
2022 Annual Student and Faculty OSCARS
Outstanding Scholarship, Creative Activities and Research Symposium
April 27-May 4, 2022

In Person and Virtual Events Scheduled throughout the Week (all events on the Rapids Campus)

Wednesday, April 27, 2022

1:00 pm	Welcome, Land Acknowledgement and Opening Remarks; Cafeteria
1:15 pm	Oral Presentations; Riverview Room and C256
2:00 pm	Poster Session and Art Exhibition; Cafeteria, Upper Grand Staircase and Visual Arts Upper Atrium

Thursday, April 28, 2022

8 am – 5 pm	11 th Annual Minnesota State Undergraduate Research Scholars Symposium (Zoom)
2 pm	Line 3 Virtual Film Screening and Discussion, Sponsored by the Sustainability Committee (Zoom)
7:30 pm	ARCC Theatre presents <i>Everybody</i> by Branden Jacobs-Jenkins. Rapids Campus in the center Courtyard.

Friday, April 29, 2022

7:00 pm	Jazz Ensemble Concert, Performing Arts Center
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Saturday, April 30, 2022

2:00 pm	ARCC Theatre presents <i>Everybody</i> by Branden Jacobs-Jenkins. Rapids Campus in the center Courtyard.
7:30 pm	ARCC Theatre presents <i>Everybody</i> by Branden Jacobs-Jenkins. Rapids Campus in the center Courtyard.

Monday, May 2, 2022

10:00 am	Raptors of Minnesota Presentation, Student Center Courtyard Commons
2:00 pm	Chamber Ensembles Recital, M109
7:00 pm	Concert Choir and Chamber Singers Concert, Performing Arts Center

Tuesday, May 3, 2022

5:00 pm	Rapids Review Release and AFA Creative Writing Readings (Zoom)
7:00 pm	Concert Band and String Orchestra Concert, Performing Arts Center



Project Descriptions/Abstracts

Oral Presentations

Presentations 1-2 in Riverview Room, Presentations 3-4 in C256. Presentations 5-10 are recorded video presentations available on Symposium

1. **Ashlyn Awada**

Faculty Mentor: Tristan Sprague-Williams, MATH

The Continuum Hypothesis:

Georg Cantor's continuum hypothesis (CH) induced the arrival of set theory, as its own rich branch of mathematics. This is a scan of CH. We defend CH as it is more philosophical than it is mathematical. We demonstrate the philosophical context.

2. **Ashlyn Awada and Sivy Lim**

Faculty Mentor: Tristan Sprague-Williams, MATH

Proof Theory:

A presentation on general proof theory and its utility in computer architecture and programming.

3. **Jessica Strand**

Faculty Mentor: Kristen Genet, BIOL

White-Tailed Deer (*Odocoileus virginianus*) Behavior in an Actively Restored and Maintained Wetland Ecosystem:

Wetland loss and damage is a significant result of anthropogenic manipulation of the landscape, which has promoted efforts to restore these critical ecosystems. White-tailed deer behavior can be evaluated to understand how this prevalent species responds to restoration efforts in the Blaine Wetland Sanctuary, an approximately 500 acre protected open space, and the results have implications for conservation and management of wetlands in urban and suburban landscapes. This study hypothesized that deer behavior would vary in different habitat types, regions of the wetland sanctuary, and over time with ecological restoration and maintenance. Camera traps were used to capture deer behavior, and contingency table analyses were used to evaluate whether the observed behavior differed from expected. No statistical difference in deer behavior was found when comparing upland and wetland habitats ($p = 0.329$), however deer behavior differed significantly across regions of the wetland sanctuary ($p = 0.011$) and with restoration history ($p = 0.019$). The results indicate that White-tailed deer prefer using habitats and areas of the wetland sanctuary in later stages of restoration. Resource availability is vital to White-tailed deer survival, and this is what ultimately determines deer presence and activity in the Blaine Wetland Sanctuary.

4. **Stanley Renty**

Faculty Mentor: Kristin Doneen, PHIL

Should America Adopt Universal Healthcare:

I will be discussing my viewpoints on whether America should adopt universal healthcare. I will also discuss the opposing arguments of my topic.

5. **Michele Heggerston and Will Kaiser**

Faculty Mentor: Kirsten Dierking, HUM

Molière on the Radio:

A radio performance of Molière's comedy Le Bourgeois Gentilhomme, ACT II, SCENE IV. Performed by Michele Heggerston and Will Kaiser for the Humanities in the Age of Enlightenment course.

6. Morgan Hendrickson

Faculty Mentor: Kirsten Dierking, HUM

Molière, A Modern Rewrite:

An adaptation of Molière's comedy Le Bourgeois Gentilhomme Act I, Scene II. This updated version is set in a contemporary high school auditorium, and features Principal Jourdain, Two Stage Techs, a Music Instructor, a Dancing Instructor, and a Student Musician.

7. Melody Vang, Christina Moore, McKenna Peterson, Nathan Christopherson, Summer Nietz

Faculty Mentor: Peggy Guiney, BIOL

Waste Sustainability Practices

This spring, we had the opportunity to participate in a waste sustainability project. In this research project, we studied the amount of waste a household creates in a week, and how much waste is diverted to recycling and composting. Our group wanted to measure a change in an individual's behavior in sustainable waste management by the amount of greenhouse gasses saved. Our goal was to help visualize the benefits of recycling and composting to those who might believe that one person will not make a difference.

8. Margo Fletcher

Faculty Mentor: Scott Danneman, BIOL

Testing Canis lupus (wolf) and Canis latrans (coyote) responses to predator scat stimuli

There have been recent population recolonizations of Canis lupus (wolves) to the northern states. In recent years wolves have dispersed from the Northeast corner of Minnesota to more southern state parks and protected areas. This information is important because there is limited data on how Canis lupus and Canis latrans react in the northern ecosystems. The question being tested was how do wolves and coyotes react to wolf and coyote scat? It was hypothesized a change in their behavior will be observed due to the scat stimulus. At St. Croix Park, Minnesota, trail cameras were set up to monitor how wolves and coyotes react to scat at each site. Wolf and coyote reactions to the scat were measured from data on the trail cameras.

9. Michael Scarr, Caroline Camejo-Martir, David Schieffer

Faculty Mentor: Tristan Sprague-Williams, MATH

The Traveling Salesperson Problem:

The Travelling Salesperson Problem is a problem in which we are given a list of cities and tasked with finding the shortest route that takes us to each of these cities and back home to the starting point. The applications for solutions to this problem are vast, ranging from networking solutions to package delivery.

