

GVSU SUMMER SCHOLARS SHOWCASE

September 10, 2020

**via Symposium
Virtual Platform**

4:00 p.m. - 7:00 p.m.



Order of Events

Welcome and Remarks

4:00 P.M.

Robert Smart, Ph.D.

Vice Provost for Research Administration

Executive Director, CSCE

Susan Mendoza, Ph.D.

Director, Office of Undergraduate Research and Scholarship

David Geenen, Ph.D.

Associate Professor, Physician Assistant Studies

URC Chair, 2020

Live Presentations by:

4:30 P.M.

Jakob Benjamin • Michelle Dykstra • Lizzy Sielaff • Antonia Gordon • Alyssa Langlois • Haley Kuhnle • Jordan Pattison • Nicholas Layman

Pre-Recorded Presentations by:

Gabriel Alvarado • Amber Anderson • Gabrielle Angel • Jillian Ashton • Jessa Avalos • Alex Baker • Trevor Beardsley • Taylor Blad • Hailee Cederquist • Ian Curtis • Gabriella Davis • Catherine DeFouw • Kristie DeVlieger • Jessica Ensing • Nathan Funckes • Ysabela Golden • Jake Gunn • Deonquanic Hayes • Sofia Hessler • Win Hon • Jodilyn Jenkins • Colin McHugh • Grace Miller • Myren Mitchell • Noemy Parra-Cano • Hannah Pierson • Lauren Proctor • Phathit Renas • Elise Richards • Maria Sanchez-Rodriguez • Levi Smith • Isabel Soberal • Hanna Szydowski • Isabel Thompson

Welcome to the 2020 GVSU Summer Scholars Showcase!

On behalf of the Office of Undergraduate Research and Scholarship and the Undergraduate Research Council, I welcome each of you to the 2020 GVSU Summer Scholars Showcase. Today, we celebrate the scholarship, research, and creative work of undergraduate scholars in Beckman Scholars at GVSU, Library Scholars, McNair Scholars, REACH Scholars, Student Summer Scholars (S3), and Modified Student Summer Scholars (MS3).

Each scholar began the summer with a research question, a methodological roadmap, and the guidance of a faculty mentor. These tools provide scholars with a solid foundation to engage in mentored inquiry. In doing research and scholarship, they begin to direct their own educational paths and familiarize themselves with the requirements and structure of professional research. Successful projects require tenacity, courage, and patience. These attitudes, in concert with a foundation of academic and critical thinking skills, help scholars further their knowledge in a specific area while learning to incorporate academics with professional work.

The research and creative work you will see today is not complete. Rather, the presentations represent scholarship in process. We hope that you take a moment to connect with our scholars, listen to their presentations, and inquire about their work and future plans.

Dr. Susan Mendoza, Founding Director
Office of Undergraduate Research and Scholarship

Beckman Scholars

Isabel Thompson (2019)

Library Scholars

Ian Curtis

Jodilyn Jenkins

Myren Mitchell

McNair Scholars

Amber Anderson

Gabrielle Angel

Helen Bahlbi

Taylor Bowie

Gabriella Davis

Kristie DeVlieger

Antonia Gordon

Deonquanic Hayes

Win Hon

Alyssa Langlois

Nicholas Layman

Noemy Parra-Cano

Hannah Pierson

Lizzy Sielaff

Isabel Soberal

REACH Scholars

Maria Sanchez-Rodriguez

Student Summer Scholars

Jillian Ashton

Alex Baker (Stiner Scholar)

Trevor Beardsley (Ott-Stiner Scholar)

Jakob Benjamin

Taylor Blad

Hailee Cederquist, MS3

Catherine Defouw

Michelle Dykstra

Jessica Ensing

Nathan Funckes, MS3

Ysabela Golden (Stiner Scholar)

Jake Gunn (Keoze Fellow)

Sofia Hessler, MS3

Haley Kuhnle

Colin McHugh (Ott-Stiner Scholar)

Grace Miller, MS3

Jordan Pattison

Lauren Proctor (Schroeder Fellow)

Phathit Renas

Elise Richards

Levi Smith

Hanna Szydowski

Jonathan Wassink

2020 Beckman Scholars

Isabel Thompson

Faculty Mentor: Jennifer Moore, Biology

The country lizard and the city lizard: Comparing spatial genetic structure of Galápagos lava lizards occurring in natural and human-modified landscapes

Fauna of the Galápagos Islands is under increasing threat due to the growing demands of human activity. The impact of anthropogenic pressures is unknown for lava lizards (genus *Microlophus*), a group of nine species common throughout the Galápagos. *M. bivittatus* genetic samples were collected across a gradient of natural and human-modified habitats on the island of San Cristóbal in 2017/2018. Microsatellite primer optimization occurred Summer/Fall 2019. Our main objective is to fill a knowledge gap on the ecology and spatial genetic structure of Galápagos lava lizards using microsatellite genotypes to 1) estimate dispersal distances, 2) compare levels of gene flow and inbreeding, and 3) examine the distribution of related individuals across the landscape and in relation to landscape factors (e.g., habitat type, elevation). The results of this study will provide novel information on the impacts of human development on endemic lizard ecology and inform conservation efforts on the islands.

