2019

2019 Program

University of Missouri-St. Louis

URS

Undergraduate
Research
Symposium

Research • Scholarship • Creative Works

2019

April 26th, 2019
University of Missouri—St. Louis

URS Undergraduate Research Symposium

Research • Scholarship • Creative Works

Mission

The URS strives to promote undergraduate research by providing a student-engaged, professional-style venue for undergraduates to prepare and present high quality original research, scholarship, and creative works. This multidisciplinary event is intended to help students achieve their educational and professional goals by learning how to communicate their research to a community of scholars. The URS also provides an opportunity for faculty and the broader academic community to express support for these high-achieving undergraduate scholars and recognize their exceptional work through a judging and award process.

URS History

The URS has been promoting undergraduate research annually since 2002 when a Golden Key International Honour Society member, Kenneth Gunn, proposed that Golden Key sponsor an event to help students prepare for professional life. The Golden Key advisor, Kathryn Walterscheid, encouraged the group and helped them to plan a conference. With the endorsement of the dean of the Pierre Laclede Honors College, Robert Bliss, and the associate dean, Nancy Gleason, the Golden Key members hosted the first URS. Drawing participants from all colleges of the university and financial support from several departments, the URS gives undergraduates the opportunity to learn the workings of academic conferences and present their ideas more effectively. Each year, the URS team of volunteers strives to execute an exciting and rewarding academic conference for undergraduates. We continue to be amazed by the creativity of the participants and the quality of their research

The 2019 URS Committee

- Audri Adams, Graduate Assistant, History
- Kimberly Baldus, PhD, Teaching Professor, Honors College
- Bettina Casad, PhD, Assistant Professor, Department of Psychological Sciences
- Sharlee Climer, PhD, Assistant Professor, Mathematics and Computer Science
- Geri Friedline, Associate Teaching Professor, Honors College
- Dan Gerth, Associate Dean, Honors College
- Nicole Gevers, Civil Engineering, Class of 2019
- Nancy Gleason, Associate Dean Emerita, Honors College
- Jasmine Jones, President, Golden Key International Honour Society
- Madison Koogler, President, Pierre Laclede Honors College Student Association
- Helena Marvin, Institutional Repository and Reference Librarian
- T.J. Taylor, PhD, Associate Professor, Criminology and Criminal Justice
- Ann Torrusio, Assistant Teaching Professor, Honors College
- Kate Votaw, PhD, Assistant Teaching Professor, Honors College
- Ari Zakroff, Biology, Class of 2018

Acknowledgements

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- Jodi M. Heaps-Woodruff, PhD, Assistant Research Professor, MIMH, for providing poster workshops for our students;
- The faculty mentors who supervised research, reviewed abstracts, edited posters, coached oral presenters, and supported their students in many other ways;
- And a special thanks to Dr. Kathryn Walterscheid for guiding the URS from its creation in 2002 until 2017!

Authors, Titles, Mentors, and Abstracts

Because style rules differ between academic disciplines, no attempt has been made to create uniformity in titles, author listings, and abstracts. All program listings are included as submitted by student presenters.

Schedule

1:00-3:00pm - Posters on display, MSC rotunda, 2nd and 3rd floor
12:15-1:30pm – Oral presentations, session A, MSC 313, 314, 315
1:45-3:00pm – Oral presentations, session B, MSC 313, 314, 315
3:15pm – Oral and poster awards presentation, MSC Century Rooms A and B

Oral Presentation Schedule

Session A: 12:15 – 1:30 PM

Presenter / Presentation	Room
Claire McCroary, Kathryn Fraley, and Amber Schroeder The Effects of Gentrification on St. Louis	313
Nicholas Braun, Brian Hong, Abby Marler, Brittany Kertz, and Sara Ibrahim The Effect of Popular Distrust on Biological Disaster Preparedness in St. Louis	313
Christina Richardson Beyond the Buildings: Bernie Hayes	313
Patrick Kong and Anthony Ackah-Nyanzu Deep learning for predicting the number of inter-residue contacts in protein molecules	314
Emily Staden, Meghann Humphries, Leticia Soares, and Kasey Fowler-Finn Comparing two species: historical phylogeography and species delimitation of Myiarchus fl catchers in the West Indies	314
Ellen Gruebbeling and Miranda Jany The dimensional relationship between age of first traumatic exposure and perceptions of control: A pilot study	314

Session B: 1:45 - 3:00 PM

Presenter / Presentation	Room
Haley Graham Disabled Gods: A Critical Disability Studies Analysis of Ancient Greek Myths	313
Abby Naumann Water Person: an International Travel Memoir	313
Jenna Haddock Missing the 'B' in LGBTQ+	314
Maddie Woodham Measuring and Comparing the Stress Levels of Student Leaders to Students Living On-Campus	314
Joshua Evans Is Self-Imposed Alienation Among Veterans Real and What Does it Mean?	314
Lindsey Gevers Role Play: A Teaching Strategy that is out of this World	315
Cassidy Kilgore, Shawn Denton, Allison Hall, Maggie Magnetti, and Morgan Tanner Consent in the Classroom: The Inclusivity of Sexual Education in the St. Louis Area	315

Poster Presentations

Effects Reading Ability on Memory Performance

Drake A. Anderson, Rebecca S. Winkler, and Andrew J. Stoker

Faculty Mentor: Dr. Suzanne Welcome

The current study analyzed the relationship between reading ability and memory performance on words from orthographically consistent and inconsistent word families. Reading ability was measured through a sight word efficiency (SWE) task within the second edition of the Test Of Word Reading Efficiency (TOWRE-II) where participants were shown a list of words and given forty-five seconds to read them aloud as quickly as possible. Participants (N = 43) were then shown lists of words consisting of five orthographically consistent (e.g. rust, bust, crust, must, trust) or inconsistent (e.g. cut, rut, put, but, nut) word groupings one word at a time. Memory of words shown on the list was assessed after a forgetting task, during the recall phase of the experiment. It was hypothesized that participants will remember orthographically consistent fourth position words in the list faster and more accurately than orthographically inconsistent fourth position words. Results indicated a significant relationship between the SWE scores and memory performance of orthographically consistent fourth position words, such that higher scores on the SWE were correlated with greater memory performance. These results further our understanding of the impacts of reading ability, and can be used to inform educators about the importance of reading ability.

Right/Left Hemisphere Dominance: Subjective well-being, Happiness, Life satisfaction, Success, and Personality

Wallat M. Baban

Faculty Mentor: Dr. Jennifer Siciliani

There has been a popularization in society of the Right hemisphere of the brain being responsible for creativity, and the Left hemisphere being responsible for logical and analytical thinking. However, it is not fully understood whether there is an underlying, neuroscientific basis to these claims or if such claims can be rendered factual. Recent studies have been conducted, revealing that right brained leaders emphasize in innovation and managing whereas left brained leaders focus on continuous improvement and planning (Kumar & Sharma 2016). The right and left hemispheres do possess interconnectedness, however as this study has shown, individuals tend to possess dominance on either hemisphere of their brain, which can then be associated with thinking styles and leadership; traits relating to the overall success of an individual, their life satisfaction, happiness, subjective well-being, and personality. Other studies have shown that there is a correlation between hemispheric dominance and the emotional intelligence in college students, which was correlated to a student's academic success according to their score in emotional intelligence (Margaret & Lavanya 2017). From these two studies, other variables that are related to emotional intelligence, leadership, and thinking styles can be studied. Such variables include: individual personality, subjective happiness, subjective well-being, life satisfaction, and objective life success. This study hopes to determine the relation between hemispheric dominance and the mentioned variables in college students in the hopes of categorizing each participant, based on their responses, to being more left hemisphere or right hemisphere dominant, and identifying the implications of dominance as they relate to these variables.

