



GVSU SUMMER SCHOLARS SHOWCASE

August 1, 2017

**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. - 4:10 P.M.

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

Oral Presentations by: 4:10 P.M. - 5:00 P.M.

Brian Basinski • Cayla Dwyer • Claire Efting • Francesca Golus • Morgan Hayden

Poster Presentations by: 5:10 P.M. - 6:10 P.M.

Ellen Audia • Morgan Carpenter • Jessica Crawford • Elizabeth Croff • Christiana D'Annibale • Morgan Doherty • Kaylee Funckes • Megan Goy • Ashleigh Harrah • Adrian Hernandez • Victoria Irwin • Lauren King • Casey Koch-LaRue • Andrew LaDuca • Liyah Marshall • Christian Miller • Vauwn Nghiem-Olson • Halle Nienhaus • Miranda Owen • Grace Peterson • Uyen Pham • Sarah Robertson • Kristin Schepke • Morgan Sundblad • Emily Uhl • Zachariah Vander Tuin • Tyler Wheeler

Oral Presentations by: 6:10 P.M. - 7:00 P.M.

Haley Hulan • Darwin Perry • Cole Robinson • Amber Sackett • Faith Ureel

Welcome to the 2017 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 2017 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), McNair Scholars, Beckman Scholars at GVSU, and the Library Scholars 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.

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

2017 Student Summer Scholars

Ellen Audia

Brian Basinski (Ott-Stiner Scholar)

Morgan Carpenter, MS3 (Schroeder Fellow)

Jessica Crawford (Stiner Scholar)

Elizabeth Croff

Christiana D'Annibale

Morgan Doherty

Claire Efting

Francesca Golus (Ott-Stiner Scholar)

Megan Goy

Ashleigh Harrah, MS3

Victoria Irwin

Lauren King, MS3

Casey Koch-LaRue

Andrew LaDuca, MS3 (Schroeder Fellow)

Halle Nienhaus (Koeze Fellow)

Grace Peterson

Uyen Pham, MS3

Sarah Robertson, MS3

Cole Robinson

Morgan Sundblad

Emily Uhl

Zachariah Vander Tuin (Ott-Stiner Scholar)

Tyler Wheeler

2017 McNair Scholars

Carly Anderson
Maria Hamming
Adrian Hernandez
Haley Hulan
Ryan Lietzau
Liyah Marshall
Christian Miller
Mitchell Mockerman
Vauwn Nghiem-Olson
Miranda Owen
Darwin Perry
Harry Richards
Amber Sackett
Facundo Santome
Kristin Schepke

2017 Beckman Scholars

Kimberly Bottenberg
Faith Ureel

2017 Library Scholars

Cayla Dwyer
Kaylee Funckes
Morgan Hayden

Ellen Audia, S3

Faculty Mentor: Megan Woller-Skar, Biology

Using Principal Components Analysis to identify changes in phosphorus, nitrate/nitrite and chlorophyll-*a* in seven lake basins of Leelanau County from 1990-2015

The Leelanau Conservancy is home to seven lake basins, all of which Leelanau County relies on as tourist and recreational attractions. Since nutrient content is a key metric in understanding water quality, the Leelanau Conservancy has been monitoring phosphorous, nitrogen, and chlorophyll-*a* levels in each lake for the past 25 years. Measurements were taken at the surface, bottom, and intermediate depths of each lake during different seasons throughout each year. With 25 years of data collected from four depths in seven lakes, multivariate statistical techniques were needed to identify long-term trends in water quality. A Principal Components Analysis was performed on the data using Program R. The resulting biplots showed evident seasonal changes in five lakes, a decrease in nutrients from 1990-2015 in all lakes, and lower levels of nitrogen in three lakes after zebra mussels invaded. These results will be communicated to the Leelanau Conservancy for use in managing their lake basins.

Brian Basinski, S3 Ott-Stiner Scholar

Faculty Mentor: Rachel Powers, Chemistry

Structure-based inhibitor discovery for a key clinical target in antibiotic resistance

β -lactam antibiotics are critical pharmaceutical agents in the clinical treatment of bacterial infections. Over time, bacteria developed antibiotic resistance, which was accelerated by their misuse and overuse. Many bacteria express β -lactamase enzymes that destroy β -lactam antibiotics. The class D β -lactamase OXA-24 is of concern due to its ability to destroy a wide range of β -lactam antibiotics. To overcome this β -lactamase mediated resistance, we used a structure-based drug design approach to identify novel molecules capable of inhibiting OXA-24 activity. Previous work in the lab identified JM52 as a novel inhibitor of OXA-24. Kinetic assays were used to identify JM52 derivatives with improved binding affinity for OXA-24. X-ray crystallography was used to determine the structure of OXA-24 in complex with JM52 and its derivatives. By understanding the interactions between OXA-24 and novel inhibitors, we can begin to develop medicine capable of treating antibiotic resistance.