10. Isabelle Anderson, Grace Harper

Faculty Mentor: Peggy Guiney, BIOL

Sustainable Recreation:

This study looks at the impacts of consciously reducing screentime and screen-based recreation in favor of nature-based recreation over the course of a week. To do so we measured greenhouse gases emitted by each device as well as individual's nature relatedness score, a metric for gauging an individual's biophilia. Using this approach, we saw that consciously changing our behavior through recreation type increased our nature relatedness score while decreasing the amount of greenhouse gases over the week. Our results demonstrate that consciousness of one's own behavior can reduce their individual environmental impact while building a closer relationship with green spaces. Working to reduce our carbon impact is found in every facet of our lifestyle and our free time is not exempt.

AFA Portfolio Exhibition: Reflecting Moving

All artwork is displayed in the Upper Atrium of the Visual Arts Building

11. Ethan Denninger

Faculty Mentor: Aaron Dysart, ART

I like to create characters that are mostly inspired by adventure stories I grew up with. They involve ancient kingdoms and heroes with magical powers and abilities. These stories can have themes and exhibit values that may be controversial or problematic today and I want to challenge dated values and explore stories that go beyond a simple duality such good vs evil. My artwork also explores values. These can be personal values, societal values, and visual values – light and dark. For instance, I use light values to illustrate where individual characters gain their power and darkness to ground the scenes in our material world. I primarily create digital illustrations. Using an iPad, I use software that allows me to experiment while creating a piece. These experiments can be undone with a touch of a button, allowing me to really stretch the pieces and figure out what techniques and settings I think match the characters I am creating in that moment. I follow an illustrative process for line art and use painting techniques with a digital tool set to add depth.

12. Gracie Deutsch

Faculty Mentor: Aaron Dysart, ART

I feel like I have been making art since I was born, and even joke that I was born with pencil and paper in my hand. It's where I have had the most success because creating work is fun as it allows me to express my creativity. I use pen and ink, acrylic paint, pencil, marker, on paper and canvas because I feel like they allow me to easily put my ideas down. I have been playing around with various colors, symbols, and items and how the meanings behind them can change the message in the work. Everything that I put in a piece has a reason. A crystal in a picture makes the viewer ask questions, or an eye in the background may symbolize being watched. These little details add fun to a piece and enhances the meaning even if the viewer may not know why it's there. I love exploring different styles to connect a work to specific audiences. Finding the right aesthetic for the piece will help me determine lighting, color palette, clothing, setting among other details. Lately, I have been researching such styles as dark academia, goth, tropical, and fairytale. Playing around with these in art is mainly something I do for fun and I am always compelled to learn more.

13. Emily Kowalik

Faculty Mentor: Aaron Dysart, ART

Most of my work is stylized and nonrealistic though I do not really have one way of thinking about it. For Example, I often adjust color digitally so the color pops because I like to it be vibrant, though other times I am drawn to more muted works for something different. I experiment with my art, seeing what needs work for and what is best left untouched. This experimentation allows me to not get overwhelmed by all the options that digital creation affords. I primarily work digitally with programs such as Photoshop and Lightroom. They allow me to adjust the original image and experiment with different outcomes. There are many situations where some tools would work well for one artwork and other tools would work well for another artwork, so it is best to know what the tools are and know their capabilities. What I am going for depends on what is being asked of me. I know I am on the right track. when I am doing what is said, and I like how it looks. Sometimes the work has limitations like using a certain number of colors, so I think about what colors I would use and how to use them.

14. Margaret Lasseter

Faculty Mentor: Aaron Dysart, ART

15. Carolina Malinovskaya

Faculty Mentor: Aaron Dysart, ART

I am drawn to organic subjects, especially faces and hands because they have so many expressive components and potential for movement. I'm intrigued by the details in faces, every line, curve, and little features that makes everyone so unique and different. It's exhilarating to be able to analyze these little details and components. In addition to faces, I am even more fascinated by how weird and distorted hands can look. Each fold and crease in the skin, each awkward bump and curve just mesmerizes me. I've explicitly studied the ways musicians use their hands, specifically when they play their instruments. I draw messy and quick so being able to erase is useful. However, to add emphasis and detail I do like to step into more bold marks, this is where I use microns and charcoal. The darker marks make it easier to create expressive and emphasized lines. I have also been experimenting with oil paints. Their longer drying time allows me to remain the process and work for longer. I am able to step back, layer, scrape away, and layer again. This encourages me to slow down and sit in the messy process of creating instead of fixating on only the finished piece.

16. Paige Wahlberg

Faculty Mentor: Aaron Dysart, ART

I create realistic paintings and drawings and love to take the time to put a lot of detail into each of my creations. I start by taking photographs of objects or landscapes, then choose whether I want to paint in oil paints or draw in charcoal or pen. I choose what material to use based on how much detail I want in a particular piece of artwork. When painting with oil paints, I find it easier to put a lot more detail in artwork than it is to with charcoal drawings. I use a sponge or hatching to give texture to an object and blend my colors together by brushing/dabbing back and forth or creating strokes in the direction of the line. My artwork may have realistic colors sometimes while other times I experiment with different color palates that factor in what emotions I want to portray in each piece. My recent work doesn't follow a strict theme, though a lot the pieces are rooted in memories. Some of the objects I depict hold memories for our family, whereas other pieces are grounded in my memories, for example, landscapes of my home and of my neighborhood. From playing outside as a kid with the neighbor kids to relaxing with my family, these memories hold a special part of my heart because as all of us kids grew up and moved out, we don't see each other much anymore. As I am looking back on old memories, I also am making new memories as I'm creating new projects of those old memories. The act of creating art allows me to feel free of the chaotic things that surround me and give me a sense of control as I plan out the finished work. I like to explore materials as I am drawn to the challenges new techniques bring. Whether I am using a pen or working with stained glass, each new project provides me with new experiences and methods of making. This not only allows me to grow as an artist, but it also teaches me about art while creating new memories along the way.