Comparison of Hop Derived Humulone Constituents in Beer Using UV-Vis, HPLC, and LC-MS

Aaron I. Boland, Nicholas Viriyasiri, Lorna Espinosa, Hunter Campbell, and Kurt Driesner

Faculty Mentor: Dr. Bruce C. Harper

Lupulones and humulones are two families of compounds derived from the hop flower (Humulus lupulus), utilized in brewing beer. Isohumulones are produced during the boiling process by isomerization reactions of humulones and are the primary bittering compounds in beer. The concentration in parts per million (ppm) of isohumulone is reported as IBU (International Bittering Units). Measurement of these compounds is valuable to brewers, but is confounded by other constituents in beer which may also absorb at the 275nm wavelength in UV-Vis spectrometry, the industry standard method.
25 samples were measured using UV-Vis, then analyzed by High Precision Liquid Chromatography (HPLC) and HPLC-Mass Spectrometry (LC-MS). Results were varied with respect to reported IBU. Of note, a sample containing an adjunct had much higher 275nm absorbance than expected, absent when eluted through HPLC, suggesting a falsely higher reading than actual due to interference by the adjunct.

Defining a role for the Reductase/ Isomerase pathway in lipid metabolism in *Arabidopsis thaliana*

Kristin Briggs and Jonathan Klunk

Faculty Mentor: Dr. Bethany Zolman

Arabidopsis thaliana, produces oil-rich seeds, which are metabolized into triacylglycerols (TAGs) for development and growth. Before photosynthesis occurs, these TAGs must be broken down through β-oxidation, where two-carbon fragments are removed sequentially. If the fatty acids of TAGs are unsaturated, containing a double bond, they must go through one of two pathways before they can be fully processed, the hydratase/epimerase pathway or the reductase/isomerase pathway. Prior research, done in the Zolman laboratory, observed the β-oxidation process in the hydratase/epimerase pathway.

Prior research, done in the Zolman laboratory, observed the β-oxidation process in the hydratase/epimerase pathway. Mutations disrupting enzymatic activities in this pathway can cause an inhibition of growth in *A. thaliana*. For instance, a *DECR* mutation prevents cotyledon and primary root elongation. Additionally, if the plant is kept in the dark, an *MFP2* mutation retards hypocotyl growth. The hydratase/epimerase pathway also disrupts the conversion of indole-3-butyric acid (IBA) to indole-3-acetic acid (IAA), an essential growth hormone in plants. For this reason, the plant becomes unresponsive to IBA, which impedes the lengthening of lateral roots and gives rise to long primary roots. The importance of the reductase/isomerase pathway has not been discovered, however. Through phenotypic assays, it was found that all mutants obtained for the reductase/isomerase pathway possessed wild-type phenotypes. These mutants displayed neither impairment in β-oxidation, nor disruption in IBA metabolism. By disrupting enzymatic activities in the reductase/isomerase pathway and characterizing their mutations, a deeper insight into the metabolism of fatty acids in *A. thaliana* has been obtained. Likewise, this work provides a greater understanding of the conversion of IBA to IAA as well as the relationship between the hydratase/epimerase and the reductase/isomerase pathways.

Chipotle and Jack in the Box's Nightmare: The Economic Repercussions of E.Coli

Nicole A.M. Caldwell

Faculty Mentor: Dr. Rob Wilson

This research intends to examine economic repercussions restaurants face after an E.Coli outbreak. Though many forms of E.Coli aid with digestive health, certain toxin-producing strains can wreak irreversible physical and economic damage on individuals. In two landmark outbreaks, E.Coli inflicted severe emotional and physical trauma on Chipotle and Jack in the Box customers. Shockingly, Jack in the Box's contaminated food contributed to the death of several toddlers. These chilling anecdotes provide insight into a consumer perspective, yet sources rarely discuss economic repercussions restaurants face after an E.Coli outbreak. Consequently, this research aims to prove that culpable restaurants suffer from debilitating costs ranging from litigation, faltering stock prices, and rebranding. Furthermore, negative public perception extended beyond Chipotle and Jack in the Box, economically impairing businesses and suppliers associated with the restaurants. Interestingly, this research reveals that individuals with little to no involvement with the spread of E.Coli can face similar economic repercussions. In some cases, this might translate into job loss or reduced profits. A combination of government sources (i.e. the CDC), business publications, and authentic court documents yield a convincing argument about E.Coli's economic repercussions for Chipotle and Jack in the Box. For the average American consumer, eliminating potential contact with E.Coli is nearly unfeasible. Despite this, consumers, legislators, and restaurant industry experts must cooperate to establish and follow dependable procedures. Doing so will markedly reduce the possibility of an E.Coli outbreak. Ultimately, effective collaboration and teamwork will help prevent another E.Coli tragedy. It is imperative that companies implement measures and precautions to protect their consumers. If not, all parties involved might face severe economic repercussions.

Comparison of Class 1 Railroads and Barges on the Mississippi River

Marilyn C. Cifuentes

Faculty Mentor: Mike G. Edwards and Dr. Anthony Vatterott

The Mississippi River and Class 1 Railroads are among the most critical corridors for transportation in the U.S. The Mississippi River allows goods to be shipped on barges that can hold up 26,250 tons of cargo without massive fuel consumption while Class 1 Railroads, Burlington Northern Santa Fe Railway (BNSF) and Union Pacific (UP), transport commodities at a faster pace for time-sensitive goods (U.S. Army Corps of Engineers, 2009). The aim of this paper is to explore the strengths and the weaknesses of barges on the Mississippi River and Class 1 Railroads BNSF and UP on the bases of three criteria: fuel efficiency, safety, and environmental impact. Establishing the range and limits of each mode, a cross comparison of which one is better suited for certain commodities is explored.

In the Introduction, it states the purpose of the study. In Chapter One, it outlines Class 1 Railroads, BNSF and UP, on the miles of operation, fuel efficiency, greenhouse gas emissions, and on safety from previous studies. Chapter Two focuses on the Mississippi River inland waterway systems where it focuses on the miles of operations, fuel efficiency, safety and greenhouse gas emission. Chapter Three analyzes each mode based on cost, safety, and environmental impact.

Purpose
The purpose of this study was to analyze Class 1 Railroads Burlington Northern Santa Fe Railway and Union Pacific, and barges on the Mississippi River on three criteria:
1. Fuel Efficiency
2. Environmental Impact
3. Safety

Cross comparison is performed to determine the strengths and weakness of each mode as well as the effects the environment and infrastructure has on them.

The Effects of Previous Childhood Trauma on Dissociative Symptoms in Adult Survivors of Recent Trauma

Lillith J. Clark

Faculty Mentor: Dr. Michael Griffin

This presentation aims to examine the effects of previous childhood abuse (e.g. physical or sexual abuse) on the dissociative symptoms experienced by adult survivors of recent traumas (e.g. physical or sexual assaults). The aims of this study are to examine the self-reports of the participants regarding childhood experiences of trauma, their

current dissociative experiences and the severity of those experiences, and physiological markers such as skin conductance and heart rate that may play a significant role in their experiences of dissociation. The hypothesis of this research is that previous childhood abuse will significantly increase the likelihood and severity of the adult survivor reporting dissociative experiences, and that their physiological data will indicate a significant difference between individuals who experienced childhood trauma and those who did not.

Sickle Cell Anemia: Sickle Cell Trait, Genetic Testing, Cost of Treatment.

Felesha O. Clarke

Faculty Mentor: Dr. Rob Wilson

Sickle Cell Disease (SCD), a genetically inherited disorder results in "sickle" shaped red blood cells, which shortens the flow of oxygen throughout the body and causes chronic pain. People who are positively diagnosed with SCD, inherits a gene from each parent. Since there are different types of SCD, this study serves to highlight the most familiar form of SCD: Sickle Cell Anemia, and the importance of heredity, genetic testing, and treatment through Centers for Disease Control, Mayo Clinic, and National Heart, Lung and Blood Institute. This federal agency discusses how sickle cell anemia is inherited, strict regulations of SCD newborn/amniotic fluid screening, treatments, medications, and different forms of SCD therapies. This information resulted in stressing the knowledge that sickle cell anemia is inherited from both maternal, and paternal parents passing on a sickle cell gene/trait "S", expresses the importance of the American routine blood check for gene "S", encourages bone marrow transplant as it is the only potential cure, offers of pain-relieving medication during crisis, and possibly blood transfusion therapy. Although not much awareness is spread about SCD, it is important that everyone take the necessary steps needed to learn these possibly life changing facts to ensure that people are not carriers of a gene that may cause SCD, and to also know our partners genetics being that this is the best way of preventing this disease. This study will lead to difficult questions such as: Is it right for a male and female with the "S" gene to form a family with their own genetics? Through research and deep questioning, awareness will be brought to the prevention of SCD.