Morgan Carpenter, MS3 Schroeder Fellow

Faculty Mentor: Matthew Hart, Chemistry

Expanding the Role of C-N Coupling Reactions: Targeted Synthesis of Novel Antibiotics

The rise on antibiotic resistant bacteria has prompted the need for new antimicrobial agents. Linezolid, a member of the oxazolidinone class of antibiotics, was developed to target the bacterial ribosomal complex aiming to leave the human cells unaffected. However, within a year of its introduction resistance had already been detected. In an effort to increase the potency of Linezolid, we have designed novel analogs with increased hydrogen bonding sites. Our synthetic plan utilizes sequential copper-mediated coupling reactions. Herein we report our efforts towards expanding the role of C-N coupling reactions. Using a catalyst system of copper iodide, trans-1,2-diaminocyclohexane and dimethylformamide under 140°C we have mediated both Goldberg-type couplings and a Finkelstein reaction. These can be used to prepare compounds analogs to our Linezolid targets.

Jessica Crawford, S3 Stiner Scholar

Faculty Mentor: Erik Nordman, Biology

Analyzing survival, growth, and environmental effects of willow biomass energy crops at GVSU

To alleviate global temperature rise, public and private sectors need to investment in carbon neutral energy. Woody biomass feedstocks can provide low-impact energy due to their capacity to sequester carbon during growing cycles. This project analyzes a small-scale trial production of four different willow (*Salix* spp.) clones grown at GVSU. The trial's purpose is to determine if and what kind of willow will be economically feasible for commercial production in West Michigan. The four willow varieties were planted in May 2016 in a randomized complete block design with four replications. Survival, growth, resistance, and soil composition data were collected during the first growing season. The plants in the center of each plot were measured and their attributes compared using analysis of variance. Preliminary results suggest there is no significant difference in survival and growth among clones. Measurements will continue through October 2017.

Elizabeth Croff, S3

Faculty Mentor: Martin Burg, Biomedical Sciences

Generation of *pHdc*-containing transgenic flies to study *Hdc* promoter function

The spatial and temporal expression of a gene is typically controlled by its promoter. This study's goal is to generate tools to examine the functional limits of the histidine decarboxylase gene's (*Hdc*) promoter in *D. melanogaster*. To carry this out, a full version (pHdc_{LONG}) and a short version (pHdc_{SHORT}) were cloned into transformation plasmids containing the eGFP reporter and then grown, injected into embryos with transgenic flies being currently selected. Additionally, a pHdc_{LONG}-GAL4 plasmid is being synthesized that will induce expression of GAL4 in histaminergic cells. Oligonucleotide primers were designed to add unique restriction enzyme sites at the ends of pHdc_{LONG} using a polymerase chain reaction (PCR) approach. These new end fragments of pHdc_{LONG} are cloned and sequenced to select the proper clone to insert these end fragments back into pHdc_{LONG} to enable cloning of this promoter into various transformation plasmids for injection into *D. melanogaster* embryos.

Christiana D'Annibale, S3

Faculty Mentor: Ruijie Liu, Biomedical Sciences

Analysis of the induction, activation, and stability of DUSP8 protein

In this study, we analyzed the expression and induction of dual specificity phosphatases (DUSPs) in cardiac cells, and studied their activity and stability using DUSP8 as an example. DUSPs were found to be expressed in both neonatal myocytes and fibroblasts, and their expression was significantly increased upon phenylephrine stimulation. Moreover, alanine substitution of KRR in the N terminal region of DUSP8 significantly led to increased phosphorylation of ERK1/2, p38, and JNK. The KRR mutation of DUSP8 did not alter its subcellular distribution, but rather slightly decreased its binding to ERK2. Moreover, DUSP8 was found to be degraded at baseline or after phenylephrine stimulation. Further analysis of the contribution of PEST motif in the C terminal of DUSP8 will help understand the molecular mechanism for the stability of DUSP8. Together, DUSP8 is expressed in both myocytes and fibroblasts, induced and degraded to fine-tune the MAPK activity in the cells.