Poster Presentations

Posters 17-44 will be displayed during the in person poster session on Wednesday, April 27 on the Rapids Campus. Posters 45-56 are available on Symposium for the Virtual Poster Session

17. Anna Kawai, Rebekah Taepke, Lauren Estep

Faculty Mentor: William Boyle, CHEM

Acid or Base Treatments Modify the Hydrophilicity of Mycelium Biomaterials:

The substantial use of plastic in our environment is detrimental to the earth's ecosystems. As the levels of plastic pollution increase - humans must take a step back and arrive at new plastic replacements. 68-80% of diapers and feminine care products (AHPs) go to landfills. In this research project, we introduce the possible biodegradable substitution of mycelium which has shown promise as a sustainable alternative to synthetic plastics. We hypothesize that treating mycelium with varying acidic and basic conditions will produce absorbent biopolymers that may provide alternatives to AHPs. Methods: Mycelium growth blocks were obtained from R&R cultivation (Roseville, MN). After 3 days of growth, pure mycelium material was harvested, and cut into uniform pieces. Mycelium samples were then treated with water, aqueous acid or aqueous base solutions (1M and 0.1 M of each) or organic acid or organic base (1 M and 0.1 M and 2-30%, respectively) for 24 hours. After neutralization, and rinsing, the samples were oven-dried, and the resulting dry mass was recorded. The dried samples were immersed in water, and water absorption was measured at 1 hr, 4, hrs, and 24 hrs. Results: The results showed that the acid and base treatments enhanced the water absorption of mycelium. Furthermore, the magnitude of the water absorption was not affected by the concentrations of acids and bases. In the aqueous solutions, the acid treated samples exhibited a greater water absorbance than the base-treated samples. The organic solutions degraded the mycelium samples substantially; the mycelium was completely degraded by the HCl in ether and the 3% of sodium methoxide (NaOMe) solutions. The samples treated with 30% NaOMe exhibited the greatest water absorbance. Conclusions: The high water absorbance of the NaOMe-treated samples may have been due to the high reactivity of NaOMe as well as increased solvation from MeOH. Since this reagent has been found to significantly improve water absorbance, other experiments could optimize the amount of NaOMe needed. Treatment with aqueous acid resulted in less mass loss than the NaOMe treatment while still maintaining high absorption. Future experimentation with the concentration and even the specific acid used could lead to a more efficient process. It is also possible that other chemical functionalization of acid or base treated samples could lead to improved absorption. Chemical analysis of the dissolved samples could provide ideas for future synthesis of polymers.

18. Alyssa Beise, Leah Beise, Bailey Knutson, Munira Ali, Grace Uhlenkott

Faculty Mentor: Paula Croonquist, BIOL

Overexpression of Candidate Genes by Loss of CFTR May Promote Aggressive Colorectal Cancer:

Cystic fibrosis transmembrane conductance regulator (CFTR) is an ATP-gated ion channel that is involved in many systems in the human body especially the gastrointestinal tract. A biallelic inactivating germline mutation causes cystic fibrosis. Patients that have cystic fibrosis have a higher chance of developing colorectal cancer. Similarly, patients who are heterozygous carriers of the CFTR gene also have an increased risk of colorectal cancer. In Sleeping Beauty (SB) transposon-mediated genetic screens CFTR was identified as a common insertion site (CIS) gene in mouse GI tumors and likely a candidate tumor suppressor gene. The loss of CFTR has been associated with more aggressive carcinoma in the nasopharynx. This could be a

result of the expression of other genes being impacted when CFTR is downregulated and also provide insight into which genes contribute to aggressive phenotypes in colorectal cancer. We hypothesized that genes overexpressed in patient primary tumor samples containing CFTR aberrations such as mutations and copy number variations (CNV) are also overexpressed in our colorectal cancer cell lines treated with CRISPR/Cas9 genome editing tool targeting disruption of the CFTR locus. We first confirmed by immunoblotting that CFTR protein expression was gone in our loss of function mutated cell lines. We performed bioinformatic analysis of primary colorectal cancer patient data using the Xena platform to determine the top 5 downregulated genes in patients with CFTR downregulation. In addition, Kaplan Meier plot analysis showed that patients with less CFTR expression have a statistically significantly lower survival rate. Finally, we isolated total RNA from our mutant and parental cell lines, produced cDNA for RT-qPCR to evaluate the expression status of the identified genes from primary patient data.

19. Jessica Strand, Breanna Hoffman, Jami Feist, Emma Sirjord, Sydney Payeur

Faculty Mentor: Paula Croonquist, BIOL

Analysis of eIF4E1 Conservation and Synteny Across Drosophila Species to Understand the Evolution of the Insulin Pathway:

The Insulin/Tor signaling pathway regulates important physiological functions such as glucose and lipid metabolism, cell growth and survival. It is highly conserved from fruit flies to mammals. This pathway is also critical for homeostasis and its dysregulation results in prevalent human diseases such as in type II Diabetes, cardiovascular disease and even cancer. The eukaryotic translation initiation factor 4E1 (eIF4E1) encodes for a member of the eIF4F cap-binding complex that is required for cap-dependent translation of mRNA. The purpose of this study was to determine the conservation of the eIF4E1 gene in multiple species of Drosophila relative to D. melanogaster. It was hypothesized that the species highly divergent from the reference species would exhibit less eIF4E1 conservation than those closely related to the reference species. It was predicted that this gene would be most conserved in D. serrata and least conserved in D. arizonae. Gene models were proposed utilizing the UCSC Genome Browser, BLAST, Flybase gene record finder and verified by Gene Model Checker. The synteny analysis and protein alignments observed suggest that eIF4E1 in D. takahashii is the most conserved and D. arizonae is the most divergent. However, all five species had a high eIF4E1 protein identity ranging 81-94%. Previous evidence has demonstrated that position in the insulin signaling pathway may affect selective constraint, with downstream genes evolving at a slower rate than genes closer to the membrane. This may explain the high level of conservation for the eIF4E1 gene. Further studies should aim to investigate the impact of position, connectivity and/or other factors shown to influence this pathway's selective constraint.

20. Jacob McManaman, Aurora Erickson, Mariama Farah

Faculty Mentor: Paula Croonquist, BIOL

An Analysis of Putative Orthologs of D. melanogaster Pi3k92E in S. elegans, D. eugracilis, D. persimilis, and D. arizonae:

Phosphoinositide 3-kinases (Pi3Ks) are highly conserved across species, and required for a variety of cell functions as a result of their involvement in several signal transduction pathways. As a model species, the fruit fly D. melanogaster is not exempt and expresses PI3k genes. The Pi3k92E gene encodes a critical member of the Insulin/Tor Signaling Pathway (IR). The Pi3k92E putative genes found in four species of Drosophila were annotated and examined for orthology to Pi3k92E in D. melanogaster. The Pi3k92E gene was annotated in three species

within the Sophophora subgenus, D. elegans and D. eugracilis of the melanogaster group both of which exist in species-specific sub-groups, and D. persimilis of the pseudoobscura sub-group within the obscura group. Gene structure was also investigated in D. arizonae species from the drosophila subgenus, in mulleri sub-group found in the repleta group. It was hypothesized that the level of protein conservation and neighborhood synteny decreases with phylogenetic distance from the reference species. Previous evidence has shown that position in the pathway and connectivity directly affect selective constraint with more upstream genes with less physical interactions evolving faster than more downstream and highly connected genes. The gene of interest in this study is in the middle of the Insulin/Tor signaling pathway, however it is considered a hub with high connectivity. We will present data that supports synteny and conservation decreasing with increase distance phylogenetically from D. melanogaster. We believe that further investigation into purifying selection and its effects on high traffic signaling genes would provide some explanation for the trends observed in this project.