Correlates of Seasonal Variation in a Community of Shelter Building Lepidoptera

Christopher J. Ernst

Faculty Mentor: Dr. Robert Marquis

Many species of Lepidoptera larvae (caterpillars) build structures of leaves and silk, commonly referred to as "shelters". These shelters are constructed in one of several different ways, including rolling the leaf edge, folding the leaf over itself, or tying two or more leaves flat together. This study was conducted to first determine seasonal abundance of these shelters in a temperate oak forest. The second goal was to determine the influence of host plant identity, season, and topography on the abundance of these shelters, and their secondary occupancy by arthropods other than those that made them. The study site was the forest at Cuivre River State Park, near Troy, MO. Three permanent transects, each 50 m long, were established and then censused three times during the growing season, May, July, and September, 2018. All shelters encountered on woody plants in a 1 m wide strip and within 2 m from the ground were counted, the inhabitants censused, and the host plant on which they were found identified. The frequency of shelters on host plants and variation of shelter types across seasons and tree species will be tested against several hypotheses involving biotic and abiotic factors that affect caterpillar survival. Abiotic factors that may influence shelter building include avoidance of heat and desiccation, which would select for increased shelter production in late summer. Biotic factors that may affect the frequency and type of leaf shelters constructed include predator and parasitoid avoidance as well as several factors of leaf type, including the toughness, size, and leaf chemistry of the host plant. Additionally, biotic factors related to leaf type may also change across host plant species and thus result in different preferred shelter types and building seasons for Lepidoptera on different host plants.

An Ethogram of California Sea Lions (Zalophus californianus)

Tricia A. Flesner

Faculty Mentor: Dr. Aimee S. Dunlap

Studying the behaviors of captive animals provides caretakers, ecologists, and conservationists with vital information on how better to care for them. I chose captive male California sea lions (Zalophus californianus) for my ethogram as little is known about their behavioral activities. I wanted to determine if they present an asymmetrical swimming preference and whether they display agonistic behaviors when there are no females present. I also aimed to examine the sea lions time budget, how they utilized their time in the pool. I used many observational sampling methods to gather data. My findings suggested there is a possibility that captive male sea lions may have an asymmetrical swimming preference. No instances of agonistic behavior occurred during this study, which can be seen in the resulting ethogram produced.

Modifying CBT for Cognitively Impaired Older Adults with Depression

Abigail J. Foster and Mary Wells

Faculty Mentor: Dr. Ann Steffen

Although clinical depression is not common in older adults, it creates problems in daily living for those individuals who experience it in later life. Symptoms of depression can differ between younger and older adults; treatment approaches may also need to be modified to account for some of the challenges of aging such as cognitive impairments. Previous research has supported the

effectiveness of Cognitive Behavior Therapy (CBT) for treating late-life depression. The use of jargon and abstract concepts, however, are disadvantageous to those with mild cognitive impairment or neurocognitive disorders. To combat these difficulties, there is a need for therapy materials that provide modifications for use with impaired older adults. This presentation summarizes the authors' contributions to the process of revising a treatment manual: Treating Later-Life Depression: A Cognitive Behavioral Approach (2nd edition) by Oxford University Press. Examples will be provided to demonstrate how therapy materials can be modified to accommodate the needs of depressed older adults with cognitive impairments.

Knot Groups of Torus Knots

Alexander H. Galindo

Faculty Mentor: Dr. Ronald Dotzel

For this project, an expository approach was taking insofar as examining knots groups goes, specifically for torus knots. As such, the first set of materials examined covered the concept of knot groups and the general tenets of knot theory itself. The rest of the time was spent gaining acquaintance with group theory, specifically relating to free groups, and the basics of abstract algebra. The last portion of work spent on the project was examining how all of these theories work together to define the knot groups of torus knots.

Staphylococcus Infections in a Hospital Environment

Bianca V. Garza

Faculty Mentor: Dr. Rob Wilson

Staphylococcus (Staph) is a group of bacteria that can cause various infectious diseases in different areas of the body. In most cases, this infectious disease causes no problems or minor skin infections, but in some cases the disease can turn deadly by entering the body. Staph infections are prevalent in hospital settings because of various reasons such as the interaction between patient and healthcare professionals, being on hospital care for long periods of time, a weakened immune system, an open cut or sore, a medical device within the body, and being on kidney dialysis. Nearly one in three people live with the bacterial strain Staphylococcus aureus on their skin or in the nose, but most people have no ill effects from it. Also, there is a drug resistant version of the Staph bacteria and is known as methicillin-resistant Staphylococcus aureus (MRSA). This strain is unable to be killed by the normal antibiotics used for the typical Staph infection. According to the CDC, they are working to reduce the amount of MRSA infections by 50 percent by 2020. The CDC did a study viewing the decolonization of MRSA with chlorohexidine and mupirocin which reduced MRSA by 37 percent. The CDC ran another studied that proved those who were educated in hygiene and decolonization reduced MRSA by 30 percent. Hospitals are properly cleaning and covering wounds, actively washing hands, maintaining a clean environment, and limiting exposure of patient to environment. This topic was researched by analyzing the CDC's website section on the Staph bacteria and what is being done to combat it. It was also concluded from an article on EverdayHealth, Institute for Healthcare Improvement, and MedLine Plus. Everyone and every hospital are susceptible to Staph infections because it is carried on everybody. It is important to recognize how it is transferred, who is most susceptible to contracting the disease, and why it is easily spread amongst the hospital setting.

Cardiovascular Disease; America's Obesity Plague

Taylor M. Gordon

Faculty Mentor Dr. Rob Wilson

Cardiovascular Disease is the leading cause of death in the United States and remains the number one country for having the greatest population of obesity. Being obese can lead to multiple health issues and ultimately it increases the likelihood of Cardiovascular Disease. With heart disease being the leading cause of death in industrialized nations, and obesity remaining a huge factor in contracting the disease, the American population seems to have little concern about what the risks of being unhealthy generates. Research from the Centers for Disease Control and Prevention and the American Heart Association sheds light upon the numerous risk factors and behaviors that influence Cardiovascular Disease. It is estimated that about 610,000 men and women die yearly from heart disease. That is 1 in every 4 deaths each year. The few, but more serious behaviors which also increase the risk for Heart Disease are social class, the mass consumption of fast food, and making lifestyle choices like drinking excess alcohol, smoking tobacco, having an unhealthy diet, and physical inactivity. Many of the major contributing factors that cause Cardiovascular Disease, are personal choices and actions that can be averted. This disease is a huge continuing problem that is gradually taking the lives of hundreds of thousands of people in the United States each year, although Americans have the knowledge and power to avoid it.

The relationship between phonemic decoding ability and recall accuracy and reaction time.

Melissa Growney and Max Schechter

Faculty Mentor: Dr. Suzanne Welcome and Adam Runyan

The present study examines the relationship between phonemic decoding ability and recall accuracy and reaction time in orthographically consistent and inconsistent tasks. We measured phonemic decoding ability via the Test of Word Reading Efficiency, second edition (TOWRE -II) assessment tool. The phonemic decoding task required participants to read as many non-words that are made up of different phonemes (e.g. ip, ta, ko, luddy, dord) as possible within a forty-five second window. When the reading task was complete, participants were

presented with a word sequence of orthographic consistency (e.g. best, rest, test, nest, vest) or inconsistency (e.g. bone, hone, done, tone, zone), followed by a distraction task and a memory task. Here, we hypothesized that participants with higher scores on the phonemic decoding task will have higher accuracy scores in the memory task as well as potentially lower reaction times. The results of this research showed no significant correlation between phonemic decoding ability and recall accuracy and reaction time in orthographically consistent and inconsistent tasks for words in the third and fourth position of the word sequences. This research has the potential to guide future investigations into the relationship between phonemic decoding and orthographic consistencies and inconsistencies.

