sheath formation is unknown. The purpose of this study was to test the hypothesis that increased neuronal activity, produced by pentylenetetrazol (PTZ), promotes stabilization of new myelin sheaths and/or promotes increases in sheath growth. To monitor such stabilization and growth of new myelin sheaths, we performed in vivo time lapse imaging using transgenic zebrafish that label reticulospinal axons and oligodendrocytes with fluorescent proteins. To manipulate neuronal activity, we treated transgenic zebrafish with PTZ, which increases excitability of reticulospinal neurons. We observed increased locomotor behaviors in PTZ-treated zebrafish. PTZ treatment also caused decreased rates of myelin sheath retraction and greater myelin sheath growth. Additionally, PTZ treatment accelerated myelin sheath growth as compared to control larvae. This preliminary data suggests PTZ treatment increases neuronal activity and in turn regulates myelinating capacity. Moreover, this preliminary data supports the hypothesis that neuronal activity plays a role in myelin sheath stabilization and rate of myelin sheath growth.

Non-Nutritive Sweetener Depth of Knowledge Among University Students

Presenting Student Authors: Grace Chamberlin and Lee Schmalz,

Other Student Authors: Breanna Murray, Denzel Atherton, Miranda Saathoff, Tamara Price

Faculty Mentor: Ted Wilson

Understanding consumer knowledge of non-nutritive sweeteners (NNS), also referred to as artificial or reduced calorie sweeteners, may be important for understanding NNS effects on dietary heath. NNS can be identified by trade name (TN) on packaging or chemical/plant name (CN) on ingredient labels. For this study NNS were defined as ingredients or chemicals that give a sweet taste to foods and beverages, have no nutritive benefits, and contain few or no calories. NNS knowledge was evaluated with a survey delivered to 1,248 university students, and completed by 493 respondents (19 ± 2 yrs; 24 ± 3 ACT Score) between 15:00 09/11 and 15:00 09/13/2017. To evaluate NNS familiarity, respondents provided a fill-in-the-bank NNS definition and NNS examples from memory. NNS definition depth was graded based for the presence of four different definition categories (score 0 none-4 excellent; average 1. 1 ± 1. 1) which was statistically correlated with prior use of NNS, food ingredient label use, and class rank. Respondents provided 1. 0 ± 1. 1 examples of true NNS (CN or TN), which was

correlated with prior use of NNS, food ingredient label use, weight loss attempts, and class rank. After being provided with the NNS definition, a 30 item click-drag-box sorting exercise was completed consisting of a randomized list of 6 paired NNS (CN and TN), 6 decoy NNS (not true NNS), 6 nutritive sweeteners (not true NNS), and 6 items that were foods (not true NNS), items identification items identified as NNS or Not a NNS. Click-drag-box exercise food items and nutritive sweeteners were likely to be identified as not being true NNS 5. 0 ± 1. 5 and 4. 3 ± 1. 7 times. TN, CN and decoy items were identified as NNS 4. 92 ± 0. 98, 3. 89 ± 1. 87, and 4. 70 ± 1. 34 times. Significance with a Tukey HSD (P < 0. 0001) was TN > CN, TN > decoy name, and decoy name > CN. While respondents were able to identify NNS by TN, presumably from marketing/media exposure, respondents were more likely to incorrectly identify a decoy name as being a NNS than true NNS identified by CN. Respondents were not able to provide an in-depth NNS definition nor able to name the NNS typically encountered on food packaging or ingredients labels. If consumers do not know what an NNS is, or if they consume them, it may be difficult to evaluate how NNS influence our dietary health.

Observed Counts of Local Birds Along the Shore of East Lake Winona Adjacent to Highway 61

Presenting Student Author: Ethan Tosto

Faculty Mentor: Neil Mundahl

Over a period of six weeks (September-November 2017), birds were surveyed on 24 dates along the wooded shoreline and bike path of East Lake Winona. Surveys were conducted to assess bird abundance and use of the shoreline trees and shrubs prior to a planned habitat restoration project (removal of woody invasives). All birds observed were identified and recorded and survey duration was used to standardize sightings (birds/hour). There were a total of 255 birds observed, representing 20 different species. The most common species observed were Downy and Hairy Woodpeckers, Black-capped Chickadees, Red-winged Blackbirds (most abundant species), and Gray Catbirds. During September, Red-winged Blackbirds accounted for 25% of the total birds observed, whereas Gray Catbirds were the second most abundant at 11%. Bird abundance declined throughout the study as migratory species moved south, with 167 birds observed in September (65%), 73 observed in October (28%), and 14 Observed in November (5%). The decline of bird populations ranged from seeing between 18- 30 birds/hour in September, to 5-10/hour in October to 2-3/hour in November. American Robin numbers began to fall in late September and had disappeared by October. There were far fewer birds observed throughout the survey than anticipated, due in part to disturbances in the area (bike path and highway traffic). Birds were observed in many of the invasive shrubs and trees along the shoreline, such as buckthorn. No nests were visible, so it is unclear whether the removal of these invasive plants would pose a problem for these birds. However, cover and habitat are already limited because of its proximity to highway 61. The removal of invasive species of trees and shrubs may reduce bird activity in that area during autumn.

Oxidative Stress in *sod1*∆ and *ccs1*∆ Strains Results in Increased P-body Assembly in *Saccharomyces cerevisiae*

Presenting Student Authors: Lindsey Bailey, Safa Aiyana Mahina, and Lucas Seaberg

Faculty Mentor: Scott Segal

SOD1 encodes superoxide dismutase (Sod1p), which catalyzes the partitioning of the superoxide (O_2^-) radical into ordinary oxygen (O_2) or hydrogen peroxide (H_2O_2). From this partitioning, oxygen will be freely expended by the host cells, thus reducing genotoxic stress. For Sod1p to function properly in removing free oxygen species, it must have a coordinated copper ion. Ccs1p is a copper chaperon, whose levels increase in response to oxidative stress, and acts to insert a copper ion into the tertiary structure of Sod1p. Sod1p is conserved from yeast to mammals, and mutations in mammalian *Sod1* are implicated in ALS.

Prior work showed that upon Cr(VI) mediated oxidation, mRNA is translationally repressed and sent to P-bodies and not stress granules. P-bodies and stress granules are both mRNA-based structures that are found in cytoplasm. Both structures contain non-translating RNA, but have distinct differences. P-bodies contain RNA degradation factors and are thus structures where mRNA is likely degraded. Conversely, stress granules contain translation initiation factors, which act as storage compartments for mRNA that will be translated once the oxidative stress is relieved. P-body assembly in response to Cr(VI) is due to the activation of no-go decay on mRNA that has oxidative damage. Given that strains lacking Sod1p or Ccs1p should lead to high levels of oxidative stress, we looked to see if P-body assembly was increased in strains lacking Sod1p and Ccs1p. Based on the data obtained, there was an increase in P-body assembly in both *sod1*∆ and *ccs1*∆ strains, along with an attenuation in translation. Similar to the Cr(VI) experiments, translation is only attenuated in strains lacking Sod1p. As Sod1p lacking strains are exposed to higher oxidation, we would expect that no-go decay may be activated to remove mRNA with oxidative damage. Interestingly, SOD1 shows a genetic interaction with DOM34, which encodes an effector protein for no-go decay.

Research of White Sucker Cell Lines and Associated Viruses

Presenting Student Author: Mohamed Mohamed

Faculty Mentor: Casey Finnerty

Catostomus commersonii, also known as the White Sucker, is a vital part of most aquatic ecosystems in the U.S. Specifically looking at the Upper Midwest, the fish are widely distributed around the states of Minnesota and Wisconsin. The importance of these organisms is due to their species reputation, they are indicator species that are very useful in informing whether the environment around them is healthy or if contamination has occurred. To better understand the organism, we needed to start at the molecular level. Understanding the nature of White Sucker cells through cell cultures. To get the individual fins of the White Sucker to flasks with growth media and begin to have the cells grow from the tissue. Through process of cell culturing, the cells differentiated from one another through each passage and adapted to different media to

create contrasting growth rates. The differentiating cells were then characterized through DNA barcoding and examined for susceptibility to a variety of viruses to obtain better information about the multiple cell types from the fins of the White Sucker.

The Development of Primary Tissue Culture Protocol to Test the Toxicity of Biliverdin in Green-Blooded Skinks

Presenting Student Author: Erin Nolan

Faculty Mentor: Amy Runck

Green-blooded skinks (*Prasinohaema virens*) are small, tropical lizards native to New Guinea. They are known for their green skin, bones, organs, and blood, which is a result of high levels of biliverdin in the animal's system. Biliverdin is a bile pigment that is a byproduct of the breakdown of old red blood cells. While biliverdin is toxic to humans in high concentrations, and is responsible for the greenish color sometimes observed in jaundice patients, levels of biliverdin in green-blooded skinks far exceeds what would be considered toxic in humans and other animals. A primary tissues culture is being developed in order to gain a better understanding of how these green-blooded skinks can tolerate high concentrations of biliverdin. Using a close relative, the ground skink (*Scincella lateralis*), I have been able to successfully culture heart, lung, and kidney. Future work involves a toxicity assay of biliverdin. The resulting protocols developed from this work will be used in *P. virens* to help determine if green-blooded skinks have adapted to concentrations that are normally toxic to other species of skinks.

The Effects of Colony Size on the Duration of Parental Care in Cockroach *Blaptica dubia*

Presenting Student Author: Melanie Rinehart

Faculty Mentor: Robin DeVinney

Cockroaches are the largest order of insects that exhibit postparturition parental care. Species belonging to the Blaberidae family, including Blaptica dubia, are ovoviviparous. In these species, egg cases are extruded from the brooding chamber immediately prior to hatching, putting neonates in immediate contact with their mother. This provides sufficient opportunity for brooding behavior, a short-term association of mother and neonates. Neonates cluster under, around, and on top of the female for varying durations after birth, most lasting less than a day. It is believed that brooding has a protective function. After birth, it takes several hours for the cuticle of neonates to harden, and soft, unpigmented young are at risk from predators. Most cockroaches that exhibit parental care are subject to risks associated with brood defense and invest time in caring for young. These risks can differ between colonies of the same species, depending on environmental conditions. It can be argued that mothers of different sized colonies, would be subjected to a varied severity of risks. However, it is not known, whether the duration of care is affected by colony size alone. To determine if colony size impacts the duration of postparturition parental care, I recorded births from different sized colonies of B. dubia, for 12 months. The purpose was to determine if parental care times were consistent within the colonies; and if they were, how that time differed

between colonies. The parental care times recorded were inconsistent with the variable of colony size. However, there were consistent parental and neonate behaviors observed in all colonies. In all births, the mother stayed still for at least nine hours after birth. During this time, neonates clung to the mother, either underneath her or directly beside her. The mothers ended the period of parental care, by leaving the birth site to continue on with other interactions in the colony. In response to the movement of their mothers, most neonates scattered and reaggregated at a new location.

The influence of flower color on the foraging selection of the Julia Butterfly, *Dyras uilia*, in a captive habitat at the Minnesota Zoo

Presenting Student Author: Terese Zahradka

Other Student Authors: Tracy Crofoot, Jamie Toste, and Terah Grace

Faculty Mentor: Jennifer Biederman

Butterflies are among the most important pollinators. Using highly modified eyesight to see colors in the UV Spectrum allows butterflies to forage more efficiently. The goal of this study was to determine how flower color and air temperature are associated with the foraging patterns of the Julia Butterfly *Dryas uilia* in a captive habitat at the Minnesota Zoo Butterfly Garden. Due to its enhanced eyesight, Mullerian mimicry, and method of trap-lining foraging it was expected that the Julia Butterfly would most prefer the yellow target stick when provided with four color options, and that foraging activity would increase with air temperature. Observations of butterfly foraging took place over 16.5 hours during which the observer recorded the number of “hits” made by the butterfly on each of the colored targets. Overall, the Julia Butterfly most frequently landed on the yellow target, and there was a significant positive correlation between foraging activity and air temperature. These results suggest that flower color and air temperature may influence the feeding activity and food selection of the Julia Butterfly. Further research could provide valuable information about the food preferences and habitat requirements of the Julia Butterfly, and help in the management of other species due to butterflies acting as a prime indicator species for healthy biodiversity.

Transduction of retinoic acid-inducible gene 1 by Ebola virus-like particles enhances antigen-presentation

Presenting Student Authors: Paul Warneke, Jordan Braaten, and Ryan Michaletz,

Other Student Authors: Mee Kee Ester Ngu, Hannah Potter, Grace Nelson, Ethan Pottebaum

Faculty Mentor: Osvaldo Martinez

Ebola virus (EBOV), a filovirus family member, is a highly pathogenic virus that causes Ebola hemorrhagic fever resulting in documented mortality rates in humans as high as 50%. EBOV virus-like particles (VLPs) are morphologically and biochemically similar to parental virus, yet because they lack a genome and cannot replicate, are safe enough to be used as vaccines. We hypothesize that addition of a constitutionally active retinoic acid-inducible gene 1 (RIG-I) would enhance the ability of the EBOV VLPs to induce

antigen-presentation from infected antigen-presenting cells. Expression of EBOV VP40 in 293T cells induces the spontaneous production of VLPs into the media supernatant and if expressed with EBOV glycoprotein (GP), will produce VLPs studded with the attachment GP. Recombinant chimeric constitutively active (ca)RIG-I-VP40 matrix and a nonfunctional mutant L58A (mu)RIG-I-VP40 matrix genes were constructed to produce VLPs containing constitutively active and nonfunctional RIG-I, respectively. Supernatant from 293Ts transfected with caRIG-I-VP40, muRIG-I-VP40 or VP40 along with GP expression plasmids were tested for the presence of VLPs. Western blotting of purified VLPs confirmed the presence of RIG-I in caRIG-I-VP40 and muRIG-I-VP40, but not VP40 containing VLPs. Monocyte-like THP-1 reporter cells were treated with nothing, VP40+GP, caRIG-I-VP40+GP and muRIG-I-VP40+GP VLPs as well as LPS control and tested for induction of interferon signaling. CaRIG-I containing, but not muRIG-I containing VLPs induced interferon signaling. Furthermore, CaRIG-I containing, but not muRIG-I containing VLPs induced greater levels of IL-2 production from treated mixed-lymphocyte reactions. Future studies will test the vaccine efficacy of caRIG-I containing VLPs.

Unstable Change: An Examination of the Tiger Salamander Pharyngeal Arch Structures

Presenting Student Author: Joshua Sackmaster, Kelcie Kappes

Faculty Mentor: Amy Runck

The tiger salamander (*Ambystoma tigrinum*) starts life in an aquatic state much like the life cycle of a frog. The most common developmental pathway for a tiger salamander is the aquatic larva metamorphose into a terrestrial adult. Some populations of tiger salamanders however, will diverge from this developmental pathway. Instead, a larva matures into an adult neotene, and then possibly metamorphose into a terrestrial form. As a neotene, they remain aquatic and retain their larval features but are reproductively active. The metamorphosis from an aquatic to a terrestrial state requires drastic changes to skeletal and soft tissue structures. These structures are involved in functions that are essential to life on land such as breathing, feeding, and body support. Neotenic salamanders that metamorphose tend to die during transformation, or within the two years following. The pharyngeal arch (PA) is group of cartilaginous structures on the ventral side of the neck that undergo significant remodeling during transformation. In the aquatic state, the PA is a series of six arches that give structure to the gills and is involved in feeding and moving water across the pharyngeal and branchial chambers. By the end of the transformation, five of the six arches are reabsorbed, and one small triangular central bone remains in their place. Improper remodeling of these vital structures may interfere with basic life functions post metamorphosis. Specifically, it is hypothesized that neotenic salamanders cannot properly restructure their pharyngeal arch structures. This could be impacting their ability to complete transformation and their survivorship as terrestrial salamanders. The PA skeleton was studied by clearing and staining the remains of over 60 salamanders that died before, during, or after metamorphosing to a terrestrial state. The cartilage and bone were stained blue and red respectively. Many of the specimen are showing improper restructuring of the PA, and

variable calcification of the cartilage structures of the gills. These aberrations may be interfering with vital life processes.

Water Quality of Gilmore Creek in Winona, MN

Presenting Student Author: Megan Diesslin

Faculty Mentors: Neal Mundahl and Dylan Blumentritt

The purpose of this study was to investigate possible seasonal and longitudinal changes in water quality in Gilmore Creek beginning near its headwaters, continuing through Boller's Lake, and into Lake Winona in Winona, Minnesota. Four samples were taken along the creek: one near the headwaters, a second shortly before entering Boller's Lake, a third immediately after exiting Boller's Lake, and the last just before entering Lake Winona. Water samples were collected with an integrated water sampler at these locations over the course of four months (December 2017 to March 2018) and tested for eight water quality standards: phosphorus, pH, temperature, nitrate, turbidity, hardness, conductivity, and dissolved oxygen. There were increasing levels of conductivity, turbidity, and phosphorus, and decreasing levels of temperature, pH, nitrate, and hardness from the headwaters downstream toward Lake Winona, with the exception of the site immediately below Boller's Lake which exhibited data more similar to that near the headwaters. There was not a clear pattern of change in dissolved oxygen from the headwaters toward Lake Winona. There also was a strong relationship between conductivity and weather conditions, with a spike in conductivity after snow melt (possibly due to runoff containing road salt entering the creek) at both sites immediately upstream from the two lakes. There is evidence that Boller's Lake alters the longitudinal pattern of change in water quality within Gilmore Creek, and seasonal changes associated with snowmelt also affect the stream's water quality.