2020 Library Scholars

Ian Curtis

Faculty Mentor: Amber Dierking, University Libraries

Collecting the *Encyclopédie*: An Annotated Bibliography of English Sources

In the research process, the actual searching for information often takes longer than anticipated and, especially for research with deadlines, encroaches on valuable time for reading and analysis. This collection of sources on the French *Encyclopédie* serves to reduce the amount of time spent on finding resources, allowing scholars to focus on individual research needs. Within this searchable annotated bibliography are select English sources that are all available online; however, many can also be found in print journals and books. While containing a variety of topics and authors, significant subject areas are digital humanities, censorship, plagiarism, and authorship and notable scholars include Frank A. Kafker, Richard Schwab, and Arthur Wilson. This is not intended to be an exhaustive list but aims to guide students and scholars alike to sources fitted for their specific interests. It is the first step in an ongoing project to collect and annotate all sources on the *Encyclopédie*.

Jodilyn Jenkins

Faculty Mentor: Gayle Schaub, University Library

A Guide to Performing Empirical and Scholarly Research: Using a Literature Review on Exercise Dependence as an Example

The aim of this literature review was to define exercise dependence, attempt to discover if personality type, age, gender, and type of exercise are correlated with one's risk of exercise dependence, and show the research process used in the making of this review.

Myren Mitchell

Faculty Mentor: Leigh Rupinski, University Library

GVSU Historical Interactive Map

This interactive map allows viewers to explore the development and growth of Grand Valley State University's Allendale campus. Using the timeline feature, viewers can see a visual representation of the construction and demolition of academic buildings and living centers. When a user clicks on a building, they are given more information about the building's development and use along with a relevant photo. By using this tool, students can understand more about GVSU's beginnings and how it has grown and developed through the decades.

2020 McNair Scholars

Amber Anderson

Faculty Mentor: Jennifer Stewart, Sociology

Social and Economic Capital as Poverty

As a McNair Scholar, I have been researching the literature regarding the effects poverty has on education with the intent of developing research questions. Funding plays a huge role in access to valuable resources, such as test prep courses, private education, tutors, and others. It is important to think of poverty in relation to Social and Economic Capital. Adolescents experiencing poverty do not have the same life chances as those who are not. These disparities come from income and access to prestigious, potentially status advancing social networks. Within high status social networks, students have access to knowledge not taught in K-12 education, like etiquette of unspoken rules in an educational setting. This could be sending professional emails, requesting letters of recommendations, or communicating with professors. Each of these have the ability to help or harm one's education, however they are not widely taught in schools and students cannot know what they are not taught.

Gabrielle Angel

Faculty Mentor: Jae Basiliere, Women, Gender, and Sexuality Studies

The Monstrous Queer

"Monsters are phantoms that exist at the edges of society. They are the ultimate Other and are so fundamentally different from the normative that their existence works to guard boundaries of what it means to be human. As such, the monster has become an integral part of the American psyche as it tries to think through societal deviance. Marginalized communities are often branded as monstrous, and queer individuals have consistently been targeted by this rhetoric in order to dehumanize queer identities and limit queer access to power. I seek to examine this link, and I employ archival analysis of newspaper articles in order to track how print media has historically replicated and amplified rhetoric that is suggestive of queer monstrosity. I also analyze the ways in which this rhetoric, in its various incantations, is used to justify homophobic violence and the exclusion of queer individuals from society, as well as how queer individuals police their own behaviors in response."

Helen Bahlbi

Faculty Mentor: Matthew Hart, Chemistry

Computational Modeling of Diphenylureas

Most bacteria are harmless; however, some are pathogenic and can cause disease. One of the bacterial diseases with the highest disease burden is tuberculosis (TB), caused by *Mycobacterium tuberculosis* (*M. tuberculosis*). Though antibiotics have successfully treated patients with TB infections, antibiotic resistance is a rising concern as bacteria alter in response to the use of drugs. In the case of *M. tuberculosis*, the bacteria have become resistant to several clinical antibiotics. Recently, our lab synthesized a novel family of diphenylureas that exhibited antimicrobial activity versus *Mycobacterium*. While we are unsure of the exact target of our antibiotics, the structural similarities between our diphenylurea and current drugs approved for treatment suggest that our compounds are targeting the bacteria's ability to synthesize the cell wall. Herein, computational results will be offered to gain understanding of how diphenylureas bind to biological targets and inhibit bacterial growth.

Taylor Bowie

Faculty Mentor: Emily Nichols, Social Work

Addressing sexual violence in K-12 Education

Sexual assault has been widely recognized as a public health crisis for decades. Since at least the late 1980s, rates of sexual violence have been steady around 25% of women experiencing it by their freshman year of college. Our past and most prevalent prevention methods have consistently shown to be useless, as rates of violence have not decreased, and the results often do not lead to increased understanding about sexual assault and violence intervention. In recent years, college campuses have started to implement a new prevention education known as the bystander model. While the literature generally agrees it has some level of effectiveness beyond traditional rape education programs, the model is often taught too late. This project aims to gauge the effectiveness of traditional K-12 sex education in addressing sexual violence, by interviewing sex education instructors and professionals and their experiences with the topic and prevention in the classroom.

Gabriella Davis

Faculty Mentor: Médar Serrata, Modern Languages and Literatures

Chaotic Suppression: Memory, Trauma and Recovery in "Geographies of Home"

In "Geographies of Home" by Loida Maritza Pérez, the inability to confront trauma of horrific experiences causes an Afro-Dominican family's lives to divulge into chaos. Chaos in the novel is presented in two different forms: chaos in the body and in the home. Perpetual silence within the family regarding the realities of rape, parental abuse, and intimate partner violence only fuels this chaos as it threatens to permanently destroy the emotional and physical health of several characters. Moreover, the family's collective attempts to suppress their own pain and deny the pain of others leads to brutality and disorder. In defiance of the characters' efforts to suppress their emotions, their bodies and/or memories become reminders of the trauma they hide from themselves. However, their struggles against systematic and private abuses are not without hope. Through youngest daughter Iliana's confrontation of trauma, "Geographies of Home" shows how healing is possible.