The dimensional relationship between age of first traumatic exposure and perceptions of control: A pilot study

Ellen L. Gruebbeling and Miranda Jany

Faculty Mentor: Dr. Carissa L. Philippi

An earlier age of onset of trauma (before 16 years old) has been associated with greater psychological impairments, such as increased risk of psychopathology and greater psychological distress in adulthood (Kaplow & Widom, 2007; Mueller et al., 2010; Teicher et al., 2009). Furthermore, trauma exposure has been linked to deficits in control (Fraizer, 2003; Ataria, 2015). However, the association between age of first trauma and perception of control are unclear. The present study aimed to define the relationship between age of first trauma and perception of control, or self-agency. Self-agency is defined as the sense of control of one's actions and/or thoughts (Gallagher, 2000). Participants (n = 14, Mage = 24.00 ± 9.54; Male = 2) first completed online questionnaires which examined exposure to traumatic and stressful events (e.g. jail time, neglect, and natural disasters) and measures relating to psychopathologies (i.e. depression, anxiety, and posttraumatic stress disorder (PTSD)). Participants then completed a computer based Self-agency Judgement Task, where they were asked to rate their perceived control after moving a box on the computer in various noise conditions (0%, 30%, 75%, 90%, 100%). Preliminary results show that there were statistically significant differences between age of trauma and agency ratings, such that earlier age of trauma predicted lower ratings of average control within all five conditions, $t(12) = -2.30$, $p = .040$. Interestingly, earlier age of trauma did not predict depression ($t(12) = -1.06$, $p = .311$), anxiety ($t(12) = -1.06$, $p = .312$), or PTSD psychopathology scores ($t(12) = -0.02$, $p = .981$). As data collection is ongoing, we will continue to examine the relationship between age of first trauma and perceptions of control, and its relationship to psychological disorders.

Identifying New Genes that Regulate Nitrogen Fixation in A. variabilis

Mara N. Hamilton, Dr. Teresa Thiel, and Brenda Pratte

Faculty Mentor: Dr. Teresa Thiel

Cyanobacteria are photosynthetic, gram-negative prokaryotes, which facilitated Earth's atmospheric shift from predominantly carbon dioxide to rich in oxygen allowing for more complex organisms to evolve. Some cyanobacteria perform nitrogen fixation, a process that reduces dinitrogen from the air to usable nitrogen sources, such as ammonium. Cyanobacteria do this using an enzyme called nitrogenase. However, nitrogenase is oxygen-sensitive and cyanobacteria must separate this process from oxygen-producing photosynthesis either spatially, in different cell types, or temporally, night vs day. The regulator gene cnfR1 controls the nitrogenase genes, but the regulatory elements that control cnfR1 are not yet known. The goal of this project is to identify new protein factors that control the nitrogenase regulator, cnfR1. Transposon mutagenesis and genetic screening will be paired with fluorescent reporter proteins, such as GFP, to identify new genes required for nitrogenase gene regulation.

Regulation of mRNA decay by Puf proteins is dependent on environmental conditions.

Alexandra J. Hamrick and Shayna Mueller

Faculty Mentor: Dr. Wendy Olivas

The nucleus of a eukaryotic cell contains the genetic code within DNA that directs growth and function of the cell. The genes contained in DNA make copies of themselves called RNAs, which are molecules able to leave the nucleus and direct protein synthesis. Over- or under-production of any one protein can cause cell malfunction and disease. Regulation of RNA lifespan is one method to ensure proper protein production. The Puf family of RNA-binding proteins regulate mRNA lifespans by controlling the rate of mRNA decay. More specifically, Puf proteins stimulate the removal of the poly(A) tails of mRNAs, which results in translational inhibition of the mRNA into protein and leads to complete mRNA degradation. In yeast, the Puf3 protein (Puf3p) regulates hundreds of mRNAs that encode proteins necessary for mitochondrial function. The ability of Puf3p to regulate mRNA decay is altered by the type of sugar source present. Puf3p is turned "on" in the presence of galactose and "off" in dextrose. The goal of this study was to analyze the effects of mutations in a component of the RNA decay machinery (Pop2p) that is required for condition-specific Puf3-mediated decay stimulation. The mutational effects were tested on both an mRNA normally targeted for degradation by Puf3p (COX17) and a control mRNA not targeted for decay (CBS1). Transcriptional shut-offs were performed to examine the decay rate of pooled mRNA following inhibition of mRNA production. When the temperature sensitive yeast cells are heat-shocked, new mRNA production is turned off and the existing mRNAs begin to decay over time. If the Pop2p mutations affect the decay rate of COX17 only, a regulation mechanism specific to Puf3-mediated decay is indicated. If both COX17 and CBS1 decay rates are affected, a global RNA-decay control mechanism is indicated

Cloning, sequencing, expression, and characterization of an Alzheimer's-specific monoclonal antibody

Anna K. Jones and Thao Pham

Faculty Mentor: Dr. Michael R. Nichols

Alzheimer's disease (AD) is characterized by chronic inflammation and neurodegeneration, which leads to loss of cognitive functions. Dr. Nichols' research laboratory is studying the neurological effects associated with AD. Amyloid precursor protein (APP) is a membrane spanning protein whose primary function is unknown, but it is associated with many tissue types and found clustered at the synapse of neurons. APP can be cleaved by secretases into 40 or 42 amino acid fragments called amyloid beta protein (Aβ). These cleaved amyloid-β proteins can accumulate (aggregate) and form extracellular plaques in AD brains. Antibodies are normally produced in an adaptive immune response and are a high affinity binding protein that recognizes a specific molecule, whether it be a protein or foreign cellular component. Antibodies are commonly used in the lab to quantify the levels of aggregated proteins, such as Aβ and are often used in immunotherapy clinical trials to target plaques in AD patient's brains. The aggregates of Aβ assemble into multiple different confirmations, some of which are soluble and others insoluble, but the most toxic and active form is the soluble protofibril form. Antibodies that have been made to be selective for the protofibril form of Aβ are required constantly to study the effect of Aβ. A combination of biological and biochemical techniques has been used to obtain the DNA sequence of a monoclonal antibody (mAbSL). The antibody mAbSL was purified with an affinity column and has been shown to be selective and specific for Aβ protofibrils by a series of immunological techniques, such as enzyme-linked immunosorbent assays (ELISA) and dot blots. With the sequence and means of expression we can create a stock of the antibodies and they will be applied in multiple aspects of this laboratory to help characterize Aβ protofibrils and their effects.

Tuberculosis Remains a Menace of Society

Jonathan D. Kane

Faculty Mentor: Dr. Rob Wilson

Despite Tuberculosis (TB) being one of the top ten causes of death worldwide, the disease does not garner much attention in first world countries. According to the Center for Disease Control and Prevention (CDC), one fourth of the world's population is infected with TB. Not only does TB carry a high death rate of about 45% for HIV-negative people, but also acts as a death sentence for almost all HIV-positive people since their immune systems are weakened. Over one million people die each year from the millions of infected. Fortunately, TB is treatable with the proper use of specific antibiotics. However, improper use of these antibiotics has led to problematic drug-resistant TB. As world travel and immigration statistics grow each day, citizens of first world countries, along with the rest of the world, are now put in danger of contracting advanced forms of TB such as multidrug-resistant TB. For instance, some 4.2 million migrant farm workers are in the United States according to the Department of Human Health and Services. Due to poor living conditions, not only do these workers often have diseases such as TB, but also carry said diseases with them to each seasonal destination. To gather information on this topic, this paper referred to the World Health Organization, CDC, and other health services. In a world with a large HIV-positive population, migrant workers, and third world countries, TB cannot afford to be ignored. These statistics and overall information will educate people in order to bring greater attention to TB incidence worldwide. By bringing attention to global TB, this project seeks to lower the yearly death toll of approximately 1.3 million people.