West-Nile virus replicon particle entry requires the C-terminal half of the carbohydrate-recognition domain of the Dendritic cell-specific ICAM-3 grabbing non-integrin related protein

Presenting Student Authors: Hannah Kunkel, Emin Budimlic, and John Keilty,

Other Student Authors: Wells Pollock, Madilyn R Schmitz, Nicole Crowson, Nathan L Leonard, Amanda Madigan, Victoria R Schwarzinger, Alyssa J Meyer, Mary Soderlund, Jean K Lim

Faculty Mentor: Osvaldo Martinez

West-Nile virus (WNV) is an arbovirus usually transmitted to humans via a mosquito vector. Infections commonly result in febrile symptoms while rare severe neuroinvasive cases may result in encephalitis or meningitis. Studies have shown that WNV infection efficiency is enhanced by expression of DC-SIGNR on target cells, which normally do not express DC-SIGNR. To investigate WNV tropism, we established 293T kidney epithelial cell lines that stably express vector, DC-SIGNR and mutants of DC-SIGNR that lack the entire carbohydrate-recognition domain (CRD) or lack the C-terminal half of the CRD. We demonstrate successful surface expression of DC-SIGNR and its mutants

from stably-transfected 293T cells, but not vector-transfected 293T cells. Further, we show that monoclonal antibody 120604 which binds specifically to the DC-SIGNR CRD binds to DC-SIGNR expressing 293T cells, but not to vector nor any of the DC-SIGNR mutants expressing cells. Virus replicon particles (VRPs), replication-incompetent viral particles containing necessary structural proteins for infection and a viral plasmid including a GFP reporter are used to safely and conveniently study viral entry. Entry assays using WNV (NY99) VRPs as well as a variant of WNV (NY99) which contains the beta-lactamase enzyme show significant entry into DC-SIGNR expressing cell lines, but not in controls that do not express DC-SIGNR. Additionally, we show that WNV VRPs do not enter DC-SIGNR expressing cells that lack the CRD or the C-terminal half of the CRD suggesting that the C-terminal half of the CRD is required for successful entry of WNV via DC-SIGNR. Future experiments may be able to shed light on which amino acids are required for entry.

Business Administration

An Empirical Analysis About Employee Selection Process at Navitor, Inc.

Presenting Student Authors: Lauren Hunter, Samantha Pickel, Racheal Ausrud

Faculty Mentor: Jing Han

Anyone who wants to see their company succeed, needs to carefully select who works for the company. Employee selection has a critical impact on the company's ability to compete; therefore, companies must select the candidates who will contribute to the company's overall growth and success. This study analyzes the issues that Human Resources comes across during the employee selection process and offers ways to overcome these issues. In order to gather this information, we conducted three interviews with HR professionals working at Navitor, Inc. as well as information from scholarly articles and a textbook which lead us to our results. One of the issues during the employee selection process include drug testing and whether they represent an invasion of privacy or violation of due process. Furthermore, the HR Professionals at Navitor, Inc. have an issue with applicants providing inconsistent work history on their resumes. This study allows us to provide solutions to the issues during the employee selection process for HR professionals at Navitor, Inc., as well as other HR professionals. For example, designing a selection process that correlates with the company's goals and values could have a positive impact on the company's success.

Winona State University "Warrior Wellness Program"

Presenting Student Authors: Karissa Brand, Rachele French, and Megan Sticha

Faculty Mentor: Jing Han

Winona State University offers a myriad of resources for their students in regards to taking care of themselves, but faculty are not always given the same opportunities. The Warrior Wellness Program (WWP) is a program based around both mental and physical

health of full-time faculty and staff at Winona State University. The focus is on the pieces of health and wellness that help employees perform effectively, work smarter, and live a better life. Emphasis is placed on mental health of overall wellness, as a healthy mind drives people to a healthy body, a more fulfilling life, and a successful career, which will benefit employee and employer. Mental health is being put in the forefront of society and individuals are doing more to become mentally healthy. Some of the main components of the program that will set it apart from any current program are: stress management techniques, a focus on back/spinal health, holistic methods for wellness, and healthy meal options. Employees will be provided extensive resources for their wellness goals, whether that is resources created in-house, have access to through MinnState, the City of Winona, and more. The WWP focuses on the core age of employees at the university, late 20's to early 50's, and all parts of the program can appeal to any person in that age range. With this program, employees will have contacts within the program to come to with questions, concerns, and ideas.

Chemistry

Rapid Microwave Synthesis of Phosphine Sulfides

Presenting Student Author: Ashley Olichwier

Faculty Mentor: Joseph West

A variety of phosphine sulfides have been synthesized by a new, facile approach utilizing microwave irradiation and an eco-friendly solvent, ethyl acetate. Reaction times of 35 minutes provide very high purity products in nearly quantitative yields even for less reactive tertiary phosphines. All products have been confirmed by $^{31}P\{^{1}H\}$ NMR, IR, MS and Mp.

"Greener" method for the synthesis of phosphine selenides

Presenting Student Author: Der Vang

Faculty Mentor: Joseph West

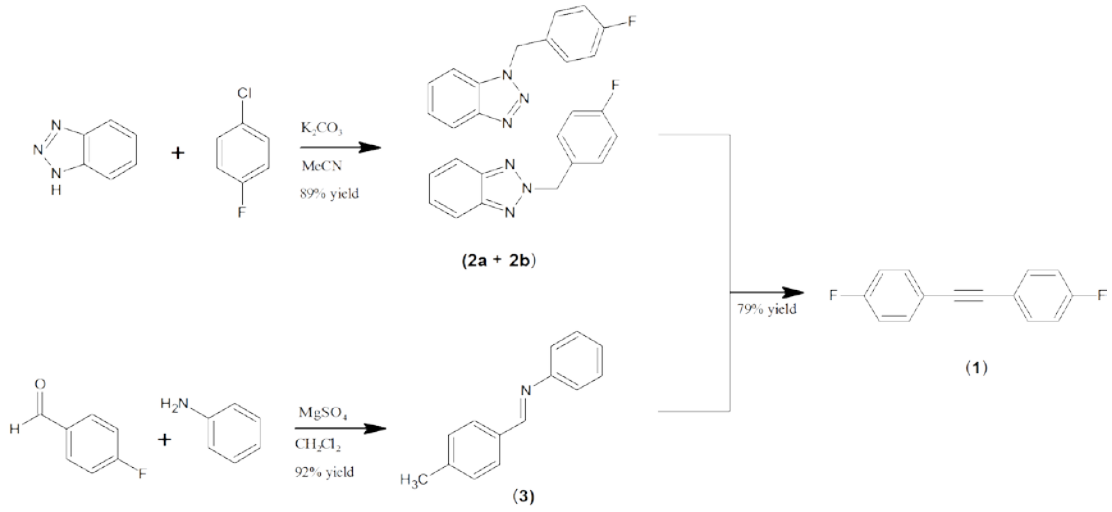
Various aryl, tertiary phosphines were oxidized by elemental selenium in ethyl acetate. In contrast to the standard 20-24 h toluene reflux, microwave irradiation at 170 ºC for 55 minutes produced the targeted phosphine selenides with high conversion rates and high purity. Products were confirmed by mp, IR, MS, and heteronuclear NMR techniques. This procedure proved to be an environmentally friendlier alternative utilizing a less hazardous solvent and significantly reduced reaction time.

Acetylenic Poly(aryl ether)s: Preparation of the S_NAr Monomer Bis(4-fluorophenyl)acetylene

Presenting Student Author: Wail Aljuhani

Faculty Mentor: Thomas W. Nalli

Poly(aryl ether)s (PAEs) are important commercial polymers and are a member of the family of materials known as engineering thermoplastics. The most ordinarily used synthetic route to PAEs involves creating an ether linkage by nucleophilic aromatic substitution (S_NAr) and requires an electron-withdrawing group to activate the benzene rings. For this research, a literature method was used to synthesis bis(4-fluorophenyl)acetylene (**1**) with the intent of using the ethynylene bond to activate the phenyl rings for S_NAr polymerization to form PAEs that have alternating alkyne and ether linkages. First, fluorobenzylbenzotriazole (**2**) was synthesized in 89% yield as a mixture of isomers (2a+2b), by refluxing a mixture of benzotriazole, 4-fluorobenzyl chloride, potassium carbonate, and acetonitrile. Then **2** was reacted with (E)-1-(4-fluorophenyl)-N-phenylmethanimine **(3)**, which was prepared by adding a mixture of magnesium sulfate and dichloromethane to 4-fluorobenzaldehyde and aniline.



Adsorption of Methane using Metal Organic Frameworks

Presenting Student Author: Keir Kristiansen

Faculty Mentor: Jeanne Franz

Methane is both a valuable resource as well as a greenhouse gas that has a negative impact on atmospheric quality. When methane is flared off in industrial settings, the resource is essentially wasted. The goal of this research project is to increase efficacy in terms of flared methane by capturing the gas with the intent of using it elsewhere, productively. This would be done by adsorption of methane using a metal organic framework (MOF). When selecting a MOF to attempt to synthesize, the biggest factor considered was the MOF's ability to both adsorb and release methane. Based on molecular modeling and chemical computations, the MOF with codename SUKYON was chosen as a target for synthesis. Although a literature synthesis for the compound

was found and followed, SUKYON was never successfully synthesized. This was due to the unreported high sensitivity of the method. MOF-205 has been chosen as the next synthetic target due to having a less sensitive synthesis as well as having a reported methane saturation capacity of 84758 mol/kg. The method involves using microwaves as a catalyst and has shown success.

Air-sensitivity prediction of Amide-stabilized Primary Phosphines via Inexpensive Computational Methods

Presenting Student Author: Taylor Bell

Faculty Mentor: Joseph West

Primary phosphines (RPH_2) are notorious for their stench and pyrophoric behavior. However, several examples of air-stable primary phosphines have been reported. We have designed and explored a class of electronically-stabilized phosphines based on the previously reported, air-stable, bis(primary phosphine), $PhN(H)C(O)CH(CH_2PH_2)_2$. Mono-, bis-, and trisphosphines, were modeled and tested with the PM6, PM7, and RM1 methods using MOPAC as well as with Hartree-Fock methods with MINI, MIDI, and 3-21G basis sets using GAMESS. All methods were benchmarked against a training set with experimental backing. Several promising targets, with predicted air stability, have been identified.

Carbon Nanotube and Transition Metal Oxide Composites as Supercapacitors via Microwave Synthesis

Presenting Student Author: Merlin Havlik

Faculty Mentor: Jennifer Zemke

Power storage is an important aspect of the modern world. Ideal power storage solutions should maximize charge density, have a slow discharge time, and minimize charge time. Currently lithium ion batteries provide the best charge density and discharge time, but have a long charge time. Supercapacitors, especially pseudocapacitant supercapacitors, offer a possible solution. With charge densities approaching that of lithium ion batteries, a potential for slower discharge times, and extremely fast charge times, these supercapacitors (in one form) store energy in the oxides of transition metals deposited on a conductive substrate. As these oxides have a large internal resistance, surface area should be maximized, and oxide thickness minimized. Carbon nanotubes offer a highly conductive substrate with an extremely high surface area upon which to deposit transition metal oxide nanoparticles or sheets. Challenges remain in the form of scalable synthesis methods and metal oxide compositions that will achieve the needed charge density. The goal of this work is to explore the highly scalable microwave synthesis method as presented by Kumar, Singh, Dubey, Singh and Yadav and attempt to find a more optimal metal oxide nanoparticle for use in a pseudocapacitant supercapacitor. This work will specifically focus on iron, copper, nickel, cobalt, manganese and other metal oxides, as well as combinations of the above metals.

Computational investigation of substituent effects on the predicted air-sensitivity of aryl primary phosphines

Presenting Student Author: Emily Landgreen

Faculty Mentor: Joseph West

A variety of substituted aryl primary phosphines have been modeled using semi-empirical and *ab initio* methods. Electron withdrawing and donating groups, exhibiting both inductive and resonance effects, are examined solely in the *ortho*, *meta*, *para* positions in the pursuit of aryl phosphines stabilized by electronic effects alone. The PM6, PM7 and RM1 methods in MOPAC and HF/MINI, HF/MIDI, and HF/3-21G theory levels in GAMESS were all utilized to identify probable air-stable targets. These methods were also benchmarked against an experimentally-backed training set at the B3LYP/6-31G* level of theory.

Detection of Trimethoprim in Wastewater using HPLC and Solid Phase Extraction

Presenting Student Author: Alyssa Brown

Faculty Mentor: Jeanne Franz

Wastewater treatment plants have made improvements with the removal of pharmaceuticals within the wastewater but still are not fully capable of removing all, leaving the public to be exposed to drugs in their water. Trimethoprim is common antibiotic that is prescribed to treat urinary tract, ear infections, and malaria. Through the development of a High-Performance Liquid Chromatography (HPLC) method, the quality of work wastewater treatment plants are doing at the removal of trimethoprim can be determined. This can further assist the wastewater treatment centers in developing a method to degrade trimethoprim in the environment at a faster rate. To start the experiment, a standard of known concentration and composition was created and tested through UV-Vis spectrometry. The UV/Vis spectrometer was used to find the wavelength of maximum absorption of trimethoprim, 280 nm. The sample was then set to run through a HPLC to determine an applicable method, an isocratic method of 14% acetonitrile in a 10-minute run. The peak found and confirmed to be the analyte was depicted around 2.5 minutes on the chromatogram. The same method was used on the internal standard, sulfanilamide, and a lambda max of 261nm was determined. The antibiotics were run through the HPLC method at both wavelengths and peaks were found around 1.8 and 2.3 minutes. Method development for the solid phase extraction method is currently underway.

Determination of phytosterols in dried shaggy mane and morel mushrooms by GC-MS.

Presenting Student Author: Natalie Walker

Other Student Authors: Chun Wa Chu, Sumar Quint, and Alix Overgard

Faculty Mentor: Thomas Nalli

The focus of our research is analyzing phytosterol content in commercial, dried mushrooms. The types of mushrooms that were studied for this project were shaggy mane (*Coprinus comatus*) and morel (*Morchella*). The sterol content was analyzed by Soxhlet extracting the ground mushrooms with petroleum ether, saponifying the extracts with NaOH/EtOH, and then derivatizing the extracts as TMS ethers, which were analyzed by Gas Chromatography Mass Spectrometry (GC-MS). An internal standard, cholesteryl stearate, was added to the ground mushrooms to allow absolute sterol concentrations to be determined. As expected, in both of these mushrooms species, a prominent sterol was ergosterol. Ergosterol is a precursor of Vitamin D2, and mushrooms are a rich source of this nutrient. Shaggy mane mushrooms, although not highly valued, are edible and common throughout North America. However, there is little information on the sterol composition of this species. Our results show that shaggy manes are typical mushrooms, containing a high abundance of ergosterol, and relatively small amounts of other sterols. In contrast, morels have an interesting and varied composition of sterols, and are one of the few species that have brassicasterol as the most abundant sterol. This research specifically examined if there are consistent differences between sterol composition in small (immature) and large (mature) morels.

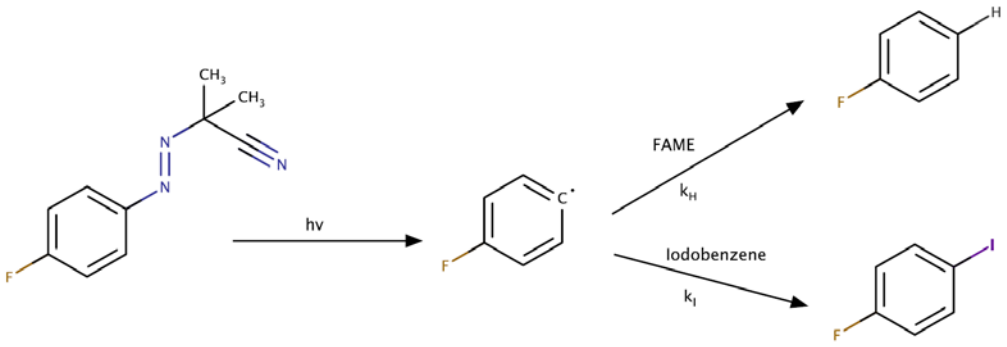
Determination of rate constants for H-abstraction by 4-fluorophenyl radicals from fatty acid methyl esters by F-19 NMR

Presenting Student Author: Kevin Plaisance

Faculty Mentor: Thomas Nalli

In this research, we used the visible photolysis of 4-fluorophenylazoisobutyronitrile (FPAIN) to generate fluorophenyl radicals, which were used to study phenyl radical reactions by F-19 NMR. Specifically, we measured relative rate constants for H-abstraction from a series fatty acid methyl esters (FAMEs). Adaptation of a literature method was used to make FPAIN in two steps; the reaction of acetone cyanohydrin with 4-fluorophenylhydrazine gave a 49.9% yield of recrystallized 4-fluorophenylhydrazinoisobutylnitrile with excellent purity by NMR. The hydrazino compound was then oxidized with $KMnO_4$ to give a 46.4% yield of FPAIN, after purification by flash chromatography.