Morgan Doherty, S3

Faculty Mentor: Christopher Pearl, Biomedical Sciences

The Effects of Leptin Induced Obesity on Fertility

Parameters in Male Mice

Obesity rates doubled from 1980 to 2014 and is an epidemic today. Obesity is linked with various health issues but its effects on reproduction remain unsolved. Leptin is a hormone secreted by fat tissue and helps to control a number of body processes. Leptin and leptin receptor deficiency lead to obesity and may be related to impaired fertility parameters. In this study, male c57, ob/ob, (leptin deficient) and db/db (leptin receptor deficient) mice were raised to 8 and 16 weeks when tissues were collected and evaluated. Obesity was evident in both the ob/ob and db/db groups since body weight was grossly larger than c57 mice. Sperm/mg in the testis was reduced in the ob/ob group compared to controls but not in the db/db group at both age groups suggesting that lack of leptin reduces sperm production. Total sperm in the epididymis increased in controls with age but was decreased in both obese groups suggesting leptin related obesity impairs sperm storage and likely male fertility.

Cayla Dwyer, Library Scholar

Faculty Mentor: Lindy Scripps-Hoekstra, University Libraries

The Language of the Library: Developing a Library Workshop for French Classes

In a foreign language class students are bound to succeed more if they access resources that are in their language of study. Fortunately, the library readily provides these resources. Unfortunately, many are unfamiliar with the language of the library and how to access those resources. This project is one solution to this problem: a workshop designed to be conducted in French in order to make the French resources at the GVSU library more readily accessible by students. The workshop will aim to teach students how to use confusing French databases, how to access materials from other institutions, and how to make their searches more effective. The goal is to teach the language used in libraries to French students, so they will be able to further enhance their own language acquisition.

Claire Efting, S3

Faculty Mentor: Brandon Youker, School of Social Work

The Parent Behind the Potential Farmer

This study seeks to explore the experiences of 4-H livestock parents. These parents themselves lack raising livestock experience, yet have chosen to involve their children in 4-H livestock projects. The study will discover how these parents have supported their children in 4-H and asks about its impact. There are studies examining the impact of 4-H and livestock on the youth, however there is a deficit in the research about the parents of these participants. Data were gathered through ten semi-structured, face-to-face, audio recorded interviews asking 4-H parents from suburban Detroit and Grand Rapids about their and their children's experiences with 4-H livestock projects and the impacts they encountered or witnessed in their children. The interviews were transcribed and content analysis will be used in analyzing the data.

Kaylee Funckes, Library Scholar

Faculty Mentor: Gayle Schaub, University Libraries

Information Literacy in the Social Sciences

Undergraduates' information literacy (IL) is a growing concern among colleges and universities, especially since students must now be taught that in scholarly communications and research, a Google search isn't the best answer. I explored why this is the case and why it matters, wanting to help students at GVSU better understand what IL is and how to appropriately use information in scholarship. I collaborated with the GVSU library and the social sciences departments of Psychology, Sociology, and Anthropology to survey faculty. I investigated faculty perceptions of undergraduate's comprehension struggles, utilization of library resources, and how faculty assess and guide student's development of IL in their courses. Combining the limited survey responses, my literature review and experiences, and various GVSU library resources, I created an IL instructional tool: a Subject Guide on the GVSU library website. It will help direct users to resources relating to IL in the social sciences

Francesca Golus, S3 Ott-Stiner Scholar

Faculty Mentor: Jodee Hunt, Biology

Assessing Enrichment Protocols for Carnivores at the John Ball Zoo

Enrichment stimulates activity and suppresses negative behaviors in captive animals and may include sensory stimulation, food, and manipulable items that encourage exploration or play. We studied their effect on positive and negative behaviors in carnivores at John Ball Zoo. We quantified behaviors of Lions, Mt. Lions, Grizzly Bears, Amur Tigers and Bobcats in 45-minute all-occurrences sampling between May 15-July 28, for a total of >80 sessions that included >30 enrichment activities. Bears, Tigers and Bobcats were the most active carnivores, but Mt. Lions exhibited the fewest stereotypic behaviors and Tigers the most. Older individuals were equally active as younger individuals. Food enrichment elicited the strongest response. All species exhibited positive behaviors more often than negative ones, but enrichment further increased overall activity. We recommend varied categories and times of presentation of enrichment to best enhance behaviors of carnivores at the zoo.

Megan Goy, S3

Faculty Mentor: Sheila Blackman, Cell and Molecular Biology

Identification and Expression Analysis of Phenylalanine Ammonia-Lyase in *Echinacea purpurea*

Echinacea purpurea is increasingly important as a source of medicinal phenylpropanoids. The aim of this work is to identify growth conditions that promote medicinal potency of the crop. We hypothesize that growing the plants with a legume cover crop will induce the Phenylpropanoid Pathway and lead to higher bioactive compound concentration. Phenylalanine Ammonia-Lyase (PAL) catalyses the first committed step in the Phenylpropanoid Pathway and its expression mirrors the activity of this pathway. In this study, an *E. purpurea* PAL sequence was obtained via Polymerase Chain Reaction using cDNA synthesized from leaf tissue and primers designed from PAL sequences of related taxa *Helianthus annuus* and *Rudbeckia hirta*. This sequence will be used to design primers to monitor expression of this gene through qPCR of plants grown with and without the legume cover crop. The results will provide an understanding of the effect of cover cropping on yield and medicinal quality of *E. purpurea*.