Academic Self-Efficacy and Undergraduate Research Opportunities Predict Graduate School Intentions

Elizabeth A. Koellner, Heather M. Lange, Drake A. Anderson, Steven J. Mellifont, and Dr. Bettina J. Casad

Faculty Mentor: Dr. Bettina J. Casad

Students who have undergraduate research opportunities tend to have higher identification as a scientist, also known as science identity. Furthermore, students with higher science identity are better prepared for advanced science education, compared to students with lower science identity. The current studies seek to examine predictors of undergraduate students' intentions to pursue graduate school. In the first study, underrepresented students in science, technology, engineering, and mathematics (STEM) fields who attended the Annual Biomedical Research Conference for Minority Students (ABRCMS) filled out a survey that assessed their research confidence and intentions to pursue graduate school. Students who attended ABRCMS more often and had higher research confidence from attending were more likely to intend to pursue a research degree in graduate school. In study two, undergraduate students completed a survey with items measuring research confidence, science identity, and academic self-efficacy. All variables significantly predicted students' intentions of pursuing graduate education, with science identity being the strongest predictor. Results suggest that students' undergraduate research experiences and ability to view themselves as scientists prepares them for further education and increases their intentions of pursuing graduate education. Exposure to undergraduate research opportunities, like ABRCMS, is especially important in providing underrepresented groups a sense of belonging in STEM fields. Greater sense of belonging and stronger identification with science can increase the number of underrepresented students who pursue STEM fields, which can lead to more advances in science.

Malaria: Causing Havoc in Sub-Saharan Africa

Awa Konte

Faculty Mentor: Dr. Rob Wilson

Much is known on the cause of malaria, as well as the various treatment options for those affected. Yet many keep dying from this preventable disease, most being children in sub-Saharan Africa under the age 5. This disease creates a remarkable burden by stifling the economic growth of these societies, and the global community. There is a high potential for these communities to generate wealth for the global market; however, because of malaria, this potential is wasted. The purpose of this study is to examine the components that are directly affected by malaria such as income, education, and foreign investment and trade. Currently, there are many efforts to eradicate this disease, by the international community, through increased funding for research, utilization of nets and vaccines- organizations include: the Bill and Melinda Gates Foundation, the World Health Organization (WHO), World Bank, Center for Disease Control and Prevention (CDC), Malaria No More (MNM), Global Fund to fight AIDS, Tuberculosis, and Malaria. Even with the billions of dollars invested thus far, the disease has proven to be difficult as there are increasing rates of drug and insecticide resistance as well as financial factors that allow the disease to remain endemic.

Application of TSP+k for Heatmap Production

Alberto P. Maiocco

Faculty Mentor: Dr. Sharlee Climer

Rearrangement clustering has been used in many applications. When applied to gene clustering, the base rearrangement clustering method is not enough to preserve natural clustering to make human-readable heatmaps. By using the TSP+k method devised by Climer and Zhang, these clusters are preserved. This application uses the Rearrangement Clustering with TSP+k method with the png++ library to simplify the process of creating a heatmap from a given gene expression cluster. Given a matrix of gene expression, this application creates a travelling salesman problem using a user defined measure of distance, by default we use the Pearson Correlation Coefficient. This is solved with the Concorde TSP solver, and the resulting expression data is utilized by the png++ graphics library to generate colorblind-viewable heatmaps.

Classroom Gender Equity Predicts Positive Academic and Social Outcomes for Women in STEM.

Megan Mayfield, Paige E. Lyell, Christopher R. Bach, and Gregory T. Terschluse

Faculty Mentor: Bettina Casad, PhD

Prior research has demonstrated the existence of several barriers which prevent women from pursuing science, technology, engineering, and math (STEM) related fields in college; for example, threatening intellectual environments may impact college women's self-efficacy, sense of belonging, and commitment to a STEM career. These types of environments may be facilitated by disproportionate gender equity in classrooms and perceived pervasiveness of gender discrimination. A sample of college women in biomedical studies (N = 474) completed a series of questionnaires to determine the relationship among these variables. Results indicated that greater classroom gender equity predicted: (1) a significantly greater sense of belonging to the STEM community, (2) a significantly greater academic self-efficacy, and (3) a significantly greater commitment to a STEM career. These results suggest that college women in biomedical studies feel more accepted in the STEM community, believe they can achieve more academically, and have greater intentions to pursue a STEM-related career when there is more equality between women and men in intellectual environments. Furthermore, all three positive relationships were moderated by perceived pervasiveness of gender discrimination, such that these relationships were stronger when perceived pervasiveness of gender discrimination was low. These results help us not only understand the effects of threatening intellectual environments on college women in STEM fields, but also why women do not initially pursue these fields – both of which are important for creating effective interventions to increase the number of women pursuing STEM.

Developing Progressive Tactics of Student Engagement and Classroom Interpersonal Interactions

Joseph A.D. McBride

Faculty Mentor: Dr. Matthew Taylor

Identifying factors associated with positive interpersonal interaction in the classroom (school commitment, classroom climate, self-esteem, and attitude towards violence) can elucidate the processes involved with student learning and classroom teaching. EnTeam programming fosters student participation through the implementation of tactics that enhance student engagement and involvement, encouraging collaborative learning and team building activities. Research suggests that adolescent delinquency serves as a predictor to school nonattendance, crime, and misconduct, and despite evidence of an association between low-school commitment and adolescent delinquency, many of the underlying facets of positive classroom interpersonal interaction remain unknown. The current study addressed this gap and examined the impact of communal learning approaches with school commitment, classroom climate, self-esteem, and attitude towards violence. 82 elementary student participants were randomly assigned to two conditions and either received EnTeam programing or a control group activity. It was predicted that students who received the EnTeam programming would have positive or enhanced views to classroom climate, higher self-esteem and school commitment. Further, we predicted that students who received the EnTeam programming would have fewer positive attitudes toward violence.

A repeated measures ANOVA assessed across 328 data points provided preliminary results and partially support our initial hypotheses. Students who had EnTeam programming had significantly higher results across the domains of school commitment and classroom climate. Additionally, for the EnTeam group, enhanced school commitment was linked to more favorable ratings of classroom climate.

Collectively, these results provide some evidence that the facets involved with the student school experience are enhanced through incorporating classroom community goal attainment strategies. Since the achievement of students relies on the intricate combination of interactions with peers, family, teachers, and the school, future studies should examine team building activities and collaborative efforts within the family to assess the educational climate in our neighborhoods and the future of our nation

Immunoassay test iScreen 5 Panel test

Jennifer McNeese

Faculty Mentor: Gerianne Friedline

I plan on visiting three different doctor offices in Florissant, Fenton and Hermann Missouri under a local Missouri doctor. By visiting these offices, I plan on collecting data for a drug analysis by using an iScreen 5 Panel Drug Test (also called a dip-test) to see if there is any correlation between location and drug use. The specific drugs I will be looking at are THC, cocaine, opiates, methamphetamines and amphetamines.

In 2016 there were over 914 opiate related overdose deaths in Missouri at a rate of 15.9 deaths per every 100,000-person compared to the National rate of 13.3. Missouri was once called the meth capital of the world but after a decade of storming meth labs, federal and state laws restricting pseudoephedrine sales Missourians saw a drop-in methamphetamine production. But, it is silently on the rise again with opioids.