Relative rate constant determinations are in progress and are using a visible light source to photolyze FPAIN in the presence of iodobenzene and a FAME (methyl lineolate, methyl oleate, methyl stearate). The rate constant for iodine abstraction by phenyl radicals from iodobenzene is known ($k_I = 1.05 \times 10^8\ M^{-1}\ s^{-1}$), thus the product ratio of 4-fluoroiodobenzene and fluorobenzene will allow determination of k_H for the FAMEs. Each product shows a single peak in the F-19 NMR so product yields can be determined by simply integrating the spectra.

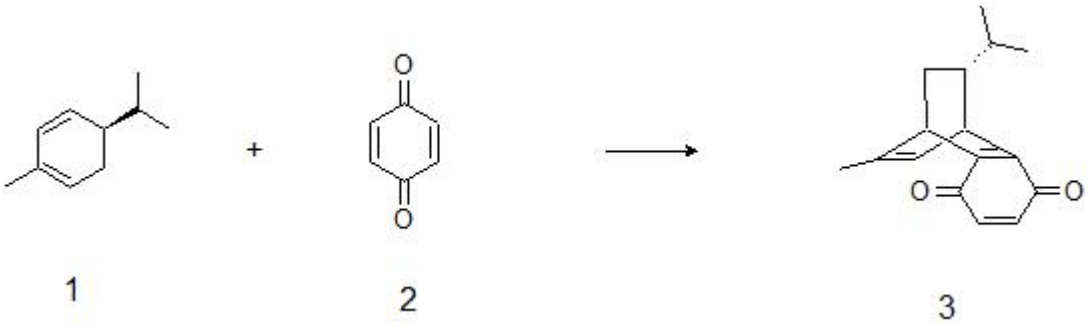


Diels-Alder reaction of α-phellandrene and p-benzoquinone as an experiment for the organic chemistry teaching lab

Presenting Student Author: Jacob Wittenberg

Faculty Mentor: Thomas Nalli

The Diels-Alder reaction is one of the most important and widely studied reactions in organic chemistry, and is usually taught and performed in the second-semester of organic chemistry courses. Therefore, a variety of different Diels-Alder experiments that can be used in teaching labs is necessary. Despite the innumerable possible diene-dienophile combinations, very few are used for experiments in organic chemistry teaching labs. The reaction of α-phellandrene **1** and p-benzoquinone **2** to produce adduct **3** (11-isopropyl-9-methyltricyclo[6.2.2.$0^{2,7}$]dodeca-4,10-diene-3,6-dione) reported by Diels and Alder in 1928 is an overlooked example that can be considered for this educational purpose. We investigated the effects of solvents on the kinetics of this reaction by refluxing **1** and **2** in ten different solvents and observed precipitated yields from cooling the reaction solution and collecting the product using vacuum filtration. The primary goal was to achieve a reflux time of <1 h and yield >50%. Our results indicate that the Diels-Alder reaction of **1** and **2** can be used as an organic chemistry teaching lab. The % yield and purity of crude product was higher in polar solvents. The most promising solvents were 1:1 ethanol/water, water, and methanol, affording 76.2%, 60.5%, and 52.9% yields of **3** in 1h respectively.



Exploration for New, Facile Synthetic Approaches to Bisphosphine Monoxides

Presenting Student Author: Safa Aiyana Mahina

Faculty Mentor: Joseph West

Bisphosphine mono-oxides (BPMOs) are hemi-labile ligands useful for a variety of applications. Current synthetic routes are limited, standard oxidizers produce a mixture of dioxide and monoxide products with remaining bisphosphine reagent. Current methods used include selective, Pd-catalyzed oxidation and mono-reduction of bisphosphine dioxides using several moisture-sensitive materials. The primary goal of this project has been the discovery of simpler methods to selectively produce BPMOs in high purity. Explored methods, described herein, include using mild, organic oxidizers and using the well-established Wittig reaction to selectively oxidize one phosphorus center. $^{31}P\{^{1}H\}$ NMR and MS were used to characterize the products and determine product distributions for all attempts.

Exploratory computational analysis of solvent effects on condensation-based imine syntheses

Presenting Student Author: Logan Peters

Faculty Mentor: Joseph West

Thermodynamic favorability of formation has been assessed for a variety of imines formed from primary amines and various carbonyls (aldehydes, ketones, amides and esters). All starting materials and products were modeled in the gas phase. Implicit solvent phase calculations were also conducted in water and benzene to ascertain solvent driven preferences. Modeling results are compared to previous and ongoing experimental findings. Specific atomic and molecular properties such as Mulliken charges and electron delocalization effects have also been examined to correlate with observed trends.

Formation and Degradation of Lysozyme Amyloid Fibril Complex

Presenting Student Authors: Colin Engesser and Samantha Skaar

Other Student Authors: Jordan Welshons

Faculty Mentor: Myoung Lee

Protein amyloid fibril aggregates will be made from Hen Egg White Lysozyme (HEWL) and Bovine Serum Gamma Globulin (BSGG) and they will be used as a non-pathogenic model for the formation of Beta Amyloid Fibril complexes in the human brain. We will then try to determine the effects of metal ions and antioxidants on the formation of the aggregated fibril complexes. We plan to use nanomolar concentrations of these substances. Thioflavin T (ThT) will be used as a time-dependent fluorescence marker to detect the fibril aggregate formation and its fluorescence will be compared to a control to see the effects of the metal ions and antioxidants on the aggregated fibril formation.

Geometric Preferences for Bis(chlorophosphine)palladium(II) Chloride Complexes

Presenting Student Author: Isaac Viss

Faculty Mentor: Joseph West

An assortment of bis(chlorophosphine)palladium(II) chloride complexes have been modeled using the B3LYP DFT functional and the core potential LANL2DZ basis set for palladium and 6-31+G* basis set for all other atoms. Energies of the square planar cis and trans geometries along with previously obtained X-ray crystallographic data are compared to ascertain electronic and steric driving forces for selection of the preferred geometries. Pd–P and Pd–Cl distances are used as a means to infer relative bond strengths. The quality of modeled data is further gauged by comparison of structural parameters to crystallographic equivalents.

Primary Phosphines: New Synthetic Methods and New Targets

Presenting Student Author: Bethany Palen

Other Student Authors: Emily Landgreen

Faculty Mentor: Joseph West

Primary phosphines, compounds of the type RPH_2, are notorious for their reactivity with oxygen - many exhibit pyrophoric behavior. This reactivity has hindered the development of its chemistry despite its potential utility as a synthon and its analogy to well-explored primary amines. Herein, two new approaches for aryl and alkyl primary phosphines are reported. We also report the first aryl, air-stable primary phosphine that is not kinetically stabilized by bulky *ortho* substituents. Phosphines are identified primarily by ^{31}P spectroscopy. Experimental air-stability observations are compared to molecular modeling predictions.

Selectivity of Wohl-Ziegler Brominations of Cyclohexene and trans-2-Hexene

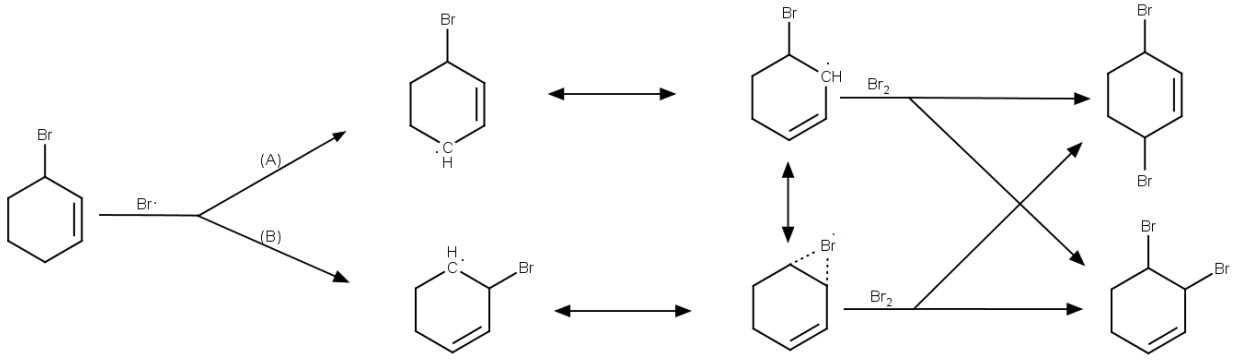
Presenting Student Author: Rick Dorn

Other Student Authors: Eden Willcox

Faculty Mentors: Thomas Nalli and Joseph West

Alkene bromination with N-bromosuccinimide (NBS) has long been valued for its selectivity for allylic substitution, however, the selectivity of further bromination is not well known. For example, cyclohexene with 2 equiv NBS has been reported to yield 3,6-dibromocyclohexene as the major product (49 % isolated yield). We brominated 3-bromocyclohexene (CCl_4, 275-W sunlamp, reflux) and here report that five dibromocyclohexene isomers result in GC-MS yields of *trans*-3,6- (41 %), cis-3,6- (39%), *trans*-3,4- (15 %), *cis*-3,4- (3 %), and 1,3- (2%). The relative product yields are invariant with conversion of the reactant. The major products (*trans/cis*-3,6- and *trans*-3,4-) have long been thought to arise solely from allylic hydrogen abstraction at C-6 (path A). However, preliminary DFT calculations suggest a bromine bridge can stabilize the C-4 radical and thus favor hydrogen abstraction at C-4 (path B). This bridged

intermediate would be the same as that formed via allylic resonance in path A and both the 3,4- and 3,6- products could arise from abstraction at either C-4 or C-6. Our results hint at a bromine bridged intermediate with the trans-3,4- isomer forming in greater yield than the cis-3,4- isomer (15 % compared to 3 %). We are attempting to explore this idea more closely by brominating *trans*-4-bromo-2-hexene to look for the products of hydrogen abstraction at C-5; 4,5-dibromo-2-hexene and 2,5-dibromo-3-hexene.



Soil CO_2 and CH_4 Emissions in Prairie Ground Following a Controlled Burn

Presenting Student Authors: Joseph Coleman and Angela Hartman

Other Student Authors: Micah Alman, Nathaniel Becker, Frank Beissel, Kacey Davitt, Megan Diesslin, Alex Franta, , Ethan Horstmann, Christopher Kluzak, Jacob Nett, Drew Rindflesch, Amy Scherer, Avery Schnaser, Hannah Schoenfuss, Alexandra Theyson, Ethan Tosto

Faculty Mentor: Mark Engen

This study was undertaken in order to determine flux rates of CO_2 and CH_4 in a prairie area before and following a controlled burn on Winona State University's prairie garden in Winona, MN. The objective of this study was to determine if there was a clear trend in CO_2 and CH_4 emissions following a controlled burn and what possible benefits a controlled burn has on the prairie system. A closed system canister was placed in the ground in the prairie and gas was allowed to collect for twenty minutes. Gas samples were collected for analysis by GC-FID and GC-TCD to determine CH_4 and CO_2 concentrations respectively. Initial data indicates there is a net gain of CO_2 and little to no change in CH_4 levels within each sampling period. Data collection is currently underway for analysis.

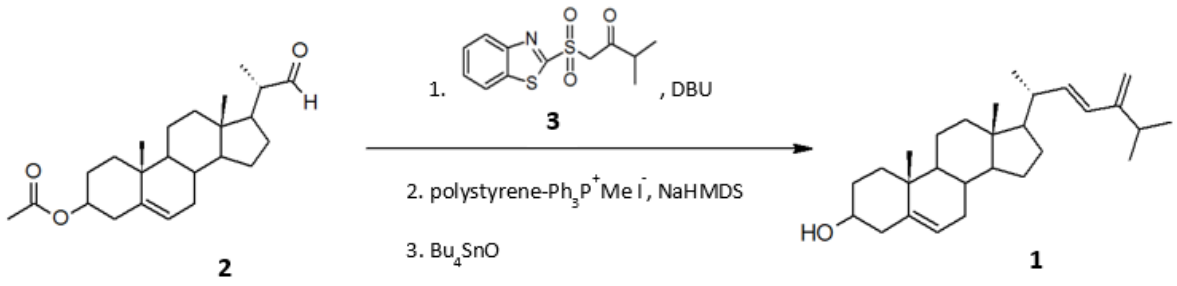
Synthesis of Ergosta-5,22,24(28)-trienol from Stigmasterol

Presenting Student Author: Caitlin Hilger

Faculty Mentor: Thomas Nalli

GC-MS analysis of phytosterol profiles in dried morel mushrooms by our lab revealed the presence of several compounds not previously known to be found in mushrooms. However, one compound with a molecular weight of 396, thought to be ergosta-5,22,24(28)-trienol (**1**) has yet to be confirmed. Thus, the goal of this research was to

synthesize **1** and obtain GC-MS data that proves the identity of the unknown compound. The synthesis of **1** begins with stigmasterol, which is converted in four steps using a literature method to the aldehyde (**2**). We anticipate that sequential Julia and Wittig reactions followed by hydrolysis of the acetate ester will afford 1. The Julia reagent is proposed through the reaction of 2-mercaptobenzothiazole with 1-bromo-3-methyl-2-butanone (prepared by bromination of 3-methyl-2-butanone) to form the sulfide, 1-(benzo[d]thiazol-2-ylthio)-3-methylbutan-2-one (72% yield). This intermediate was then oxidized with mCPBA to produce the sulfone, 1-(benzo[d]thiazol-2-ylsulfonyl)-3-methyl-2-butanone (**3**) (19% yield).



Synthesis of new bisferrocenyl-Schiff base compounds and their Pt(II) Complexes

Presenting Student Authors: Robert Walters

Faculty Mentor: Joseph West

Schiff bases based on ferrocenecarboxaldehyde and several diamines have been prepared via a "green," aqueous route. These diimines have been utilized as chelating ligands, L, for the synthesis of several Pt^{II} complexes of the form cis-$LPtCl_2$. ^{1}H NMR, IR, MS and Mp were used to confirm the successful production of all diimine ligands. These methods along with $^{195}Pt\{^{1}H\}$ NMR were used to verify all synthesized platinum complexes. Additional spectroscopic properties of ferrocenyl diimines and platinum complexes were also explored.

Computer Science

Application of Machine Learning Algorithms to Correct Images to Help the Color Blind

Presenting Student Author: Jimmy Hickey

Faculty Mentors: Sudharsan Iyengar and Mingrui Zhang

Many people suffer from color deficient vision; though they learn to cope, they still have many issues distinguishing between colors. In this research, I propose a combination of machine learning algorithms that can help eliminate some of the problems faced by

these individuals. As a prototype, specialized data with intentional color blind issues is generated, transformed, and used to train the system. The colors in these images are then segmented using k-means clustering. A supervised neural network is trained to predict these clusters and applied to other images. The image will then be analyzed and corrected if neighboring clusters are found to be conflicting. After correcting, the image will be more color blind friendly.

Chaotic Random Number Generation

Presenting Student Author: Michael Holmblad

Faculty Mentors: Barry Peratt, Mingrui Zhang, and Sudharsen Iyengar

This paper focuses on creating and testing a pseudo random number generator. (pRNG) We create a generator where the algorithm is based off of a chaotic dynamical system called the tent map. This paper goes through the process of how we modify the tent map so that it can be a viable pRNG. There has been research on the tent map as a generator, but not in this kind of sense. Since the tent map doesn't work that well on a computer, we tackle that problem. We then modify it so that we can get a much more random distribution. We then discuss the methodology for coding the generator, and then testing it. Then we determine whether the generator is worth using or not.

CSS Grid for Responsive Web Applications

Presenting Student Author: Lucas Credie Nogueira de Lima

Faculty Mentors: Mingrui Zhang, Sudharsan Iyengar, Joan Francioni

This project involves analyzing the current technologies that are used to create responsive applications in the web and aims to test the newest option, CSS Grid, as a more powerful option for building flexible layouts. Two equal landing page layouts were created and compared for this research using Bootstrap and Grid. To avoid biases, the original landing page design was created using pen and paper. CSS Grid was selected as the first technology used for development. After having developed both versions, there were some key differences that should influence the decision of choosing one versus the other. CSS Grid allows for grids based on different column numbers and the naming of different areas in the grid as well of assigning components to an area making it more flexible to change and giving developers more power to create different types of layouts that are not possible with Bootstrap. That said, Bootstrap makes it so the developer doesn't need to create media queries for responsiveness and it also includes style classes that are useful for non artistic developers that want to save time. Those differences should matter when choosing a technology over another and as far as layout and responsive design goes, CSS Grid is superior to Bootstrap in situations where custom design of components is not an issue but a priority.