Kristie DeVlieger

Faculty Mentor: Corinna McLeod, English

Meaning-Making in the Spaces of Fairy Tale Metamorphosis

The metamorphosis of fairy tales can be observed through the spaces that occur within the reader, resulting in personality reintegration. Fairy tales are magical stories where an everyday hero faces a crisis and experiences external transformation. They are often initiation stories, creating social stability by providing a way to respond to the crisis of a new stage in life. They undergo memetic transformation through their deliberate alteration by storytellers who change features of the story to satisfy the needs of their society. The spaces within these texts allow meaning making to occur as the reader fills them with their own similar experiences. I examined 3 versions of Snow White and the metamorphosis of the spaces in the text through what has been altered in each one. Understanding how fairy tales function to stabilize society, their role in meaning-making, and how effective metamorphosis occurs can lead to the development of new fairy tales that answer our own society's needs.

Antonia Gordon

Faculty Mentor: Davia Downey, Public, Nonprofit & Health Administration

The True Costs of Education and Why Money Matters

Despite years of education reform, Michigan still has low k-12 student performance. The state's ranking started to decline in 2003 and was expected to continue its downward spiral for fifteen years. Traditionally, education policy research in Michigan has focused on the state's largest municipality Detroit. The implications of focusing on a singular case study makes it difficult to determine if disparate education outcomes are perpetuated systematically throughout the state. This study uses a comparative case analysis of Detroit Public Schools and Muskegon Heights Public Schools - a city with a similar demographic composition - to test if education policy enacted in the mid 1990s led to decreased test scores in both schools. The research will draw attention to overlooked schools in West Michigan that do not receive the same scrutiny in education research, while identifying flaws in education policy to suggest reform to change the downward trajectory of Michigan student performance.

Deonquanic Hayes

Faculty Mentor: Amanda Dillard, Psychology

Effects of Anticipated versus Retrospective Regret on Eating behavior in real time

Past research found that anticipated regret is important in decision-making about health, but little studies has tested the role retrospective regret plays in these decisions. Theory of regret regulation suggests that regret about past and future behaviors can be independent, but no research, to date, has teased them apart. Our research compares anticipated and retrospective regret on people's motivation to engage in healthy or unhealthy eating. Participants were told they would complete two separate experiments. All participants wrote about a time they regretted an eating behavior. However, they were randomized to two experimental factors: they either described an anticipated or retrospective regret and either an action or inaction regret. Participants rated their negative emotions, intentions for future eating behavior, and were invited to eat as much candy and raisins they wanted. The study's findings provides insight into how to best use regret as a behavioral intervention.

Win Hon

Faculty Mentor: Martin Burg, Biomedical Sciences

Effects of increased excitability on histaminergic neuron development in the early larval brain

Neural plasticity has been described as the ability of neurons to undergo structural and physiological changes in response to changes in their environment. Two *D. melanogaster* mutants, *eag¹* and *Sh¹²⁰*, have been shown to increase levels of excitability as they disrupt K⁺ ion channel function, resulting in hyperexcitable nerve cells. The induced excitability in *eag¹Sh¹²⁰* flies were shown to increase growth and branching at the larval neuromuscular junction. Herein, we examine the ability of histaminergic (HA) interneurons to demonstrate plasticity-related changes in *eag¹Sh¹²⁰* mutants. An immunofluorescent whole-mount procedure was performed to detect HA cells in intact central nervous systems dissected from the early larval brain. Once the staining was completed, the specimens were imaged using confocal microscopy to localize HA throughout the cells, including synaptic varicosities. Preliminary results suggest that HA cells varicosity number and outgrowth are affected in *eag¹Sh¹²⁰* flies.

Alyssa Langlois

Faculty Mentors: Laurel Westbrook, Sociology & Rachel Campbell, Sociology

Perceptions of manhood: Exploring the Relationship between heterosexual, cisgender Men and the Norms of Masculinity

Aspects of identities that are privileged often go unexamined. In American culture, masculinity encapsulates this taken-for-granted quality, rendering it seemingly natural and unquestionable. However, masculinity is socially constructed, and it is important to ask what, at this moment in time, it means to be a man, what it means to be masculine, and how men relate to the norms of masculinity. To explore these questions, I conducted fifteen interviews with heterosexual, cisgender men between the ages of twenty and twenty-six. Preliminary findings reveal that men interviewed felt a disconnect between the expectations associated with masculinity and their perceptions of themselves. Men indicated this disconnect through separating societal and personal beliefs, describing a difference between their public and private self, and creating distance between themselves and gendered norms. This research suggests that masculinity, though privileged, can also be incredibly constraining.

Nicholas Layman

Faculty Mentor: David Clark, Mathematics

Continuous Guessing Games With Two Secret Numbers

A guessing game is a game played between a questioner and a responder. The two players first agree upon the set, N , in which the game will be played as well as the number of questions, Q , which will be asked by the questioner. The responder first chooses two distinct numbers from N . The questioner then asks questions of the form "How many of your chosen numbers are in the set S ?" where S is some subset of N , to which the responder answers truthfully. The goal for the questioner is to determine the responder's two numbers using at most Q questions. We study a continuous version of this game where N is the closed interval of real numbers from 0 to 1. In our research we introduce and examine strategies for the questioner using a geometric approach. We introduce a strategy which is optimal in some cases and near-optimal in others. We also discuss how the questioner's strategy changes if the responder is allowed to lie at most one time. We introduce a general strategy for this case as well.

