

# **GVSU SUMMER SCHOLARS SHOWCASE**

**September 5, 2019**

**Grand River Room  
Kirkhof Center  
Allendale, MI  
4:00 p.m. - 7:00 p.m.**



# Order of Events

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## **Welcome and Remarks** **4:00 P.M.**

Robert Smart, Ph.D.  
Vice Provost for Research Administration  
Executive Director, CSCE

## **Oral Presentations by:** **4:15 P.M.**

Nick Busby • Gabriella Davis • Kristie DeVlieger • Brynn Wilfong

## **Poster Presentations by:** **5:00 P.M.**

Jessica Avalos • Helen Bahlbi • Piper Burghduf • Kyezie Bwanangela • Caitlan DeVries • Rebecca Doran • Evangalene Dreyer • Micah Fernando • Erin Fish • Alex Florian • Brady Fritz • Lauren Gapp • Jose Garcia • Lauren Gerritsen • Jessalyn Gonzalez • Lavar Green-Jackson • T Hill • Jeannie Kane • Grayson Kosak • Nicholas Layman • Curtis Mack • Karissa McFarlane • Lauren Miling • Christian Miller • Tanner Napierala • Maxwell Okros • Gage Paul • Alexander Perez • Alyssa Piechocki • Hannah Pierson • Violet Ruiz • Maria Sanchez-Rodriguez • Amarri Smallwood • Anna Tarach • Isabel Thompson • Jack Tietema • Austin VanDenTop • Jazmine Vasquez • Richard Vegh

## **Oral Presentations by:** **6:00 P.M.**

Trevor Ditmar • Kendra Garcia • Julia Jesko • Erin McIntosh • Erin Reasoner • Maia Wichman

## **Closing Remarks** **6:55 P.M.**

Kristy Dean, Ph.D.  
Associate Professor, Psychology  
URC Chair, 2017-2019

# Welcome to the 2019 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 2019 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

Erin Fish (2018)

Gage Paul (2018)

Isabel Thompson (2019)

# Library Scholars

Kristie DeVlieger

Rebecca Doran

Erin McIntosh

# McNair Scholars

Jessica Avalos

Helen Bahlbi

Kelli Bowers

Kyezie Bwanangela

Gabriella Davis

Caitlan DeVries

Trevor Ditmar

Jose Garcia

Kendra Garcia

Jessalyn Gonzalez

Lavar Green-Jackson  
Nicholas Layman  
Christian Miller  
Alexander Perez  
Alyssa Piechocki  
Hannah Pierson  
Violet Ruiz  
Amarri Smallwood  
Austin VanDenTop  
Jazmine Vasquez  
Richard Vegh

## REACH Scholars

Maria Sanchez-Rodriguez

## Student Summer Scholars

Piper Burghduf  
Nick Busby (Stiner Scholar)  
Evangalene Dreyer  
Micah Fernando (Ott-Stiner Scholar)  
Alex Florian (Stiner Scholar)  
Brady Fritz

Lauren Gapp

Lauren Gerritsen

T Hill

Julia Jesko

Jeannie Kane

Grayson Kosak

Curtis Mack

Karissa McFarlane

Lauren Miling

Tanner Napierala, MS3

Maxwell Okros, MS3

Erin Reasoner (Schroeder Fellow)

Anna Tarach (Ott-Stiner Scholar)

Jack Tietema (Koeze Fellow)

Maia Wichman

Brynn Wilfong

# 2019 Beckman Scholars

## Erin Fish

Faculty Mentor: Brad Wallar, Chemistry

Characterization of Novel Triazole-Containing Boronic Acid Transition State Inhibitors (BATSIs) of *Acinetobacter*-derived Cephalosporinase (ADC-7)

Much of the resistance to  $\beta$ -lactam antibiotics in the multidrug resistant bacterium *Acinetobacter baumannii* is attributed to its production of  $\beta$ -lactamase enzymes that deactivate  $\beta$ -lactams by hydrolyzing the amide of the defining lactam ring. In order to develop more effective treatment against multidrug resistant pathogens like *Acinetobacter baumannii*, we have characterized a series of five novel Boronic Acid Transition State Inhibitors (BATSIs) for activity against the class C  $\beta$ -lactamase, *Acinetobacter*-derived cephalosporinase-7 (ADC-7). This series of BATSIs is characterized by the presence of a triazole ring that allows for easier synthesis and modification than previously studied BATSIs. Overall, our structure-function analysis suggests the triazole BATSIs provide a convenient and intriguing template for further modification to increase their binding affinity for ADC-7.

## Gage Paul

Faculty Mentor: Sok Kean Khoo, Cell and Molecular Biology

Beta-synuclein as treatment for Parkinson's disease in *Drosophila*

Parkinson's disease (PD) is the second most common neurodegenerative disorder that impacts 1-2% of the elderly population. PD is characterized by the loss of midbrain dopaminergic neurons, leading primarily to motor impairment. A further hallmark of PD is alpha-synuclein (aSyn) protein aggregates known as Lewy bodies. Lewy bodies can be targeted by beta-synuclein (bSyn), a protein homolog of aSyn, that has been shown to reduce aSyn aggregation. In this study, aSyn transgenic flies are fed bSyn peptide to determine the effects of bSyn on PD symptoms. Assessment of motor function will be evaluated by locomotion assays while Lewy bodies inhibition will be observed using immunohistochemistry confocal microscopy within the flies CNS. The use of bSyn to treat motor impairment and protein aggregation in fly can potentially lead to more effective and noninvasive treatments for patients with PD.

# 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. Our main objective is to fill a knowledge gap on the ecology and spatial genetic structure of Galápagos lava lizards. *M. bivittatus* genetic samples were collected across a gradient of natural and human-modified habitats on the island of San Cristóbal in 2017 and 2018. We plan use 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 various landscape factors (e.g., habitat type, elevation). The results of this study will increase knowledge of lava lizard ecology and provide novel information on the impacts of human development on endemic lizards, informing conservation efforts on the islands.