Detecting Bots in Online Multiplayer Video Games through User Input

Presenting Student Author: Alexander Boutelle

Faculty Mentors: Sudharsan Iyengar and Mingrui Zhang

The main purpose of our project is to develop a metric for detecting botting in online multiplayer video games, specifically through user input. Our stance is that modes of either detecting or preventing cheating are too intrusive on the player or they hinder game play in some way that makes it less enjoyable. For example, some video game developers choose to deploy software that runs concurrently with their video games to check for cheating programs on the user's device or a developer may implement an in-game mechanism that forces players to react to captcha to prove they are not a bot. Proponents to these mechanisms consider process-monitoring software to be a form of spyware and in-game captchas can be a hindrance to a player's experience, leading to a less enjoyable experience in the video game. We have found many different ways that we can monitor a user's input that can be helpful in creating a metric that will allow to detect botting in a video game that is non-intrusive or hinders gameplay in any way. To develop our cheat detection metric, we observed a user's mouse clicks and keystrokes that the game server received, and from their input, we could see if a user's behavior is similar to that of a bot.

Developing Computer Security Documentation for a Non-Technical Audience

Presenting Student Author: Salman Quraishi

Faculty Mentors: Sudharsan Iyengar and Mingrui Zhang

This research project investigates the development of computer security documentation. Computer security includes the protection of hardware, software, and/or digital information from theft and/or damage, along with preventing disruption or misdirection of the services a computer may provide. The scope of the research was to develop a document detailing the basic fundamental concepts of computer security that individuals of all backgrounds can use without requiring prerequisite knowledge of computer security. The core concepts of the document encompass phishing, social engineering, password security, trusted/untrusted networks, viruses, malware, and antivirus software. Both technical and non-technical individuals can utilize the document to learn how to be safe online and make informed decisions on the internet. The evaluation of the efficacy of the document relies on two surveys. The methodology involved participants taking a pre-survey before reading the document. Followed by reading the developed document, and afterwards taking a post-survey. The results of the first survey in comparison to the second survey are used to determine the efficacy. The participants are selected on a voluntary basis, with the focus being on non-technical individuals of varying backgrounds.

Emblematic Design: A Study into Game Design Principles

Presenting Student Author: Nawid Ayobi

Faculty Mentors: Mingrui Zhang and Sudharsan Iyengar

This project aims to advance the standard knowledge and practice of game design, especially those designers focused on the realm of strategy games. A set of principles hence called Emblematic Design is tested in this project. The outlook of the experiment is strictly to validate or invalidate the viability of these principles, and whether the design industry can benefit from using them. As part of the experiment, we develop a tactical video game with specific measures to include the Emblematic Design principles and then create flawed clones of that game each with its own inverse quality in one of the principles. With user play testing, we sample all the games and statistically analyze which game is most enjoyed by the testing group.

Load balancing a 2D cellular automata over a cluster

Presenting Student Author: Jared DuPont

Faculty Mentors: Mingrui Zhang and Sudharsan Iyengar

The goal of this paper is to create an algorithm to distribute the workload of a 2D cellular automata (CA) across a computing cluster. This will be done by dynamically partitioning the regions that each computer is responsible for simulating such that each region has roughly the same work load. The goal of this algorithm is to speed up the simulation when compared to simpler partitioning strategies. The work load of each computer must be the same because CA must be simulated synchronously meaning that each frame must be completely done before the next can start. An example CA rule set was used that purposefully created concentrated areas of high work load and areas of low work load to better demonstrate the algorithm.

Predicting attrition in a children's well-being program using a neural network

Presenting Student Author: Uzma Ghazanfar

Faculty Mentors: Joan Francioni, Nina Marhamati, Mingrui Zhang, Sudharsan Iyengar

This paper demonstrates the use of a supervised learning mechanism of backpropagating Artificial Neural Network (ANN) to predict attrition in a children's well-being program. This paper presents the findings of the study that was designed to explore whether a neural network could be trained on missing data as well as a clean data set to predict attrition early on in the program. The findings of this study indicate that attrition can be predicted with reasonable accuracy and that machine learning could be used to anticipate future refusal-of-services. This paper will also list the factors that influence attrition. The paper also identifies further areas of research and study.

Small Web-Based Denormalized Database Effectiveness Threshold

Presenting Student Author: Min Young Lee

Faculty Mentors: Mingrui Zhang, Sudharsan Iyengar

The main purpose of this paper is to observe the efficiency of different database organizations. The effectiveness of database organization influences database's performance. As the size of a database increases, data is organized in smaller sets in order to be cost-efficient. The process of organizing the dataset to achieve least amount of redundancy and dependency within the database is called normalization. The denormalization is a process to revert parts of the normalization in order to increase a read effectiveness. Denormalization is a strategy used to increase readability at the cost of a lower writability and more redundancy within the database. The sets of database will be created from a completely normalized database then systematically adding redundancy until the database only has one table of data. Then each set of the database will be tested on readability and writability.

Usability of Web Applications developed in Angular 4 and Firebase

Presenting Student Author: Kieran Gordon

Faculty Mentors: Mingrui Zhang and Sudharsan Iyengar

Web application development has a variety of tools and technologies that can be used to create applications which are efficient and user friendly. At times it can be difficult to determine what combination of technologies is best for a particular project. This decision can only be made with a good knowledge about the different technologies. Two of the technologies that one can use are Angular 4 and Google Firebase. Angular 4 is a javascript framework and Google Firebase is a cloud document database service. In the interest of contributing to the knowledge of web application technologies, this research will examine the usability and user experience of a web application developed using the aforementioned technologies. To this end, a content management application was developed, and a usability test was designed. Sample users took the usability test and their responses were scored.

Education

Inclusion for “Exceptional Learners”

Presenting Student Author: Danielle Poole

Faculty Mentor: James Schul

This article analyzes the nature of inclusion for exceptional learners in public schools. A total of seven professionals were interviewed who all have a variety of experiences in the public-school system of different Midwest school districts. The findings indicate that the interpretation of the term “exceptional learners” varies based off the backgrounds and experiences of the reader. The inclusion of these exceptional learners also greatly varies based off the administration and school districts the professionals work or live. The analysis also indicates that inclusion offers a variety of benefits but an inclusive classroom may not be the best fit for every learner. Implications of this study include the need to advocate for exceptional learners, inclusion, and working to create environments that work best for each student as an individual.

Teacher Education Professional Attire

Presenting Student Author: Derek Dravis

Other Student Authors: Models: Greer Kosidowski, Sarah Pongratz, Ashley Krohnberg, Brooke Raske, Breanna Raske, Jordan Bruestle, Matthew Wagner, Jacob Hebeisen, Greer Kosidowski

Faculty Mentors: Joan Sax-Bendix and Mary Anderson

As an aspiring teacher the quandary of what to wear in the schools in this day and age is different than even five to ten years ago. The current informal dress code is relaxed attire where the teacher candidates reflect the dress of the students they will be teaching. This informal attire impacts classroom management. Thus, the mission became: to create and publish a professional attire presentation with the collaboration of students and professors. Dr. Anderson wrote a poem reflecting her perspective on professional dress as a retired school principal. A group of students were invited to work with Dr. Anderson and Dr. Sax-Bendix to publish a WSU Teacher Education Professional Attire presentation. This presentation has been discussed during previous years informally with the general guidelines adhered to by all in the EEEC Department students during field experiences in the schools. To take this project to the next level, a group of students collaborated to dress in acceptable and unacceptable outfits based on agreed upon criteria. Pictures were taken by another student. The photographer was another student in the program. He took all pictures and is assisting in the visual presentation/power point that will be further published as an audio powerpoint that can be used in department classes and shared within the College of Education as well. The final presentation has been used in EDUC classes to guide conversation regarding professional dress at field experience placements. The use of the presentation in classes this semester has resulted in positive comments from partnering teachers and principals about the professional attitudes and appearance of the students that allows their teacher skills to shine. In fact, when participating in an event with other area

university teacher education students the Winona State University received accolades from school staff regarding their professional appearance.

What is the Nature of Safety and Security in Public Schools?

Presenting Student Author: Kallie Nelson

Faculty Mentor: James Schul

This research investigates the nature of safety and security within the American public school system, with an emphasis upon how those within the school setting are impacted by security measures taken by their school district. Data for this study consist of interviews of parents, teachers, administrators, and school board members on how they feel their schools handle safety and security and how their school staff is trained for emergency situations within the school system. The findings and implications of this study are provided in the presentation.

The Effects of Social Media on Student Learning

Presenting Student Author: Ellen Palmen

Faculty Mentor: James Schul

This paper discusses the effects of the use of social media on students' learning. The intention of the research is to discern if technology use, such as social media is a benefit or a deficit to students learning. This paper includes research that has been done on students using social media in the classroom. It also includes a series of interview responses from individuals relating to the education background both directly and indirectly. The interviewees consist of teachers, school officials and parents. Surveying the results of the responses in both journal articles and interviews, the findings are unequivocal. Some research recommended that if social media becomes a distraction for students, that it be used in the classroom by the teacher as a vehicle to communicate with students inside and outside of the classroom. Other research claimed that social media is a distraction for students and will affect students' learning to different degrees depending on the ability level of the student. From the interviews conducted in this paper, there were also discrepancies. Some respondents believe social media to be harmful to students' learning and that it is a distraction from learning. Others claimed that if used properly and with appropriately set parameters it could be beneficial to students' learning. Based on the findings from research and interviews from individuals directly involved in education or indirectly involved through their own children it can be asserted that social media should be used as a cautionary tool by teachers and monitored by parents. If used appropriately and moderately, for some, technology can be valuable. Nevertheless, for those who do not use it in a suitable manner, social media can be damaging and inhibit learning.

What is the relationship between students who drop out and their environment?

Presenting Student Author: Sarah Pongratz

Faculty Mentor: James Schul

This research examines the school dropout rate, including the impact of low academic achievement and social implications upon those who dropout. Interviews from school professionals and parents highlight the correlation these individuals may see between low academic achievement and social experiences with the dropout rate. In addition to discussing the implications of dropout rates, the research discusses potential solutions to the problem, including ways school professionals may improve the learning environment. The findings indicate that an engaging and motivating environment will improve the outcome for high risk students to stay on track for graduation. Withdrawal from academic engagement as well as lack of involvement in the school setting are both indicators of school dropout. The research suggests that moving away from a 'one size fits all' mentality into a personalized education system will have a positive impact on student success. Excellent schools foster the developmentally responsive environment that high-risk students need in order to continue a trajectory toward excellence.

Engineering

The Design and Fabrication of a Composite Hitch-Mounted Bicycle Carrier

Presenting Student Authors: Kamal Chishty, Ryan Erickson, Chris Gabrielson, Ross Gilbertson, and Jessica Lavorata

Faculty Mentor: Keith Dennehy

The C6 carbon fiber bike rack is a high end bike rack that uses advanced technology of composite materials to ensure a strong, stiff, and weather-proof bike rack. This design not only improves the materials used for standard bike racks but adds flexibility in regards to the size of bikes it is able to carry and how accessible the trunk is with bikes already loaded on the rack. This product ensures that top tier carbon bikes will be transported without damage and wear from the rack it is carried upon. The design consists of a diamond weave carbon fiber shell paired with a closed cell rigid foam core to maximize its strength and stiffness along with giving a lightweight and compact design that bikers of every caliber can appreciate.

Durability of Composite Materials

Presenting Student Author: Maria Wrage

Faculty Mentor: Beckry Abdel-Magid

This study examines the durability of composites materials in extreme environments. Samples of glass fiber reinforced polyurethane and glass fiber reinforced epoxy have been conditioned in seawater at room temperature and at high temperature (65 °C). The main objective of this research is to analyze and evaluate the effects of seawater and

high temperature on these composite materials. This evaluation is done through both the change in mechanical properties and the analysis of failure mechanism. The change in mechanical properties show that when conditioned for 7 years, the E-Glass/Epoxy showed slight decrease in strength and stiffness at room temperature. However, at elevated temperature the E-Glass/Epoxy showed about 50% decrease in strength and still very little change in stiffness. The E-Glass/polyurethane at room temperature showed about 40% decrease in strength at room temperature and about 60% decrease at high temperature. However, both the room temperature and high temperature polyurethane composites experienced a slight increase in modulus. Failure analysis of the fiber, matrix, and fiber/matrix interface using FEI Quanta 250 SEM is conducted to investigate the correlation between the effect of seawater environment at the microscopic scale and the material performance at the macroscopic scale.

M.U.L.S.: Multi-Use Lifting System

Presenting Student Authors: Ejemen Aimienwauu, Blake Allen, Korey Rossman, Nick Simondet and Nick Lanaski

Faculty Mentor: Keith Dennehy

Multi-Use Lifting System (MULS), pronounced “mules” is a composite device that can easily carry an injured or deceased person. It is manufactured with carbon fiber/epoxy poles, carbon fiber/epoxy crossbars, aluminum connection pins, and nylon fabric. The stretcher needs to be lightweight, able to support the weight of the patient, compact, easy to move, and it also needs to be exceptionally safe for the patient. This product will serve as a replacement for already existing aluminum stretchers as it will be lightweight and more economical over the long run. The different components of the stretcher have been fabricated in accordance with a strict design plan.

Mechanical Properties of 3D Printed Nylon Matrix Composites

Presenting Student Author: Micah Callies

Faculty Mentor: Maryam Grami

The goal of this research is to evaluate the effect of 3D printing with other fabrication methods on the mechanical properties of several different polymer matrix composite materials. The Markforged 3D printer was used to print composite samples from two different matrix materials and three types of continuous fiber reinforcements. Five samples of each types of nylon matrix composites with continuous Glass, Carbon, and Kevlar fibers were prepared and tested along with the samples of the nylon 6 without any reinforcement and Onyx (Markforged engineered short fiber reinforced Nylon). As expected, adding continuous fiber directly related to an increase in strength of the specimen. The fractured surfaces of composite samples were examined by the scanning electron microscope. It was observed that the interface bonding of the continuous fibers and the nylon 6 matrix are not strong and the fibers were not wetted well with the matrix. FTIR and TGA analysis tests were performed to better identify the matrix materials and correctly compare to the published data. By comparing the results of this work with the published data, it was concluded that the data gathered from the

Markforged printed samples was significantly lower than posted on the Markforged website.

QuadroCarbon Halo

Presenting Student Authors: Peter Campbell, Dillon Geiger, Abdoul Kone, and Josh Robinson

Faculty Mentor: Keith Dennehy

The purpose of this design project is to target the middle-class consumer and provide them with a market competitive quadcopter that would mimic the performance of high end drones. Our product offers a higher impact strength shell than competing products. The shell protects all major components as well as providing a water-resistant barrier. The ease of operation is another major concern addressed by the QuadroCarbon. We wanted a user-friendly device that would allow anyone to be able to control it. This was all made possible by SolidWorks design software to determine required mechanical properties. To obtain the desired part geometry a tool was machined using a CNC mill to the specified SolidWorks part profile. A prototype was then manufactured. Testing is underway on the prototype to determine if the actual mechanical properties meet the design requirements.

Record Setter Fishing Net (RSFN)

Presenting Student Authors: Ben Davidson, Hayden Full, Jake Hill, Tyler Larson

Faculty Mentor: Keith Dennehy

The RSFN is a high strength, light weight, carbon-epoxy fishing net that allows any angler to secure the largest fish with ease. Its two-piece design allows for easy storage and quick set up. Mechanical and chemical properties of the RSFN allow it to be used in all environments without worry or failure or degradation. Rubber grips that are sprayed onto the 48-inch handle will allow for comfort grip and have use in any weather conditions. The design of this net ensures an easy and reliable way to net any fish up to 120 pounds. The nylon netting used will prevent damage to the fish. There is a lifetime warranty on the RSFN to ensure customer satisfaction.

UltraNetter

Presenting Student Authors: Hannah Betsinger, Rachael Geerts, Jason Rieke, Joe Sorensen, and Steven Wells

Faculty Mentor: Keith Dennehy

The UltraNetter is a fish landing net that offers high strength composite capabilities in a light weight product used for fishing freshwater rivers and streams for small to medium sized fish. With a handle and rim manufactured of carbon fiber/epoxy and a rubber netting, this net will be able to support the weight of landing a fish, hold up against the outdoor elements, and be able to measure fish after they are landed. With a bolt holding the rim and handle together, this product will be modular and allow the user to switch

out different length handles for specific applications and interchange parts if necessary. A rubber coated handle makes for comfort in using the net and aids in gripping when the net gets wet.

English

A Raisin' of the Dollar: An Examination of the Economic Universality in Lorraine Hansberry's *A Raisin in the Sun*.

Presenting Student Author: Arich Herrmann

Faculty Mentor: Gretchen Michlitsch

Lorraine Hansberry's *A Raisin in the Sun* is a play that debuted on Broadway in 1959. In it Lena Younger, mother of Beneatha and Walter, receives a life insurance check for $10,000. This paper examines the validity of Lena, Beneatha, and Walter using the money to actualize their dreams of buying a house, enrolling in college to become a doctor, and buying a liquor store in 1950 and 2017. Data for the prices of these dreams was acquired from the United States Census Bureau, United States Department of Labor, old newspaper articles, etc. A CPI inflation calculator was then used to adjust for inflation. Then the differences between the costs of these dreams in 1950 and 2017 was compared and analyzed.