Impaired Meningeal Lymphatic Drainage Exacerbates Microglial Hyper-Ramifications Following Chronic Unpredictable Stress

Robert J. Moreland, Joseph McBride, Richard Parks, Kalya Kapral, Brian Fogarty

Faculty Mentor: Dr. George Taylor

Recent discovery of the meningeal drainage pathway has brought a wave of research aimed at elucidating the effects of impairment to the meningeal lymphatic drainage system and its relationship to neurodegenerative disorders. The proposed study looks to utilize preliminary data from the Taylor lab indicating hyper-ramification of microglia in key brain regions associated
with spatial memory and anxiety- like behaviors, which may contribute to certain forms of behavioral pathology. I have designed a study that will examine the behavioral consequences of impaired meningeal lymphatic drainage in an 8- week long chronic stress model. Given the current literature showing the effects of 4-week ablation of meningeal lymphatic vessels, I will measure spatial learning and memory, as well as fear reactivity, throughout the 8-week period to investigate how long-term chronic unpredictable stress could exacerbate the consequences of long-term impairment of the meningeal lymphatic drainage. I hypothesize that either the removal of lymph nodes, effectively impairing the drainage of CSF flow, or stress- alone will cause similar behavioral deficits, But the combination of both lymph node removal and stress will produce the greatest behavioral impairments. Additionally, I hypothesize that the highest levels of hyper-ramified microglia will be present in the combined treatment group.

Regulation of mRNA decay by Puf proteins is dependent on environmental conditions.

Shayna M. Mueller and Alexandra J. Hamrick

Faculty Mentor: Dr. Wendy Olivas

The nucleus of a eukaryotic cell contains the genetic code within DNA that directs growth and function of the cell. The genes contained in DNA make copies of themselves called RNAs, which are molecules able to leave the nucleus and direct protein synthesis. Over- or under-production of any one protein can cause cell malfunction and disease. Regulation of RNA lifespan is one method to ensure proper protein production. The Puf family of RNA-binding proteins regulate mRNA lifespans by controlling the rate of mRNA decay. More specifically, Puf proteins stimulate the removal of the poly(A) tails of mRNAs, which results in translational inhibition of the mRNA into protein and leads to complete mRNA degradation. In yeast, the Puf3 protein (Puf3p) regulates hundreds of mRNAs that encode proteins necessary for mitochondrial function. The ability of Puf3p to regulate mRNA decay is altered by the type of sugar source present. Puf3p is turned "on" in the presence of galactose and "off" in dextrose. The goal of this study was to analyze the effects of mutations in a component of the RNA decay machinery (Pop2p) that is required for condition-specific Puf3-mediated decay stimulation. The mutational effects were tested on both an mRNA normally targeted for degradation by Puf3p (COX17) and a control mRNA not targeted for d cay (CBS1). Transcriptional shut-offs were performed to examine the decay rate of pooled mRNA following inhibition of mRNA production. When the temperature sensitive yeast cells are heat-shocked, new mRNA production is turned off and the existing mRNAs begin to decay over time. If the Pop2p mutations affect the decay rate of COX17 only, a regulation mechanism specific to Puf3-mediated decay is indicated. If both COX17 and CBS1 decay rates are affected, a global RNA-decay control mechanism is indicated

Building Blocks for Oligosaccharide Synthesis

Mariya Novakova, Mithila Bandara, and Catherine Alex

Faculty Mentor: Dr. Alexei Demchenko

Carbohydrates (sugars or glycans) are involved in many processes and are referred to as the "essential molecules of life." Our life begins with fertilization, which takes place via carbohydrate-protein recognition. Our journey with sugars continues with human milk that becomes the ideal first food for babies. Oligosaccharides present in human milk (HMOs) can provide prebiotic effects, function as antimicrobial agents, and provide necessary nutrients for the development of the brain and cognition of infants. Throughout our lifetime, sugars are involved in many upkeeping processes and defensive mechanisms including joint lubrication, cell growth, antigenic determination, anti-inflammation, immune response.
Presented herein is the synthesis of two different families of building blocks. The first one will be used for the synthesis of HMOs. Thanks to the explosive growth of glycomics, we already know that HMOs are a unique and diverse family of glycans, but our understanding of the HMO function is far from complete. Adding HMOs to infant formulas could be beneficial for the infant's health, but HMOs are challenging to produce and purify. The synthesized molecules will help to investigate the exact roles of individual HMOs which remain largely unknown.

The second family of building blocks will be used for the synthesis of high mannose N-glycans that are involved in many fundamental processes. The synthesized molecules will aid our collaborative efforts dedicated to understanding the roles of N-glycans in mediation of the pathogenesis of cancers, AIDS, and other diseases.

"The Art of Science" - Augmenting a bacteriophage

Thomas A. Perrot

Faculty Mentor: Dr. James Bashkin

Large ceramic sculpture of a T4 bacteriophage and other themes in the physical sciences.

Portrayals of Substance Use on Gossip Sites During Coverage of Celebrity Overdoses

Redmond Reily and Reilly Meyer

Faculty Mentor: Dr. Lara Zwarun

According to Social Cognitive Theory, one way a person learns their behaviors is from observing other people, including media figures such as celebrities. In this study, we will evaluate what sort of references are made to drugs, alcohol, and smoking in tweets and on webpages of gossip organizations on days surrounding highly-publicized celebrity overdoses from 2011-2018. We will analyze tweets from organizations such as TMZ, as well as the webpages to which they direct followers, for the extent to which and the ways in which they portray substance use. The frequency of mentions and whether they are positive or negative in nature will provide insight into the types of message followers of celebrity gossip may be receiving and absorbing about drugs, alcohol, and tobacco products.

Risk Factors for a Secondary Diagnosis of a Substance Use Disorder in Adolescents with Anxiety

Trent S. Ruckman and David Von Nordheim

Faculty Mentor: Dr. Jodi Woodruff

Approximately 31.9% of adolescents in the United States are diagnosed with an anxiety disorder in their lifetime (Merikangas et. al., 2010). Furthermore, anxiety is commonly comorbid with substance use disorders (SUD) in this population (Lopez, Turner, & Saavedra, 2005). Because anxiety disorders are also comorbid with many other psychiatric conditions (Essau, Lewinsohn, Lim, Ho, & Rohde, 2018), it is often difficult to separate premorbid SUD symptoms from other serious mental illness (SMI) pathologies. To identify the early risk factors uniquely associated with comorbid SUD pathology, retrospective analyses were conducted using claims submitted to MO HealthNet, the Missouri Department of Social Services' Medicaid Division, from 2008 to 2018. Pharmacy and healthcare utilization claims were analyzed for individuals aged 10-25 with a primary diagnosis of an anxiety disorder and secondary diagnoses of a SUD or other SMI (e.g., post-traumatic stress disorder, eating disorder, psychotic disorder), n=10,005 claims within three years prior to the secondary diagnosis were analyzed. Self-identified tobacco use ($\chi2=944.022$, $p<.001$, O.R.=7.82), consecutive claims for an opioid ($\chi2=61.107$, $p<.001$, O.R.=5.008), benzodiazepine prescription ($\chi2=8.031$, $p=.005$, O.R.=3.64), and an STD/STI diagnosis ($\chi2=29.562$, $p<.001$, O.R.=2.88) were the strongest predictors of a comorbid SUD diagnosis. An attention deficit/hyperactivity disorder diagnosis ($\chi2=139.636$, $p<.001$, O.R.=0.352) and consecutive claims for an antipsychotic prescription ($\chi2=70.468$, $p<.001$, O.R.=0.399) were the strongest negative predictors of an SUD diagnosis. Additionally, non-psychiatric hospitalizations were a positive predictor of SUD diagnosis ($\chi2=39.547$, $p<.001$, O.R.=2.48), while psychiatric hospitalizations were a negative predictor ($\chi2=39.249$, $p<.001$, O.R.=0.525). These results highlight potential risk factors for those diagnosed with an anxiety disorder to develop a SUD, and can inform the healthcare field on the epidemiology of co occurring anxiety and substance use disorders.