21. Maddie Oliver, Albert Tarpeh , Foley Jama, Aleko Mihailidis

Faculty Mentor: Paula Croonquist, BIOL

S6k Gene Orthology and Conservation Across Drosophila Species:

The S6 kinase (S6k) gene is a vital part of the Insulin/Tor signaling pathway in Drosophila melanogaster. It is close to the nucleus, and physically interacts with many other proteins. It encodes for an important component of the target of the rapamycin pathway, is involved with synapse development, autophagy, and cell size. Loss of function mutations in S6k were found to lead to type-2 diabetes and increased alcohol sensitivity. Previous evidence demonstrated that S6k activity is both an acute target of ethanol exposure and a regulator of ethanol's effects. S6k signaling influences flies sensitivity to alcohol-induced sedation. We investigated orthology of the S6K gene in four different Drosophila species (D. persimilis, D. hydei, D. eugracilis, D. sechilia) utilizing the UCSC Genome Browser, FlyBase, Blast, the Gene record finder, and the Gene Model Checker. We hypothesized that the S6k gene is under selective constraint across all our species due to its position in the Insulin Pathway and its high connectivity. This would be consistent with a previous report by Alvarez-Ponce et al. that demonstrated that downstream and highly connected genes (hubs) are more conserved thus evolving slower than genes located upstream and with less connectivity. Preliminary results support our hypothesis that S6K may be under high selective constraint even in highly divergent species such as D. hydei.

22. Ethan Raivala, Camryn Bliayang, Nicole Barnes, Mariama Farah, Matthew Binsfeld

Faculty Mentor: Paula Croonquist, BIOL

Downregulation of Candidate Genes by Loss of CFTR Map Promote Aggressive Colorectal Cancer:

Cystic fibrosis transmembrane conductance regulator (CFTR) is an ATP-gated ion channel that is involved in many systems in the human body especially the gastrointestinal tract. A biallelic inactivating germline mutation causes cystic fibrosis. Patients that have cystic fibrosis have a higher chance of developing colorectal cancer. Similarly, patients who are heterozygous carriers of the CFTR gene also have an increased risk of colorectal cancer. In Sleeping Beauty (SB) transposon-mediated genetic screens CFTR was identified as a common insertion site (CIS) gene in mouse GI tumors and likely a candidate tumor suppressor gene. The loss of CFTR has been associated with more aggressive carcinoma in the nasopharynx. This could be a result of the expression of other genes being impacted when CFTR is downregulated and also provide insight into which genes contribute to aggressive phenotypes in colorectal cancer. We

hypothesized that genes downregulated in patient primary tumor samples containing CFTR aberrations such as mutations and copy number variations (CNV) are also underexpressed in our colorectal cancer cell lines treated with CRISPR/Cas9 genome editing tool targeting disruption of the CFTR locus. We first confirmed by immunoblotting that CFTR protein expression was gone in our loss of function mutated cell lines. We performed bioinformatic analysis of primary colorectal cancer patient data using the Xena platform to determine the top 5 downregulated genes in patients with CFTR downregulation. In addition, Kaplan Meier plot analysis showed that patients with less CFTR expression have a statistically significantly lower survival rate. Finally, we isolated total RNA from our mutant and parental cell lines, produced cDNA for RT-qPCR to evaluate the expression status of the identified genes from primary patient data.

23. Bethany Lieser, Reece Lawlor, Bao Khang, Alyssa Beise

Faculty Mentor: Paula Croonquist, BIOL

The Conservation of the GlyP Gene Across Highly Divergent Species of Drosophila:

*The Insulin/Tor signaling pathway is responsible for the uptake of glucose into cells and its metabolism. It has also been linked to cell growth, fat and protein metabolism, and longevity. Its dysregulation in humans plays a major role in type II Diabetes, cardiovascular disease, and cancer. GlyP, a member of the Insulin signaling pathway, encodes for the glycogen phosphorylase enzyme which is responsible for glycogen breakdown in the cell by releasing glucose into the bloodstream. Previous evidence has indicated that a gene's selective constraint is influenced by its protein connectivity and position in the pathway, among other factors, so that genes with less molecular interactions and a closer location to the membrane evolve faster than those with more protein-protein interactions and located closer to the nucleus. We hypothesized that GlyP would exhibit high selective constraint in *D. busckii*, *D. hydei*, *D. kikkawai*, and *D. suzukii* when compared to *D. melanogaster*, the reference species, due to its high connectivity and downstream position in the insulin pathway. The GlyP gene was annotated in each species utilizing the Genomics Education Partnership (GEP) tool pipeline, namely, the UCSC Genome Browser, tBlastn, Blastp, the Gene Record Finder, and verified in the Gene Model Checker. Genes models were proposed based on synteny, RNAseq data and other lines of evidence. The protein alignment of GlyP in all species was examined. All species were within 97% similar to the reference species despite *D. busckii* being the furthest diverged species from *D. melanogaster*. This supports our hypothesis that highly connected genes, also known as hubs, are under high selective constraint even in species vastly separated by evolutionary time. The gene's downstream position may also provide evidence that GlyP is highly conserved and a cornerstone enzyme in the insulin pathway.*

24. Bethany Lieser

Faculty Mentor: Scott Dannemann

Phenotyping Wild Wolves from St. Croix State Park from Fecal DNA using SNP Biomarkers:

St. Croix State Park does not allow resident wolves to be trapped and sedated for sample collection, but fecal samples can be collected from the environment. DNA isolated from fecal samples can be used to examine SNPs with phenotypic consequence to identify the genotype and phenotype of wolves. The phenotype then can be used to tie the sample collected to individuals identified in pictures captured by camera traps in the park. Using a LightCycler, DNA was amplified and fluorescence level from a SNP assay was measured to reveal genotype. This approach revealed various genotypes, indicating moderate genetic variation among pack

members. In the future, more SNPs could be tested to provide further insight into individual genomes.

