Grand Valley State University
Office of Undergraduate Research and Scholarship

# GVSU SUMMER SCHOLARS SHOWCASE

## August 4, 2015

Hager-Lubbers Exhibition Hall, DeVos Center
Grand Rapids, MI
4:00 p.m. - 7:00 p.m.

# Order of Events

## Welcome and Remarks 4:00 P.M. - 4:15 P.M.

Robert Smart, Vice Provost for Research Administration and Executive Director, CSCE

## Oral Presentations by: 4:15 P.M. - 5:00 P.M.

Jordan Cloud • Lindsay Czap • Gabriel Ellis • Sarah Hayes

## Poster Presentations by: 5:15 P.M. - 6:15 P.M.

Alexis Awdziejczyk • Crisol Beliz • Lauren Berry • Matthew Biener • Charles Bradfield • Hunter Brunges • Dionna Cheatham • Kelsie Colley • Emily David • Macy Doster • Darian Farrell • Marie Griffith • Bailey Groendyke • Jennifer Grousd • Amaya Guthrie • Nicholas Huisingh • Marina Ibarra • Talon Kosak • Alex McBride • C'arra Miller • Bikash Mishra • Nathaniel Orndorf • Luke Pardy • Brianna Powell • Kristi Ruvina • Victoria Sanders • Emma Schroder • Lindsey Schroedter • Stacie Stuut • Chela Wallin • Carly Wiersma • Ryan Zahran

## Oral Presentations by: 6:15 P.M. - 7:00 P.M.

Sultan Hubbard • Taylor Lewis • Nikolaus Schroeder • Brandon Wright

# 2015 McNair Scholars

Crisol Beliz
Lauren Berry
Dionna Cheatham
Kelsie Colley
Darian Farrell
Marie Griffith
Amaya Guthrie
Sarah Hayes
Sultan Hubbard
Marina Ibarra
Taylor Lewis
C'arra Miller
Bikash Mishra
Stacie Stuut
Chela Wallin
Brandon Wright

# 2015 Student Summer Scholars

Alexis Awdziejczyk
Matthew Biener
Charles Bradfield
Hunter Brunges
Jordan Cloud
Lindsay Czap
Emily David (MS3 Ott-Stiner Scholar)
Macy Doster (MS3)
Gabriel Ellis
Bailey Groendyke
Jennifer Grousd (Schroeder Fellow)
Nicholas Huisingh
Talon Kosak
Alex McBride
Nathaniel Orndorf
Luke Pardy
Brianna Powell (Koeze Fellow)
Kristi Ruvina
Victoria Sanders (MS3)
Emma Schroder (Ott-Stiner Scholar)
Nikolaus Schroeder
Lindsey Schroedter
Carly Wiersma
Ryan Zahran

# Welcome to the 2015 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 2015 GVSU Summer Scholars Showcase Today, we celebrate the scholarship, research, and creative work of undergraduate scholars in the Student Summer Scholars (S3), Modified Student Summer Scholars (MS3), and McNair Scholar Programs.**

**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.**

**Susan Mendoza, Director, Office of Undergraduate Research and Scholarship**

# Alexis Awdziejczyk

**Faculty Mentors: Jeffery Potteiger, Movement Science and Ross Sherman, Movement Science**

## Impact of Standing on Power Output during Sprint Cycling in Females

Traditionally, the Wingate cycling test of anaerobic power has been administered in a seated position. It has been observed that during a sprint or uphill climb, cyclists tend to rise out of the saddle in an attempt to generate more power. The purpose of this study was to determine if standing up results in increased power output. Ten female athletes performed two Wingate tests, one seated for the entire 30s, and the other seated for the first 15s, then standing for the final 15s. Testing conditions were randomized and separated by at least 3 days. Power output was adjusted for flywheel acceleration and recorded every second using integrated software. A significant difference was found between the two conditions at seconds 15 and 16. The data do not support our hypothesis as we expected to see an increase in power after subjects were allowed to stand. The difference in conditions shows that athletes generate less power for the first 2s upon standing when performing the Wingate test.

# Crisol Beliz

## Faculty Mentor: David Stark, History

### "They do not treat us like human beings:" Latino-Police Relations in Chicago-1960's

Police brutality against African Americans is a subject that increasingly dominates the news today. However, this segment of the population is not the only racial group to have a difficult relationship with law enforcement. This research will examine three cases of police brutality against the Puerto Rican community that were significant in creating a Puerto Rican consciousness of police-community relations in 1960's Chicago. It will also examine the responses of the Puerto Rican community to hostile policing. Reviewing historical cases of police brutality may reveal alternative and possibly more effective methods for improving police-community relations between minority groups.