# 2019 Library Scholars

## Kristie DeVlieger

Faculty Mentors: Maya Hobscheid & Hazel McClure,  
University Library

### The Monomyth Strikes Back: The Continued Importance of the Hero's Journey

The Monomyth, commonly referred to as The Hero's Journey, examines the stages of the hero who goes on an adventure, faces a crisis, and returns victorious. This narrative framework has relevance in a variety of fields, including marketing, narrative creation, classroom instruction, and literature analysis. As a WRT major, I encountered many stories that would have benefited from the monomyth and sought a way to provide a tool to fill this need for student writers. My research involved reading related texts and creating a survey to evaluate current student knowledge. I learned several of the invisible research components, such as HSP training, user accessibility training, and two software systems. I was able to create a Subject Guide for the Library Website on the Monomyth, as well as the Heroine's Journey, that provides a comprehensive introduction to the topic and provided further resources. The Monomyth has continued importance as new applications of the framework develop.

# Rebecca Doran

Faculty Mentor: Annie Benefiel, University Library

## History of Medicine at Seidman House

This presentation will describe my process creating a history of medicine exhibit, in Seidman House, as a library summer scholar. The research process included becoming familiar with rare medical texts through the creation of an annotated bibliography, then translating the images into a physical display, featured in the archives during Fall 2019. A digital component of the exhibit is posted on the archives blog. These exhibits focus on images, rather than text, as many rare medical books are in languages other than English. This project is an example of how archival collections transcend disciplines, including medicine, art, history, and more. The goal of this exhibit was to display this interdisciplinarity, increase visibility of the collection, and inspire other students to research medical topics featured in these exhibits.

# Erin McIntosh

Faculty Mentors: Jon Jeffries & Matt Ruen, University Library

## Open Access Advocacy, for All

Open Access is not just the distribution of journal articles and scholarly information that's free of barriers. It's an issue of income inequality, paywalls, supplemental course material, and research impact beyond the university. Open Access has not been thoroughly discussed throughout all members of the university. This project takes a look at the conversations going on at the university levels through the perspectives of students, teaching faculty, and library faculty. Through this research, it became apparent that the value of Open Access advocacy is multifaceted, interdisciplinary and benefits from advocacy across all levels of the university. This essay is broken up into two sections. The first is a collection of talking points, used for advocacy across audiences, while the second is an analysis of those points using scholarly articles. These advocacy points are to be used to facilitate conversation throughout members of the university to promote Open Access policy.

# 2019 McNair Scholars

## Jessica Avalos

Faculty Mentor: Alexandra Locher, Biology

The effects of hemlock woolly adelgid and imidacloprid on the abundance and diversity of ectomycorrhizal fungi of eastern hemlock

Invasive insects like hemlock woolly adelgid (HWA) may compromise belowground functionality of infested hosts. Studies show that HWA affects belowground functionality of hemlocks by reducing ectomycorrhizal fungal associations (ECM). ECM benefit hemlock hosts by expanding the root system and increasing resource uptake. Defoliation from HWA herbivory halts photosynthate production, reducing ECM food supplies. To combat this, forest managers treat with the insecticide imidacloprid. Limited research exists on how imidacloprid may affect ECM colonies. This study aims to determine if imidacloprid affects ECM colonies. PCR amplification and Sanger sequencing will be used to compare the ECM community structure of treated hemlock trees, untreated healthy trees, and untreated infested trees. Results will reveal whether fungal communities diminish in the presence of imidacloprid treatments. It is hypothesized that ECM colonies decline in the presence of imidacloprid-treated hemlocks.

## Helen Bahlbi

Faculty Mentor: Matthew Hart, Chemistry

### Synthesis and Structure-Activity Relationship Study of Novel Nitrodiphenylurea Antibiotics

According to the World Health Organization, tuberculosis (TB) is the leading cause of death by infectious disease. Tuberculosis is caused by the bacteria *Mycobacterium tuberculosis* and occurs globally. Additionally, in 2017, TB was reported in all 50 states. Due to the scope of TB, strict observation of patients is required to ensure adherence to the current drug regimen. However, most reported cases are in developing countries where proper care is difficult. With the emergence of multidrug-resistant TB exhibiting resistance to current treatments, novel antibiotics are needed urgently. Recently, our lab discovered a family of diphenyl ureas that exhibit antimicrobial activity against several bacterial strains, including *Mycobacterium*. Based on our lab's previous results, we have synthesized several diphenyl urea derivatives to examine their structure-activity relationship. Herein, we report the synthesis of the diphenyl ureas with varying nitro positions, chain lengths, and R-groups.

# Kyezie Bwanangela

Faculty Mentors: David Eick, Modern Languages and Literatures & Tonisha Jones, Criminal Justice

## Jaucourt's contribution to 18th century ideas about crime and punishment

During the Enlightenment, many important philosophers contributed ideas on the topic of crime and punishment in Europe, including Beccaria, Bentham, Voltaire, and Montesquieu; however, one scholar who has not received recognition but should is Chevalier Louis de Jaucourt and most of his work is displayed in the *Encyclopédie*. The *Encyclopédie* was created to change the common way of thinking through the expansion of knowledge and the development of critical modes of thought. This study will examine Jaucourt's contribution to the topic of crime and punishment which matches that of currently recognized philosophers, but also furthering their ideas and contributing original concepts deserves to be brought to the same valuation.

# Gabriella Davis

Faculty Mentor: Regis Fox, English

## Ecuador is Black: Afro-Ecuadorian Literary Resistance in *Drums Under My Skin*

The transcendent space of Black Ecuadorian literature has the power to rewrite narratives that have erased Black Ecuadorians from history or that have constructed their existence as hypersexual, villainous or invisible. However, by telling their own stories Black Ecuadorian authors not only place Blackness into the Ecuadorian national narrative. They make their existence the center of everything. In *Bajo la piel de los tambores* (*Drums Under My Skin*) Afro-descended writer Luz Argentina Chiriboga writes of Rebeca, a mulata teenager struggling to accept her Black roots while spilt between the ideological "mestizo" space of Quito and her mostly Black hometown of Esmeraldas. Through analysis of Rebeca's journey, I contend that although Rebeca suffers sexual and racial abuse from white Ecuadorian people, she ultimately rejects Ecuadorian racist sexism as her sole reality by accepting her physical body as a historical memory of Black resistance.