Noemy Parra-Cano

Faculty Mentor: Jennifer Stewart, Sociology

The Misconception of Bias towards Mental Health

An assumption made in the U.S. society is that minoritized populations such as Hispanic, Asian, and Native Americans are more culturally collectively oriented than White Americans who are culturally individualistically oriented. In the initial literature review, no link was found between race and cultural orientation or cultural orientation and stigma against therapy. Having examined these points, the purpose of this study shifted to an analysis of the literature regarding patterns in mental health disorders that vary along lines of race in the US. Relevant findings of this research demonstrated marginalized race groups in the US are underrepresented in psychological studies, frequently misdiagnosed, and overmedicated. Social factors such as racism and lower socioeconomic status increase the severity of mental health disorders as well their duration. Therapy that involved culturally adaptive models were shown to improve outcomes.

Hannah Pierson

Faculty Mentor: Anna Hammersmith, Sociology

The Link Between Nativity and Racial Infant Mortality Disparities

The United States has one of the highest rates of infant mortality in the developed world. Studies indicate infant mortality varies greatly across racial groups. Black women are twice as likely to report preterm birth or infant death relative to White women. Foreign-born Black women have similar rates to that of native-born White women rather than native-born Black women, suggesting the link between race and reproductive health is more complex than previously understood. Thus, this study examines the interplay between nativity, race, and reproductive health. The cumulative disadvantage perspective will be employed to better unpack how life course stressors may be negatively linked to reproductive health of native-born Black women relative to the foreign-born. The National Longitudinal Study of Adolescent and Adult Health will be utilized to examine if a woman's nativity is associated with their reproductive health outcomes based on unique life course stressors they may have endured.

Elizabeth Sielaff

Faculty Mentor: Kathryn Haley, Biomedical Sciences

The Role of Heme Homeostasis in the Pathogenesis of *S. aureus*

Staphylococcus aureus, a virulent bacterial pathogen, is capable of infecting every tissue within the human body. The capacity to colonize diverse niches within its host is partially mediated by the metabolic flexibility of *S. aureus* and its ability to perform both aerobic and anaerobic respiration. Heme is required for both these biochemical processes making it vital for *S. aureus* viability. Paradoxically heme is toxic to *S. aureus* at high concentrations necessitating precise intracellular regulation. *S. aureus* achieves heme homeostasis via three mechanisms, regulating exogenous heme acquisition, regulating endogenous heme synthesis, and controlling heme catabolism. The coordination of these mechanisms is facilitated by two-component heme-sensing system as well as post-translational regulation of two paralogous heme oxygenases IsdG, and IsdI. These dynamic systems enable *S. aureus* to maintain the appropriate intracellular heme concentrations critical for colonization and virulence.

Isabel Soberal

Faculty Mentor: Chad Frederick, Geography & Sustainable Planning

Does Grand Rapids Take Sustainability Seriously? Connecting Municipal Policy Outcomes to a Conceptual Framework

The city of Grand Rapids, Michigan is home to efforts in equitable sustainability. The purpose of this article is to examine the extent to which the Grand Rapids prioritizes sustainability through the lens of the triple bottom line standard. By including equity, environmental quality and economic vitality in the analysis of sustainability efforts, policymakers are able to better serve their communities. Using qualitative methodologies, including interviews with city stakeholders and software analysis of municipal planning documents related to sustainability, a comparison was made between planning goals and outcomes and theoretical frameworks in the field of urban studies. The findings of this case study suggest that there is a notable disconnect between theory and practice, and that the aspect of sustainability being focused on varies among professionals in the city of Grand Rapids. The consequences of the vagueness within the field is illustrated well in this case study.

2020 REACH Scholars

Maria Sanchez-Rodriguez

Faculty Mentor: Mary Bower Russa, Psychology

Familial CPS Cases: Social Support, Parental Stress, and Mental Health

Child abuse and neglect leads to lifelong negative outcomes including physical impairments and mental health impairments (World Health Organization, 2016). Mental health impairments, in parents, create challenges for parenting, increasing the risk of a second generation of child maltreatment (Maybery, Ling, Szakacs & Reupert, 2005). However, significant life stressors and low social support can also contribute to parent mental health challenges (Emery, et al., 2018). This study assessed the impacts of social support and parenting-related stress on mental health outcomes among 699 maltreating parents in Kent County, MI. As expected, we found that 33% of our parents had limited support and that low levels of social support predicted higher rates of mental illness. Because parent social support and mental illness are known to increase the risk factor for child maltreatment, they may be targets for intervention in high risk parent populations.