25. Panhavuth Ith

Faculty Mentor: Scott Danneman, BIOL

Testing for the presence of Cyanobacteria and Lactobacillus in Minnesota Wolves' Guts

A wolf's microbiome has a large effect on its health and well-being and many factors could influence the type of microbe which reside there. Previous studies [1][2] yield results that suggest that cyanobacteria and lactobacillus were found in the wolf samples of their respective study. The aim of our study is to determine if either or both cyanobacteria and lactobacillus can be found in the guts of Minnesota's wolves. We suspect that cyanobacteria would be absent while lactobacillus would be present. Fecal samples were collected and DNA was isolated. After this process, using the cyanobacteria primer pA (Edwards et al., 1989) and B23S (Lepère et al. 2000) as well the lactobacillus primer LbLMA1-rev (Dubernet et al. 2002) the 16S rRNA was amplified. Once the PCR is complete, the DNA is run through electrophoresis before being sequenced. The guts of the wolves were tested to reveal that neither cyanobacteria nor lactobacillus was present. The proposed hypothesis was therefore not supported.

26. Quenten Lovett, Jamal Al buzz, Mya Arsenault , Beau Kenney

Faculty Mentor: Kristen Genet, BIOL

Abundance of Waterbucks in Gorongosa During the Different Seasons:

Our team analysed how the change of seasons would affect the amount of waterbucks in Gorongosa National Park. Gorongosa National Park was once home to a diverse wildlife until war when most of that wildlife was wiped out through efforts made by Mozambique citizens and wildlife scientists restorations were and are still being made to restore its diverse population. We hypothesized that the number of waterbucks would change based on the season. Using the camera traps set up in Mozambique we were able to prove our hypothesis correct. The amount of waterbucks in the different seasons did in fact change.

27. Cameron Rowe, Erik Blanco

Faculty Mentor: Kristen Genet, BIOL

How Vegetation Affects Porcupines:

For this research, we analyzed porcupine activity in Gorongosa National Park to determine which vegetation community housed the most porcupines. We analyzed results from four communities: Mixed Savannah + Woodland, Floodplain, Miombo Woodland and Limestone. Our initial hypothesis was that the highest numbers of porcupines would be found in the Mixed Savannah + Woodland because that's the vegetation community that best supports the porcupine's main diet. After analyzing the results, we came to the conclusion that the Mixed Savannah + Woodland was in fact, home to the most porcupines.

28. Dakota Zimmer, Chris Lituma, Patrick Moos, Keme Jikaowhonda

Faculty Mentor: Kristen Genet, BIOL

Seasons Effect on Elephant Population:

Gorongosa National park has helped bring awareness to many diverse species. The focus of our research is the African elephant. Our central question is how do the seasons influence elephant populations? Our hypothesis was that the elephant population would be higher during the dry season, and this was because of the abundance of their foods. The results were concurrent with our hypothesis that the elephant population was higher during the dry months between July and September.

29. Hailey Vinje

Faculty Mentor: Kristen Genet, BIOL

Baboon Activity is Influenced by the Time of Day:

The Gorongosa National Park is in Mozambique, in southeastern Africa. The park is primarily concerned with nature conservation and the preservation of wildlife and their habitats. The vegetation in the park includes floodplain grassland, miombo woodland, and mixed savanna and woodland. Species include a wide range of insects, herbivores (such as zebras, buffalo, antelope, and elephants), and predators (lions, hyenas, leopards, crocodiles, etc.). (From the interactive map of Gorongosa National Park.) Baboons can be found in a variety of habitats, including savanna grasslands, steppes, and rainforests. They live in troops, which are groups of people that live together. Grass, fruits, seeds, reptiles, birds, and other primates such as vervet monkeys and bushbabies are all part of their diet. Our project is on how the time of day affects the number of Baboons. Our hypothesis is that more Baboons are active during the day. Our Prediction is If there are more baboons active during the day then there should be fewer baboon sightings at night. We looked at how many baboons were collected at different times of day, such as dawn, day, dusk, and night. We'll look at the average number of baboons that are active (caught on video) at different times of the day. We will compare the number of Baboons captured to the number of Baboons captured at a specific time of day (dawn, day, dusk, night). The more Baboons trapped, the more active they are during the specified time of day. These data tables revealed that you are far more likely to see a Baboon during the day or at dawn than at dusk or night. The day category has many more sightings than any other on the list, however, this is due in part to the fact that dawn and dusk are just 25-minute periods, whereas day is 646 minutes. Nonetheless, the sightings were predicated on the number of baboons to minutes in the interval.

30. Ethan Emary Yonezawa, Hailey Milliman, Kristy Lindenfelser, Panhavuth Tan

Faculty Mentor: Kristen Genet, BIOL

The Difference in Wing Melanization between Male and Female North American Pieris rapae in summer (June-September):

Pieris rapae is an invasive species of butterfly. It has several traits that can be attributed to its adaptive success. This allows P. rapae to be a great research subject. We wanted to determine how the wing melanisation and spot size differed in North America during Summer. Since there is sexual dimorphism in this species, we hypothesized that the female P. rapae would have greater melanisation and spot size than the male P. rapae. All of our butterflies came from the iDigBio website and was measured using imageJ software. The results indicated no significant difference between the two sexes in regard to the melalinization. However, the size of the spots of the female P. rapae were about 36% larger on the left wing and about 35% larger on the right wing as compared to the male P. rapae. This is in line with previously done studies. The significance of this will have to be researched in further studies regarding other seasons.

31. Julia Grabow, Alyssa Kosbau, Mady Neubauer, Johnny Nguyen

Faculty Mentor: Kristen Genet, BIOL

The Effect of Latitude on Wing Apex Melanization and Wing Anterior Spots in Pieris Rapae Butterflies During Spring Months (Feb-May):

Animals of the same species will have different phenotypes in different environments. More precisely, animals change their appearances to adapt to the conditions of their habitat. Besides that, environmental conditions are not similar in distinctive latitudes. Therefore, this study focused on determining whether different latitudes affect the melanization on wing

spots and wing apex of *Pieris rapae* butterflies. To study, we chose butterflies found in the Spring months (from February to May) and collected their images at different latitudes from the iDigBio Website (1). Also, the butterfly's sex was identified based on the sexual dimorphism criteria. Then, we used the ImageJ application (2) to measure the area melanization on each butterfly's wing spots and apex. The results obtained from that study indicated that latitude had a slight correlation with the melanization of male butterfly's wing apex and wing spot. This outcome showed that other factors, not the latitude, significantly affect the variety of wing melanization. Therefore, later analysis related to the melanization area of wing apex and wing spots should focus on primary factors (pupal rearing temperature, etc.) that cause variation in their wing apex and spots' size.