# Lauren Berry


## Faculty Mentor: Ernest Park, Psychology


## Motivational Fit and Taste Perceptions


Avoidance and approach are motivational orientations that people take on during goal pursuit. When these orientations match aspects of the situation, fit occurs. Experiencing fit makes us “feel right” and this feeling may transfer to other judgments (e.g., how much a product is worth). Our research tests if fit can be applied to enhance the taste of foods. Using an experimental design, participants’ motivational orientations were measured and conditions of fit and non-fit were created. Foods were then sampled and rated for enjoyment. Hypotheses were partially supported. Implications and applications will be discussed.

# Matthew Biener

## Faculty Mentor: Gary Greer, Biology

## Hydraulic Traits as Determinants of Epiphyte Distribution in Mid-Elevation Rainforest in Puerto Rico

I am investigating the relationship between water-conducting (hydraulic) traits of epiphytic ferns and their occurrence and relative abundances among eighty-eight trees (surveyed 2012) as well as along their vertical gradients of increasing drought with increasing height. Xylem is the hydraulic tissue of plants and is composed of a variety of cell types that vary in length and width, as well as in the size, ornamentation, and number of their openings. I traveled in May to Puerto Rico to acquire tissue samples from the eighteen dominant species and expand the distribution data. In June and July I macerated and made slides of stem and leaf sections from each species, photographed all hydraulic cell types in each species, and measured their traits using image analysis software. Relationships between the specific hydraulic traits of each species will be related to overall plant size and species distribution among trees and along their vertical gradients using ordination (PCA) and correlation.

# Charles Bradfield

## Faculty Mentor: Jodee Hunt, Biology

## Global Warming and Oxygen Consumption in Embryonic White-spotted Bamboo Sharks (*Chiloscyllium plagiosum*)

Warming oceans can stress fish embryos past their physiological tolerance. We examined the physiological response of embryonic white-spotted bamboo sharks *Chiloscyllium plagiosum* to warming by measuring their $O_2$ consumption at 20, 25 and 30° C in closed-chamber & flow-through respirometers. These data permitted comparison of $O_2$ consumption across the range of temperatures experienced in the wild as well as comparison of the efficacy of respirometer designs. $O_2$ consumption was difficult to measure accurately because the tiny embryos consumed little $O_2$ at any temperature, but the closed respirometer's smaller volume yielded more consistent data than the flow-through design. At 20 & 25° $C_2$ $O_2$ consumption was similar, but it was greater & more erratic at 30° C. Embryos died within five days of prolonged exposure to 30° C. We predict that tropical sharks will experience reproductive failure or shift their population distributions as oceans warm, leaving them at great risk to global warming.

# Hunter Brunges

## Faculty Mentor: James Dunn, Biology

## The Effects of Invasive Earthworm Species on Salamanders in the Grand Valley Ravine Ecosystem

Earthworms are an invasive species that are causing ecological damage to northern forest ecosystems. The disruption to soil nutrient cycling and litter decomposition can negatively impact organisms that live within the leaf litter, such as salamanders and arthropods. To test this hypothesis, we sampled earthworms within three ravines at thirty-six sites using the mustard extraction method. We surveyed salamander populations twice at each site using cover boards. We also collected data on aspect, altitude, soil moisture, litter coverage, and canopy cover at each site to determine their effects on earthworm and salamander populations. Preliminary results show a wide earthworm distribution of eleven different species. Unexpectedly, the earthworms appear to have little effect on salamander populations. Populations of epigeic (leaf litter dwelling) earthworms were found to be lower in areas with high moisture. Endogeic (top soil dwelling) earthworms had higher populations in moist areas.

# Dionna Cheatham

## Faculty Mentor: Kim McKee, Liberal Studies

### Evolution of the Devaluation of Black Mothers: Contexualizing the Intersections of Disabled Black Mothers in Culture and Policy

The intersections of race, socioeconomic status, and disability greatly impact the experiences of Black mothers, their children and caretakers. Studying the historical devaluation of Black motherhood and disabilities brings attention to narratives concerning the portrayal of disability and Black motherhood. This research will discuss preliminary survey findings of the adult children of mothers with disabilities. The inclusion of these voices provides a new lens to consider how families are explicitly and implicitly shaped by federal and state policies. The study reveals the broader needs of these families related to access to health care, transportation, housing, education, food security, and income.

# Jordan Cloud

**Faculty Mentor: James Smither, History**

## The Polar Bear Expedition: A Bottom-Up Reinterpretation of America's Military Intervention in Northern Russia

During the Russian Civil War, the American military sent troops to Northern Russia to guard supplies sent to the country's former government. Known as the Polar Bear Expedition, this force was a part of a larger Allied expeditionary force under British leadership. Landing in Russia in September 1918, the American troops were used by the British command as combat troops for the purpose of directly intervening in Russia's civil war. Lasting only nine months, the expedition failed in its original goals as well as those set for it by the British. To date, the only military histories written on the expedition have been top-down in their approach. Frequently these histories fail to critically analyze a large portion of the primary source material and often adopt the biases found in the sources. Consequently, a bottom-up history is needed in order to properly understand the history of the expedition, as well as to correct errors in the historical record caused by a lack of critical analysis.