2020 Student Summer Scholars

Jillian Ashton

Faculty Mentors: Peter Wampler, Geology & Tara Kneeshaw, Geology

Comparison of 1990 and 2020 Water Quality data for the Grand River, Michigan

The Grand River Expedition, launched by Verlen Kruger in 1990, documented Grand River water quality. The 2020 expedition was postponed due to COVID-19, which required changes to our sampling plan. Samples were taken at 1990 sampling locations and additional sites using an In-situ Aqua Troll 500 Sonde. Data was collected every two seconds, including: temperature, dissolved oxygen (DO), pH, salinity, conductivity, total dissolved solids (TDS), and oxidation reduction potential (ORP). Discrete water samples were also collected at each location and analyzed for E. coli, chloride, nitrate, ammonia, total phosphate, and orthophosphate. Preliminary comparison of 1990 and 2020 water quality data shows that DO and total phosphate concentrations remained essentially unchanged while pH, temperature, TDS, chloride, nitrate, ammonia and E. coli concentrations decreased. ArcMap Geographic Information System (GIS) will be used to analyze reaches with high spatial and temporal resolution data.

Alex Baker (Stiner Scholar)

Faculty Mentor: Kristin Hedges, Anthropology

Addy-ing it all up: ethnographic analysis of students' perspectives study drugs

Cultural norms of non-prescribed pharmaceuticals have arrived on college campuses, with an increase in students using study drugs (non-prescribed stimulants) as a performance enhancer for academic success. The average rate of NPS use among US college students is around 15% (Benson et al 2015) and has been the second most common illicit drug used on campus (Johnson et al 2016). Given this rise, there is a need for drug education to shift from scare tactics to programs from the students' perspective. This study's purpose is to understand NPS use on a US Midwestern University campus from students' perspective. Data was collected by student researchers trained in ethnographic and drug research methods, and included 33 interviews, observation notes from 25 student researchers, and 2 focus group discussions. Findings showed that pharmaceuticalization and cultural construction of addiction play a large role in the perception of NPS and the motivation for use as a performance enhancer.

Trevor Beardsley (Ott-Stiner Scholar)

Faculty Mentor: Brad Wallar, Chemistry

Structural and functional characterization of ADC-212: a new clinically relevant enzyme involved in antibiotic resistance

As bacterial resistance to beta-lactam antibiotics continues to evolve, there comes a need for optimizing treatment of bacterial infections. For multi-drug resistant *Acinetobacter baumannii*, a significant source of antibiotic resistance comes from β -lactamase enzymes, *Acinetobacter*-derived cephalosporinases (ADCs). These enzymes bind and destroy antibiotics, and many related versions of ADCs exist in *Acinetobacter baumannii*; some of which improve their ability to resist antibiotics. Here, we have focused on three ADC enzymes: ADC-33, -162, and -212; each of which is highly prevalent in clinical *Acinetobacter baumannii* infections. The structure and function of each enzyme will be explored through X-ray crystallography and enzyme kinetics. With few changes in the amino acid sequences of their active sites, these experiments will allow comparison of the binding and mechanism for turnover of antibiotics, a critical step in the process of developing drugs capable of inhibiting ADC enzymes.

Jakob Benjamin

Faculty Mentors: Ian Cleary, BMS & Derek Thomas, BMS

Analyzing the Impact on a *Candida Albicans* Virulence

Associated Trait of Several Genes Altered During Spaceflight
Candida albicans is one of the many organisms that live as part of the normal human microbiome. It is known for its ability to cause minor yeast infections, but it is also an opportunistic pathogen that has a mortality rate of 30-50% in immunocompromised patients. *C. albicans* pathogenicity relies on its ability to change from yeast to hyphae, allowing for greater cellular adhesion and formation of drug-resistant biofilms. Since it lives on humans, it would also be present in places such as the ISS and manned rockets. This could lead to complications due to candidiasis in astronauts, especially since cellular adhesion in *Candida* has been shown to increase during Spaceflight. Our goal is to characterize the role of previously unstudied genes whose expression is changed during spaceflight in morphology and adhesion. We began with a bioinformatics approach comparing the genes to other yeast species and we are working on constructing over-expression strains to test functions of the genes.

Taylor Blad

Faculty Mentor: David Kurjiaka, Biomedical Sciences

Population doubling of culture endothelial cells

In cell culture experiments, cell density can impact gene expression through contact inhibition and therefore must be controlled. bEnd.3 cells (endothelial cells) require 24 hrs to divide meaning the population should double (twice the number of cells) every day. Early experiments had fewer cells after 1-2 days than expected from the initial cell density. To determine whether cell doubling times have changed, we counted cells (hemocytometer) and added 400K/plate to 3 plates. After 24 hrs, the number of cells in one plate was counted: this was repeated every 24 hrs. After 24 hours, there were only 355 + 53 K cells (n=7) in a plate, many fewer than expected. At 48 (589 + 143 K) and 72 (1,250 + 213 K) hrs, the number of cells suggested the populations had doubled from the first 24 hrs. These data could reflect a slow return to cell division or an issue with the initial plating of 400K cells. In either case, it provides us with enough data to start experiments.

Hailee Cederquist, MS3

Faculty Mentor: Jodee Hunt, Biology

Zoo research in the time of Covid-19

We proposed to investigate the influence of environmental noise and visitor abundance on the behavior of felids in a public zoo, but were unable to observe the cats until July. Our project was too complex to begin so late in the season. Instead we collected behavior data for Canada lynx (*Lynx canadensis*), lions (*Panthera leo*) and Amur tigers (*Panthera tigris altaica*), focusing on two key changes that created natural experiments: the birth of a lynx cub, and change in the social structure of the tigers (introduction of a new, young female and movement of a male to another zoo, both for breeding purposes). We collected data on all three groups of felids in July and August. We also delved statistically more deeply into our 2018-2019 data and developed a presentation for the 2020 Animal Behavior Society Conference, held remotely. We worked out more details for our project addressing noise and visitor abundance, which we hope to initiate next summer, conditions and situations permitting.