32. Nicole Urban, Bryan Coskey, Margo Fletcher

Faculty Mentor: Kristen Genet, BIOL

The Wing Melanization Difference between *Pieris rapae* Sexes in Europe:

*We care about *Pieris rapae* butterfly project because it will further the study of how these butterflies are able to search for their mate. We hypothesized that a male *Pieris rapae* butterfly will have more wing melanization compared to a female because more melanization increases the males' ability to search for females. To approach these questions, we used butterflies specifically from Europe, images were downloaded from iDigBio, and ImageJ a program to measure the wing melanizations. Our findings show that melanization increases in the summer and female *Pieris rapae* butterflies have more melanization on their anterior wings compared to their opposite sex. We conclude that females had higher averages in all our variables. Our results do not support our hypothesis. Further research can be studied based on female butterflies' melanization which contributes to the mating patterns.*

33. Jessica Strand, Bethany Lieser, Xander Bacon, Ranad Ghalban

Faculty Mentor: Kristen Genet, BIOL

Impact of Climate Change on Cabbage White Butterfly (*Pieris rapae*) Wing Apex and Anterior Wing Spot Melanization in the Summer

**Pieris rapae*, more commonly known as the Cabbage White Butterfly, is an invasive Eurasian species that has caused agricultural havoc around the world. Wing melanization of *P. rapae* has proven important for sexual selection as well as thermoregulation. As global temperatures continue to rise due to climate change, the amount of melanization on *P. rapae* wings could possibly be affected. This study hypothesizes that wing melanization would decrease as global temperatures increase. *P. rapae* specimens were available for viewing on iDigBio. This study digitally measured the area of wing apex and anterior spot melanization using ImageJ. Linear regression analyses were used to calculate data. Analyses revealed a significant ($p=0.0007$) difference in average anterior wing spot melanization, when specifically examining the two sexes, only females had a significant ($p=0.0019$) change in melanization over time. These results suggest that anterior wing spot melanization decreases as temperatures increase, specifically in females. These results give insight into the importance of sexual selection, sexual dimorphism, and the evolution of this invasive species.*

34. Jordan Arevalo, Annabel Inman, Jessica Strand

Faculty Mentor: Joan McKearnan, BIOL

Foraging and Cue Association in Blue Jays:

Our research is studying foraging and cue association in Blue Jays. The purpose of our research was to identify if Blue Jays can associate food with color cues. In order to study this, a two part experiment was designed. First a conditioning period to associate food with a color.

Peanuts were placed in a green container for two days. Next, repeated trials took place after to observe how Blue Jays forage for food when given multiple colors. Four different colors were arranged randomly on a stand with peanuts still only in a green container. It was recorded what color the Blue Jays interact with first. Results and conclusions will be presented.

35. Angelina Palumbo, Camryn Keller, and Matt Olson

Faculty Mentor: Joan McKearnan, BIOL

Dogfood Preference – Raw vs. Cooked Meat:

Our project description tests the preference of cooked vs. uncooked meat for dogs. We chose this experiment because the theory of human evolution and cooked meat go hand in hand. When humans began to cook our meat, we could digest our food easier and more thoroughly. Our project is to test if dogs share the same dietary evolution as humans by testing if the dogs gear toward cooked meat.

36. Walter Watts, Aleko Mihailidis, Aurora Erickson

Faculty Mentor: Joan McKearnan, BIOL

Color Preference in Predation of ARCC Wildlife:

Predators use different senses to find their next meal. One of those senses is sight. In different birds, eggs laid can be paler or vary in color. In one study done by Nicolass Verbeek the northwestern crow's eggs when examined would have one or two eggs that were paler than the rest of the clutch (1). We hypothesized that eggs that were red would be preyed upon first. Six eggs were colored and left in clutches in front of a trail cam to record the events. Six trials were completed using three different trail cameras over two weeks.

37. Samantha Karels, Sarah Neubauer, Reese Lawlor, Breanna Hoffman

Faculty Mentor: Joan McKearnan, BIOL

Light Color Preference in Guppies:

We set up a tank with three different light zones, red, blue, and a central neutral zone. Once a week the fish were placed one at a time into the neutral zone and given time to acclimate. We then timed each fish for 2 minutes, and the time spent in each zone was recorded. The results and conclusions will be presented.

38. Ryan Bjorfald, Mya Mochinski, Hannah Kiewel

Faculty Mentor: Jill Gromberg, HPER

Acute Effects of Moderate-Intensity Aerobic Exercise on Cognitive Inhibition:

BACKGROUND: Cognitive inhibition is the ability to control one's impulsive responses to emotions behaviors and attention, as well as manage these stimuli; this ability can be assessed using various cognitive tests (Diamond, 2013, Scarpina & Tagini, 2017, Xie et al., 2017). Chronic aerobic exercise can promote adaptations in the neural pathways by enhancing activity in regions of the brain responsible for cognitive inhibition in the frontal gyrus, as well as increasing the efficiency of the brain. This leads to improvement in cognitive assessment performance; however, the supporting evidence for the acute effects of moderate intensity exercise is unclear (Gomez-Pinilla, F. & Hillman, C., 2013). Exploration of the acute effects of exercise on cognitive inhibition could establish further evidence of the cognitive benefits of

exercise and lead to the development of practical exercise applications that promote cognitive health. **OBJECTIVE:** The current study aims to explore the acute effects of a single bout of moderate-intensity, aerobic exercise on cognitive inhibition assessment performance. **METHODS:** Three male and five female volunteers with a mean age of 23.5 ± 3.20 years old were included in the study based on self-reported physical activity levels and completion of the pre-activity screening questionnaire, the PAR-Q+. The study was conducted at Anoka-Ramsey Community College, where subjects were randomly assigned to one of two exercise intensity groups: a low-intensity (control) group or moderate-intensity (experimental) group. Subjects were instructed to walk on a treadmill for 25 minutes at the predetermined intensity. Heart rate was used to assess exercise intensity and measured using a heart rate monitor (FT7 Polar™). Modified versions Stroop Color and Word test and Flanker test were administered to each group before and after the bout of exercise and the number of correct responses were recorded. Paired t-tests were used to analyze change in mean scores between pre- and post-exercise cognitive assessments within each group. Two-sample t-tests were also used to compare the mean changes in pre- and post-exercise cognitive assessment test scores between the control and experimental group. **RESULTS:** The control group exercised at a mean heart rate of 107.73 ± 3.83 beats per minute and the experimental group exercised at a mean heart rate of 134.94 ± 6.01 beats per minute. While the experimental group saw an increase in the mean score for the Stroop Color and Word test between pre- and post-exercise tests ($p=0.120$) and the control group saw a small decrease in mean scores for the Stroop Color and Word test ($p=0.804$), results were not statistically significant. When comparing differences between groups in pre- and post-exercise Stroop Color and Word test scores, the exercise group saw a larger increase in mean scores ($p=0.071$), but this result did not reach a level of statistical significance. No subject in the experimental group was observed having a change in Flanker test score. A small, insignificant increase in mean Flanker test scores was observed in the control group ($p=0.196$). **CONCLUSIONS:** The exercise group saw positive increases in mean scores for the Stroop Color and Word test, although the results were not statistically significant. The resulting data failed to support the hypothesis that an acute bout of moderate-intensity aerobic exercise would lead to improved performance in cognitive inhibition assessments. Further studies with larger sample sizes, more measures of cognitive function, and refined cognitive assessments are needed to better establish the relationship between cognitive inhibition and acute aerobic exercise.