# Caitlan DeVries

Faculty Mentor: Glenn Valdez, Psychology

Sex Differences in CRF<sub>2</sub> Receptor Regulation of Anxiety-like Responses Following Long-Term Alcohol Withdrawal  
Corticotropin-releasing factor (CRF) is one of the main regulators of anxiety during ethanol withdrawal, with CRF<sub>2</sub> receptor activation alleviating stress responses. Urocortin 3 (Ucn 3) selectively activates CRF<sub>2</sub> receptors and reduces anxiety-like behavior during acute alcohol withdrawal and potentially following protracted abstinence. Prior research suggests that sex differences may also influence alcohol withdrawal. The current study sought to investigate the role of sex differences in CRF<sub>2</sub> receptor regulation in anxiety-like behaviors following protracted abstinence from ethanol. Female and male Wistar rats were fed a liquid diet for four weeks and then assessed for physical withdrawal upon removal of the diet. Five weeks later, rats were injected with Ucn 3 or vehicle before being tested in the elevated plus maze. We hypothesize that female Wistar rats will have higher anxiety-like behaviors than their male counterparts and that this effect will be mediated by Ucn 3 administration.

# Trevor Ditmar

Faculty Mentors: Babasola Fateye, BMS &  
Adedipupo King, BMS

Examining the Effect of a Hypothetical Safe Injection Facility on HIV and HCV Transmission Rates in Kent County, Michigan  
Previous literature has established that increases in prescription opioid misuse has resulted in similar increases in injection drug use (IDU), collectively referred to as the “opioid epidemic” in the US. Due to this surge in IDU, incidence of Hepatitis C (HCV) and Human Immunodeficiency Virus (HIV) are on the rise in many regions. Research conducted in Canada and elsewhere has supported the use of Safe Injection Facilities (SIFs) and Syringe Service Programs (SSPs) to abate disease incidence, but only SSPs are operating in the US despite SIFs having been in use in nearby Canada for several decades. As little research has been conducted in the US about where SIFs could be of benefit, we employ an analytical model to estimate the value of a hypothetical SIF in Kent County, Michigan using local surveillance data. Preliminary results of adding such a facility was found to reduce HCV by 7 cases / year, and in addition may decrease HIV incidence by 5% in the West Michigan area.

# Jose Garcia

Faculty Mentor: Taylor Short, Mathematics

## Automated Conjecture Making: Domination on Planar Graphs

A planar graph  $G = (V, E)$  is a graph that can be embedded in the plane, i.e. it can be drawn in the plane so that no edges intersect except at the vertices. A subset  $S$  of vertices in a graph  $G$  is called a dominating set if every vertex  $v \in V$  is either an element of  $S$  or is adjacent to an element of  $S$ . The domination number of a graph  $G$  is the smallest cardinality of a dominating set; we denote the domination number as  $\gamma(G)$ . Automated conjecture making is the process of having a computer generate conjectures. We investigate the domination number of planar graphs with the use of the automated conjecture making.

# Kendra Garcia

Faculty Mentors: David Stark, History & Mayra Fortes Gonzalez, MLL

## What is Masculinity? Identity Formation through Mexican Machismo and Homophobia

The study begins around 1900, which signaled a cultural change regarding homosexuality and homosocial relations among men in Mexico. The year 1901 marks a monumental moment with Los 41, a group of twenty-two men arrested for cross-dressing. Demonstrating a shift in thinking, it is the most discussed event related to sexuality or gender non-conformity in Mexican history. The Revolution resulted in the exaltation of masculinity with revolutionary figures as prototypes for Mexican identity. Homophobia and the notion of all actions within Mexico being gendered were thus pushed to the forefront. Utilizing textual analysis, the study examines constructions of masculinity and homophobia to create a unified national identity. The central questions are the following: how did societal norms of masculinity evolve during the Porfiriato and after the Revolution? How has machismo and homophobia become central to the formation of identity and how did men subvert, or attempt to challenge these norms?

# Jessalyn Gonzalez

Faculty Mentor: Tara Kneeshaw, Geology

## Hydrogeochemical Investigation of Native Wild Rice Habitat in Southwest Michigan

The Hultmark Preserve, a wetland in Van Buren County, Michigan, is a unique geomorphic location providing habitat for Great Lakes native wild rice (*Zizania aquatica*). It serves as a setting to evaluate the hydrogeochemistry of a relatively pristine ecosystem housing native species. Since wild rice is a resource with deep spiritual ties to Native American tribes, there is interest in understanding the *in situ* conditions vital for survival of such native habitats. A delineation of the site, which included map construction and evaluation of the wetland's geomorphology, including sediment lithology and organic matter, was completed. Hydrogeochemical characterization of the wetland included regular monitoring of surface water and porewater pH, conductivity, redox potential, dissolved oxygen, and major ions. Results indicate the wetland is overall anoxic and dominantly sulfate-reducing. These parameters were also used to determine recharge source, groundwater or precipitation-fed.

# Lavar Green-Jackson

Faculty Mentor: Glenn Valdez, Psychology

## Sex Differences in CRF2 Receptor Regulation of Depressive-Like Behavior During Protracted Ethanol Withdrawal

Alcoholism is the third-leading preventable cause of death in the U.S. While certain medications treat alcoholism, there are none that reduce depressive symptoms experienced following long-term withdrawal. This study seeks to understand why individuals experience depression during alcohol withdrawal, which often leads to relapse. In our experiment, we examined the CRF2 receptor's ability to alleviate depressive-like behaviors following long-term alcohol withdrawal by investigating the ability of Urocortin 3 (Ucn 3), which selectively activates CRF2 receptors, to reverse immobility in an animal model of depression. We found that animals injected with Ucn 3 display less immobility compared to rats injected with the placebo. Currently we are investigating sex differences in CRF2 receptor activity and its relation to alcohol relapse. After analyzing our results, we hope to find a treatment for humans experiencing depression following long-term alcohol withdrawal.