# Kelsie Colley

## Faculty Mentor: Christopher Kurby, Psychology

### Perception of Events in Stories Guides Eye Movements during Reading: A working memory load hypothesis

During comprehension, readers generate mental representations of the situations described in the story. Readers segment their mental representations into discrete events and update their representations at boundaries between events. Event boundaries tend to be perceived when there are changes in situational dimensions. At these boundaries, reading time tends to slow down, and the pattern of regressive eye movements change. This may indicate an increase in working memory load during moments of updating. If updating at boundaries incurs a working memory load, maintaining an additional load should increase the effects of boundaries on reading behavior. In this study, we are testing this possibility. Participants maintained a working memory load (5 no load vs. 8 verbal load vs. 8 spatial load) while their eye movements were tracked during reading. Individual working memory capacity was also measured.

# Lindsay Czap


## Faculty Mentor: David Clark, Mathematics


## Guessing Games and Error Correcting Codes

A two-player "guessing game" is a game in which the first participant, the "Responder," picks a number from a certain range. Then, the second participant, the "Questioner," asks only yes-or-no questions in order to guess the number. We will discuss a technique for minimizing the number of questions by asking questions that divide the range of possible choices in half each time.

Next, we will introduce guessing games in which the Responder is allowed to lie. Guessing games with lies are closely linked to error correcting codes, which are codes that allow us to detect an error in the information that we receive and correct these errors. We will give basic definitions in coding theory and show how error correcting codes allow us to still guess the correct number even if one lie is involved.

We will then introduce cost functions to guessing games. After assigning a cost to the games, instead of minimizing the number of questions we ask, we must find a way to minimize the total cost of our game. We will discuss optimization methods for minimizing the total cost of a guessing game when the cost function is applied to the answers or when the cost function is applied to the questions.

# Emily David, MS3 Ott-Stiner Scholar

## Faculty Mentor: Paul Cook, Chemistry

## Mutagenic studies of a unique cysteine ligase enzyme

BshC is the final enzyme in a three step pathway for the synthesis of bacillithiol, a compound that enables resistance to fosfomycin in Gram-positive bacteria. BshC is unique from other enzymes of its kind because of an additional ADP binding site and inactivity when studied in the laboratory. To explore BshC function, several site-directed mutants have been selected within the ADP binding pocket. Fluorescence assays have been utilized on the wild-type BshC and one mutant, Y510Q. We determined that Y510Q does not bind ATP as effectively as wild-type BshC. These fluorescence assays will be utilized on W506L, E384A, and H386A mutants and structural analysis of all the mutants will be initiated. Gaining more understanding of the structure of these mutants and how they bind ATP will give a better understanding of how BshC binds its substrate, which will allow the development of inhibitors to combat fosfomycin resistance.

# Macy Doster, MS3

**Faculty Mentors: Paul Keenlance, Biology and Joseph Jacquot, Biology**

## A Comparison of American Marten Habitat Use From Data Collected Using VHF Radio Telemetry Versus GPS Telemetry

Our understanding of wildlife habitat use and selection and therefore our efforts to create or manage suitable habitat are based almost exclusively on research conducted using VHF-based radio telemetry. This technique generally allows researchers to locate an animal between once a day and once a week. The habitat type where these locations occur is used as an indication of habitat preference. GPS-based telemetry allows the researcher to collect locations as often as once every half an hour. This increase in the frequency of locations likely allows for increased accuracy in our understanding of habitat selection, but requires radio transmitters that are roughly ten times the cost of VHF transmitters. GPS transmitters small enough to use on an American martens have recently been developed. We intend to evaluate whether the inferences regarding marten habitat use vary between VHF and GPS derived data and I they do, whether the differences justify the increased cost of GPS transmitters.

# Gabriel Ellis

## Faculty Mentor: Lee Copenhaver, Music and Dance

## Analyzing Music Video in a New Light: The Color of Music and the Music of Color

This project examines the use of color in music video. We are interested in color's expressive and functional roles, correlations between color palette and musical genre, and the counterpoint between color and elements of the music. In our analysis, we utilize "color barcodes", visual representations of the colors employed within videos, comparing representative hues, saturations, and values from these images in order to look for correlations with genre, tempo, and genre of performer. We also discuss our findings regarding the different functions of color in structure, symbolism, and storytelling.