Catherine Defouw

Faculty Mentor: Jennifer Winther, Biology

Characterizing fungal symbionts and their impact on Glomalin amounts in soil from corn and soybean fields under till or no-till management practices. Many crops have mutualistic arbuscular mycorrhizal fungi (AMF) associations that positively affect plant and soil health. AMF likely mitigates agricultural problems like topsoil depletion and compaction from tilling. Our literature review on AMF associations under different practices showed the need for more studies. We studied an AMF community's impact on soil quality and plant health in conventional till (CT) and no-till (NT) managed corn and soybean plants. We gathered data from these fields in West MI, using field soil to inoculate greenhouse plants in normal/drought conditions. We collected three types of data for each case: 1) AMF community via spore type and presence, 2) Soil structure via aggregate size and nutrient quantity, and 3) Plant productivity via root-shoot biomass ratio and structure. Our poster will provide an update of our ongoing data collection and analysis. This study aims to describe the conditions where AMF benefit crop production and soil quality locally.

Michelle Dykstra

Faculty Mentor: Sheila Blackman, Cell and Molecular Biology

Functional Chaos: Solution Driven Amino Acid Migration in Intrinsically Disordered Proteins

The interactions between a protein's sequence of amino acids and its solvent drive its folding. Intrinsically Disordered Proteins (IDPs), represent a challenge to the classic static conception of protein structure and function. Late Embryogenesis Abundant (LEA) proteins are IDPs that mediate water interactions in seeds. We hypothesize that LEA proteins, like other IDPs, are enriched in amino acids which are sensitive to solvent. Half-Sphere Exposures of each type of amino acid from Protein Data Bank files will be calculated and plotted as a function of the solvent system to determine whether the solvent exposures of individual amino acids change with different salt concentrations. The implications of the unusually high proportions of alanine, lysine, and glycine found in LEA proteins will be discussed. Our work should help elucidate the relationship between structure and cellular environment, which may have implications for the solvents used to study proteins in the laboratory.

Jessica Ensing

Faculty Mentor: Kristin Renkema, Biomedical Sciences

Evaluating the microbial experience influence on anti-tumor immune response

Despite the steady increase of hygienic standards, the CDC continues to report an increase of immune-mediated diseases such as allergies and asthma. This may be caused by reduced exposure to microbes and pathogens. We investigated if increased microbial exposure results in an immune system more prepared to respond to cancer (B16 melanoma injection) by measuring levels of activated lymphocytes between two groups of C57Bl/6 mice: SPF mice (which had no microbial exposure) and CoH mice (which were microbially exposed). The CoH mouse model mimics a human adult's immune system, while the SPF mouse model mimics that of a human infant's. Activated lymphocyte levels were quantified with weekly bleeds using antibody staining flow cytometry. Response to cancer exposure was evaluated through multiple harvests. CoH mice were expected to have heightened levels of activated lymphocytes and a more successful response to cancer exposure than SPF mice.

Nathan Funckes, MS3

Faculty Mentors: Erin Carrier, CIS & Greg Wolffe, CIS

Tag: Autonomous Image Captioning

Many websites remain non-ADA compliant, containing images which lack accompanying textual descriptions. This leaves sight-impaired individuals unable to fully enjoy the rich wonders of the web. To address this inequity, our research aims to create an autonomous system capable of generating semantically accurate descriptions of images. This problem involves two tasks: recognizing an image and linguistically describing it. Our solution uses state-of-the-art deep learning: employing a Convolutional Neural Network that "learns" to understand images and extracts their salient features, and a Recurrent Neural Network that learns to generate structured, coherent sentences. These two networks are merged so as to input arbitrary images and output relevant captions. The model's accuracy is quantified using the Bilingual Evaluation Understudy language metric. After training, we hope to serve the community by deploying our model on the local Grand Valley State University social media feeds.

Ysabela Golden (Stiner Scholar)

Faculty Mentor: Alice Chapman, History

Changing Perspectives on Hildegard of Bingen

"The focus of this project is St. Hildegard of Bingen, a 12th century Christian visionary, composer, polyglot, theologian and natural scientist. Not only was Hildegard counted among the greatest thinkers of her time, but letters indicate she served as advisor to both kings and clergy alike, and her medicinal research is still being used in health fields today. Despite her accomplishments, Hildegard was only recognized as a saint and Doctor of the Church in 2012 833 years after her death. This presentation tracks the changing perceptions of Hildegard and her work throughout her lifetime and in the centuries after her death, based on research of historical sources written by Hildegard and her contemporaries, as well as secondary scholarly analysis of Hildegard and the movements that drew inspiration from her. These impressions shifted based on an era s prevailing politics and theology, as well as its cultural understanding of concepts like mental illness or gender and womanhood."

Jake Gunn (Keoze Fellow)

Faculty Mentor: David Geenen, Physician Assistant Studies

Gap Junctions in Stem Cells Provide an Essential Conduit for Cell-Cell Communication

Background: Myocardial infarction (MI) results from the death of cardiomyocytes (CM) following obstruction of blood flow and diminished oxygen supply to the tissue (hypoxia). Human adipose tissue-derived stem cells (hADSCs) used in pre-clinical models can replace damaged CM, however, this has not been replicated in human clinical trials due to early loss of hADSCs. We hypothesize that coupling of hADSCs to dying CMs may account for part of this loss. Methods: hADSCs will be cultured for different lengths of time with fluorescent dyes that are either permeable or impermeable to the cell membrane. We will assess the time course of coupling between hADSCs under both normoxic and hypoxic conditions by using fluorescent-activated cell sorting (FACS). Results: Our previous studies demonstrate that stem cells possess membrane proteins (connexins) that contribute to cell-cell coupling. The proposed studies will address the functional significance of connexins related to hADSC coupling.