Interactions and Activity of the NLRP3 Inflammasome Proteins

Kristen Schmutzler and Nyasha Makoni

Faculty Mentor: Dr. Michael R. Nichols

The presence of inflammation in the brain is a common indicator of many neurodegenerative diseases including Alzheimer's disease (AD). A trademark of AD is the accumulation of misfolded amyloid-beta (Aβ) proteins into insoluble, senile plaques that aid in the progression of inflammation in the brain. Glial cells in the central nervous system have the capability to uptake Aβ protofibrils from the environment, and within the cell can interact with a larger protein complex called the NLRP3 inflammasome. The NLRP3 inflammasome is composed of three distinct protein segments: NLRP3, apoptosis-associated speck-like protein containing a CARD (ASC), and caspase -1. Within the complex there is unique binding between the three segments as well as potential binding between Aβ and each segment individually. The NLRP3 complex as a unit functions to produce the mature pro-inflammatory cytokine Interleukin-1 Beta, so understanding the specific binding of this complex can provide a lens into inflammation progression in AD. the three segments as well as potential binding between Aβ and each segment individually. The NLRP3 complex as a unit functions to produce the mature pro-inflammatory cytokine Interleukin-1 Beta, so understanding the specific binding of this complex can provide a lens into inflammation progression in AD.

Psychopathic Personality Traits and Other-Focused Thought in a College Sample and a Prison Sample

Tammy D. Shartzer

Faculty Mentor: Dr. Carissa L. Philippi

Individuals with psychopathy are known to exhibit egocentric and cold-hearted behavior. However, the psychological underpinnings of these interpersonal and affective psychopathic traits remain unclear. Establishing unique psychological correlates of distinct psychopathic traits could have important implications for the future development of interventions for this disorder. In this study, an open-ended sentence completion task and a self-report measure of psychopathic traits were administered to a sample of incarcerated offenders (N = 201) from 2 medium-security correctional institutions in Wisconsin. We also tested a college sample (N = 188) from the University of Missouri-St. Louis on the same measures to assess features of psychopathy in a non-institutionalized setting.

Pearson correlation coefficients were calculated to assess the relationships between psychopathy traits and self-focused and other-focused thoughts, including self-positive and other-negative responses, in both the prison and college samples. In the prison inmate sample, higher total psychopathy trait scores were not significantly associated with greater self-focused thought responses, $r(199) = -.040$, $p = .570$. However, total psychopathy traits were significantly associated with diminished other-focused thought, $r(199) = -.501$, $p = .000$. Similarly, in the college sample, higher total psychopathy trait scores were significantly associated with reduced other-focused thought responses, $r(179) = -.14$, $p < .05$. A trend-level relationship was found between higher egocentricity scores and fewer positive self-focused thought responses in the college sample $r(179) = -.139$, $p = .062$. Surprisingly, higher cold-heartedness was not significantly associated with negative other-focused thought responses in the college sample, $r(179) = .04$, $p = .261$.

These findings demonstrate a novel relationship between psychopathic traits and the propensity for diminished other-focused thought within both an incarcerated population and a college population. Broadly, our findings also highlight a key dimension of social cognition that may underlie lack of empathy and remorse in psychopathy.

Keywords: Psychopathy, Social Cognition, Empathy, Cold-heartedness, Egocentricity

Preparation, characterization, and application of a biotinylated Alzheimer's-specific affinity-purified antibody

Cristina Sinobas Pereira

Faculty Mentor: Dr. Michael R. Nichols

Alzheimer's disease (AD) is the most common neurodegerative disease and principal cause of dementia that originates problems with behavior, thinking and memory loss. One of the most important indication in patients with AD disease, is the accumulation of plaques in the brain. The plaques are deposits of a protein called AB amyloid that build up in the spaces between the brain. A oligomerization occurs through several intermediates: Protofibrils, Fibrils and monomers being protofibrils the most toxic specie. The preparation, characterization, and application of a biotinylated Alzheimer's-specific affinity-purified antibody will help to better understand the specificity of several antibodies for protofibrils, fibrils and monomers. The goal of these series of experiments was to prove that mAbSL 113 and mAbSL 108 are conformational specific antibodies for protofibrils. Based on the results, can be state that mAbSL 113 and mAbSL 108 showed higher specificity for protofibrils than for fibrils and monomers.

HPLC-based automated synthesis: Building blocks for the development of new technologies

Hayley B. Steber and Matteo Panza

Faculty Mentor: Dr. Alexei Demchenko

Use of automated technologies is of increasing interest in glycosciences.1 Among the new methodologies, a number of recent advancements have emerged in the area of solid-phase oligosaccharide synthesis.2-3 Demchenko and Stine developed a synthesizer based on a commercial HPLC instrument that was recently improved by the implementation of the autosampler for the delivery of glycosylation promoters.4 Despite the added versatility, the system still lacks complete automation.

The foundations of glycan syntheses are acceptors and donors, grouped together under the general term of building blocks. Presented herein is the synthesis of the building blocks of the rhamno and galacto series. We then showcase how these building blocks can be used in

the next generation HPLC system to build two oligosaccharides of biological interest. A split-valve and a programmable autosampler are employed to provide recirculation, and each step of the synthesis can now be fully automated. The synthesis of these target compounds illustrate the versatility and reliability of the automated technology, which is still in development at this point. The automated technology is expected to provide a quicker and more universally available way of generating glycans in the future.

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Molecular Assembly Line for Intramolecular Electron Transferring Bimetallic Fe and Mn Cyanometallate Clusters

Austin L. Stelling

Faculty Mentor: Dr. Stephen M. Holmes

There has been emerging worldwide research dedicated to finding molecular complexes suitable for molecule-based high-density information storage via intramolecular electron transfer. A known cyanoferrate switchable material, Prussian Blue, has inspired research efforts of Holmes et al. to create families of heterometallic Prussian Blue derivatives that display optical and magnetic behavioral transitions with the variation of light and temperature.

The task for my undergraduate research project is synthesizing massive switchable molecular clusters containing cyano-bridged Fe and Mn units. During the process, Marcus-Hush theory of electron transfer was an important consideration during the synthesis of tri- and tetranuclear complexes with varying redox potentials and ligand environments to impact the movement of electrons in the metal centers. Using a method known as "self assembly" with the building blocks of [(TpR)Fe (CN)3]- (TpR = poly (pyrazolyl)borates), Manganese cation complexes, along with the combinations of 2 different bidentate ligands and 2 choices of counteranions I have produced a closely related family of novel cyanometalate complexes. When looking for electron transfer, I found that the compounds have altogether failed according to variable temperature IR spectra collected from 77 K to 300 K. I present my observed trends and further plans and predictions of the synthetic design,; this includes tuning the electron density of the metal centers and how to encourage electron transfer using electrophiles bonded to the cyanides within the structure to forcefully pull the electrons through the cyanide bridges. Ultimately, my studies have shown each unique complex helps us understand the variety of factors and challenges that relate to structure-property relationships in the manufacture of electron transfer and spin crossover complexes.

Transition Metal Complexes: a New Wrench for the Toolbox

Evan Stephenson

Faculty Mentor: Dr. Eike Bauer

The manufacturing of drugs and other complicated molecules often requires a catalyst. A catalyst reduces the energy required to perform a reaction, but can also influence the products. The research done by Evan Stephenson is on the complex ion ferrocenium and its uses as a catalyst. In the early stages of research the nature of the catalyst is explored in order to optimize product yield and energy input. Further stages of research focus on building a system of derivative catalysts that are tailored to specific reaction conditions. In these stages work is done to develop an asymmetric catalyst that will create chiral products.

Childhood Obesity: Social History and Issues

Sarah S. Teemul

Faculty Mentor: Dr. Rob Wilson

There is an alarming increase in the rates of childhood obesity. The social issues that obese children face begin with the society's behavior towards them. Obesity is viewed by the public as a lifestyle disease therefore, victim blaming is involved. Society created how a "perfect" body should be and this has led to bullying. People are taken advantage of due to low-economics status, resulting in the purchase of unhealthy food. The challenges that overweight children face from society are important to acknowledge because understanding the social issues can prevent this epidemic. Although, society has come to terms with the epidemic, the public continues to ignore this disease by continuing harmful habits that increase rates of youth obesity. The Obesity Society Journal has studies from anthropologists using biocultural approach, investigating how economic status influences the consumption on unhealthy foods, why society results to victimization and bullying. Results have shown that obesity is not caused by only genetics, therefore an opportunity to blame the individual. Bullying stems from bullies "sensing" vulnerabilities in others and are more than willing to exploit those things. Lastly, eateries take advantage of low-income individuals, by strategically pricing fried foods less, leaving families no chose, but to purchase unhealthy options because of budget restraints. The consumption of unhealthy food results in overweight youth which increases a child's chance of victim blaming and bullying. Society has accepted youth obesity as an epidemic, but this disease is promoted by ignoring and not educating the public.