# Nicholas Layman

Faculty Mentor: Feryal Alayont, Mathematics

## Non-attacking Queen and Rook Placements

In 1848, Max Bezel introduced the problem of placing 8 queens on an  $8 \times 8$  chess board so that none of the queens could attack each other. One generalization of this — the placement of  $n$  non-attacking queens on an  $n \times n$  chess board — is the famous  $n$ -queens problem. A different but similar problem is that of placing non-attacking rooks on a generalized chess board which has connections to restricted permutations and has more general solutions known as compared to its queen counterpart. In this paper, we investigate the intersection of these two problems — placing  $n$  pieces (either queens or rooks) on an  $n \times n$  board.

# Christian Miller

Faculty Mentor: Darren Parker, Mathematics

## Winnability for the Group Labeling Lights Out Game

The game Lights Out consists of a  $5 \times 5$  grid of buttons that have two states, on and off. Pushing a button will cause the pushed button and all adjacent buttons to change their states. We can also represent these states with a number label, either 1 if the button is on or a 0 if it's off. The game's goal is to "turn off" all the lights by getting all the buttons to have a label of 0. The game's rules and setup lend itself well to a graph theory representation, with buttons being represented as labeled vertices of a graph. Because this game is not always winnable on an arbitrary graph, we are interested in looking at the winnability of this game. This research will be focused on a slightly modified version of the game's original rules, with the vertices' labels coming from the group  $\mathbb{Z}_n$ . We will investigate the values of  $n$  for which this group labeling Lights Out game is always winnable when played on various families of graphs, including complete bipartite graphs.



# Alexander Perez

Faculty Mentor: Eric Ramsson, Biomedical Sciences

## Characterization of Dopamine Neurotransmission in SN4741 Cells

Neuronal degeneration of dopamine (DA) neurons within the substantia nigra (SN) results in the development of Parkinson's disease that presents both motor and non-motor symptoms. To counter this neuronal degeneration, research has focused on identifying genetic pathways contributing to DA neurogenesis and neural protection. This endeavor has led to the creation of a clonal DA neuron progenitor cell line SN4741. SN4741 has demonstrated close resemblance to mature SN DA neurons following morphological and phenotypic differentiation making these cells an ideal model for studying Parkinson's. Unfortunately, the use of SN4741 presents an issue in that DA neurotransmission is not fully understood as studies have yet to quantify DA concentrations as neurotransmission occurs. In an effort to address this limitation, our study utilizes constant potential amperometry in tandem with well-documented pharmacological measures to further characterize DA neurotransmission in real time.

# Alyssa Piechocki

Faculty Mentor: Gwyn Madden, Anthropology

## Age Estimation of Adult Remains in Forensic and Bioarchaeological Contexts

In forensic and bioarchaeological cases, many techniques generate an age-at-death estimation from the skeletal remains of an individual. Some techniques can be destructive to the remains or have significantly larger margins of error and are not ideal. One non-destructive aging method being explored relies on digital x-ray images of the teeth. From these images, an area measurement of the tooth's pulp chamber and the entire tooth is recorded as a ratio. Age can be calculated based on the rate of dentin accumulation in the pulp chamber. The purpose of this research is to assess the validity of this method using single-root teeth on a skeletal collection housed at Khon Kaen University in Khon Kaen, Thailand. Digital x-ray images will be taken of the teeth both loose and in-situ of 100 adult individuals: 50 males and 50 females. The pulp to tooth area ratio (PTR) data and inter- and intra-observer error will then be analyzed for significance using statistical analysis with SPSS.

# Hannah Pierson

Faculty Mentor: Jennifer Stewart, Sociology

## Social Movements: An Analysis of the Youth Climate Strike

Youth dominated social movements have been important agents of social change. From the Civil Rights Movement and Anti-Apartheid to March for Our Lives and Friday's for Future. These organizations have covered many bases and involved themselves in activism for change. This research project is designed to understand and apply a social movement framework to a specific organization. Therefore, the goal is to determine if The Youth Climate Strike (TYCS) organization is, in fact, a social movement. If TYCS is a social movement then what are the possible effects this organization can have? Alternatively, if this organization is not a social movement then how can it become one? With these questions in mind, identifying this organization as a social movement or a potential social movement can educate other organizations on how to do so, while also aiding in drawing attention to this group.

# Violet Ruiz

Faculty Mentor: Brad Wallar, Chemistry

Structural and functional characterization of new clinically relevant enzymes involved in antibiotic resistance.

The rise of antibiotic resistance is a global health threat requiring development of novel treatments.  $\beta$ -lactamase enzymes found in many multi-drug resistant bacteria contribute to resistance of  $\beta$ -lactam antibiotics. The enzyme cleaves the  $\beta$ -lactam ring, preventing the drug from reaching its cellular target. A class of  $\beta$ -lactamases, *Acinetobacter*-derived cephalosporinases (ADCs) are found in the multi-drug resistant bacteria *Acinetobacter baumannii*. Specific ADCs were selected from a group of antibiotic-resistant infections. With no known structures of these newly identified ADCs, it is key to discern how minor differences in sequences between ADCs contribute to drug resistance. In this project, structural and kinetics characterization of ADCs will aim to develop a relationship on how small structural variations can affect the enzyme's ability to bind and destroy antibiotics. These results will help identify potential inhibitors against enzymes that contribute to antibiotic resistance.

# Amarri Smallwood

Faculty Mentor: Ayana Weekly, Women, Gender, and Sexuality Studies

## Invisible No More: Black Women and Violence in the Reconstruction Era.

The Reconstruction Era spanning from 1863-1877 was a tumultuous time, viewed as one of the most violent historical periods in the United States. This era was significant because White Supremacist wanted to maintain economic and political superiority over newly freed slaves. Racialized and gendered violence endured by Black men and the development of White Supremacist organizations became the focus of historical research on the Reconstruction. With scholarship focusing on men as both perpetrators and victims of violence Black women had their experiences with violence ignored as a result. This research is a textual analysis that examines newspaper articles from the New York Times during the Reconstruction Era and analyzes the disproportionate reporting of the murder of Black women in comparison to White women. Additionally, it explores the racialized and gendered messages portrayed within the newspapers.