Effect vs. Affect: Confusion in History

Presenting Student Author: Lauren Lott

Faculty Mentor: Andrew Higl

Effect and Affect have very complicated histories that add to the confusion that comes with using the correct form of them today. Part of the confusion of the words affect and effect does relate to phonology. There is a very slight variation in the pronunciation of these words which can make it hard to determine which one is being used in spoken language. It is unnatural to over exaggerate the letters 'a' and 'e' to make sure the listener can tell the difference. Afficere (which became affect) and Efficere (which became effect) both derive from the Latin verb facere meaning "to do, make" and affect derives from the Latin verb afficere meaning "to do something to, to have influence on." Effect descends from the Latin verb efficere meaning "to make, carry out." According to the Oxford English Dictionary, Effect as a verb was around in the 1500's and then affect became the spelling for the verb for that meaning in the 1600's. On the other hand affect as a noun was around in the 1500's and then effect became spelling for the noun for that meaning in the 1600's. This could be part of the cause of confusion since now affect is commonly a verb, and effect is commonly a noun. Many questions come up with this as to why the two different words were formed in the first place? Also, why did the spelling of those meanings change? Lastly, why do we need both spellings of the word today? This research project attempts to answer these questions by going through the history of these words, the current usage, and contemporary examples. My

hypothesis is that the confusion regarding these two words will continue until one of them becomes obsolete, or people use other terms instead of effect or affect making both of them obsolete.

IM-Speech is Taking Over. Lol.

Presenting Student Author: Taylor Eddy

Faculty Mentor: Andrew Higl

My research project explores the history, use, and future predictions of the acronym lol. It started out as an initialism used in texting and online speech and has developed into a large part of everyday communication. It's become so integrated in today's language because of how much we rely on technology to communicate with one another. My research has shown that lol has changed in meaning as well. It no longer just means "laugh out loud" it has many other connotations attached to it depending on where it's used and how it's used. It is interpreted as an acknowledgment that you saw someone's text, in some cases, many have compared it to a head nod in person. It can be used as sarcasm or to confirm somethings funny but not funny enough to truly laugh. Lol has also become a homonym, or something that looks that same but has many different meanings. In some ways, lol has moved into our spoken language. After taking a poll of some of my Instagram peers the results showed almost an even split, with half the voters saying they use lol in speech and half saying they don't. From this I've predicted that lol will continue to work its way into our spoken language because when lol first made an appearance it wasn't used in spoken language at all. For further research in this area I plan on polling how people say lol if they pronounce it "lal" or say each letter individually. This will help me make more predictions on what lol will do in the future. I also would like to ask some of the older generation how they use lol or if they do and if they use it in their spoken language. To achieve some of these answers I plan on polling my Facebook friends, where I have a lot wider range of generations, and ask them those questions. Those questions will help me expand my knowledge on all the generations use of lol in all forms of communication.

Lie and Lay as Verbs: Different and Decaying

Presenting Student Author: Rachel Hollcraft

Faculty Mentor: Andrew Higl

This research project discusses what the difference is between "lie" and "lay" as verbs. "Lie" as an intransitive verb, and "lay" as transitive. Both "lie" and "lay" come from the Proto-Indo-European root "legh". The word "lie" comes from Old English "licgan" and "lay" from Old English "lecgan". The project constructs a hypothesis that the confusion between lie and lay in the present tense comes from slang used in the 1900s. Another confusion between the words is the myth that "lie" is for people and "lay" is for objects, and the research I present proves why this is incorrect. The project also shows how to correctly conjugate "lie" and "lay" to past, past participle, and present participle tenses. The project draws on grammar bloggers, the Oxford English Dictionary, and several grammar handbooks to show how the usage of "lay" and "lie" has become quite

descriptive. The research project concludes with a theory about why and how some of the tenses of “lie” and “lay” will decay in the future.

Say It Ain’t So: An Analysis of the Etymology and the Colloquial Usage of “Ain’t”

Presenting Student Author: Abbey Johnson

Faculty Mentor: Andrew Higl

The word “ain’t” faces great controversy in everyday usage in the English language, often being coined “not a real word.” This claim raises three primary questions: how and why did this word come to exist in the first place? Who is using the word “aint?” And if it is “not a real word,” why has it not died out from Present Day English? In my research project, I answer each of these questions, examining professional academic opinions on the controversy, the word’s etymology, the demographics – such as region, age, and education level – of whom most often use “ain’t,” and my own speculation. From this research, my project draws conclusions such as how education level correlates to frequency in use of the word, how the word is best used, and speculates upon the future fate of “ain’t” in the English language.

Geoscience

Analysis of a Microsite from the Late Cretaceous Hell Creek Formation, North Dakota

Presenting Student Author: Samantha Khatri

Faculty Mentor: William Beatty

The Hell Creek Formation is a series of 66-miilion-year-old mudstones and sandstones found in the western United States and is well known for its assemblage of fossils from the end of the Cretaceous period in North America. It represents a low-lying coastal plain environment cut by numerous river channels. The formation has produced important invertebrate and vertebrate specimens including plants, fish, reptiles, amphibians, small dinosaurs and large dinosaurs such as *Tyrannosaurus* and *Triceratops*. In contrast to the large vertebrate fossil sites commonly found in the Hell Creek Formation, fossil microsites are areas where small invertebrate and vertebrate fossils are concentrated, often by stream currents. Microsite localities offer insight into ecosystems due to the high abundance and diversity of species they contain. This project documented the presence and abundance of taxa at a fossil microsite within the Hell Creek Formation. Microfossils and bulk sediment samples were collected from a newly identified microsite near Marmarth, ND, yards away from and at the same stratigraphic level as several dinosaur fossils. The microsite was divided into five regions and each region was searched by closely examining the ground surface and collecting all fossil material. Fossils were identified to the most specific taxon possible. Individual fossils of each identified taxon were tallied to determine the relative

abundance of different taxa at the microsite. The results present a more nuanced picture of the local ecosystem and will be used to provide greater environmental context and depositional information for nearby dinosaur excavation sites.

The Death of a Dinosaur: What it Reveals About a Prehistoric Environment

Presenting Student Authors: Amber Schmidt and Breanna Babcock

Faculty Mentor: Lee Beatty

An assemblage of disarticulated dinosaur vertebrae was recently discovered in the Hell Creek Formation near of the town of Marmarth, North Dakota. The Hell Creek Formation is a group of sandstones, mudstones and shales located in the northern Great Plains that was deposited during the last 2 million years of the Cretaceous period, 66 million years ago. The vertebrae are believed to be the remains of a hadrosaur; a type of herbivorous dinosaur that inhabited North America during the Cretaceous period. The hadrosaur vertebrae were found preserved in massive claystone, and although they are disarticulated, they remained in close proximity to each other. In addition to excavating and documenting the number of vertebrae at this site, we mapped and measured their spatial orientations and collected sediment samples in order to reconstruct the environment where the bones were deposited. The orientation of each of the vertebrae at the site was measured with a Brunton compass to determine the attitude of each dorsal process. Orientation data collected in the field was plotted to determine how scattered the bones had been during burial, which would be related, in part, to the energy of the depositional environment. Sediment samples taken from the site consist primarily of clay deposits. The orientation of the vertebrae does not appear to be random, suggesting that they were deposited in an articulated state, then became disarticulated, but not scattered, before final burial. The apparent trend in orientation of the vertebrae, along with the presence of clay sediments, suggests these bones were deposited in a low-energy environment, perhaps a floodplain.

Health, Exercise & Rehabilitative Sciences

Anterior Shoulder Instability Surgical Technique Comparison

Presenting Student Author: Spencer Rotter

Faculty Mentors: Shellie Nelson and Nora Kraemer

Clinical Scenario: Anterior shoulder instability is a common problem in the athletic population. Treatment for this problem typically involves rehabilitation and if instability continues surgical repair to stabilize the joint. The technique that is used is controversial. **Focused Clinical Question:** In patients with anterior shoulder instability what is the effectiveness of the Bristow Latarjet coracoid bone block compared to capsular shift with suture anchors on the recurrence of instability? **Search strategy:** The search for research studies began on PubMed, CINAHAL Plus, and Pro-Quest

Nursing. The search terms included anterior, shoulder, instability, surgical, techniques. With these search terms brought up about 250 studies. After reviewing some of the studies it was decided to analyze the effectiveness of the Bristow Latarjet procedure and the capsular shift with suture anchors. The same search terms were utilized. **Evidence Quality Assessment:** The PEDro Scale was utilized to determine the quality. The studies had a range on the Pedro scale from 5/10 to 7/10. The 2011 Oxford level of evidence was utilized with the studies ranging a score of 2-4. The Strength of Recommendation (SORT) score was a B. **Results and Summary of Search:** After reviewing the 9 studies it was concluded that the two surgical procedures produced the same outcome with no statistical significant differences when looking at instability recurrence. There was a slight favor the Bristow Latarjet procedure for stability when comparing Western Ontario Shoulder Instability Index (WOSI) scores. It was also found across all the studies that patients that dislocated their shoulder more than four times before surgery were more likely to suffer instability after surgery. The strengths of these studies include having a long follow up time of at least 2 years post completion of rehab. The patients, researchers, and therapists were not able to be blinded in these studies possibly allowing for bias. **Bottom line:** When comparing the Bristow Latarjet procedure to the capsular shift, both procedures produce comparable results with no statistical significant differences when looking at the rate of recurrent instability. **Clinical Implications:** This research can be used to help better decide what procedure athlete's may want to choose to have done if they are suffering from shoulder instability. This study shows that both procedures are effective in stabilizing the shoulder after chronic dislocations. However, there is an increased risk of instability if the patient has dislocated their shoulder more than 4 times before surgery, or if the patient is returning to a collision sport.

Comparison of Meniscectomy to Conservative Management on Meniscal Repair

Presenting Student Author: Austin Feltner

Faculty Mentors: Brian Zeller and Nora Kraemer

Clinical Scenario: The meniscus transmits load and reduces stress and compression of the articular cartilage and subchondral bone of the knee during weight bearing. A meniscus tear is a common musculoskeletal injury that occurs in active populations. An investigation analyzing the effectiveness of surgical intervention vs. conservative management is important for patients to determine which provides better functional outcomes and pain reduction. **Focused Clinical Question:** When treating patients with medial meniscus tears and osteoarthritis, is meniscectomy or conservative management more beneficial in alleviating pain? **Search Strategy:** Databases used to search for evidence included PubMed, ProQuest Nursing Collection, and CINAHL Plus with Full Text. Inclusion criteria for this appraisal were randomized controlled trials (RCTs), with the articles having to be published after the year 2000 and the use of human subjects. Terms used to search for the articles included "partial meniscectomy," "physical therapy," "osteoarthritis." Exclusion criteria involved patients that had symptoms persisting for three months or less, patients with an ACL, MCL, PCL, or LCL related injuries. **Evidence Quality Assessment:** Quality of evidence was assessed by one evaluator using the PEDro scale, the scores ranged from 6/10 to 9/10 and The

Oxford 2011 Levels of Evidence (OCEBM) score was 2 for all studies. The Strength of Recommendation based on a Body of Evidence (SORT) score was a B. **Results and Summary of Search:** Pain was measured using various scales, such as Knee Injury and Osteoarthritis Outcome Score (KOOS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Analyzing the articles pain scales to compare both treatment options, they showed conservative management as the better option for short term pain relief. When looking at the 6 and 12-months follow up surgical intervention showed improvement when looking at the pain scales as compared to the conservative treatment. Critical analysis of the studies showed mixed results; overall both treatment options were effective in decreasing pain after a meniscal tear. A weakness, the patient population amongst all the studies were similar, but primarily pin-pointed the older adult population rather than the younger athletic population. **Clinical Bottom Line:** The treatment that should be considered as the first option is partial meniscectomy. Conservative management should not be overlooked as a treatment option, but surgical removal of the torn meniscus is highly valued to effectively treat pain. **Implications:** These findings can help when deciding which type of treatment for a meniscal tear would return someone in a safe and orderly fashion.

Effect of Repair Versus Debridement in Patients with Femoroacetabular Impingement and Associated Labral Tear

Presenting Student Author: Maria Sequeira

Faculty Mentor: Nora Kraemer

Clinical Scenario: Femoroacetabular impingement (FAI) is a common injury among the athletic population and is often associated with a labral tear. FAI results from variations in the femoroacetabular joint caused by repetitive impact and may cause pain and dysfunction. **Focused Clinical Question**: The purpose of this study is to compare the effect of labral repair and labral debridement for the treatment of FAI on patient reported outcomes. **Search Strategy**: In order to be included in this review, studies had to include both labral debridement and labral repair as treatment options for FAI. Studies were found using multiple databases including PubMed, CINAHL Plus with Full Text, ProQuest Nursing Collection, and Cochrane Library. The terms used to find the studies were “femoroacetabular impingement,” “hip impingement,” “hip labral repair,” and “hip labral debridement,” as well as synonyms and abbreviations for such terms. Studies were excluded if they contained patients that were older than 80 years old, had advanced osteoarthritis, Legg-Calve-Perthes disease, osteonecrosis, or history of previous hip trauma. References found in each study were also used in order to find similar studies. A total of eleven studies were found that were included. **Evidence Quality Assessment**: A single evaluator used the PEDro Scale and the Oxford 2011 Level of Evidence (OCEBM) in order to determine the quality of the evidence obtained from each study. Each study was assessed using the standard scales. The PEDro scores of the studies ranged from 4/10 to 7/10. All studies included were either level 2 or level 3 on the OCEBM scale. **Results and Summary of Search:** Six out of 11 studies found significantly better patient-reported outcomes when labral repair was performed rather than labral debridement. The other studies found a slight improvement in patient-reported outcomes with labral repair; however, the improvement was not

significant. The studies measured patient-reported outcomes using standard scales and questionnaires such as the Modified Harris Hip Score, the Merle d' Aubigne-Postel Score, the SF-12, and patient satisfaction surveys. This allowed for an accurate measure in the difference between pre-operative and post-operative function. All studies were completed with older populations. A younger, athletic population would also need to be studied to better understand the long-term effects of both surgical interventions. This would allow athletic trainers to better understand how the surgical intervention would affect their patient population. **Clinical Bottom Line**: Labral repair may result in better patient-reported outcomes than labral debridement. The strength of recommendation (SORT) score for this review is B. **Implications**: The results of these studies indicate that when possible, labral repair should be done in order to maximize hip function and patient satisfaction post-surgically. Athletic trainers may use this information to better understand the rehabilitation needs of patients undergoing either surgical intervention.

Function-Based Comparison of Bracing and Taping on Lateral Ankle Sprains

Presenting Student Author: Payton Lindsey

Faculty Mentors: Shellie Nelson and Nora Kraemer

Clinical Scenario: Lateral ankle sprains are one of the most common injuries associated with athletes. Based on the current evidence, external support has been found to be one of the most effective preventative measures for ankle injuries alongside neuromuscular training. **Focused Clinical Question:** The purpose of this review was to find the difference in effects between taping and bracing for the treatment of lateral ankle sprains when focusing of functionality using the Karlsson score. **Search Strategy:** Participants were included if they were between the ages of 16 and 65, and reported with a history of an isolated lateral ankle sprain within 72 hours of the injury. Studies were excluded if there was previous history of ankle or lower limb injuries within the last year, any previous surgeries to the lower limb, chronic ankle instability, current fractures, and non-compliant participants. Computerized literature searches were limited to the Journal of Athletic Training and databases within PubMed, Cochrane, ProQuest, and CINAHL. In order to limit the number of studies found within each database, keywords were used in combination for search topics. Applicable studies were generated through this set of keywords: lateral, ankle sprain, bracing, taping, semi-rigid, function, and Karlsson. A total of 161 articles were reviewed from the given criteria and terms. This review is constructed from the seven studies that did qualify based on the set criteria. **Evidence Quality Assessment:** Scores of 3/10 – 8/10 were received via the PEDro scale, whereas the Oxford 2011 Level of Evidence Scale scored each of the utilized articles as a 2. **Results and Summary of Search:** While taping may be a short-term fix, bracing could in fact be a better long-term solution. Tape can contour to the body providing reinforcement and maximal support to a previously injured joint however, movement reduces the lasting effects of the tape job by breaking down the elastic hold. Bracing provides compression and support however, it leaves the ankle weak and reliant on the brace. Overall weakness of the studies includes using a variety of rehab protocols, braces, and consistently low inter-rater reliability among tapings. Overall strengths of the studies include all studies using the Karlsson scoring system and the

duration of treatment length remained similar. **Clinical Bottom Line:** There is not enough significant statistical evidence to be able to say that there is a difference in effectiveness between bracing and taping for the treatment of lateral ankle sprains when focusing of functionality. This review scores a “B” for the Strength of Recommendation Taxonomy. **Implications:** Upon review, both taping and bracing have proven to be beneficial for the treatment of lateral ankle sprains. Taping or bracing however; should not be the extent of treatment. Treatment should include the use of strengthening, proprioception, and functional exercises.