Sofia Hessler, MS3

Faculty Mentor: Merritt DeLano-Taylor, Biomedical Sciences

A Systematic Review on the Effects of Phosphorylation on the Function of Pro-Neural bHLH Proteins

Purpose: Basic helix-loop-helix (bHLH) proteins are factors involved in neurogenesis, specifically in regulating the self-renewal of neural progenitor cells and fate determination of neurons, oligodendrocytes, and astrocytes (Bertrand et al., 2002, Ross et al., 2003, Meijer et al., 2012, Namihira and Nakashima, 2013). This review aims to summarize the evidence of the effects of phosphorylation on known proneural bHLHs in terms of their biochemical characteristics and the impact on the function of the protein. **Methods:** PubMed, UniProt, qPhos database, and the GVSU Libraries Database were used to search for existing research on the biochemical mechanisms of phosphorylation of bHLHs and neurogenesis. **Results:** Phosphorylation of proneural bHLHs can have diverse effects on the biochemical behavior and function of the protein via differing mechanisms. **Conclusions:** More research is needed on the biochemical effects of phosphorylation on bHLHs with known links to neurogenesis.

Haley Kuhnle

Faculty Mentor: Carl Ruetz, Environmental & Sustainability Studies

Evaluating an Environmental Gradient along Eastern Lake Michigan

Michigan's drowned river mouth (DRM) systems are lake-like, transitional habitats that link a tributary to Lake Michigan. These habitats are a common feature on the eastern Lake Michigan shoreline. We hypothesized that a latitudinal gradient in productivity exists, with more eutrophic conditions in the south and more oligotrophic conditions in the north, which has important implications for DRM and Lake Michigan food webs. To test our hypothesis, we measured chlorophyll-a concentrations (a measure of phytoplankton biomass, which forms the base of the food web) and observe Secchi depths (a measure of water clarity, where larger values are associated with greater water clarity) at three sampling locations in 12 DRMs. We observed greater chlorophyll-a concentrations and decreased Secchi depth in southern DRMs compared to northern DRMs. Thus, our results supported our hypothesis of a latitudinal gradient with DRM productivity decreasing at more northern latitudes in eastern Lake Michigan.

Colin McHugh (Ott-Stiner Scholar)

Faculty Mentor: Paul Cook, Chemistry

Structural Investigation of Bacilliredoxins: Enzymes Involved in Bacillithiol Redox Metabolism

Bacillithiol is an important compound involved in intracellular redox homeostasis and fosfomycin resistance mechanisms of some Gram-positive bacterial pathogens. Cellular regeneration of active bacillithiol (BSH) from a disulfide (BSSB) or mixed disulfide state (BSS-Protein) involves the bacilliredoxin enzymes BrxA/B. An X-ray crystallographic structure of apo BrxA from *Bacillus subtilis* has been previously characterized, but no BrxB or BSSB-bound Brx structure currently exists. Here we present an X-ray crystallographic structure of BrxA from the pathogen *Staphylococcus aureus* with a bacillithiol disulfide (BSSB) bound in the active site. Elucidation of this structure will help to understand how BSSB binds in bacilliredoxins, and provide insight into the Brx catalytic mechanism. Functional activity of YdpA, another enzyme involved in BSH regeneration, is also investigated.

Grace Miller, MS3

Faculty Mentor: Mark Staves, Cell and Molecular Biology

Phototropism of rice (*Oriza sativa*) roots

Phototropism growth oriented with respect to a light source is a critical developmental response for the orientation of the root/shoot axis. While phototropism has been extensively studied in shoots, it has been less examined in roots. Gravity and light signals integrate to determine the final orientation of the axis. We created an action spectrum of phototropism for rice (*Oriza sativa*) roots. We illuminated roots with unilateral light, collected time-lapse images and measured the curvature over time. Maximum curvature of roots occurred at four hours, followed by a relaxation to a slightly lesser curvature (proprioception). Maximum curvatures were used for the action spectrum. The wavelength that induced the maximum negative phototropic response was 580nm (yellow) and the minimum phototropic response was found with 720nm (red) light. Most wavelengths induced a negative phototropic response. We will use these results for future experiments combining phototropism with gravitropism.

Jordan Pattison

Faculty Mentor: John Constantelos, Political Science

Institutions, Structural Policies, and Economic Development: How Rule Spaces Shape Outcomes for Developing Countries

Research on long term economic development has consolidated around the central role of economic and political institutions. Within these institutional spaces, structural policies represent a subset of incentive structures with their own effects on economic behavior. To capture the separate effects of both institutional environments and structural policies, we construct an Institutional Index (II) and a Structural Policy Index (SPI) to evaluate their effects on income levels and short term growth rates for non-high-income states. This paper finds that both the II and SPI predict variations in income levels between non-high-income states, with the II producing a larger and more statistically significant estimate. Conversely, no robust relationship between either the II or SPI and short term growth rates was found. We conclude with case studies of Botswana, Zambia, Lesotho, and Uganda, to illustrate the differential economic effects of the II and SPI in four southern African states.