# Darian Farrell


## Faculty Mentor: Kristy Dean, Psychology


## Social Exclusion and its Effects on Physical Vulnerability


Social exclusion has both social and physical consequences (Baumeister & Leary, 1995). A growing body of literature argues for the fundamental nature of belonging as well as the interconnections between belonging and physical security needs (e.g. Eisenberger 2012;DeWall et al., 2010). The current study included experimental manipulations (via a visualization task) of social exclusion and acceptance and utilized different measures of one's motivation to obtain physical security. We expected that social exclusion would motivate behavior aimed at achieving physical safety or preventing physical vulnerability. The results demonstrated few differences in the valuation of objects that provide physical safety as a function of condition, and those that emerged were contrary to hypothesis. Also contrary to hypotheses, excluded (vs. accepted) participants made more physically risky decisions. Discussion focuses on alternative explanations for these findings.

# Marie Griffith

## Faculty Mentor: Paul Stephenson, Statistics

## Modeling the Development of World Records in Track and Field

Assuming that there is a threshold in world records for every track and field event, the researchers used analytical techniques to develop a model of world records over time. The linear model, exponential curve, logistic curve, and the Gompertz curve were examined to identify which best fits the data. The Gompertz curve was ultimately chosen for predicting these threshold limits. This model was executed on data for the 100 M, 200 M, 400 M, long jump, and shot put. After the limit values were computed, the estimates were verified based on visualization of the curve produced and the R2 values which show how much variation of the data is explained by the model. Sensitivity analysis or "playing around with data" was then conducted to see if the limit values would change. This process did indeed change these thresholds which suggests that the definite limit values for track and field events can vary between time periods.

# Bailey Groendyke

## Faculty Mentor: Karen Gipson, Physics


## Acoustics of Louis Armstrong Theatre


Like many multipurpose auditoriums, the Louis Armstrong Theatre (LAT) at Grand Valley State University has been reported by a considerable number of students and faculty to have unsatisfactory acoustics for music performance. This study focused on physical measurements and simulated changes to LAT. Reverberation time (RT) was measured by filling LAT with sound and measuring the decay for select frequencies as per ASTM E2235 protocol, and the initial time delay gap (ITDG) was determined using slapsticks as an impulsive sound source. A model of LAT was also constructed from blueprints and physical measurements; simulations using this model were conducted using Odeon. Data from the physical measurements as well as the simulation confirmed that the RTs over a wide range of frequencies were smaller than desired for music, whereas ITDG measurements showed prevalent spurious reflections. Modifications to the model were made to increase reverberation time and reduce undesirable reflections in order to improve LAT for musical performance without compromising its functionality for speech.

# Jennifer Grousd, Schroeder Fellow

**Faculty Mentor: Amy Russell, Biology**

## Patterns of neutral genetic variation in bat populations affected by an emerging wildlife disease

Genetic diversity is an important factor contributing to the fitness of a species; more diverse species hold the potential to respond more quickly to environmental changes such as climate change or novel diseases. Microsatellite markers are useful in assessing recent changes in diversity due to their high mutation rate. Measures of effective population size (Ne) can be used to detect historical events such as population bottlenecks. White-nose syndrome (WNS), first detected in North America in 2006, has caused severe population declines in several species of hibernating bats. The big brown bat has experienced a 41% decrease due to WNS, whereas the federally endangered Virginia big-eared bat has undergone increases in population size. Here, I present coalescent- and frequency-based analyses to estimate Ne for these species and to determine whether changes in population size due to WNS are detectable at microsatellite loci.

# Amaya Guthrie

## Faculty Mentor: Lawrence Burns, Psychology

## Childhood Antecedents of Perfectionism: Implications for Self-Esteem, Self Confidence, and Life Satisfaction

The origins of perfectionism were investigated with specific focus on familial variables that may contribute to it's development. Additionally, we assessed the adaptive benefits and maladaptive symptoms associated with positive and negative perfectionism. Participants completed measures of perfectionism, parental authority styles, confidence, and satisfaction with the self and life. Findings suggest that individuals raised in harsh environments develop perfectionist tendencies and report lower levels of self-esteem, self-confidence, and satisfaction with the self and life. Negative perfectionism predicted decreased confidence, self-esteem, and lowered satisfaction with the self and with life while positive perfectionism predicted higher levels of these variables. The findings of the present study add to the current literature by shedding light on the relationship between the environment in which one was reared and the motivating factors that fuel one's perfectionistic strivings.

# Sarah Hayes

Faculty Mentor: Amanda Dillard, Psychology

## Social Influence and the Experiential Processing System as Moderators of a Narrative Message about Skin Cancer

Female students were randomly assigned to complete sentence tasks designed to make them use a cognitive or experiential processing system. They then read a narrative about a young woman who went to her doctor after noticing a skin change. Participants reported their risk perceptions of skin cancer, along with information about any peers who tan. It is hypothesized that people who report greater social influence will have higher risk perceptions following the narrative message. Further, it is expected that those who experience more social influence and also use experiential processing should have the highest risk perceptions. Linear regression was used to examine associations between information processing systems and social influence. No main effects were observed for the processing system, but social influence did produce several significant main and interaction effects. This study provides more insight about narratives that can be helpful for future health interventions.