Ashleigh Harrah, MS3

Faculty Mentor: Sok Kean Khoo, Cell and Molecular Biology

miRNA-34b/c as disease progression biomarkers for

Parkinson's Disease

Parkinson's Disease (PD) is a neurodegenerative disorder that causes impaired motor control, tremors, muscle rigidity, and bradykinesia. While the cause of PD is unknown, it has been found that PD patients have decreased levels of dopamine due to aggregation of alpha-synuclein (α -Syn) protein in dopaminergic neurons. MicroRNAs (miRNAs) are small, regulatory molecules that bind to complementary messenger RNA to inhibit or decrease protein expression. It is observed that downregulation of miRNA34b/c leads to an increase of α -Syn. Here, we used quantitative real-time PCR to quantify expression of miRNA34b/c in fast and slow progression PD patients at time of diagnosis. Comparison of fast and slow progression PD patients showed fast progression patients have significantly lower expression of miRNA34b (p-value= 0.0025) and miRNA34c (p-value=0.0156), meaning that fast progression PD may have higher α -Syn at time of diagnosis. Thus, miRNA34b/c serve as disease progression biomarkers for PD.

Morgan Hayden, Library Scholar

Faculty Mentor: Hazel McClure

Alternative databases funded by alternative facts (What else is a poem by an alternative fact?)

I am the artist in residence of the Mary Idema Pew Library. I am here to make things weird. This is not an unreflective strangeness, but strangeness in opposition to the cohesion emphasized by capitalism. There are two levels to my inquiry; the product and the question of how. Creative projects can be difficult to pin down, to objectively measure success or completion. The development of a creative practice occupies a large part of my research, taking inspiration from those who created things that meant something, or alternatively, "dared to mean nothing, and as such demanded everything from you" as Miranda July states in her book *It Chooses You*. My study is the practice of making, the production of failure. I examine structures as expansive as capitalism and as specific as cataloguing--mastering neither. A desire for completion and wholeness is a projection of the brokenness that's present in all our lives; the truth is lived out in-between the cracks.

Adrian Hernandez, McNair

Faculty Mentor: Amanda Dillard, Psychology

Retrospective and anticipated regret for self and other: are there implications for health behavior decision-making?

Research indicates that regret relates to general decision-making, including serving as a source of motivation for health behaviors. As data surfaces to support this, it is necessary to conduct experimental research to test antecedents and consequences of regret. Extending previous research, the present study examines outcomes of both anticipated (i.e., future) regret, and retrospective (i.e., past) regret. Social factors (i.e., regret for others versus self) and how they influence the experience are also examined. This exploratory research has the potential to provide basic insight into why regret influences decision-making, as well as the beneficial implementation of regret in behavior change interventions.

Haley Hulan, McNair

Faculty Mentor: Danielle DeMuth, Women, Gender, & Sexuality Studies

Bury Your Gays: History, Usage, and Context

Bury Your Gays is a literary trope that originated in the 19th century as a way for queer authors to write queer characters without breaking laws and social mandates against “endorsing” homosexuality. In any story featuring a same-gender couple, by the end of the story, one of the lovers died and the surviving one realized that they were not actually queer. The trope is still in use today despite the fact that it is no longer necessary for authors to kill off gay characters in order to get published.

The way that *Bury Your Gays* is used varies widely between queer and straight authors and has changed significantly throughout its history. Contemporarily, queer authors only invoke this trope when it serves a greater purpose in the narrative. Straight authors will use it to exploit or punished queerness in their narrative as well as to shock their audiences.

Victoria Irwin, S3

Faculty Mentor: Derek Thomas, Biomedical Sciences

Analyzing the Role of a Subset of Degraded Proteins in the Ability of *Candida albicans* to Cause Disease

Candida albicans is a common hospital acquired infection contributing to the rising mortality rates on a national and global level. The capability to alter forms is important in the organism's ability to cause disease. The transition of *C. albicans* into its filamentous form is significant because it appears to be essential for causing tissue damage and disease. Previous work suggested there was a subset of proteins facilitating the transition between the non-filamentous and the filamentous forms, and that overexpression of these specific proteins prevents filamentation. Here we attempt to identify additional members of protein subsets and further define and analyze their functions.