Optimal Treatment for Decreasing Re-Dislocation Rate Following Primary Patellar Dislocation

Presenting Student Author: Jesse Moline

Faculty Mentors: Brian Zeller and Nora Kraemer

Clinical Scenario: Determining the best treatment option of an acute primary patellar dislocation to return the athlete to their sport with the lowest re-dislocation rate is a commonly discussed topic. **Focused Clinical Question:** With patients who have sustained an acute primary patellar dislocation, what are the effects of surgical treatment with physical therapy versus conservative treatment on re-dislocation rate? **Search Strategy:** Inclusion criteria consisted of the injury needing to be an acute primary patellar dislocation, no previous history of knee surgeries on the effected knee and a positive apprehension test. Exclusion criteria was history of chronic patellar instability, previous surgeries on the effected, or a history of a major lesion on the effected side. Databases used were PubMed, Cochrane summaries, CINAHL complete, and ProQuest Nursing Collection. Search terms used were patellar dislocation treatment, Patellar dislocation, surgical treatment, conservative treatment, operative treatment, non-operative treatment. Nine articles were selected after the search was complete. **Evidence Quality Assessment:** All studies received either a 6/10 or a 7/10 on the PEDro scale. The studies were rated a level 2 or level 3 on the 2011 Oxford Centre for Evidence-Based Medicine levels of evidence scale. **Results and Summary of Search:** The studies show that surgical repair of the medial patellofemoral ligament followed by physical therapy resulted in better outcomes of re-dislocation rate. Although conservative treatment was found to be a viable treatment choice, surgical reconstruction and repair of the medial structures showed to have better results. The results showed that re-dislocation with surgery ranged between 0% to 67% while conservative treatment showed re-dislocation rates between 4% to 75%. Strengths of the studies are having very similar physical therapy regimens and similar surgical procedures. Weakness in these studies are that there is a wide range of ages between the patients which other factors such as anatomical factors may play a role in weakness of stabilization. With younger populations ligaments and muscles have not fully developed leading to weakened stabilization. With older population, ligaments and muscles may become weaker as people begin to slow down in life and become less active. **Clinical Bottom Line:** Surgical treatment was found to give patients the lowest re-dislocation rate in 5 of the 9 studies. The SORT score was given a B. **Implications:** As athletic trainers commonly work with acute injuries, they may encounter acute patellar dislocations throughout their careers. They will need to be able to recognize the

injury then determine whether surgery or conservative treatment will lead to the lowest re-dislocation rate for the patient. Having the knowledge of which treatment is will have better results for re-dislocation rates will enable the athletic trainer to know when to refer the patient for follow-up with an orthopedic surgeon.

Patellar Tendon Reliability vs. Hamstring Tendon Reliability

Presenting Student Author: Allison Boltjes

Faculty Mentors: Brian Zeller and Nora Kraemer

Clinical Scenario: There are multiple methods of repairing an anterior cruciate ligament (ACL). Two different procedures that will be compared is with a patellar tendon autograft or with a hamstring tendon autograft. **Focused Clinical Question:** In participants who have an ACL rupture, what is the effect of the patellar tendon repair method compared to the hamstring method on Lysholm Knee Scoring System? **Search Strategy:** The following databases were used included PubMed, CINAHL plus, ProQuest Nursing, and Cochrane. The search terms were ACL reconstruction, patellar tendon, hamstring tendon, lysholm score, ACL, and lysholm knee score. The inclusion criteria included patients with ACL ruptures along with, patellar tendon, hamstring, and Lysholm Knee Score. The exclusion criteria were posterior cruciate ligament (PCL), lateral collateral ligament (LCL), medial collateral ligament (MCL), and meniscus. A total of 872 articles meeting the initial search results and 8 meeting the inclusion criteria. **Evidence Quality Assessment:** The PEDro score were 6/10 to 9/10. The Oxford 2011 Levels of Evidence Score ranged from a level 2 to a level 4. **Results and Summary of Search:** Both the patellar tendon autograft and the hamstring tendon autograft had good outcomes. There were no significant differences between the patellar tendon autograft and hamstring tendon autograft with the Lysholm Knee Scoring System. The primary strength of each study was that there were good follow up numbers where the lowest was 70% follow up and the highest was 100% follow up. One of the main weaknesses, included that the studies did not have many blinding factors for the subjects or the ones performing the surgery. **Clinical Bottom Line:** The patellar tendon autograft and the hamstring tendon autograft are good options for an ACL repair as there were no major concerns or differences between the two types of grafts. The strength of the recommendation (SORT) score was a B. **Implications:** Either the patellar tendon or the hamstring tendon would be appropriate to use. The decision is ultimately up to the surgeon and the patient due to the patellar tendon autograft and hamstring tendon autograft having the same outcome. Using the patellar tendon autograft or the hamstring tendon autograft will not affect the return to play protocol that the athletic trainer will have.

Plantar Fasciitis: Platelet Rich Plasma Injection vs. Corticosteroid Injection

Presenting Student Author: Hailey Ebacher

Faculty Mentor: Nora Kraemer

Clinical Scenario: A common overuse injury in athletics is plantar fasciitis. Plantar fasciitis is usually treated conservatively with the use of analgesics and anti-

inflammatory medications like NSAIDs. When this condition becomes chronic and conservative methods have failed; a different intervention may be indicated. **Focused Clinical Question**: In patients with chronic plantar fasciitis, what is the effect on platelet rich plasma injection vs. corticosteroid injection on pain? **Search Strategy:** Pubmed, Proquest Nursing, Cochrane Library, and CINHAL Plus databases were searched using terms: Plantar fasciitis, platelet rich plasma injection, and corticosteroid injections. Inclusion criteria were patients with chronic plantar fasciitis that failed conservative treatment, platelet rich plasma injection, corticosteroid injection, and articles published after the year 2002. Exclusion criteria were publications dates prior to the year 2002 and chronic injuries other than plantar fasciitis. Initial search revealed 273 articles which were narrowed to eight articles after reviewing the inclusion and exclusion criteria. **Evidence Quality Assessment:** Eight articles were collected; all eight articles scored a two or three on the Oxford levels of incidence chart. PEDro scale scores ranged from a score of 4/10 to 6/10. **Results and Summary of Search:** Four out of eight articles concluded that platelet rich plasma is equally as effective as corticosteroid injection on reducing pain in patients. In the other four articles, platelet rich plasma was shown to be more effective than corticosteroid injection on reducing pain. Platelet rich plasma has a longer lasting effect than corticosteroid injection, but corticosteroid injection is less invasive and safer than platelet rich plasma injection. Platelet rich plasma proved to last up to twelve months in effectiveness where corticosteroid lasted up to six months post injection. Pain in all articles was measured using the visual analog scale (VAS). Strengths of the articles PEDro criteria were concealed randomly allocated groups that were similar at baseline testing and results reported for at least one key outcome had variability and were obtained from at least 85% patients that were in the article. Weaknesses included blinding of patients and assessors. **Clinical Bottom Line:** The conclusions based on the evaluated research is that platelet rich plasma is equally as, if not more, effective as corticosteroid injection on reducing pain in patients with chronic plantar fasciitis. Platelet rich plasma has a longer lasting effect than corticosteroid injection, but corticosteroid injection is less invasive and safer than platelet rich plasma injection. Both treatments showed improvement in patients with chronic plantar fasciitis and are effective based on the patient's symptoms and goals from treatment. However, platelet rich plasma may prove to be superior due to longer lasting effects of the treatment. The SORT score is an A level of recommendation. **Implications:** This information can be used to educate patients on possible treatments that they can choose from if conservative treatment of plantar fasciitis fails. Depending on state law and what the supervising physician allows, an athletic trainer may be able to perform this procedure and should know which treatment could be most effective for patients.

Re-rupture of Achilles tendon rupture following surgical versus nonsurgical repair

Presenting Student Author: Austin Mihalovic

Faculty Mentor: Nora Kraemer

Clinical Scenario: Achilles tendon rupture most commonly occurs in sports that involve running, jumping with sudden starts and stops. Comparison between surgical and nonsurgical repair of Achilles tendon ruptures has not shown one treatment being

significantly superior than the other. **Focused Clinical Question**: In patients with Achilles tendon ruptures what effects does surgical versus non-surgical repair have on re-rupture? **Search Strategy**: PubMed and CINAHL Complete were used to gather studies. Search terms included Achilles Tendon rupture, surgical repair, nonsurgical repair. Studies were included if the observed patients sustained full Achilles tendon rupture, compared surgical versus nonsurgical repair, utilized functional bracing, and included early weightbearing. Studies were excluded if they had bilateral Achilles tendon rupture, utilized Platelet-rich plasma (PRP) injections, or compared open surgery versus minimally invasive surgery. The original number of studies found using "Achilles tendon rupture" on PubMed was 2628. Studies were narrowed down to 46 using the inclusion criteria on PubMeb. Only 9 studies were used. **Evidence Quality Assessment**: The studies included range in scores from 4/10 to 7/10 on the PEDro scale. Oxford 2011 Levels of Evidence (OCEBM) scores for the studies included range from 2 to 3. **Results and Summary of Search**: Overall studies showed similar outcomes regarding re-rupture rates. Studies ranged from 42 to 363 patients. Studies ranged from 0.04% to 10.37% re-rupture rate among both surgical and nonsurgical treatments. Weakness of the studies was the majority focused on less active populations placing less stress on the repair. **Clinical Bottom Line**: In surgical versus nonsurgical repairs of Achilles tendon ruptures in the studies selected there was no statistically significant difference between both interventions. Both treatments where shown effective overall in Achilles tendon repair. There was a slightly higher rate of re-rupture among nonoperative patients, but not statistically significant. The Strength of Recommendation (SORT) score for the studies was "B". **Implications:** Surgical versus nonoperative treatment of Achilles tendon ruptures can be based on the patient's activity level. Patients with a higher activity level are encouraged to undergo surgical repair due to the slightly higher risk of re-rupture with nonoperative treatment. Patients who are less active could undergo nonoperative treatment due to the decreased amount of stress he/she will be placing on the repaired tendon.

Surgical Failure Rates of Rotator Cuff Repair

Presenting Student Author: Justin Roe

Faculty Mentors: Shellie Nelson and Nora Kraemer

Clinical Scenario: Rotator cuff tears are particularly common in the overhead athlete and the prevalence of such injuries increases with age. After a tear, surgery may be necessary to provide support and get the patient return to activity. **Focused Clinical Question:** Which surgical repair method has a lower failure rate, double-row or single-row surgical repair? **Search Strategy:** Initial search of PubMed included the search term "rotator cuff repair," which resulted in 3477 hits. This was then narrowed down to 17 hits using the search term "rotator cuff repair double-row vs single-row". After searching other databases, such as CINAHL, ProQuest Nursing, and Cochrane 9 articles met the final inclusion criteria. Studies were included if the patients had a rotator cuff tear that was repairable with either a double-row or single-row repair. Studies were excluded if they were in a foreign language, done on animals, cadavers, or used other surgical techniques that didn't involve a variation of the double- or single-row technique. **Evidence Quality Assessment:** Studies were assessed using the PEDro scale and the

Oxford Levels of Evidence. Scores for PEDro ranged from 4/10 to 8/10 and Oxford 2011 Levels of Evidence ranged from level 2 through level 4. **Results and Summary of Search:** Patient population ranged from 40 to 160 patients per study. There were no significant differences between the repair techniques in two studies. Failure rates for patients who underwent double-row surgery ranged from 7% to 48% failure. Failure rates for patients who underwent single-row surgery ranged from 8.5% to 60% failure. However, in most of these studies the subjects were over the age of 60 years old. **Clinical Bottom Line:** In reference to the "SORT" score these studies demonstrated an "A" grading. Overall, patients undergoing the double-row surgical technique had lower failure rates than patients who underwent the single-row surgical technique. **Implications:** Double-row surgical technique appears to demonstrate better tendon healing possibly leading to lower failure rates. With athletes, they may be willing to sacrifice long term durability for the benefits of short term function. Detailed discussions with the athlete may help them determine which surgical procedure is best for them.

Superior Labrum Anterior Posterior Lesion Repair vs. Biceps Tenodesis

Presenting Student Author: Holly Winiarczyk

Faculty Mentors: Shellie Nelson and Nora Kraemer

Clinical Scenario: Superior labrum anterior posterior (SLAP) tears are found in an overhead population, especially athletes. Two surgical methods being researched for the best outcome include repairing the labrum tear or performing a biceps tenodesis. **Focused Clinical Question:** In patients with SLAP lesions what is the difference in repair versus biceps tenodesis on return to previous level of activity? **Search Strategy:** For research methods, many data bases were used and are PubMed, CHIAHL Plus, Cochrane Library and ProQuest Nursing Collection. To narrow down the results, a variety of terms were searched on each of these databases. They are SLAP Lesion Treatment, repair, biceps tenodesis, return to play, and return to full function. Inclusion criteria included for these studies were SLAP lesion repair, biceps tenodesis, return rates to full function. Exclusion criteria were multiple labrum tears, rotator cuff tears, or minimal function before injury or having another repair along with the labrum repair. Evidence Quality Assessment: The PEDro score is used to measure the quality of the studies that are done. The studies ranged from 5/10 to 8/10. And the Oxford levels ranged from 2-3. Results and Summary of Search: Studies found that in an older population biceps tenodesis could be a better option as to repairing the SLAP lesion. The recovery time was shown to be shorter and more of the patients return to full function. Some studies used the American Shoulder and Elbow Surgeons score to measure function as well as just assessing over all return to full previous level of function. The studies stated that repairing the SLAP lesion should be done in a young active overhead population, as opposed to biceps tenodesis is better for an older non-overhead population. Strengths in the studies were the amount of shoulders evaluated and worked on, whereas weaknesses include lack of follow up with patients. **Clinical Bottom Line:** Biceps tenodesis is better for an older non-overhead population, whereas SLAP repair is better for a younger overhead athlete population. This is because there will be a deficit with range of motion with biceps tenodesis, because this involves cutting the long head of the tendon. A SORT grade of B is given. **Implications**: This

information can be used in clinical practice by Certified Athletic Trainers by helping guide a patient to see which procedure they should think about. This information can help patients weigh the pro's and con's to each option. Pro's can include recovery time with tenodesis whereas con's can come from issues with full range of motion due to the cutting of the biceps tendon.

Surgery and Conservative Treatment of the ACL-MCL Injured Knee

Presenting Student Author: Mason McManimon-Myers

Faculty Mentors: Brian Zeller and Nora Kraemer

Clinical Scenario: There is a clinical need to evaluate the effectiveness of non-operative versus operative treatment of the anterior cruciate ligament (ACL)-medial collateral ligament (MCL) combined knee injury. The incidence of these injuries is frequent in athletic populations and requires the best treatment for optimal patient outcomes and function in day-to-day life as well as athletics. The appraisal focuses on whether or not to pair ACL reconstruction with MCL reconstruction or ACL reconstruction with MCL bracing. **Focused Clinical Question:** What is the effect on patients with a combined ACL-MCL injury of the knee with conservative treatment compared to surgery on patient reported outcomes (PROs)? **Search Strategy:** The search strategy included searching PubMed, CINAHL Plus with Full Text, ProQuest Nursing Collection, Cochrane Library, and EBSCO Host for original research studies. The terms used included "ACL", "MCL", "ligament", "knee", "surgery", "bracing", "conservative", and "treatment". The initial results started at 5,593 and narrowed to 13. Three of those studies discarded because they did not fulfill the clinical question. **Evidence Quality Assessment:** Methods of evidence evaluation included the Oxford 2011 Levels of Evidence (OCEBM) and the Physiotherapy Evidence Database (PEDro) scales. OCEBM levels ranged from two to four. PEDro scores ranged from 5/10 to 7/10. **Results and Summary of Search:** The studies demonstrated that non-operative management of the MCL with surgical treatment of the ACL allowed for the best patient outcomes. This treatment regularly scored higher in Tegner Lysholm Knee Scoring Scale, Knee Injury and Osteoarthritis Outcome Score (KOOS), and International Knee Documentation Committee (IKDC) scores as compared to operative treatment of both ACL-MCL, 94.5 to 92 Lysholm, 88.2 to 74.4 KOOS, and 87.6 to 76.0 IKDC. A higher number signifies a higher level of function in a patient. Five studies used Lysholm scale and one study utilized the KOOS score. Stability and function also graded higher in non-operative groups, with stability rated as excellent in 91% of the non-operative groups and 58% rated as excellent in operative groups. Strengths of studies included follow-up above 85% in all studies with a weakness being only four studies being randomized control trials. **Clinical Bottom Line:** The recommendation is that the patient undergo ACL reconstruction with non-operative management of the MCL via bracing with rehabilitation exercises. Strength of Recommendation Taxonomy (SORT) grade of this appraisal is a B. **Implications:** Patients with combined ACL-MCL injuries of the knee should undergo ACL reconstruction with non-operative treatment of the MCL for best possible PROs. Non-operative treatment would be bracing of the MCL combined with ACL reconstruction. The evidence indicates that this is the best treatment available for

this injury and results in the best functional outcomes for patients with this debilitating injury.