# Sultan Hubbard


## Faculty Mentor: Brian Lakey, Psychology


## Perceived Support's link to affect


This current replication of Lakey, Molen, Fles, & Andrews (in press) seeks to test the predictions of Relational Regulation Theory (RRT). RRT makes predictions regarding main effects and hypothesizes that through ordinary social interactions, rather than enacted support, perceived support and affect emerge. RRT also predicts that a recipient's affect regulation is a matter of personal taste. In the current study, a sample of an existing data set was used in which 10 groups of 4 roommates (40 recipients, 40 providers, and 120 dyads) completed a round robin assessment. Each roommate rated their respective roommates on supportiveness, quality of conversation, similarity to a particular roommate, and affect when with the roommate. It was found that perceived support and ordinary conversation were primarily relational and that relational perceived support highly correlated with relational ordinary conversation, positive affect, similarity, and negatively correlated with negative affect.

# Nicholas Huisingh

## Faculty Mentor: Merritt Taylor, Biomedical Sciences

## Nato3 is sufficient to drive Lmx1b expression in the developing neural tube

The basic helix-loop-helix transcription factor, Nato3, is endogenously expressed in the floorplate region of the developing neural tube. This region also gives rise to dopaminergic neurons which are affected in Parkinson's disease. Nato3 has a broad and not fully understood role in the proliferation and differentiation of stem cells in the neural tube. Here, we show that overexpression of Nato3 promotes novel Lmx1b expression in the midbrain and spinal cord. Nato3 was transfected using *in ovo* electroporation and monitored using a bicistronic EGFP reporter expression vector. The observed effects were characterized using immunohistochemistry. This data suggests that Nato3 strongly regulates Lmx1b expression in the neural tube.

# Marina Ibarra

## Faculty Mentor: Suganthi Sridhar, Biomedical Sciences

### Interaction of tetraspanin KAI1/CD82 and tetraspanin CD151 in hepatocyte growth factor c-Met receptor regulation in prostate cell lines

Understanding the progression of metastatic cancer at the cellular and molecular level are fundamental for engineering effective and efficient treatments. The research focuses on observing changes in protein interactions involved in metastatic prostate cancer cells: CD151 association with C-met in the presence and absence of CD82. The hypothesized results indicate the overexpression of CD82 in a metastatic cancer cell line significantly reduce the association and regulation between CD151 and C-met; therefore, inhibiting metastasis at the molecular level. Analysis of the specific molecules contributing to metastasis could orchestrate the development of successful targeted drug therapies as treatment for cancer.

# Talon Kosak

## Faculty Mentor: Andrew Korich, Chemistry

## How Does BBr3 Cyclize o-alkynylanisoles to form Benzofurans - Part Deux!

Benzofuran-containing natural products and their synthetic derivatives exhibit a broad range of pharmacological activity including anticancer, antiviral and antifungal. Due to the biological importance of these systems, the benzofuran skeleton has been the target of several research groups. As such numerous techniques have been developed, however, many of these methods employ either complex precursors or expensive and toxic metal catalyst. Therefore, in collaboration with the Lord research group at GVSU, we have developed and mechanistically studied a new approach to preparing benzofurans. Our method eliminates the need for a metal catalyst and starts with relatively simple *o*-alkynylanisoles.

# Taylor Lewis

## Faculty Mentor: James Smither, History

### The Evolution of Military Systems during the Hundred Years War

This research focuses on the gradual shift in both the English and French military systems during the Hundred Years War. Focusing primarily on the emergence of military professionalism, this study illustrates the extent to which these changes influenced the course of the war as well as the larger evolution of European warfare. Careful analysis of the major battles, campaigns, as well as the periods in between, provides new insight into the evolutionary nature of the war. A close examination of warfare in proceeding centuries reveals the extent to which the structure of future European military systems reflected the adaptive nature of the English and French armies in the late medieval period.

# Alex McBride

## Faculty Mentor: Kyle Barnes, Movement Science

## Metabolic Demands of ElliptiGO Cycling Compared to Running

ElliptiGO cycling is a new form of exercise; the metabolic demands, however, have not been investigated. In a cross-over design, 17 runners completed 5×3 min stages while either cycling on a stationary ElliptiGO or running on a treadmill during which HR, RPE, and expired gases were collected using a portable metabolic analyzer. Subjects increased one gear or 1 mph every 3 min during cycling or running respectively. A 10 min recovery between modes of exercise was given. For each testing intensity, metabolic demand ($VO_2$), HR, and VE was significantly higher during running ($p<0.05$), however the RPE for each intensity was similar ($p>0.05$). There was a linear relationship between speed and $VO_2$ but the relationship for running had a steeper slope compared to the ElliptiGO. As a result, the ElliptiGO speed that was equivalent to the $VO_2$ of each running speed increased at a greater rate. When matched for $VO_2$, the HR, $V_E$, and RPE were actually higher for ElliptiGO compared to running.