Lauren King, MS3

Faculty Mentor: Evelyn Clingerman, Nursing

Understanding the Application of Polarity Thinking by Nurses in the Clinical Setting

The aim of this research is to understand nurses' experiences of applying polarity thinking in clinical settings. We sampled nurses who attended at least 8 hours of polarity education. We used a classical grounded theory methodology to identify themes in narrative one-on-one interview data. Using a constant comparative analysis technique, we analyzed transcribed interviews. Preliminary findings reveal three broad themes: (1) Process of knowing; (2) Practice using; and (3) Deepening knowledge, and 10 subthemes: (1) Attending workshops; (2) Reading about; (3) Recognizing the reoccurrence of problems; (4) Recognizing barriers and facilitators; (5) Gaining confidence; (6) Increasing skill; (7) Trying it out; (8) Seeking validation; (9) Acquiring more education; and (10) Intentional use. Data reveal comfort and confidence increased as resources increased and that consequences were intentional use and identification of specific polarities. Analysis of additional interviews continues.

Casey Koch-LaRue, S3

Faculty Mentor: Steven Schlicker, Mathematics

Geometries for the Finite Cyclic Groups

We explore the subgroup structure of a finite group in a novel way, using finite geometries. We define distances between the elements of a group using word lengths. Then we measure distances between the subgroups of a finite group using our distance between elements. Finite geometries emerge in which the points are the subgroups of a finite group and the lines are sets of subgroups of the same finite group. This poster displays a complete characterization of the lines in the geometries from finite cyclic groups, discovered in this summer's research, and it depicts examples of some the finite geometries that correspond to the subgroup structures of groups. This research was conducted as part of the 2017 Student Summer Scholars Program at Grand Valley State University.

Andrew LaDuca, MS3 Schreoder Fellow

Faculty Mentor: Shannon Biros, Chemistry

Incorporating Soft Electron Donors in Nuclear Waste Extraction Methods to Boost Selectivity

Nuclear waste remediation is a massive roadblock in generating nuclear power, as the waste contains primarily both Lanthanides and Actinides. These sets of elements are rare, expensive, and cause problems if not dealt with properly. Currently, remediation methods use synthesized ligands to isolate Uranium so it can be recycled. The most common ligand in use, however, doesn't selectively draw out actinides but also extracts Lanthanides as well. Our proposed ligands contain softer donor atoms show significantly higher extraction rates for Actinides over Lanthanides.

Liyah Marshall, McNair

Faculty Mentor: Glenn Valdez, Psychology

The Effect of CRF2 Receptor Regulation on Depressive – Like Behaviors During Protracted Alcohol Withdrawal

Alcoholism has detrimental effects on the citizens and budget of the United States. Those experiencing withdrawal report unpleasant mood disturbances such as anxiety, depression, and negative affect. These mood disturbances increase the chance of relapse and make the process of long-term recovery more difficult. Based on previous research showing that activation of type 2 corticotropin-releasing factor receptors (CRF2 receptors) has the ability to alleviate stress-related behaviors during acute withdrawal, the current study proposes studying the effects of the selective CRF2 receptor agonist urocortin 3 (Ucn 3) on depressive-like behavior following protracted abstinence from alcohol. Wistar rats were the subjects of this study and were placed on either an ethanol or control liquid diet for 28 days followed by a 42 day period of abstinence. At the end of this period, they will they will be tested for signs of depressive-like behavior in the forced swim test. We expect that Ucn 3 will decrease depressive-like behaviors in rats with a history of ethanol dependence.

Christian Miller, McNair

Faculty Mentor: Ruijie Liu, Biomedical Sciences

Characterizing the Cellular Function of Protein Phosphatase 1 Isoforms

Protein phosphatases are enzymes that have the function of dephosphorylating different protein substrates. This is done by removing a phosphate group from a specific amino acid residue on the protein. This protein phosphatase-regulated dephosphorylation is an important mechanism for many different processes and regulation inside mammalian cells. In this study, we examined the alpha and beta isoforms of protein phosphatase 1 (PP1). Specifically, we investigated the localization of these isoforms, with the alpha and beta isoforms being predominately expressed in the cytoplasm and nucleus of cells respectively. Furthermore, previous studies have shown that some histone deacetylases (HDAC's) and the cAMP regulatory element binding factor (CREB), may be substrate targets for the beta isoform of PP1 and as such, we also are examining how these effect gene expressions to get a better idea of the role that PP1 beta plays in the nucleus.