# Austin VanDenTop

Faculty Mentor: Matthew Christians, Cell and Molecular Biology

## Exploring an alternative role for the COP9

### Signalosome in the ethylene response pathway

The gaseous phytohormone ethylene regulates various responses in almost all developmental stages of all plant species. A key regulator in the signal transduction pathway is Ethylene Insensitive 2 (EIN2). EIN2 is cleaved by an unknown protease upon ethylene signaling, after which, the C-terminus of EIN2 translocates away from the ER to alter gene expression. Previous work suggests the protease complex COP9 Signalosome (CSN) plays a role in ethylene signaling. This study hypothesizes that the CSN is responsible for the cleavage of EIN2. Comparing the amount of cleaved EIN2 under conditions of CSN inhibition will demonstrate if the CSN is responsible for cleavage of EIN2. Western blots were used to detect cleaved EIN2 and will be used on CSN mutants generated in our lab. Additionally, we plan to visualize EIN2 cleavage by confocal microscopy. The localization of GFP-tagged EIN2 will show the amount of cleaved EIN2 and can be viewed under the effects of CSN mutants or inhibitors.

# Jazmine Vasquez

Faculty Mentors: Derek Thomas & Ian Cleary,  
Biomedical Sciences

Analyzing the role of a protein downregulated early after induction of filamentous growth in *Candida albicans*

*Candida albicans* is a commensal fungus, normally living with its human host, however, it has the ability to cause invasive infection. *Candida albicans* is the fourth most frequent nosocomial infection affecting a vulnerable immunocompromised population. *Candida albicans* exhibits different morphologies including yeast, pseudohyphae, and hyphae. The varying morphological potential of this organism is a virulence trait. Because of this, research has focused on what drives activation of hyphal formation as well as what impedes it. During a filamentation assay, a novel observation pertaining to a subgroup of proteins being downregulated early after germination, was made. In this study, we constructed an over-expression strain of one of these proteins and have used known hypha inducing media to determine if it will have an impact on filamentation. With the conditions tested thus far, no significant impacts on morphology have been observed.

# Richard Vegh

Faculty Mentors: Dan Brown, English & Michael  
Wroblewski, Anthropology

Dialogue, Discourse, & Dragons

In recent years, popular tabletop role-playing games (TRPGs) such as Dungeons & Dragons (D&D) have undergone shifts in their rules and in the demographics of who plays them. This ethnographic study investigates player involvement in TRPGs through conversation, critical discourse, and frame analysis, drawing on dialogism and intertextuality, to explore how participants with a range of identities view and negotiate gender, sexuality, and representation in TRPGs. Four groups of gamers were audio-recorded during gaming sessions over four weeks, then interviewed individually and collectively. Questions centered on motivations for playing, meanings attributed to discourse in and around the game, and how players engage with politics, morality, sexuality, and gender identity. A framework mapping player motivations to the moral and social orders discursively constructed by groups was developed to explain and contextualize differences in meaning and involvement players experience in TRPGs.

# 2019 REACH Scholars

## Maria Sanchez-Rodriguez

Faculty Mentor: Christine Smith, Psychology

### Policing the Boundaries Around Race and Gender

Growing acceptance of transgender identities in the absence of parallel shifts regarding race can be perceived as somewhat paradoxical, especially in light of how differently each construct is imagined to be rooted in biology. Perceptions of race and gender as alterable aspects of identity were explored using four identity transition scenarios. Participants' beliefs about identity transitions were dependent upon both the type of transition and political ideology. Results indicate that identity transitions involving gender (both male to female and female to male) and one race transition (white to black) were perceived similarly whereas the black to white transition was perceived as relatively less plausible. Coded rationales suggest that gender identity is more frequently perceived as driven by choice relative to racial identity. Participants' political ideology was associated with their acceptance of identity transitions.

# 2019 Student Summer Scholars

## Piper Burghdudf

Faculty Mentor: Matthew Hart, Chemistry

### The Synthesis of Novel Diphenyl Ureas

In 2017, the World Health Organization reported that 10 million people were infected with tuberculosis, 1.6 million of which died. Tuberculosis is caused by a bacterium called *Mycobacterium tuberculosis*, which primarily infects an individual's lungs. Unfortunately, failure to adhere to the long and arduous drug regimen has rendered many of the current medications ineffective and has led to drug-resistant strains of *M. tuberculosis*; therefore, the need for novel antibiotics is imperative to saving millions of lives. Our lab has recently developed a family of diphenyl ureas that exhibited increased antimicrobial activity toward *Mycobacterium*. Initial studies indicate that increasing the ester chain length increases the activity. By building on our lab's previous results, we hope to synthesize similar compounds that are potent antibiotics against *M. tuberculosis*. Herein, we report the synthesis of a variety of diphenyl ureas with varying ester chain lengths and aromatic substituents.

## Nick Busby (Stiner Scholar)

Faculty Mentor: Louis Moore, History

### “What’s Happen’n Brother”: Analysis of Detroit’s Revolutionary Black Auto Workers and the Vietnam War

The decade of the 1960s was pivotal in Detroit's history. At a time when people struggled against imperialism and racism, Detroit's Black community was especially cognizant of their role in this struggle. Based on extensive archival research findings, Detroit's Black community intensely opposed racism and oppression, and Black auto workers were at the vanguard of this struggle within Detroit. These workers had strong reactions to the Vietnam War. The *Inner City Voice* and the League of Revolutionary Black Workers were militant groups in Detroit's Black community during the Vietnam War. The politics and ideals of these Black groups were aligned with the North Vietnamese as both vehemently detested imperialism, capitalism, racism, and oppression. These organizations opposed America's involvement in the war on numerous grounds, but most important was their affinity with the Vietnamese people based on ideals, economic philosophies, and a perceived common enemy: the American Government.