# C'arra Miller

## Faculty Mentor: Rachel Powers, Chemistry

## Fragment-Based Drug Discovery of a Novel Inhibitor of OXA-24 β-lactamase

β-lactamases are enzymes that confer resistance to β-lactam antibiotics like penicillin. These enzymes hydrolyze the four-membered lactam ring conserved among all β-lactams. The class D β-lactamase OXA-24 hydrolyzes our last resort antibiotics, carbapenems, making this enzyme a major clinical threat. In an effort to combat β-lactamase mediated resistance, combination therapies consisting of a β-lactam antibiotic with a β-lactamase inhibitor have been employed. However, β-lactamases have acquired resistance to the inhibitors, due to chemical similarity. Previous research identified a novel lead with low binding affinity using molecular docking. This lead was optimized using commercially available analogs to improve the binding affinity toward OXA-24. Using this structure-based approach, a potential new class of inhibitors for OXA-24 may be identified.

# Bikash Mishra


## Faculty Mentor: Suganthi Sridhar, Biomedical Sciences


## Testing Novel BIBR 1532 Derived Telomerase Inhibitor


All cancer cells have enzymes called telomerase, which prevent the telomeres from shortening, so that the cells continue to divide and become immortal. BIBR 1532 is a known effective telomerase inhibitor, but cancer cells are becoming increasingly resistant to it. Eighteen known derivatives of BIBR 1532 synthesized at GVSU were tested and a few (5) showed anti-proliferative effects. Drugs exhibiting the anti-proliferative effect will be further tested to determine if they are actually good telomerase inhibitors. These drugs could potentially inhibit the function of the telomerase so the telomeres continues to shorten and can be effective drugs in treating cancers.

# Nathaniel Orndorf


## Faculty Mentor: Richard Vallery, Physics


## Effects of Surface Attachment of Polymer Chains on Material Properties

Polymers with varying material properties are of great importance in the design and production of many everyday products. In this study, two specific material properties of Polydimethylsiloxane (PDMS) Silica nanocomposites with varying volume fractions were studied: Young's Modulus (*Y*—a measure of "stiffness") and Poisson's Ratio (*v*—the amount of contraction in the direction perpendicular to the stretching of an object). In order to make these measurements, an apparatus was designed, constructed, and used to measure the force needed to stretch an object to a corresponding strain.

# Luke Pardy

## Faculty Mentor: Osman Patel, Cell and Molecular Biology

## Neoadjuvant therapy with anti-telomerase potentiates the effects of anthracycline based chemotherapy

The US has among the highest incidence of breast cancer in the world. Moreover, 20% of all breast cancer cases in the US are from the subtype known to be the most aggressive and invasive form of the disease, called Triple-Negative Breast Cancer (TNBC). Over the decades, interest in pre- (Neoadjuvant) and post-chemotherapy (Adjuvant) treatments, in the management of TNBC has increased. Therefore, we evaluated the adjuvant and neoadjuvant effects of anti-telomerases (BIBR 1532 and GV6) with Doxorubicin. In the neoadjuvant experiment, the TNBC cells were supplemented with anti-telomerases for 14 days, then exposed to Doxorubicin (n=4) for 7 days. In the subsequent experiment, cells were first primed with Doxorubicin for 7 days prior to 14 days of anti-telomerase therapy. After 14 days of BIBR1532 or GV6 pre-treatment the cell densities decreased by 55% ($p<0.05$) and 21% ($p=0.06$), respectively. These data indicates that anti-telomerase neoadjuvant therapy has beneficial effects.

# Brianna Powell, Koeze Fellow

## Faculty Mentor: Cynthia Thompson, Biomedical Sciences

### How do they stay warm? Behavioral thermoregulation in the Japanese snow monkey (*Macaca fuscata*)

Thermoregulatory behaviors are used by mammals to maintain optimal body temperature when facing varying seasonal weather conditions. We assessed this behavior in a semi free-ranging group of Japanese snow monkeys (*Macaca fuscata*) during winter 2014 because they are one of the few cold-habitat primates. Behavioral samplings included activity, body posture, and sun exposure while we continually quantified the duration of activities. Macaques utilized strategic body postures to maximize heat conservation, engaged in longer periods of physical contact, and restricted total movement during colder temperatures. When solar radiation was present, macaques spent more time in direct sun and had greater ventrum skin temperature measurements than in shade. These results indicate that Japanese macaques attempt to behaviorally thermoregulate in order to offset thermogenic costs when encountering cold temperatures in their natural environment.