Vauwn Nghiem-Olson, McNair

Faculty Mentor: Kristy Dean, Psychology

The Effect of Social Exclusion on Perceptions of Poverty and American Identity

The current study examines how social exclusion and physical vulnerability influence perception of marginalized groups of people in the United States (i.e., the poor, ethnic minority groups). Specifically, we hypothesized that social exclusion (versus acceptance) would elicit negative perceptions of people in poverty and limit who is perceived as possessing an American identity. We also predicted thoughts of physical vulnerability would mediate the relationship between social exclusion and these outcomes. Utilizing the reliving task paradigm to manipulate the experience of social exclusion, participants completed questionnaires assessing thoughts of physical vulnerability, perceptions of the poor and middle-class, attributions for poverty, and perceptions of Americanness amongst various ethnic Americans. Contrary to hypotheses, the experience of social exclusion did not influence thoughts of physical vulnerability or perceptions of others.

Halle Nienhaus, S3 Koeze Fellow

Faculty Mentor: Roderick Morgan, Biology

Preliminary Analysis of Grand River and Nearby

Groundwater: The feasibility of a Large-Scale Biosand Well

Currently, millions of people around the world are drinking water contaminated with *E. Coli* and other pathogens. One point-of-use (POU) method that has been adopted to combat this issue is bio-sand filters (BSF) which function primarily via to remove pathogens from small amounts of water. A variety of issues surrounds POU bio-sand filters that limit access to potable water within communities. In contrast to POU BSFs, large in-ground bio-sand wells (BSW) have the potential to overcome the challenges of POU BSFs while increasing access to potable water. In order to install and better study how BSW function, we evaluated the level of *E. coli* in the Grand River and nearby ground water. Water samples from two in-ground sample wells and the Grand River were analyzed by Colilert to determine the number of total coliforms and *E. Coli*. The results indicate that both the river and ground water had sufficient levels of *E. coli* to warrant further investigation into creating a BSW.

Miranda Owen, McNair

Faculty Mentor: George Lundskow, Sociology

Denying Atrocities: Comparing Policies and Pressures in Turkey and Japan

This project analyzes the denial of mass atrocities through a comparative-historical lens. Turkey's denial of the Armenian Genocide and Japan's denial of the Nanking Massacre are used as case studies to compare denialist arguments and strategies, as well as potential progress in admitting the commitment of these atrocities. The analysis includes both past and current acts of denialism by each state, as well as an overview of the atrocities that are being denied. Japan's importance in the global economy is discussed as a possible theoretical explanation for their apologies. This is especially important given the economic power and trade agreements with states victimized by the Japanese military during WWII, such as China. Turkey, however, does not have as large and as strong of an economy on a global scale, and neither does Armenia, so they face no economic pressure or incentives to apologize for the Armenian Genocide.

Darwin Perry, McNair

Faculty Mentor: Joel Wendland, Liberal Studies

The Black church and communal empowerment in Grand Rapids, Michigan

In the midst of increasing rates of violence, crime, and poverty, the Black church in Grand Rapids has the potential to not only bring about a fervent Sunday morning sermon, but prolonged communal empowerment. The Black church, defined as an abstract collectivity of churches with predominately black congregations, possesses the potential resources, and responsibility(s) of bringing about prolonged racial, social, economic, and political uplift. Thus, the precise goal of this study is to build an historical and contemporary narrative of the Black church's function and role in Grand Rapids, Michigan, for the purpose of bringing about prolonged communal empowerment.

Grace Peterson, S3

Faculty Mentor: David Linn, Biomedical Sciences

Characterization of a drug for Alzheimer's in the retina using a confocal microscope: Applications to glaucoma

Past research and recent S³ projects have demonstrated that with increasing concentrations of DMP 543 in vitro, retinal neurons release increasing levels of acetylcholine (ACh), and there is higher cell survival over time indicating a possible neuroprotective effect. Therefore, DMP 543 has potential as part of a combination therapy for glaucoma to enhance release of 'protective' ACh. A confocal microscope imaging protocol was developed to examine retinal slices treated with an intracellular calcium indicator and increasing DMP 543 to demonstrate the cells activated by the compound. It is predicted that amacrine cells releasing ACh will be activated first, then the ACh release will activate retinal ganglion cells. In the future, the images will be analyzed, comparing the fluorescence intensity produced by various cells. By using the confocal microscope to observe which cells are activated by DMP 543, we can more conclusively define the process involved in the increased cell survival.

Uyen Pham, MS3

Faculty Mentor: Rachel Powers, Chemistry

Structural and Functional Characterization of Fragment-based Inhibitors for OXA-24, an Antibiotic Resistance Enzyme

Since their introduction in the 1940's, β -lactams have been the most prescribed antibiotic due to their effectiveness and minimal side effects. Extensive use of antibiotics has contributed to the emergence of several defense mechanisms that inactivate β -lactam antibiotics. The most concerning is the production of β -lactamase enzymes that hydrolyze the amide bond in the four-membered β -lactam ring, inactivating the antibiotic before it reaches its transpeptidase target in the bacteria. One way to suppress the action of β -lactamase enzymes is by identifying novel inhibitors that do not share a lactam ring. The program DOCK was used to identify a fragment molecule (NK3) that inhibited OXA-24, a member of the carbapenem-hydrolyzing class D β -lactamases. Kinetic assays of analogs of NK3 were performed to determine binding affinities with OXA-24. Of the five analogs tested, two showed improved binding affinity and can be optimized to become a new series of class D β -lactamase inhibitors.