# Evangelene Dreyer

Faculty Mentor: Richard Vallery, Physics

## Connecting the Nano and the Macro: A Study of Pore Structure in Carbon Black Nanocomposites

Positronium Annihilation Lifetime Spectroscopy (or PALS) uses the lifetime of the bound state of the electron and its antiparticle the positron (positronium) to determine the pore size, a nanoscale property. By measuring the evolution of pore size as a function of temperature one can determine the phase. Additionally, a macroscopic property called Young's Modulus affects how much the sample is capable of stretching when a known force is applied. Thus, by measuring the pore size and Young's Modulus, it is possible to gain a better understanding of how alterations at the microscopic level (pore size) affect the macroscopic properties (Young's modulus) of carbon filled PDMS polymers. For this study, Young's modulus and pore size will be systematically measured in samples where (1) the particle size is held constant and fraction of particle (relative to the polymer) is increased and (2) where the volume of the sample occupied by the particles is constant but the particle size is changed.

# Micah Fernando (Ott-Stiner Scholar)

Faculty Mentor: Brad Wallar, Chemistry

## Structural and functional characterization of new clinically relevant enzymes involved in antibiotic resistance

Resistance to  $\beta$ -lactam drugs, such as penicillins and cephalosporins, has become a worldwide health problem. The World Health Organization has listed multi-drug resistant *Acinetobacter baumannii* as requiring "top priority for new antibiotic development." Such antibiotic resistance derives primarily from  $\beta$ -lactamases, including *Acinetobacter*-derived cephalosporinase (ADC), which bind and destroy antibiotics. A recent study of clinical *Acinetobacter baumannii* infections identified the most prevalent ADC  $\beta$ -lactamases conveying antibiotic resistance. This research study seeks to determine the structure and function of two clinical ADC variants: ADC-30 and ADC-162. By using X-ray crystallography and enzyme kinetics, we aim to relate the small changes in structure to their enhanced ability to turn over antibiotics. Characterizing the structure and function of clinical ADC variants will be critical to developing molecules that could inhibit ADCs, thereby restoring antibiotic effectiveness.

# Alex Florian (Stiner Scholar)

Faculty Mentor: Charlyn Partridge, AWRI

Alternative reproductive tactics in invasive round goby (*Neogobius melanostomus*): How fish increase fitness by doing less

Understanding the reproductive biology of invasive species is an important step in managing populations. Yet, little is known about the reproductive strategies of invasive round goby (*Neogobius melanostomus*) in Lake Michigan. For round goby, fertilization occurs externally in nests guarded by large males. However, some males pursue alternative reproductive tactics (ARTs), where males sneak into a larger male's nest and fertilize a portion of the eggs. We investigated if the proportion of ARTs varies between sites and how that affects population dynamics of round goby. We caught 265 fish from 4 lakes along Eastern Lake Michigan. We measured their color, morphology, gonad traits to determine each male's reproductive type. Preliminary results suggests ARTs represent at least 20% of reproductive round goby males, and that this proportion doesn't vary between sites. This research allows us to more accurately model how ARTs impact population growth of this invasive species.

# Brady Fritz

Faculty Mentor: Norma Ortiz-Robinson, Mathematics

## Optimal Control applied to Cancer Vaccine Protocols

In our poster, we will report on the optimization of a mathematical model for a specific cancer vaccine. Using the Sparse Optimization Suite, we found a close approximation of the optimal numerical solution, which will be our main focus in the poster. We will also present on the software itself, and some of the aspects involved in programming for it. The mathematical model describing our problem involves time delays, which complicates the optimization process. Lastly, we will provide an analysis of the solutions obtained through this software, and discuss their significance.



# Lauren Gapp

Faculty Mentor: Cynthia Thompson, Biomedical Sciences

The effect of nocturnal competitors on common marmoset monkey (*Callithrix jacchus*) feeding behavior

Marmoset monkeys obtain food by gouging holes in trees to stimulate exudate secretion. Although marmosets are among few mammalian species who consume exudate, there is limited evidence they may face competition from nocturnal foragers. We studied wild common marmoset monkeys (*Callithrix jacchus*) at Tapacurá Field Station in Brazil and used camera traps to monitor visits at exudate feeding sites. We assessed revisitation rates and latency between feeding visits to identify if marmosets changed their feeding behavior in the presence of nocturnal foragers. Marmosets had higher revisitation rates for feeding sites that shared nocturnal foragers compared to sites that did not. Marmoset exudate consumption varied among sites, with shared site having higher baseline exudate production. This provides some evidence that the presence of nocturnal foragers may generate behavioral modifications in marmoset feeding, although high volumes of renewable food may reduce negative effects of competition.

# Lauren Gerritsen

Faculty Mentor: Martin Burg, Biomedical Sciences

Determining the mechanism of histamine's action in the post-mating response of *Drosophila* females

The male fly's accessory gland's function is analogous to the human prostate in that it contributes to sperm viability and induction of female post mating responses (PMRs). The function of the *D. melanogaster* accessory gland requires specific genes to be active in the gland's secondary cells for induction of PMRs. Histamine was localized to the secondary cells of the accessory gland recently. A lack of histamine within male secondary cells, caused by a mutation in the *Hdc* gene, decreases egg laying and female rejection of male courtship advances, two well-studied PMRs. Current studies are using ort males, which have a mutation that disrupts the receptor for histamine. Preliminary results indicate that male ort mutants fail to induce female egg laying behavior, similar to what occurs in *Hdc* males. Additional female PMRs, such as sperm viability and male rejection, are still under study. These results suggest that histamine signaling in the male is necessary for induction of female PMRs.

# T Hill

Faculty Mentor: Marilyn Preston, Liberal Studies

## L'dor V'dor: Muskegon Jewish History and Culture

The L'dor V'dor Project involves the creation of a public exhibit documenting the history of Jews in Muskegon, Michigan through the members of Temple B'nai Israel. The purpose of this exhibit is to educate the community about Jewish history and life in West Michigan in an effort to spread awareness and understanding of diverse populations in an increasingly antisemitic society. This project involved collaboration between temple members, Museum staff, and GVSU faculty and students. Using interview data, as well as multiple dialogues and conversations with stakeholders, several themes were identified that will be used in the exhibit to meet the goals. These themes are: Holidays, Ritual, Identity, Tradition, and Tikkun Olam (healing the world). The exhibit not only tells an intimate story of the congregation but is also appropriate for various learning levels, accessible, interactive, and immersive. The design will be implemented at The Lakeshore Museum of Muskegon in fall of 2020.