# Kristi Ruvina

## Faculty Mentor: Daniel Bergman, Biomedical Sciences

## Neuropharmocological Alterations of the Aggressive Behavior of Crayfish

Serotonergic-related compounds often facilitate aggression in various animals, including crayfish. However to date, studies have seldom shown the mechanism by which serotonergic-related compounds alter aggressive behavior. It is assumed that serotonin changes the neurochemistry of those injected. In our study, we have attempted to report an observable mechanism by examining the communication system of crayfish. Crayfish use urine to communicate aggressive status, thus we analyzed the frequency of urine release from those injected with serotonergic-related compounds. For each trial, two size-matched crayfish, within 5% body weight, were allowed to interact after injection with serotonin, an agonist, an antagonist, or vehicle control. The concentration of all drugs was 3mM at a delivery dosage of 0.1ml/g. Aggressive interactions were recorded under black light to illuminate a fluorescein dye that was added to all injections. Urine release and aggressive behaviors were then analyzed.

# Victoria Sanders, MS3


## Faculty Mentor: Wolfgang Friedlmeier, Psychology


## Emotion Displays in Media: A Comparison Between Mexican, Hispanic-American, and European-American Storybooks


Cultural artifacts like children's books may serve to facilitate learning of emotion display norms. We compared displays in European-American (EA), Hispanic-American (HA), and Mexican (MEX) books to infer cultural differences. Based on acculturation literature, we assumed that HA authors and illustrators may shift toward norms of the mainstream culture. $N = 1059$ images were coded from 10 popular books from each culture. We focused on emotion type (positive, negative powerless, negative powerful) and intensity of expression. Context variables were also compared like social partners, gender, etc. Positive emotions were dominant in all groups, occurring most in HA books; as expected, MEX books displayed negative powerful emotions less, as did HA books. Also as expected, EA books displayed highest expression intensity overall; HA displayed lowest intensity. Results support the acculturation assumption for HA books, but also point to effects possibly explained by the minority status of HA.

# Emma Schroder, Ott-Stiner Scholar

**Faculty Mentor: David Leonard, Chemistry**

## Biochemical analysis of enzymes responsible for increased antibiotic resistance in *Acinetobacter baumannii*

Class D β-lactamases such as OXA-66 provide resistance to many antibiotics. Variants of OXA-66 in dangerous bacteria such as *A. baumannii* include Pro130Gln (OXA-109), Pro130Leu (OXA-80) and Pro130Ser (OXA-206). These mutations may increase catalytic efficiency against carbapenem antibiotics like doripenem. *bla*OXA-109 was created from *bla*OXA-66 by overlap extension PCR. OXA-109 was expressed in *E. coli* and purified by ion-exchange chromatography. Kinetic parameters (*K*m and *k*cat) were measured by UV-Vis spectroscopy. Compared to OXA-66, OXA-109 has a 10-fold decrease in *K*m and 4-fold increase in *k*cat against doripenem and a 15-fold decrease in *K*m with similar *k*cat against imipenem. Overall, the Pro130Gln mutation results in an ~15-40-fold increase of catalytic efficiency (*k*cat/*K*m) against carbapenems. The δ methyl group of Ile129 is known to sterically clash with the hydroxyethyl group of carbapenems. A mutation of Pro130 may allow Ile129 to move aside alleviating this steric clash.

# Nikolaus Schroeder


## Faculty Mentor: Lisa Feurzeig, Music and Dance


## Operettas in German-American Life around 1880: Transcription, Analysis, and Cultural Contexts

William Henry Pommer was respected as a pedagogue and proponent of music education reform in late 19th and early 20th–century Missouri. Early in his career, he was also well-received as a German-trained composer in various genres, including operetta. He stands out as a third-generation, Midwestern, and German-American composer in an era of integration and assimilation. His resistance to his formal German training is also distinctive, and his rejection of some Old-World traditions while he embraced others gave his works a unique (and truly German-American) tone.

In his work *St. Etheldethelwethelberga* (ca. 1878), a comic operetta on the relationship of a princess and a Welsh slave, these qualities are established: his "Free-Thinking" upbringing manifests itself in his librettist's mockery of the church, his German-ness in the mockery of the Welsh and Irish, and, most interestingly, his anti-traditional composition style in his unique musical mannerisms and gestures.

# Lindsey Schroedter

**Faculty Mentor: David Linn, Biomedical Sciences**

## A drug for Alzheimers appears to work in a retina in a dish model of glaucoma. But, what receptors are involved?

Glaucoma, a neurodegenerative disease, is a leading cause of blindness. In previous research, it has been shown that activation of α7 nicotinic receptors (nAChRs) on retinal ganglion cells (RGCs) can provide neuroprotection. Hypothetically, if one increased the amount of ACh released more nAChRs should be activated to provide neuroprotection in the eye. Past S^3 work has shown DMP 543 can increase the release of ACh in a pig eye-cup and in our 'retina in a dish' model. DMP 543 was originally developed to treat Alzheimer's disease by increasing the release of ACh in the brain to compensate for the loss of cholinergic neurons.