Sarah Robertson, MS3

Faculty Mentor: Sok Kean Khoo, Cell and Molecular Biology

***AIM2* (Absent in Melanoma 2) gene as diagnostic biomarker for typhoid fever**

Typhoid fever (TF) is an infectious disease caused by *Salmonella typhi* (*S. typhi*), transmitted via contaminated water sources. Early treatment of TF involves a broad-spectrum antibiotic which contributes to antibiotic resistant strains of *S. typhi*. Therefore, it is necessary to identify diagnostic biomarkers to combat resistance. Quantitative real time PCR was used to investigate gene expression of Absent in Melanoma 2 (*AIM2*), an inflammatory protein that responds to infectious microbes which trigger an innate immune response. *AIM2* was compared between healthy controls (HC), acute stage TF patients, and other bacteremia patients. *AIM2* showed to be significantly up-regulated in TF patients compared to HC (p-value=0.0002) while there was no significant difference between TF and other bacteremia patients. In summary, *AIM2* can serve as a potential diagnostic biomarker to differentiate acute stage TF from HC further work is warranted to identify additional biomarker candidates from TF.

Cole Robinson, S3

Faculty Mentor: Michael Huner, History

The Overlooked Builders of Nations: Middling Carolinian Elites and the Construction of Sovereignty in the Atlantic World, 1772-1776

This paper examines middling elites of the Carolinas on the eve of the American Revolution. It asks: How did conceptions of sovereignty among this group inform their decisions whether to leave Empire? Recent studies on Atlantic World independence struggles focuses on the marginal peoples of colonial empires to offset decades of scholarship focused on leading liberators. Lost often in the discussion are middling elites. My research recovers the story of middling elites of the Carolinas at the start of this Age of Revolutions. Their correspondence reveals a transactional approach to imperial sovereignty. Their loyalty to the British Crown hung on the promise of material benefits acquired while being a subject-citizen within empire- a pattern that persisted throughout the Atlantic World during this period. In the case of the Carolinas, we see that the intensity of economic ties to the metropole dictated inclinations to leave empire or renegotiate its terms.

Amber Sackett, McNair

Faculty Mentor: David Eick, Modern Languages and Literatures

Anti-Islam Representations in Diderot's Encyclopédie

The eighteenth-century European Enlightenment promoted values like tolerance, equality, rationality, scientific empiricism and human rights. Denis Diderot's twenty-eight volume *Encyclopédie* (1751-1772) was its literary embodiment, challenging the powers of the French monarchy and the Catholic Church. Its publication in the face of harsh censorship laws and repression constitutes a triumph of freedom of expression. Yet despite its progressive Enlightenment outlook, in entries concerning Muslims the *Encyclopédie* espouses an intolerant and ill-informed narrative which can be traced back to the Medieval period. My study appropriates Michel Foucault's notions of *épistémè* (1966) and *discourse* (1969), Edward Said's work on *Orientalism* (1978), and the current scholarship of Jonathan Lyons and John Tolan to explore the anti-Islam/Arab/Sarrasin narrative in *Encyclopédie* entries by Diderot and Edme-François Mallet.

Kristin Schepke, McNair

Faculty Mentor: Jen Moore, Biology

Genetic Connectivity of Eastern Massasauga Rattlesnakes in Michigan

Eastern massasauga rattlesnakes are a species of high conservation concern and have recently been listed under the Michigan Endangered Species Act. Their natural habitat has been fragmented leading to smaller, isolated populations and conditions that do not support high gene flow. Decreased gene flow can result in increased homozygosity and inbreeding depression. We used microsatellite and statistical analysis to determine the level of gene flow and relatedness between EMR populations in Michigan. This will give us crucial information on the effects of habitat fragmentation on gene flow. Based on the conclusions of our study, we will be able to determine the best next steps that should be taken to assist recovery of these populations and help optimize the success of future management plans.