39. Trevor Weidt, Alexis Welch

Faculty Mentor: Jill Gromberg, HPER

Effects of Proprioceptive Neuromuscular Facilitation Stretching Among Baseball Players:

Background: Proprioceptive Neuromuscular Facilitation (PNF) stretching is a form of stretching that is used to increase the range of motion in specific joints through a hold-relax and contract-relax technique. There has been limited research that has looked at the effects of PNF stretching and how it effects the range of motion in the shoulder joint. Baseball players often deal with shoulder and arm soreness throughout the duration of their season. The intent of this study was to determine if PNF stretching would be a useful and effective stretching technique to help prevent shoulder and arm soreness among baseball players. Objective: The purpose of this study was to see how PNF stretching affected the range of motion of the shoulder joint compared to self-static (SS) stretching, and how range of motion affected shoulder joint soreness among baseball players. Methods: This study was conducted at Anoka Ramsey Community College (ARCC) in conjunction with the ARCC baseball team. Participants

were men, between the ages of 18-35 (mean age 19.875 ± 0.120 years) who were currently on the ARCC baseball team and have dealt with minor shoulder and/or arm soreness in the past. Sixteen male subjects participated in this study and met a total of six times. Participants were randomly assigned to either the control group which performed static stretching, or the experimental group which had PNF stretching performed by researchers. All participants performed a warmup and then had initial measurements of shoulder internal and external rotation taken by researchers using a goniometer. Once both groups completed their stretching routine, post-stretching measurements were taken of shoulder internal and external rotation. Participants went to practice after each session and then answered four survey questions about their arm soreness after each practice. *Results:* Participants who completed either PNF stretching and static stretching both experienced increased range of motion and decreased muscle soreness in the shoulder joint. A one-way ANOVA showed there was not a significant difference between the control and experimental groups' internal rotation ($p < 0.05$). A one-way ANOVA showed there was significant difference between the control and experimental groups' external rotation ($p < 0.001$). One-way ANOVA showed there was not a significant difference between the control and experimental groups' arm and elbow soreness ($p < 0.05$). *Conclusion:* Based on the results, there is a relationship between increased range of motion and decreased muscle soreness of the shoulder joint among baseball players. The findings of this study suggests that both PNF stretching and static stretching are useful and effective stretching techniques to help decrease shoulder and arm soreness among baseball players. The findings of this study suggest that all baseball players should perform some form of stretching before participating in their sport.

40. Megan Nicholls

Faculty Mentor: Kristin Doneen, PHIL

Do Physicians have a responsibility to act as healthy role models for their patients?

Physicians do have the responsibility to act as healthy role models for their patients to promote healthy lifestyle choices, reflect responsibility, and to show integrity and the qualifications of holding a medical degree.

41. Lauren Estep

Faculty Mentor: Kristin Doneen, PHIL

Is Child Participation in Medical Research Ethically Permissible?

In my poster board, I will be discussing child participation in clinical studies. I am in favor of ethically using children in research; we need to be able to represent every population in research findings. I will be refuting common concerns poised towards studies using children, as well as going over current laws in place regarding child participation.

42. Mayrick Mwakabuta

Faculty Mentor: Kristin Doneen, PHIL

Stop the War on Black Lives:

I am going to be talking about the disparities and racial injustice in the healthcare system being pregnant while black. I will explore the statistics and stories talked about many mothers who are black and was giving birth in the U.S healthcare system.

43. Mackenzie Gruber

Faculty Mentor: Kristin Doneen, PHIL

Ethics Around Involuntary Hospitalizations:

I will be presenting why involuntary holds need to be better checked and how they can negatively impact the patient

44. Ethan Emary Yonezawa

Faculty Mentor: Rita Newton, GERMAN

Warum Deutsch Lernen?/Why Learn German?

There are infinite reasons why one should learn an additional language. German is a beautiful language spoken by around 130 million people in over 40 countries. Learning German opens many academic and career opportunities. Germany has a rich culture that has some branches here in the United States. The German language is one of the easiest languages for native English speakers to learn and can help set the foundation for learning other languages as well.

45. Timothy Voges, Henry Gibbs

Faculty Mentor: Kristen Genet, BIOL

How Civets' Population Varies in Different Seasons:

In this research project, we looked at the population of Civets in different seasons. We use Gorongosa camera traps to determine how many civets are seen in a particular season. Our dependent variable was Civets, while our independent variable was seasons. We predicted that there would be more Civets in the wet seasons. After analyzing the data sets, We found out that they prefer the dry season with little water and brown vegetation. What we got out of this was that Civets can survive through a lot with limited resources.

46. Julia Schulz, Chelsea Kappes

Faculty Mentor: Kristen Genet, BIOL

Waterbuck Activity Poster:

The Gorongosa National Park located in Mozambique, Africa is the home of our main research group, the water-buck. In this report, we present the results of the activities of water-bucks at different times of the day. We predict that our data will show maximum activity of water-bucks during the day. We have learned a lot about our species by studying WildCam's trap cameras. We discuss our inconclusive findings below.

47. Bailey Paulsen, Avery Kaliszewski, Brenden Geiselhart

Faculty Mentor: Kristen Genet, BIOL

Sighting of Baboons During Various Seasons:

Our scientific research poster consists of research pulled from the camera traps at the Gorongosa National Park in Mozambique, Africa. We decided that we wanted to investigate how each season impacted the population of baboons. We found that the dry season is the most populated season for baboons, based on the data we collected.