# Julia Jesko

Faculty Mentor: Dave Eaton, History

## Citizenship through Conversion: Catholic Marriage in Senegal's Communes, 1870-1897

Until recently, scholarly interest in African history concentrated on politics or economics, ignoring the lives of many Africans, especially those of women. Senegal, situated in West Africa, was no exception. However, the colonial archives in Dakar contain letters, court cases, and other materials that, if properly analyzed, reveal how ordinary people grappled with the new administrative landscape created by 19th century French colonialism. One well-documented colonial court case focuses on two Catholic African foreigners in the coastal city of Saint-Louis named Michel Moussa Sow and Marie Sagna. Their efforts to naturalize into a Commune city, a necessity before they could be legitimately married, offer valuable insights into the impact of the colonial state on everyday people in colonial Senegal.

# Jeannie Kane

Faculty Mentor: Babasola Fateye, Biomedical Sciences

## Toxicity evaluation of plastics immersed in Muskegon Lake

As a result of the mass production of plastics, aquatic ecosystems are becoming highly polluted with microplastic contaminants. Little is known about the toxicants associated with micro-level plastics, therefore results from this study will give insight on their physicochemical properties and the way they effect biological systems. Polyethylene, polystyrene, and polypropylene microplastics were immersed in Muskegon Lake in benthic and pelagic regions at different locations. Samples were collected after 3 months and the associated biofilm eluted. Bioassays were conducted using *Caenorhabditis elegans* as a model organism. Ten synchronized L1 staged worms were exposed to the biofilm in a 96 well microliter plate and incubated at 20°C for 72 hours. Two columns received a dose of EDTA or sodium thiosulfate. Results implicate the role of metals in toxicity because the addition of EDTA increased growth and survival.

# Grayson Kosak

Faculty Mentor: Eric Snyder, Biology

## Competition-induced changes in diet, behavior, and physiology in Brook Trout (*Salvelinus fontinalis*)

Since the late 19th century, naturalized populations of Brown Trout (*Salmo trutta*) have been competing with native populations of Brook Trout (*Salvelinus fontinalis*) for habitat and food resources in Michigan streams. We investigated changes in the diet, behavior, and physiology of Brook Trout as a result of competition with Brown Trout by comparing an isolated population of Brook Trout in Frost Creek and a population of Brook Trout living in sympatry with Brown Trout in Cedar Creek, Michigan. A controlled in-stream enclosure experiment was used to measure and observe feeding and resting behaviors, metabolic respiration, blood cortisol levels, and fitness metrics of brook trout in isolation vs. in competition with brown trout. Diet breadth and electivity of Brook Trout was determined based on collected stomach contents. Behavior, physiological stresses, and fitness metrics were deduced from observations and measurements obtained from both the wild and in-stream enclosures.

# Curtis Mack

Faculty Mentors: Ian Cleary & Derek Thomas,  
Biomedical Sciences

Testing the ancestral function of divergent *Candida albicans* virulence-associated proteins via expression in *Saccharomyces cerevisiae* mutants  
*Candida albicans* is an opportunistic fungal pathogen and a member of the normal human microbiota. It is closely related to the harmless fungus, *Saccharomyces cerevisiae*. Some genes associated with the virulent nature of *C. albicans* are similar to genes in *S. cerevisiae*. Three of these genes, *PHO13*, *NRG1*, and *TUP1* are known to repress the change from yeast to filamentous growth in *C. albicans*, an important virulence trait. However, similar genes in *S. cerevisiae* are known to have functional differences. Our goal was to see if the ancestral function of these genes have drifted apart by examining the expression of *C. albicans* genes in *S. cerevisiae* mutants. This will lead us to know more about the regulatory mechanisms of *C. albicans*. We have successfully constructed *S. cerevisiae* strains expressing *C. albicans* genes and are now in the process of testing phenotypic differences.

# Karissa McFarlane

Faculty Mentor: Wil Rankinen, Communication  
Sciences & Disorders

Language regard in Michigan's Upper Peninsula: Perceptual dialectology through the mental maps of nonlinguists  
Folk beliefs and attitudes about language, known as language regard in perceptual dialectology, shape how language is used. As a geographic region and speech community, Michigan's Upper Peninsula (UP) is well positioned to examine language regard due to its immigration history, local pride, and proximity to regional influences. The present study seeks to examine the geographic distribution of the perceived "Finnish-ness," "Yooper-ness," and "Canadian-ness" categories across Michigan's UP. Data was obtained from 92 UP residents. Each participant 1) indicated where they think people speak differently from themselves by circling or outlining specific areas on a Michigan map, and 2) provided a label for each identified region. Responses were extracted, compiled, and analyzed using ArcGIS. This study reveals that "Finnish-ness" and "Yooper-ness" are focused on the northwestern regions of the UP, while "Canadian-ness" shows variation with a loose focus on the eastern UP.

# Lauren Miling

Faculty Mentor: R. Marshall Werner, Chemistry

Progress towards a snake venom Metalloproteinase inhibitor that is bacterially expressed derived from the North American opossum (*D. virginiana*)

Numerous mammalian species, including the mongoose, hedgehog, and opossum appear to be resistant to a variety of snake venoms. Often this resistance is conferred by an endogenous protein. One such protein, oprin/DM43, has previously been identified in the N. American opossum (*Didelphius virginiana*) and several South American opossum species as a snake venom metalloproteinase inhibitor (SVMPI). This work presents our efforts to insert the oprin gene into the bacterial expression vector pET28 using Gibson assembly in order to over-express and purify this protein. This recombinant protein contains a 6xHis-tag at the C-terminus to assist in purification. The pET28-oprin construct can be successfully used to express the oprin/DM43 protein, and data is presented assessing this protein's inhibitory effect on snake venom.