Morgan Sundblad, S3

Faculty Mentor: David Kurjiaka, Biomedical Sciences

Omega 3 fish oils protect endothelial cells from damage

The leading causes of cardiovascular diseases is the presence of vascular plaque. The progression of these plaques is impacted by a variety of factors including blood free fatty acids (FFA). Interestingly, some FFA can increase plaque formation (saturated and trans) while others (ω 3 fish oils) can decrease it. We were interested in how the ω 3 FFA docosahexaenoic acid (DHA) affects endothelial cells (EC) to inhibit plaque formation by reducing the inflammatory response. We are evaluating expression of Cx43 in these cells as it reflects the extent of inflammation (Cx43 increases with inflammation). bEnd.3 cultured EC were treated with 30 ω M DHA and protein isolated at 1.5, 3, 6, 12, 24, and 48 hrs along with a control at the same time. The concentration of the protein samples were assayed and equal amounts of each sample (10 ω g) was run in a 4-20% PAGE gel. We have protein from 8 experiments and are awaiting results on changes in Cx43 expression.

Emily Uhl, S3

Faculty Mentor: Thomas Pentecost, Chemistry

An Investigation of the Awareness of Desirable Difficulties in University Chemistry Courses

A deeper learning can be achieved through the use of desirable difficulties. Incorporating the ideas of testing v. restudying, spacing v. massing, interleaving v. blocking, and varying conditions of learning into studying practices can create a beneficial cognitive challenge. This study explores the extent to which professors and students in college chemistry courses recommend/utilize desirable difficulties. Cognitive interviews were conducted with chemistry while a survey that was constructed after existing surveys was given to current chemistry students. Preliminary results suggest that students understand that studying strategies employing desirable difficulties would lead to more learning, but choose to use less effective practices that do not create this cognitive challenge. The cognitive interviews suggest that professors are not aware of the significance that incorporating desirable difficulties into instruction and self-regulated study could have on their students' learning.

Faith Ureel, Beckman Scholar

Faculty Mentor: Amy Russell, Biology

From the Shadows of the Southeast: A Population Genetic Perspective on *Myotis austroriparius*

Historically naïve to the deadly fungal disease, White-nose Syndrome (WNS), little is known about the population dynamics of *Myotis austroriparius*, the southeastern bat. This population genetic study was undertaken to forecast how the species will be impacted by WNS. A population is being assessed at 15 microsatellite loci shown to work well in the southeastern bat and previously identified in other vespertilionid species belonging to the genera *Myotis* and *Corynorhinus*. Each individual's DNA was extracted following the Qiagen DNeasy Kit Animal Tissue Extraction Protocol, and PCR reactions were tested at 52 loci. The literature protocols for each PCR load were followed with modifications to load volumes. After genotyping, Bayesian methods will be used to model changes in the southeastern bat's population size and determine the extent of genetic structuring. As a result, bat conservation strategies will be better informed about how the southeastern bat may be affected by a WNS outbreak.

Zachariah Vander Tuin, S3 Ott-Stiner Scholar

Faculty Mentor: Scott Thorgaard, Chemistry

Electrochemical Investigations of Facilitated Lanthanide Ion Transfer at Micro-Liquid/Liquid Interfaces

Facilitated ion transfer (FIT) occurs when transport of an ion between two phases is enhanced by complexation with a receptor molecule. FIT is applied in technologies including ion sensing and removal of harmful ions from waste. Here, electrochemistry at the interface between two immiscible electrolyte solutions was used to study FIT. FIT of K^+ by dibenzo-18-crown-6 (DB18C6) and FIT of Tb^{3+} by a tripodal carbamoylmethylphosphine oxide ligand (TREN-CMPO-OEt) were characterized using cyclic voltammetry at water/1,2-dichloroethane(DCE) micro-interfaces. The Tomeš criteria measured in steady state voltammograms were 75.4 mV and 45.2 mV for the K^+ -DB18C6 and Tb^{3+} -TREN-CMPO-OEt transfers, respectively, consistent with reversible or quasi-reversible binding of the two ions. The binding constant for the K^+ -DB18C6 complex in DCE was measured to be 1.6×10^{10} . Future work will include screening of organic ligands for their ability to bind Tb^{3+} and investigation of unassisted Tb^{3+} transfer.

Tyler Wheeler, S3

Faculty Mentor: Richard Vallery, Physics

Study of Polymer Network Phase Transitions

Polymers exist in different thermodynamical states, such as the glassy or rubbery state, and undergo phase transitions at different temperatures. By exploring the rate at which a polymer's porosity changes as a function of temperature we are able to determine the temperatures at which polymers undergo phase transitions. Using Positron Annihilation Lifetime Spectroscopy (PALS), a well established technique for probing pore volume, we investigated three thiol-ene polymer networks with modified divinyl sulfone ends. Pore volume was measured at selected temperatures between -230°C and 70°C , and all three samples exhibited both a beta transition (T_{β}), which signals side chain movement, and a glass transition (T_g), which indicates coordinated movements of polymer chains. The samples had T_{β} values between -129°C , and -90°C , and T_g values between 5°C , and 39°C .



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