48. Leah Beise, Courtney Mackedanz, Camryn Bliayang, Collin Carlson, Natalie Urban

Faculty Mentor: Kristen Genet, BIOL

Pieris rapae Wing Melanization Variation Between Sexes in Europe:

In this study, we are focusing on the melanization of the apex and anterior wing spots on the wings of the Pieris rapae butterfly, a very common invasive species that can be seen around the world. This butterfly is characterized by a white to cream color along with its black melanization on the tips of its wings and its wing spots. The melanization on the wings of Pieris rapae can vary greatly depending on environmental factors such as temperature or sun exposure and internal factors such as the sex of the butterfly. In this study we focused on

*the melanization of the *Pieris rapae* butterfly between different sexes in Europe. To do this, we first identified and obtained specific butterflies by plugging their coreID into the iDigBio database. This not only showed us images of the butterflies, but also the specific location of where the butterflies were captured and examined. We then measured the apex melanization, and the melanization of the wing spots of each butterfly by using the software program ImageJ. After measuring a large portion of random butterflies we performed a t-test, and as a result we found that the amount of melanization between male and female *Pieris rapae* butterflies was very different as the females had more melanization than the males. We concluded that the females have more melanization on their wings because they need to stay warmer in order to give the offspring the optimal conditions to develop.*

49. Shawn McCabe, Ethan Erickson, Annabel Inman, Najma Adan

Faculty Mentor: Kristen Genet, BIOL

Seasonal Wing Pattern Melanization in Cabbage White Butterflies from North America:

*Pieris rapae, the cabbage white butterfly, is an invasive species and destructive insect to Brassicaceae crops. Understanding how *P. rapae* became such a successful invader requires studies into ecological and adaptation factors such as adaptive phenotypic plasticity, or seasonal polyphenism. The purpose of this study was to investigate how seasons affect melanization in dorsal forewings of butterflies in North America. It was hypothesized that summer butterflies would have less melanization than spring butterflies. Specimens obtained from iDigBio were measured using ImageJ to determine the area of melanization in the apex and anterior (M3) regions. The results show increased melanization in summer butterflies compared to spring ones, but a t-test of the data revealed the difference is not statistically significant.*

50. Blazden Mueller, Ethan Raivala, Matthew Binsfeld, Walter Watts, Abigail Allen

Faculty Mentor: Kristen Genet, BIOL

Seasonal Differences in European Cabbage White Butterfly Melanization:

*The effects the seasons gave on melanization on each and every butterfly's wing is important. Being able to see what controls these changes could give further insight into why the Cabbage White butterflies are so invasive. In this study, *Pieris rapae* butterflies were studied, measured, and organized by season when captured. The butterflies' apex melanization and wing spot area were recorded and analyzed. The results show that the change in melanization is a product of the different seasons. The melanization during the summer was greater than during spring. Wings during summer months also proved to be longer.*

51. Matthew Olson, Alexandros Mihailidis, Mackenzie Austin, Camryn Keller

Faculty Mentor: Kristen Genet, BIOL

Apex and Anterior Spot Melanization Variances of Male and Female *Pieris rapae* in North America:

*The *Pieris rapae*, or the cabbage white butterfly, is one of the most globally spread invasive species. *Pieris rapae* has spread throughout the world as human travel and trade routes have expanded. Our research was focused on the influence of anterior wing spot and apex melanization in male and female butterflies in North America. Our hypothesis states that males will have less melanization compared to females on both accounts. The area of the anterior wing spot and apex melanization were measured using ImageJ. A T-test was performed and found females had a larger area of melanization in the anterior wing spot.*

52. Breanna Hoffman, Samantha Karels, Reece Lawlor

Faculty Mentor: Kristen Genet, BIOL

How White-Tailed Deer Behavior is Affected by Time of Year, Temperature, and Time of Day:

Previous studies have shown that the most active time for white-tailed deer are during summer near dusk and that males become more aggressive during mating season in the fall. The purpose of this study was to determine if there was a significant difference in the activity patterns of white-tailed deer in different seasons, times of day, and temperatures. It was hypothesized that the activity levels would increase in spring and fall and during dawn and dusk with temperature only affecting the deer during the winter season. Camera traps were placed and pictures were recorded throughout the Blaine Wetland Sanctuary. The photographs taken and data from the photographs were then analyzed. Deer behavior resulted in higher activity levels during the day and night times. The data from the time of year and temperature recordings were insignificant. Our hypothesis was rejected and further experiments need to be observed.

53. Sydney Payeur, Camryn Keller, Tori Carroll

Faculty Mentor: Kristen Genet, BIOL

The Impact of Seasonal Changes on Animal Diversity Within the Blaine Wetland Sanctuary:

Seasonal transitions have a prominent influence upon species diversity within wetlands. Assessment of community diversity metrics were used to distinguish how mammalian diversity within the Blaine Wetland Sanctuary fluctuates in response to seasonal variations. Determining periods of greater diversity can be imperative information when it comes to determining the most beneficial methods for restoration and management projects. Camera traps assembled across upland and wetland habitats collected data from summer 2019 and fall 2021. Analysis of photos taken within a 14–21-day period allowed us to make calculations of diversity indices. We suspected that there would be a greater presence of community diversity as well as species richness in the summer months. Results show that both diversity and evenness is greater in the summer in comparison to the fall. Summer months had approximately 5% greater values in both categories, confirming our hypothesis.

54. Hannah Flanagan

Faculty Mentor: Peggy Guiney, BIOL

Recreation Research Project:

This research project was designed to reduce any negative impact on the environment, specifically, how our electricity and our time outside aids in environmental sustainability. The research project consisted of a two-week data collection and active changes to made to reduce greenhouse gas emissions which is a big contributing factor to environmental sustainability.

55. Andrew Kim

Faculty Mentor: Peggy Guiney, BIOL

Food Data and Green Gas Emissions:

This research purpose was to explore the relationship between diet and environmental impact. This is an important topic because of the negative effects these greenhouse gasses have on the environment. Specifically, we measured our consumption of protein (meat, dairy, and plant-based) then used an online calculator to measure greenhouse emissions from the food production. We separated the measurement into two weeks, the first week is the baseline week where we don't change anything about our eating habits, and the second week is the behavior change week where we deliberately changed what we ate to less animal-based and

more plant-based proteins. In conclusion the type of protein we consume heavily impacts the amount of greenhouse gasses we emit.

56. Nicolette Rheude

Faculty Mentor: Lisa Becker, ANTH

Creating a Pollinator-Friendly Yard in Coon Rapids:

With the current lawn ordinances in our city of Coon Rapids, it's hard to know how to create a safe space for bees to thrive. This poster helps residents of Coon Rapids learn the ordinances and obtain resources to get started on a bee friendly lawn.