# Tanner Napierala, MS3

Faculty Mentor: Ruijie Liu, Biomedical Sciences

Protective role of active ERK1/2 in DUSP6/8 null mice does not involve cell death pathway

Previous studies have shown the cardio-protective benefit of an increase in extracellular signal regulated Kinase 1 and 2 (ERK1/2) activity by knocking out the dual-specificity MAPK phosphatases (DUSPs) that regulate ERK1/2 phosphorylation in mice. Other studies have demonstrated that mitochondria targeting of ERK1/2 protects cells from death by altering the expression levels of the mitochondrial proteins Bax and BCL-2. In this study, genetically modified mice with knockouts of both the DUSP6 and DUSP8 genes (DKO) were used to study whether increased ERK1/2 phosphorylation in DKO mice changes the expression of these proteins. We found out the increase in ERK1/2 phosphorylation mainly stayed in cytoplasm, with no obvious changes in mitochondria or expression levels of BCL-2 and Bax. Our mouse model demonstrates that increased phosphorylation of ERK1/2 plays a protective role through their unidentified cytosolic function without influencing mitochondria-mediated cell death pathway.

# Maxwell Okros, MS3

Faculty Mentor: Merritt DeLano-Taylor, Biomedical Sciences

Cyclic AMP dependent protein kinase regulation of *Nato3*

induction of dopamine neuron gene expression

*Nato3* has been shown to be necessary for normal dopamine neurogenesis in vivo but it is not known if *Nato3* is sufficient to drive dopamine neurogenesis. Others have shown *Nato3* can induce *Sonic hedgehog* and *Nurr1* mRNA expression in the immortalized mouse midbrain cell line SN4741. However it is not known if other factors such as phosphorylation may regulate the magnitude or number of dopaminergic genes induced by *Nato3*. In this study we test if the presence of the catalytic subunit of cAMP dependent protein kinase can promote the effect of *Nato3* expression of dopaminergic genes.

# Erin Reasoner (Schroeder Fellow)

Faculty Mentor: Shkelzen Shabani, Biomedical Sciences

Investigating the role of dopamine D2 receptor in the aversive effects of methamphetamine

Innate avidity for methamphetamine (MA) use is influenced by sensitivity to its rewarding and aversive effects. MA induces these effects through release of the neurotransmitter dopamine, stimulating dopamine D2 receptors (D2R). Little is known about the contribution of D2R to MA-induced motivational effects. In this study, we investigate motivational effects of D2R activation by using mice selectively bred for low MA drinking (MALDR) and high MA drinking (MAHDR). In a condition place preference (CPP) procedure, quinpirole, a D2R agonist, was paired with specific environmental cues; mice were later tested for cue preference. In both lines, quinpirole induced significant aversion (CPA). MALDR mice alone demonstrated significant hypermotility in a drug-free CPP test. In a drug-present CPP test, both lines show significant hypomotility. Overall, our findings indicate that D2R plays a central role in the aversive effects of MA and is a potential therapeutic target for curbing MA intake.

# Anna Tarach, Ott-Stiner Scholar

Faculty Mentor: Scott Thorgaard, Chemistry

## Effect of Bacterium Redox Activity on Current

### Transients in Single Bacteria–Electrode Collisions

Electrochemical bacteria collision experiments were performed using the previously untested redox mediator N,N,N',N'-tetramethyl-p-phenylenediamine (TMPD). Increasing current transients were observed during bacteria collisions at an ultramicroelectrode(UME) where TMPD was oxidized to TMPD<sub>2</sub><sup>+</sup>, suggesting that the bacteria reduce TMPD<sub>2</sub><sup>+</sup> to TMPD<sup>+</sup>, which is oxidized again at the UME. *L. lactis* and *S. saprophyticus* had significantly different increasing transient heights, indicating that this method may be used to discriminate between bacteria species on the basis of bacterial redox activity. To our knowledge, this is the first time such an effect has been measured at the single bacterium level. Fluorescence microscopy revealed that bacteria approach the UME with trajectories which reverse upon reversal of the current sign. This suggests that competition between electrophoresis and electroosmotic flow affects transport of bacteria to the UME, as well as whether they adsorb to the surface.

# Jack Tietema, Koeze Fellow

Faculty Mentor: David Geenen, Physician Assistant Studies

## Early Cell-Cell Coupling Impairs Stem Cell Retention when Co-cultured with Hypoxic Cardiomyocytes

**Rationale:** Bone marrow-derived mesenchymal stem cells (BM-MSC) induce beneficial effects in the heart following hypoxia but loss of these cells would diminish their effect. We hypothesized that coupling between BM-MSC and cardiomyocytes (CM) through gap junctions (GJ) during hypoxia may play an important role in stem cell retention. **Methods and Results:** Both human and murine BM-MSC express connexin43 (Cx43), a critical protein in the formation of GJ. FACS analysis revealed that BM-MSC exhibited a significant reduction in apoptosis (3-5 fold;  $p < 0.05$ ) in co-culture with hypoxic CM and the presence of a GJ inhibitor compared to hypoxic co-cultures in which the inhibitor was not present. **Conclusion:** Stem cell loss following co-culture with hypoxic CM represents a novel GJ-mediated mechanism that can be attenuated by inhibiting GJ formation. Furthermore, the expression of Cx43 in human BM-MSC suggests that GJ may also be an important target in the efficacy of cell therapy for humans.

# Maia Wichman

Faculty Mentor: Michael Santana, Mathematics

## Structures within Networks

Networks allow us to model the world around us. Everything from the internet, social media, traffic, human relations can each be represented using networks. As a result, studying networks allow us to better understand the connections that are embedded throughout modern society. However, these networks are typically complex and studying them is not simple. One way we seek to better understand them is to know when and why specific structures arise within them. In this talk we will discuss conditions that guarantee a network contains structures known as “doubly chorded cycles.” In particular, we will discuss our findings on these conditions and how they fit with previous results in this area.

# Brynn Wilfong

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

## The Hidden Cost of Gaycations: An Interdisciplinary Investigation of Queer Cross-Class Contact in Rural Resort Towns

This paper explores the cultural collisions that occur between wealthy urban visitors and queer locals in rural gay resort towns. These towns, which rely on the economic support provided by an annual influx of urban tourists, experience a yearly metronormative colonization of space, the effects of which fail to prioritize the needs of year-round queer residents, thereby alienating them. I will trace the origins and consequences of these class-based ruptures by sharing narratives that illuminate local residents’ experiences of place, queer identity and power dynamics within these spaces, and tourists’ motivations for visiting gay resort towns.





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