Lauren Proctor (Schroeder Fellow)

Faculty Mentor: Dawn Hart, Cell and Molecular Biology

Analyzing Planarian Behavior Following RNA Interference and Injury

Neurodegenerative diseases, such as Alzheimer's and Parkinson's Diseases, are associated with neuronal death that leads to changes in brain function and behavior. Because human brains regenerate poorly, we use an animal model — planarian flatworms — to understand how neurons can be regrown after injury or disease. To study neural repair, the immediate goal of my project was to identify behaviors that can be reproducibly measured as an output for brain function. After establishing behavioral assays, I employed RNA interference (RNAi) to knock down the function of 10 genes and then identified changes in planarian behavior with and without injury. Behaviors such as turning 15° or greater were systematically quantified in control animals and RNAi animals. The area regenerated was also measured after RNAi. The outcome of this project is identification of genes important for neural regeneration, which could eventually provide insight into therapeutic targets for human disease.

Phathit Renas

Faculty Mentors: Joe Jacquot, BIO & Paul Keenlance, BIO

The Status of Northern Flying Squirrels in the Lower Peninsula of Michigan

With climate change becoming an increasingly pressing issue many animals are at risk, especially small mammals. Of specific importance are Northern flying squirrels (*Glaucomys sabrinus*) and Southern flying squirrels (*Glaucomys volans*) which are both native to Michigan's lower peninsula and whose habitats are being altered by climate change. The purpose of this project was to determine presence of these species in the Huron national forest while also comparing the efficacy of three trapping methods (cameras, live traps, acoustic detectors). By comparing these different methods guidance can be given to the United States Forest Service who are responsible for maintaining flying squirrel populations within the forest. This guidance would minimize cost and maximize detections. An additional goal was to collect genetic and fecal samples from captured flying squirrels. This was for further investigation into their population genetics.

Elise Richards

Faculty Mentor: Todd Williams, Psychology

Machiavellianism and Morality

Recently, researchers have advanced a two-dimensional conceptualization of Machiavellianism (Monaghan et al, 2020). The views dimension captures individual's cynical worldviews while tactics identifies interpersonal manipulation. The goal of this study was to determine how views and tactics relate to morals values and foundations. A sample of (N =477) undergraduate students completed the two-dimensional Machiavellianism scale (TDMS; Monaghan et al., 2020) along with the moral foundation s questionnaire (MFQ; Graham et al., 2013), a modified version of moral dilemmas (Moore et al., 2008), and the dimensions of secularity scale (DoS; Schell, 2015). Results show that while tactics correlated with most dimensions of the DoS and MFQ views were negatively correlated only with loyalty. Responses on the moral dilemma s questions showed that tactics was associated with endorsing moral consequentialism. These results clarify the relationship between Machiavellianism and moral and secular values.

Levi Smith

Faculty Mentor: Joshua Veazey, Physics

Electric properties of manganese doped bismuth ferrite

Multiferroic materials have recently become a significant interest in many different scientific fields. Due to the presence of both ferroelectricity and ferromagnetism, the ideal multiferroic at room temperature is highly sought after. Ferroelectricity is a property analogous to the properties of permanent magnets, where there are strong electric poles rather than the magnetic poles we see in magnetic materials. The multiferroic material BiFeO is a strong ferroelectric but has a weak ferromagnetic moment in its pure form. Using an atomic force microscope (AFM), experimental results suggest that thin film 10% Mn-doped BiFeO exhibits stable ferroelectric poling, and that 50% Mn-doped BiFeO does not retain any ferroelectric properties.

Hanna Szydlowski

Faculty Mentors: Patrick Colgan, GEO & Ian Winkelstern, GEO

Preliminary groundwater levels and isotope data suggest a quick response to precipitation recharge of spring discharge, Ottawa County, Michigan. Aquifers provide water sources to various environments as precipitation enters the groundwater system and exits through springs. In this study, we measured stream height variation, groundwater levels, and isotope ratios of precipitation and springs in Ottawa County, Michigan to determine a time between precipitation recharge and spring-fed stream discharge. From May 2018 to present, measurements for groundwater levels, temperature, and conductivity, as well as stream variations were taken. Water samples used for isotope ratios of precipitation and streams were taken from November 2019 to present with ongoing sampling to reach a full year of data. Preliminary isotope data suggest that the time between recharge by precipitation and spring discharge is less than a few months, while changes in groundwater levels show a response to large rainfall events of less than a week. Determining this time will allow us to better understand pollutant travel through this type of groundwater aquifer.

Jonathan Wassink

Faculty Mentor: Martin Burg, Biomedical Sciences

The Effect of Histamine Deficiency on the Differentiation of Secondary Cells in *Drosophila melanogaster*

The accessory gland of *Drosophila melanogaster* is composed of two cell types: main cells and secondary cells. Secondary cells have been implicated in the induction of post-mating responses in females, although it is not clear how secondary cells perform this function. Histamine has been detected in these cells and recent evidence suggests that some post-mating responses of female flies is affected by absence of histamine in males. This study sought to determine whether histamine deficiency affected the differentiation of the secondary cells or affected accessory gland morphology. *Hdc* mutant flies (unable to synthesize histamine) were compared to wild-type flies, using the UAS-GFP system to mark secondary cells with GFP. Results indicate that secondary cells were still present in *Hdc* mutant flies. These results indicate that histamine deficiency does not block the differentiation of secondary cells, although examination involving the maturation of the accessory gland is ongoing.



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