Surgical Interventions for Distal Radius Fractures

Presenting Student Author: Jake Dotseth

Faculty Mentor: Nora Kraemer

Clinical scenario: Distal radius fractures are a common injury throughout the lifespan. As healthcare professionals, knowing the best interventions for a wide range of ages is crucial information. Common interventions can include external fixation, volar plating, internal fixation and casting. **Focused clinical question:** In patients with distal radius fractures, does volar plating or external fixation surgery lead to better restoration of range of motion? **Search strategy:** When researching distal radius fractures, inclusion criteria were volar plating, external fixation, radial fracture and range of motion (ROM). The exclusion criteria were bilateral fractures, fractures including the ulna, and closed reduction. Over 14,000 studies searched and 9 of them were reviewed based on the inclusion criteria. The studies reviewed were found on PubMed, CINAHL, ProQuest Nursing Collection, and Cochrane Library. **Evidence quality assessment:** The PEDro scores for the studies ranged from 5/10-9/10. OCEBM levels of evidence scores were 2/5 for all studies. **Results and summary of search:** Both interventions were consistent with increasing ROM throughout the studies. Strengths of choosing volar plating over external fixation was the amount of ROM gained by patients at the end of the studies. With pronation and supination ranged from 76-89˚ for volar plating and ranged 68-74˚ for external fixation. A limitation was patients with volar plating took 6 months to a year to achieve greater ROM than external fixation. Many of the outcomes were close in end ROM and made it hard to choose an outcome with better restoration. **Clinical bottom line:** Throughout the studies, patients with the volar plating surgery ended with larger ROM numbers, compared to external fixation. Patients with volar plating surgery did start with lower ROM numbers but finished with higher ROM ranges after 6-months post-surgery. The SORT score for the studies was a B. **Implications:** With the review of these studies both are still acceptable outcomes when it comes to ROM, but volar plating showed to be more consistent with higher ROM degrees. A patient who is looking to decrease the amount of time away from activity should consider a volar pate.

Surgical Methods for Distal Radius Fractures

Presenting Student Author: Heather Pierce

Faculty Mentor: Nora Kraemer

Clinical Scenario: Distal radius fractures commonly occur in contact sports but have a significant effect on those that involve upper extremity activity. Throwing, catching, shooting, gripping, and hitting abilities are highly impacted by radius fractures. **Focused Clinical Question:** In patients with distal radius fractures, what is the effect of volar locked plating surgery versus external fixation surgery on grip strength? **Search Strategy:** Participants included in this review were between 18-80 years of age and

sustained an isolated distal radius fracture with >3-mm shortening within the previous two weeks prior to entering the study. Exclusion criteria were patients with a contralateral radial malunion, open fractures, or any other associated fracture or injury. A search was conducted using the following databases: *PubMed, Cinahl Plus with Full Text, ProQuest Nursing Collection,* and *Cochrane Library.* The key terms were: distal radius fractures, external fixation, volar plating, plates, internal fixation, grip strength, and distal radius fracture surgical treatments. The initial search resulted in 293 hits, with nine that met the inclusion criteria. **Evidence Quality Assessment:** The evidence was appraised with use of the PEDro scale and Oxford 2011 Levels of Evidence. The PEDro score requirement was a score of at least 6/10. The scores of the articles reviewed ranged from 6/10-8/10. The Oxford 2011 Levels of Evidence scores were two for all nine articles. **Results and Summary of Search:** All nine articles included were randomized controlled trials. Grip strength was significantly better in the volar plate group than the external fixation group in the earlier follow-ups, at six-weeks up to six months, for 6/9 studies. However, there were no significant differences between volar plating and external fixation by the one-year follow-up for any study. Some strengths of the studies were the high follow-up rates among the patients and similar patient features at baseline. Some limitations included uneven numbers of patients in each group, as well as small-numbered groups. Some findings may not correlate with younger populations well, as these studies focused on primarily older populations with an average age of 40-60 years. The duration of these studies was also short, with the follow-ups being only up to one year, so improvement in grip strength was sometimes anticipated but not recorded. **Clinical Bottom Line:** Overall, the short-term effect of the volar plating surgical method for repairing a distal radius fracture is superior in improving grip strength compared to external fixation; however, the long-term results are not significantly different. The SORT score of the studies used is “B”. **Implications:** Volar plating would be more beneficial for patients involved in sports or activities with significant hand usage. With quicker improvement associated with volar plating, the patient may be able to progress through rehabilitation at a faster rate and continue to advance to more functional activities sooner, resulting in an earlier return to play time.

Thawing the Frozen Shoulder

Presenting Student Author: Katlin Grapes

Faculty Mentor: Nora Kraemer

Clinical Scenario: Adhesive capsulitis is a condition where the glenohumeral joint and the scapular thoracic joint move cohesively instead of independently. This condition is associated with general shoulder pain, significant loss in range of motion (ROM), and decreased overall shoulder function. Generally, physiotherapy is used as the first treatment method, but corticosteroid injections are also commonly performed. **Focused Clinical Question:** In patients with adhesive capsulitis, what is the effect of corticosteroid injections versus a supervised physiotherapy regimen on ROM? **Search Strategy:** Studies were included if subjects showed symptoms for at least one month but no longer than six, ROM was limited in at least two planes, and subjects were 18 or older. Studies were excluded if subjects had previous treatment or surgery, other shoulder conditions, an allergy to anesthetic, or other pertinent medical conditions. The

search was performed using the following databases: PubMed, ProQuest Nursing, and Cochrane Library. Search terms included but were not limited to: frozen shoulder, adhesive capsulitis, corticosteroid, and physiotherapy. Over 800 results were found, but the six studies that best fit the PICO question and inclusion criteria were chosen. **Evidence Quality Assessment:** The PEDro scores of the nine studies ranged from 5/10-9/10. All studies obtained an Oxford 2011 Level of Evidence score of 2. **Results and Summary of Search:** Corticosteroids have a significant effect in short-term treatment, which indirectly leads to an increase in ROM. Whereas for long-term success, physiotherapy seems to be the preferred treatment for directly increasing ROM. The greatest improvement in ROM was seen in active abduction, which ranged from 18.2° to 54.8° in the physiotherapy group and 16.3° to 46.3° in the corticosteroid group. All authors mentioned that a combination of strategies is most effective. The common weaknesses were lack of follow-up and minimal blinding. Several examiners simply followed up once or twice throughout the entire study. Just three out of nine studies blinded their subjects, four out of nine blinded their therapy administers, and six out of nine blinded assessors. **Clinical Bottom Line:** A SORT grade of A was obtained. The effects achieved by corticosteroid injections and physiotherapy are comparable after long-term observation. Both treatments are effective for improving mobility and could be utilized by medical professionals working with a patient lacking ROM. Regaining lost ROM allows for easier performance of activities of daily living (ADL's) or athletic activities. **Implications:** Physiotherapy would be more beneficial in a setting where certified athletic trainers (ATC's) are readily available, because an ATC would have to refer the patient to a physician to receive a corticosteroid treatment. Some patients may receive multiple treatments, which costs time and money. If physiotherapy was chosen, the same ATC could monitor the condition every day and give more consistent follow up, saving patients time and money in the long-term.

History

Curriculum of Assimilation: Chemawa Indian School

Presenting Student Authors: Emma Tomb and Sarah Fischer

Faculty Mentors: Jaundrea Bates

The Chemawa Indian Boarding School was built with the intention of breaking down the culture of its Native American students. On February 25th in 1880, in Salem Oregon, the Chemawa Indian Boarding School opened its doors as the second federally funded Native American Boarding school in the United States. Thousands of students were sent to the school to be assimilated into White American culture. Those students experienced the traumatic process of culture loss through assimilation, and often died in the care of the school's administration.

Historians have written some scholarship on the history of the school and the processes of assimilation at Chemawa, but there is a lack of documentation on the lasting effect of the assimilation techniques on the school's students and their families. This project

seeks to fill the holes in exploring the historical trauma caused by Native American boarding schools in the United States today.

This project is a microhistory of the Chemawa Indian School, the second federal Indian boarding school in the country that is still running to this day. The school was built with the intent of “civilizing” Native American children from reservations all over the midwest and western part of the country, and assimilating them into White culture. There were several techniques that the school used, which had a number of severe consequences still present in the lives of alumni to this day. This project will be discussing topics such as punishments, job training, and music. It will also focus on how cultural ties were cut from students and how death of students became a common occurrence from when the boarding school began even until today.

Mathematics & Statistics

A Measure of Skill: Analyzing an Overwatch player’s skillset

Presenting Student Author: David Stampley Jr

Faculty Mentor: Silas Bergen

Overwatch is one of the premiere commercial success stories in the ESports realm in recent years, earning “*Game of the Year*” honors in 2016. Through the vast seven-layered skill tiers, players from around the globe have the chance to use one of 27 heroes to climb the competitive ladder to reach the status of top 500 players on their platform. By scraping data from Overbuff and MasterOverwatch websites, we examined the player codenamed Stampede20 in order to identify which hero from each of the four classes was the strongest. Building a logistic regression model from the best hero, we were able to examine which statistics were most important to satisfy the condition of winning for the populous of players in a given skill tier in comparison to our player Stampede20.

Application of Markov Chain in Chinese A-share Market

Presenting Student Author: Fengrui Xue

Faculty Mentor: Tisha Hooks

Because stock prices have strong volatility and uncertainty, people try to use stochastic processes to study stocks to make rational decisions. Markov chain analysis, in particular, can be used to predict trends in the stock market. The aim of this study is to use Markov chains to conduct a comprehensive analysis of the Chinese A-share stock Wuliangye (000858) for the year 2016. Data on the closing prices of this stock was obtained from China Finance over a period covering January 4 to December 30, 2016. A Markov chain model was determined based on the probability transition matrix and initial state vector, and the model was used to predict whether future stock prices would experience a rapid rise, slight rise, small fluctuation, slight rise, or a rapid decline.

Investigating Python Using Housing Data

Presenting Student Author: Catherine Nead

Faculty Mentor: Todd Iverson

There are many housing issues in the Twin Cities; the biggest amongst them is increasing living expenses. Housing is one of the highest expenses a person encounters during his or her lifetime. For many, finding the perfect house to aesthetically and otherwise meet our wants and needs and be in a certain price range poses a natural problem. To help with this common issue, Python was used to automate the collection and analysis of Zillow housing data collected through a web API. After the data was downloaded through the restful API, JMP was used to build a model that predicts housing prices and to create visualizations of the data.

Mathematics of Perspective

Presenting Student Author: Talen Rabe

Faculty Mentor: Joyati Debnath

A problem faced by visual artists is that of representing a three-dimensional space on a two-dimensional surface. In this research a means of mapping points in three-space directly to points on a plane is developed. A mathematical description of traditional vanishing points used by artists to create the illusion of depth is explored. Parametric vector equations are used to describe objects in a scene. Then linear transformations are used to place those objects in the scene and project them onto a plane. The project includes modeling an architectural space in this manner, which is then drawn onto a canvas to be painted. By approaching art from the perspective of a mathematician precise measure can be given to the problem of perspective, allowing for the creation of imaginary scenes with realistic depth and proportion.

National Park Data Analysis

Presenting Student Author: Allison Haan

Faculty Mentor: Tisha Hooks

The natural world is full of wonder and awe and National Parks of the United States are no exception. The purpose of this analysis was to investigate the National Parks of the U.S., including visitor and species information and visitor reviews of park attractions. The question of interest was: what makes people visit certain National Parks, and can those visitor numbers be predicted for upcoming years? Data for this analysis was downloaded from nps.gov (visitor data) and Kaggle.com (parks and species data). Ratings and stars information was pulled from TripAdvisor.com for some attractions in certain parks. The data was analyzed in Microsoft Excel, JMP, and R. Tableau was used to show interactive summaries including: geospatial data, yearly visit information, and photos pulled from Google. My poster will include statistical models and summaries

of the data and my laptop will have my Tableau visualizations available for people to do their own investigating of National Park data.

NBA Draft Analytics
Presenting Student Author: Sam Dokkebakken
Faculty Mentor: Chris Malone

Analytics have become increasing significant in sports. Analytics are used in a variety of way including team and individual performance. This study is centered around the NBA draft and in particular the order in which players are drafted. The order in which players are drafted has an effect on a player's salary and a team's immediate/future personnel decisions. A thorough investigation of the many factors that influence draft order was conducted. The outcomes from this investigation will be presented in this work.

Parametric Weibull Survival Regression Models of Coronary Heart Disease

Presenting Student Author: Courtney Steinmueller

Faculty Mentor: Silas Bergen

The Framingham Heart Study is a long term investigation of cardiovascular disease among a population of subjects in Framingham, Massachusetts. The purpose of the study is to identify the concept of risk factors and their joint effects on Coronary Heart Disease (CHD). The study involves an analysis of age, gender, history of diabetes, smoking history, body mass index (BMI), cholesterol, heartrate, and glucose level. The data was analyzed using parametric Weibull survival regression models. A RShiny application was created to summarize the results of time until failure or years until CHD occurred. It was determined that history of diabetes, gender, and cholesterol level strongly increase the risk of developing CHD.

Political Science

Decriminalizing Sex: An Intersectional Analysis of Sex Work

Presenting Student Author: Sarah Ortega

Faculty Mentors: Alexander Jorgensen and Edward Guernica

Questioning the current criminalization of sex work in terms of a health, social, and economic analysis, this research aims to review the socioeconomic benefits of the sex work industry. The need for a comprehensive sex work policy in the United States is demonstrated through an intersectional approach, focusing on the subordinate position of women in society and also deconstructing the stigma sex workers face. A critical analysis of current policies of sex work in the United States will elaborate on how sex work policies are used to police bodies through violence. This research concludes that

implementing a comprehensive policy to decriminalize sex work will benefit the United States.

A Comparative analysis of Race and Income as determining factors for high crime rates in urban cities

Presenting Student Author: Elijah Norris-Holliday

Faculty Mentor: Alexander Jorgensen

Recent studies have concluded that public housing authorities serve as "hotbeds" for crime in many major cities in America. The demographics of these individuals are often, associated with high levels of poverty and ethnic minority groups. Which, can lead to many unintended negative perceptions about poor ethnic minority groups in America. This study aims to conduct two comparative analysis. The first analysis will evaluate crime data on ethnic minority groups who fall below the poverty line and compare it with Caucasian groups who fall below the poverty line. The second analysis will evaluate crime data for ethnic minority groups who earn incomes over the poverty line, and Caucasian populations who earn incomes over the poverty line. Average household income and Race will be the primary variables evaluated in this study. The result of this study seeks to find if the household income of individuals is a better determinant of crime when compared to race. The study will evaluate criminal statistics for homicides, burglary, and theft. Using a statistical programming software(SPSS) crime data collected from three major cities, Chicago, Minneapolis, and Milwaukee will be used to conduct the comparative analysis study. This study hopes to find that there is little evidence that suggests that race is a more prevalent determining factor for high crime rates when compared with household income levels. Furthermore, this study hopes that a stronger correlation between household income and high crime rates can be determined.

Drone Strikes and Civilian Deaths

Presenting Student Author: Jack Vasko

Faculty Mentor: Alexander Jorgensen

Since the beginning of the War on Terror in 2001, drones have played a crucial part in air campaigns across the Middle East, North and East Africa and Southern Asia. In Pakistan alone, during his eight years in office, President Bush approved 51 drone strikes. President Obama, during his eight years in office, presided over 373 drone strikes in the same country. The increased use of drones as offensive weapons has prompted fears that “targeted killings” have led to a parallel rise civilian fatality rates. This research project will examine data released by both NGO and governmental entities to ascertain the legitimacy of these assumptions. Concurrently, this research will investigate whether drones are more or less likely to cause civilian fatalities compared to conventional forms of airstrikes.

Influence of Political Awareness on Governmental Trust

Presenting Student Author: Max Gonzalez

Faculty Mentor: Alexander Jorgensen

Changes in the trust levels that the public has in government is a concept that can be measured over time and have become increasingly important. The study measures the levels of trust that college students display towards the United States political system, and what role political awareness plays in their trust levels. This project employed a survey measuring trust and political awareness levels among students at Winona State University. I hypothesize that levels of political awareness affect the level of trust in the system. This will help show the relationship between the levels of trust and the level of political awareness. Preliminary overview indicates that those that had higher political awareness and knowledge of the process will also have higher levels of trust. In the current political climate level of trust in government the political system is critical in explaining the level of cynicism displayed by politicians and citizens. If voters become more politically aware, then the connection between voters and politicians will improve.