For this S^3 project, we want to further examine what receptors are activated in the 'retina in a dish' model when DMP 543 is added to the dissociated cell culture. In addition to investigating the role of α7 nAChRs, we are extending our investigation to examine if α4β2 receptors play a significant role in the neuroprotection observed in our culture system.

# Stacie Stuut

## Faculty Mentor: Matthew Hart, Chemistry

## The Design and Synthesis of Novel Linezolid Analogues

The extensive use and misuse of antibiotics has led to increasing frequencies of antibiotic resistant bacteria. Novel antibiotics are needed to combat this threat. Linezolid, one of the latest approved antibiotics, kills bacteria by targeting the bacterial ribosome and preventing protein synthesis. Unfortunately, resistance to Linezolid has already been detected. This project focuses on the design and synthesis of novel analogues of Linezolid that optimize interactions with the ribosome. The goal of this project is to synthesis a common intermediate that can be modified into novel drug candidates. If time allows, their effectiveness will be tested in a Kirby-Bauer assay.

# Chela Wallin

## Faculty Mentor: Glen Valdez, Psychology

## Naltrexone Regulation of Stress Enhanced Alcohol Consumption

Alcoholism has a major effect on public health and safety. Stressors increase the rate of relapse in alcoholics. One treatment examined in relation to this issue is naltrexone (NTX). NTX reduces reinforcing the effects of alcohol consumption. However, less is known in its ability to reduce alcohol consumption enhanced by stress. Objective: investigate NTX reducing alcohol self-administration when provoked by stress. Method: Rats were trained to self-administered ethanol and were then injected with a saline or NTX treatment 10 mins prior to exposure of a shock or no shock condition. Rats then tested for ethanol self-administration. Results: NTX had no significant differences in ethanol response. However, NTX treatment was approaching significance. Limitations of the current study were time constraint, low sample size and lack of ethanol dependence. Future work should look to utilize chronic stress as opposed to acute stress and establish ethanol dependence prior to self-administration.

# Carly Wiersma

**Faculty Mentor: Matthew Christians, Cell and Molecular Biology**

## Modification of LRB complex members in *Arabidopsis thaliana*

Plants can adapt and respond to their environment in a variety of ways. They have evolved sophisticated mechanisms, specifically, to respond to light. The LRBs (Light Response BTB) are E3 ligases, which are proteins involved in the degradation of other proteins in light. The LRBs are also involved in the degradation of Frigida (FRI), a protein that regulates flowering time. LRB is able to degrade FRI and allow the plant to flower. The mechanism that LRB employs to degrade FRI remains unknown. There is evidence that LRB attaches a protein tag to FRI and this may play a role in its degradation. To investigate this notion, we attempted to purify GFP-tagged LRB's from plants grown in different light conditions to detect the FRI interaction. We may have been able to successfully purify GFP-LRB. We were unable to determine if FRI was attached to the purified LRB's since we could not get the FRI antibody to work. This work may aid in our understanding of light and flowering in plants.

# Brandon Wright

## Faculty Mentor: Dwayne Tunstall, Philosophy


## No Soft Doctrine: Royce on the Problem of Evil


In this paper, I argue that traditional theodicies are insufficient answers to the problem of evil because they are too individualistic and do not adequately emphasize the role of community in the process of overcoming evil. I then argue that Josiah Royce's answer to the problem of evil in his later writings is better than the aforementioned theodicies for two reasons: (i) it does not presuppose the problematic conception of God that they do, and (ii) it adequately emphasizes the role of community in the process of overcoming evil.

# Ryan Zahran

**Faculty Mentors: Nathan Barrows, Chemistry and Jessica VandenPlas, Chemistry**

## Evaluating Pupil Dilation as a Measure of Working Memory and Logical Thinking

Previous research has indicated that students often struggle to solve problems for a variety of reasons including prior knowledge, logical thinking skills, and working memory limitations. Of these factors, instructors have the most direct control over the working memory demands of their assessment questions. Consequently, questions with high working memory demands tend to assess students' working memory capacities rather than their content knowledge. The purpose of this study is to investigate the feasibility of the Task-Evoked Pupillary Response (TEPR) as a real time measure of working memory demand during problem solving. The TEPR is a small, involuntary dilation of the pupil in response to mental effort. 20 participants completed a digit span forward, a digit span backwards, and a digit ordering test during which the TEPR was measured. Two types of findings will be presented: variations in TEPR among participants by digit-span test and comparisons of TEPR across the three digit-span tests by participant.