Issue Framing and Firearm Public Opinion

Presenting Student Author: Jack Smyth

Faculty Mentor: Alexander Jorgensen

We live in a time that seems increasingly partisan, with little room for those in the center. We know that people's political opinions are formed from their surroundings, but how much of that is can be attributed to issue framing? The study measures the effects of a question's frame and how people respond to those frames. In the study there were three separate surveys distributed randomly in equal proportions. They were distributed to Winona State University students. These surveys will ask various questions about their opinions surrounding firearms. One survey will be a "control" and ask respondents the typical Quinnipiac/pew research questions about firearms. Another survey will ask similar questions about firearms, but from a pro-gun control frame. The final survey will ask questions about firearms from a pro-gun rights frame. I am expecting the data from the survey to show that there is a statistical difference between respondents depending on the frame. Therefore, even though issues surrounding firearms are typically controversial, this study reveals that issue framing has a significant impact on people's preferences regarding the appropriate level of gun control.

Parental Income as a Determinant of Student Loan Debt

Presenting Student Author: Robert Pfaff

Faculty Mentor: Alexander Jorgensen

It is easy to assume a connection between parental income and student loan debt, but just what is the relationship? This study employs a survey distributed electronically to Winona State University students. I hypothesize a negative relationship between parental income and the amount of debt a student will incur. My findings reveal that at

certain levels of parental income, student debt begins to decline. Students who come from more well-off families are better positioned after graduation to prosper economically whereas students with less well-off families tend to be hindered by student debt.

Should LGBT+ Student Retention Be Studied?

Presenting Student Author: William Gongaware

Faculty Mentor: Alexander Jorgensen

As the United States' understandings of LGBT+ people grow, an understudied portion of that population has been LGBT+ youth. College retention rates among stigmatized populations has historically been lower than average, however unlike other data, most institutions do not actively track demographic changes of LGBT+ students. Should this data be tracked with particular focus on retention rates? Asking someone their race or ethnicity is generally seen as far less invasive than asking someone their gender identity or sexuality. Students may be particularly reluctant if they do not feel safe sharing such information due to past experiences with discrimination. This research intends to search for and indicate any positive or negative attitudes of LGBT+ students towards university retention and inclusion policies, as well as attitudes of students towards future data collection by their university.

States' Higher Education Appropriations: Effects on Student Outcomes

Presenting Student Author: Ben Reimler

Faculty Mentor: Alexander Jorgensen

At the onset of the Great Recession, higher education, unlike other sectors of the economy, saw an increasing demand. Individuals that were forced out of the labor market sought out higher education and enrollments increased. However, states' budget appropriations for higher education did not increase in relation to expanding enrollments. In fact, state funding for higher education has consistently decreased since the 1960s. These decreases have been offset by rising tuition and inflated cost-of-attendance. In an effort to determine the effects of these budget realities, I set out to examine whether states' appropriations for higher education had any relationship to student outcomes. For example, this research examined graduation rates, retention, academic success, and employment. Pursuant to this examination, I complied and analyzed data from the Integrated Postsecondary Education Data System; data from the Department of Education; state-level budget data; and institutional performance data. In an effort to more fully understand the forces driving budget allocations for higher education, this study also examined budgetary models and institutional performance; such as performance based funding for postsecondary education.

The Retention of U.S Navy Enlisted Sailors

Presenting Student Author: James Marek

Faculty Mentor: Alexander Jorgenen

The retention of qualified personnel has long been a major concern of the United States Navy, as it is more cost effective to have a trained and experienced sailor remain in service than it is to recruit, process and train a new service member to take their place. Previous studies that have tried to explain the reenlistment habits of sailors have up to this point focused on factors such as organizational commitment, job satisfaction, and quality of life. Data analysis is expected to reveal the importance, in regards to sailor retention, of demographic description of leadership when compared to organizational commitment, job satisfaction and quality of life.

We as a society are kept in the dark about the polices, regulations and lobbying interest that affect our food and our overall health

Presenting Student Author: Mariah Yos

Faculty Mentor: Alexander Jorgensen

This project examines the effects of the lobbying efforts that affect our food policies. How we are kept in the dark about the policies regulating the food we consume and the lack of public awareness of such corruption in the food industry. Whose best interest is really at heart when determining our food polices? Are we as a country well informed about the food we eat? I hypothesize that the majority of Americans are unaware of such corruption in the food industry and that we are tremendously undereducated on the labeling, ingredients, quality and the lobbying interest that set the standards for our food. I expect to find from my survey supporting evidence that will demonstrate that people do not know what's in the food we buy or how they are misinformed or not publicly aware enough as to why they make the food choices they do.

Psychology

A Research Study of Personality Traits and Health Among College Students

Presenting Student Author: Hannah Kunkel,

Other Student Authors: Lexie Sherman, Connor Shea, Heather Gerlach

Faculty Mentor: Trisha Karr

The relationship between personality and health has important implications for preventative medicine. Previous research has shown that personality traits are linked to different health behaviors. One study examined the personality traits that affect fruit and vegetable consumption, and another study addressed the effect personality has on exercise. However, to further investigate the effects of personality and health outcomes of college students a variety of health factors were addressed in the present study. The

purpose of this study was to identify personality traits among college students that contribute to healthy or unhealthy behaviors. The research design included a demographic questionnaire and the Big Five. Participants were 97 undergraduate students belonging to academic and sport clubs. The study included 58 females and 39 males with average ages of 19.9 years and an average GPA of 3.4. The ethnicity of participants was 83% Caucasian. Data was analyzed using multiple regression analyses. Extraversion and conscientiousness significantly predicted many health behaviors. Additionally, openness significantly predicted vegetable consumption. These findings could have important implications for acknowledging personality traits to prevent later health problems by addressing health habits earlier in young adults.

An Examination of Physical and Mental Health across Academic Standing

Presenting Student Author: Heather Gerlach

Presenting Student Authors: Lexie Sherman, Connor Shea, Hannah Kunkel

Faculty Mentor: Trisha Karr

Personal health is something that is important no matter what type of academic standing one has. This study was about physical and mental health across academic standing here at Winona State University. The variables to examine physical health were – body mass index (BMI), frequency of home cooking, hours of sleep, and glasses of water consumed. Variables to assess mental health were - anxiety and self-esteem. The participants involved in this study were 54 underclassmen (Freshman and Sophomores) and 43 upperclassmen (Juniors, Seniors, and 5th year students) who were between 18 and 26 years of age. The participants were mainly Caucasian, followed by several minority groups. Participants completed a series of questionnaires regarding features of mental and physical health. Independent samples t-tests were used to examine group differences across academic standing on self-esteem, anxiety, home cooking, sleep, BMI, and water consumed. Findings indicated that underclassmen reported higher self-esteem than upperclassmen. However, upperclassmen reported a greater frequency of home cooking and hours of sleep than underclassmen. Significant results were not found for water, anxiety, or BMI. A variety of reasons, such accessible resources and experience, could explain these findings across academic standing.

Bidimensional Acculturation and Second Language Acquisition among former and current East Asian exchange students in the US

Presenting Student Author: Ayaka Mizutani

Faculty Mentor: Gloria Marmolejo

Acculturation is defined as the modification of the culture of a group or individual as a result of contact with a different culture. The process of acculturation involves changes in the behaviors, values, attitudes, and abilities. Biculturals who share East Asian culture as their *heritage* culture and North American culture as their *mainstream* culture show greater acculturation due to their greater cultural difference. Some research (Ryder, Alden, & Paulhus, 2000) suggests a bidimensional acculturation process where

the two identifications are orthogonal; means both heritage and mainstream cultural identities vary independently.

Research in acculturation has has involved observing the participants' different selfgain during the acculturation process while they are in the mainstream culture. Moreover, acculturation literature examines only immigrants who are either first generation immigrants or are identified themselves as having East Asian ancestry, which are those who have been exposed to mainstream culture great amount of time. In this study, 13 current and 10 former East Asian exchange students were recruited from international services at WSU and partner institutions. We developed an online survey which included a modified Vancouver Index (Ryder et al., 2000). We also included Singelis' Self-construal Scale (Kitayama, King, Tompson, Huff, Yoon, & Liberzon, 2014) and Rosenberg's Self-esteem Scale (Rosenberg, 1965), as well as participants' demographics and language proficiency. Participation involved 2 sessions of approximately 15-20 minutes each. The 2nd session will be conducted after a week from 1st session. For the 1st session, participants were asked to fill out a questionnaire either in English or in their heritage language (Chinese, Japanese, or Korean). For the 2nd session, participants are asked to fill out same questionnaire in the other language (either in their heritage language or in English). The main goal was to find out if change in cultural identity facilitated by second language acquisition and acculturation is independent from the individual's cultural context. Data analysis is still in progress.

Delayed Matching-to-Position Performance under Triadimefon: A Replication

Presenting Student Author: Ethan Hemmelman

Other Student Authors: Rowan McGlasson, Zaria Smith, Ashley Ruhland, Erin Hoover

Faculty Mentor: John Holden

Triadimefon (TDF) is a legal, widely available fungicide which also has properties similar to other psychostimulants (e.g. cocaine, amphetamine). Administration of TDF has been shown to produce a number of behavioral effects similar to other psychostimulants, including disruptions of working memory. In this study, we examined the possibility that TDF administration would interfere with spatial working memory for location in the same fashion as other psychostimulants, using the delayed matching-to-position task. Subjects were trained to criterion on the task (e.g. from two presented levers, choosing the one that was presented at the beginning of the trial) which employed delays of 1, 5, 10, and 20 seconds. Subjects were then tested under the influence of TDF (50 mg/kg, i.p.) in corn oil vehicle or vehicle alone. It was found that performance in the delayed matching-to-position task was significantly disrupted at every delay interval tested with the exception of 10 seconds. TDF's effects on working memory may be due to some combination of D2/D3 receptor stimulation or through effects on retinoic acid metabolism.

Family and Support Factors and Positive Body Image

Presenting Student Author: Victoria Gunnufson

Faculty Mentor: Elizabeth Russell

As body image becomes more prevalent in conversation, it is important to consider the potential factors that influence a person's body image. Because there is very little research on positive body image, there are many possible unknown variables that can affect how a person perceives his or her body. In this study, we determined if caregiver eating messages and body acceptance by others may influence young adult women's body image. More specifically, we looked at the role of restrictive messages and pressure to eat from caregivers and the acceptance of one's body by friends, family, dating partners, media, and society. We hypothesized that family background and attitudes towards eating would affect positive body image in young adult women. Participants were recruited via the Psychology Department research board. The fifty-one participants completed a demographic form and three surveys, including, Caregiver Eating Messages Scale, Body Appreciation Scale, and Body Acceptance by Others Scale. The Caregiver Eating Messages Scale evaluates restrictive messages about eating and pressure to eat given by the caregiver. The Body Appreciation Scale-2 measures the overall thoughts one has for one's body. The Body Acceptance by Others Scale assesses the perceived acceptance of one's body by friends, family, dating partners, media, and society. This study is a correlational analysis to look at the relationships between restrictive attitudes towards eating and pressure to eat by caregivers, perceived body acceptance by friends, family, dating partners, media, and society, and body satisfaction and appreciation of one's body. Data analysis is currently underway.

Perfectionism: Its Association with Anxiety and Obligatory Exercise

Presenting Student Author: Lexie Sherman

Other Student Authors: Connor Shea, Hannah Kunkel, Heather Gerlach

Faculty Mentor: Trisha Karr

Greater levels of trait perfectionism may lead to an increase in anxiety and exercise behaviors. The focus of this study was to determine an association between perfectionism, anxiety, and exercise behaviors. A series of surveys was taken by 97 students from sport and academic clubs at Winona State University, including 39 males and 58 females. This cross-sectional study was conducted to determine correlations between perfectionism, anxiety, social physique anxiety, and obligatory exercise. Multiple regression analyses were conducted to evaluate relationships between variables. Results indicated positive associations between factors of perfectionism, (standards, discrepancy), anxiety, and obligatory exercise. Perfectionism plays a vital role in the increase of one's overall anxiety and feeling obliged to exercise.

Predictive Processing Effects in Visual Working Memory?

Presenting Student Author: Garrett Greeley

Faculty Mentor: Gloria Marmolejo,

Recent theoretical developments in physics, neuroscience, philosophy and psychology have posited that the brain is an organ of prediction. Specifically, Predictive Processing (PP) states that organisms continuously generate hierarchical predictions to efficiently filter enormous sets of sensory data (Clark, 2013). This experiment applied behavioral methods to test for PP effects in working memory at both different levels of environmental coherence and at varied temporal scales. It was hypothesized that participants viewing predictably presented stimuli would respond faster and more accurately than those viewing randomly presented stimuli. It was also hypothesized that participants would respond faster and more accurately after delays of 1000 ms and 5000 ms than 10,000 ms and 15,000 ms. Participants (N = 26) were randomly assigned to be presented with stimuli in a random or predictable fashion. In both conditions, participants viewed squares that included a different color in each quadrant. In the predictable condition, for each set of four responses, delay intervals were always ascending and the correct answer was the same color. Color recall was cued by presenting a square marked with an “X” in one quadrant. Reaction times and accuracy of each response was measured at each delay interval. Neither hypothesis was supported. These results suggest that the finer functions of PP may not translate to observable behavioral processes, or that the processes may be too sensitive to measure with the available equipment.

Keywords: predictive processing, working memory, delay effects, reaction time

Sign and goal tracking under compatible and incompatible conditions

Presenting Student Author: Rowan McGlasson

Other Student Authors: Ethan Hemmelman, Connor Shea, John Delke, Kerri Hoey, Ashley Ruhland, Whitney McShane

Faculty Mentor: John Holden

Sign-tracking and goal-tracking are separate kinds of Pavlovian conditioned approach responses directed at the location of conditioned and unconditioned stimuli (CS and US, respectively). Sign-tracking has been investigated as a behavioral characteristic indicative of propensity for addiction and relapse. Previous studies have drawn a distinction between sign- and goal-trackers among rats based on a commonly employed experimental procedure where sign- and goal-tracking are compatible responses (i.e. CS and US are located in adjacent locations). Conclusions drawn from this paradigm may have limited applicability in situations where CS and US are in more distant locations and sign/goal-tracking behaviors are incompatible (e.g. subject must travel from the site of US delivery to sign-track). In this study we compared how responding in the typical paradigm changed when the location of the CS (a retractable lever) was moved from adjacent to the location of the US (the food cup). Subjects were first trained in an operant chamber for five days with CS and US adjacent to each other and classified as sign-trackers based on their overall responding and Pavlovian conditioned

approach score. For the next ten sessions, the CS was moved to the other side of the chamber. We hypothesized that subjects would show less sign-tracking and more goal-tracking behavior under these circumstances. It was found that, contrary to hypothesis, no measures of responding were significantly altered with the exception of goal-tracking latency decreasing. By the 15th day, only 3 of the 11 animals lost their sign-tracker designation as a result of the change and none of those became predominantly goal-trackers. Sign-tracking as a characteristic persists even when the sign-tracking response is made incompatible with the goal-tracking response.

The Effects of Social Media on Body Image

Presenting Student Authors: Kalley Inderlee and Kayla Jacak

Faculty Mentor: Elizabeth Russell

Over recent years social media has grown, having a bigger impact on how individuals perceive their bodies. The purpose of our research was to expand on the current findings on this topic and relate it to college students. We looked at gender differences in how men and women perceive their bodies compared to their ideal body shape. A t-test will be used to analyze this data. We also looked to see if there is a relationship between people's amount of social media use, their integration of social media into their day-to-day lives, and the discrepancy between their ideal and perceived body shapes. This research question will be ran using correlational analyses. We recruited 117 participants through the psychology department at Winona State University. Data analysis is currently underway at this time.

The Role of Self-as-Doer Identity in Physical Activity: Increasing Behaviors by Increasing Self-Efficacy for Overcoming Barriers to Physical Activity

Sydney Bendtsen, Abigail Evenson, Kristen Fish, Theodore Mickelson, Jessica Schaefer

Faculty Mentor: Amanda Brouwer

Introduction: Only 21% of adults meet the recommended amount of physical activity (PA) each week. PA is associated with better health, lower disease risk, greater academic achievement, and weight control. Barriers to PA (e.g., bad weather, scheduled constraints, lack of support, etc.) tend to limit PA whereas increased self-efficacy is associated with more PA. The self-as-doer identity, a motivational identity which aims to describe oneself as the doer of one's behavior, is also associated with more PA. It is unknown, however, how the self-as-doer identity changes PA behaviors. Perhaps increasing self-as-doer identity is linked with increasing self-efficacy for overcoming barriers to PA. We explored whether the relationship between self-as-doer identity and PA is mediated by self-efficacy for barriers to PA.

Methods: Participants (N=219, M_{age}=20.05, SD=2.95) completed a survey and a writing activity assessing self-as-doer identity for PA. Mediation analyses using bootstrapping procedures (Preacher & Hayes, 2008) were conducted to test the indirect effect of self-as-doer identity on PA through self-efficacy for PA barriers.

Results: There was a significant indirect effect of the self-as-doer identity on PA through self-efficacy for overcoming barriers, b= 417.25, 95% CI [176.78, 709.89].

Discussion: Findings demonstrate that as self-as-doer identity increases, so does self-efficacy for overcoming barriers to PA. Results are consistent with the self-as-doer theory in that embracing an identity as the doer of one's behavior motivates engagement in one's behavior even when there are barriers. Those who are struggling with barriers might benefit from focusing on PA doer identities as a way to increase their ability to overcome barriers to PA.