One Note, Twenty Ways

Steven D. Tyler

Faculty Mentor: Dr. Sonya Bahar, John McGrosso, and Dr. Phil Fraundorf

The objective of this project was to examine the spectral properties of different styles of musical notes. Just as a single word or phrase can have several different meanings depending on how it is spoken, a musical note or phrase can have several different meanings depending on how it is played. The note could be played angrily by using the bow of a violin to exert a great pressure on the string and playing near the bridge of the violin, or a note could be played mysteriously by using a very small amount of pressure of the bow and playing closer to the fingerboard of a violin. This research project was carried out with help from the Department of Physics and Astronomy, and Music, at the University of Missouri-St. Louis. Musical notes were recorded onto audio files, and those files were uploaded into a computer program that analyzed the sounds using a spectrograph. Then, after all of the files had been uploaded and analyzed, the spectral properties of the notes were compared. The spectral properties of different styles of notes do seem to be different from one another. The research is ongoing, but the current findings suggest that spectral images of notes differ depending upon the way the note was played. The findings of this project could allow people who are deaf to enjoy different types of music as if they had no hearing deficiency. Not only would deaf people be able to enjoy music, but they could learn how to play instruments, as well, by mimicking the images produced using this computer software. Music teachers could also use these findings as tools for teaching their students. The students could look at these images and the teachers could help the students replicate the images themselves.

Polio: Iron Lungs, Espionage, and Fear

Steven D. Tyler

Faculty Mentor: Dr. Rob Wilson

The objective of this research project is to examine the social aspects of the Polio epidemic of the twentieth century, as well as in more recent times, particularly with regards to fear. Many people who were afflicted with Polio were placed into what were called "Iron Lungs," or large machines designed to make breathing easier for a patient. Even in the present, there are many people who are afraid of having their children vaccinated against Polio, particularly in the Middle East. This project will examine several written and published sources relating to the polio outbreak of the twentieth century, particularly about the "Iron Lungs" that were implemented. These sources include an article published in the 1950s, as well as some contemporary sources relating to advances made with Iron Lungs, and how polio is continuing to affect the Middle East in this century. For many nurses caring for patients afflicted with Polio during the 1950s, the work required was difficult, and a group effort was mandatory. For the patients in particular, there was an ever-present fear that the machines that were used to help them to breathe would stop working. In the Middle East, very recently, many parents are fearful of having their children vaccinated because of the fact that the United States had conducted espionage against Osama bin Laden in the early 2000s under the guise of vaccination. The Polio virus has had a major impact on various societies throughout the past century, which can be seen very clearly in the Middle East. In the United States, many people afflicted with the Polio virus feared for their lives because of the machinery used to keep them alive.

Cystic Fibrosis: Support Networks Help Patients Lead Normal Lives

Brandon D. Vestal

Faculty Mentor: Dr. Rob Wilson

Cystic Fibrosis (CF) is an incurable genetic disease resulting from mutations in the cystic fibrosis transmembrane conductance regulator (CFTR) gene. The lack of this gene's protein product makes cells unable to transport chloride ions to their surface, leading to a lack of water in the mucous membranes and causing mucus to become abnormally viscous. Complications derive from ducts in the body becoming clogged with this sticky mucus, resulting in early death in patients (background source: Cystic Fibrosis Foundation https://www.cff.org/What-is-CF/About-Cystic-Fibrosis/). This research discusses the personal struggles of CF sufferers to lead normal, fulfilling lives in the face of certain death utilizing primary sources that detail their social stories. These sources include background information ("Cystic Fibrosis: History." https://www.nationaljewish.org/conditions/cystic-fibrosis-cf/history) to provide a brief history of the disease and how patients were generally viewed, but predominately consist of interviews conducted as part of studies (papers by Tuchman et al, Kirk et al, Jamieson et al, and Horky et al). Interviewee age ranges from young children to late adolescents. The studies reveal how these age groups must find a balance between coping with their chronic, life-threatening symptoms and participating in the social and personal growth activities that are an integral part of childhood development. Patients often struggle with self esteem issues caused by their symptoms, and treatment often consumes enough time that normal activities must be put aside. However, the non-contagious nature of the disease means that family and peers are much less hesitant to be in contact with CF patients than other illnesses. This means that support is readily available for the patients, which significantly reduces their suffering and allows them to lead relatively normal lives.

Development of a protofibril-selective sandwich ELISA to analyze Alzheimer's amyloid-β levels

Marina Villoch and Cristina Sinobas Pereira

Faculty Mentor: Dr. Michael R. Nichols

Protein aggregation is recognized as an important contributing factor to several neurodegenerative diseases such as Alzheimer's disease (AD). One of the peptide involved is amyloid-β (Aβ), a 40-42-residue peptide and the primary component of the senile plaques found in AD brains. Aβ aggregations can be found in the form of protofibrils, mon-

omers, and fibrils intermediates. However, only protofibrils have been shown to be a crucial factor in pathogenicity due to their toxicity. This research involves the development of a novel protofibril-selective sandwich ELISA to determine Aβ levels in AD so it can be used for further research as a biomarker, detection agent, research tool, or potential therapy for Alzheimer's disease. In the sandwich ELISA developed, monoclonal-antibody mAbSL 113 is used as the detection antibody and biotinylated-affinity-purify-antibody apAbSL 40-4 is used as the capture antibody. ApAbSL 40-4 is conjugated with Streptavidin-HRP, which consist of streptavidin protein that is covalently conjugated to horseradish peroxidase (HRP). Streptavidin binds to biotin in apAbSL 40-4 and the conjugated HRP provides enzyme activity for detection using an appropriate substrate system, allowing us to quantify the specificity of such antibody for the different Aβ intermediates. The results obtained show that mAbSL 113 has higher affinity for protofibrils over fibrils and monomers, and for fibrils over monomers. This makes mAbSL 113 a protofibril-selective antibody that can be used in either sandwich and indirect ELISA to analyze Aβ protofibril intermediates in Alzheimer's disease.

The Vaccination Debate: Nursing's Role

Clare E. Vogt

Faculty Mentor: Dr. Roxanne Vandermause

Vaccination rates in the US remain abysmal, despite every effort on the part of public health authorities to improve them. It is well known from the extant research that vaccinations are critical for preventing the proliferation of previously endemic and devastating illnesses. The nursing role in vaccination is that of not only performing vaccinations, but also of educating parents beforehand about the benefits and potential side effects, as well as answering questions and dispelling myths that the parents might have. However, despite the important role that nurses play in vaccinations, they have the lowest compliance rates of all healthcare professionals. This integrated review seeks to understand nurses' perceptions and challenges regarding vaccination, and what can be done to improve the coverage rates of both nurses and the populations that they serve.

This presentation provides findings from select studies conducted over the past fifteen years. Databases consulted included the Cochrane database, PubMed, CINAHL, and the NIH. Studies were included that referenced perceptions of nurses regarding vaccination, parental perceptions of vaccination, methods to improve vaccination rates, and several studies on nurses' perceptions of measures to improve flu vaccination rates in hospitals. Keywords included "perceptions", "vaccination", "nurses", "antivaccine", and "improving rates" in various combinations.

The findings of this review reveal parental and nurse perceptions regarding mandatory vaccination and suggest ways for nurses to aid in parental decision-making. Parental reasons for refusing vaccinations are mainly based around lifestyle, mistrust of science, and a perception that they have the ability to make correct decisions for their child based on information that they find on the internet. Reasons nurses refuse vaccination are the same as for laypeople, and they tend to read the same sources. In conclusion, nurses need to better understand the information spread on the internet and in communities about vaccines, and have personal conversations with parents regarding vaccination. Nurses are insufficiently educated about vaccines and need to attend to their role in population health as they address their own and the health needs of children in their communities.

Impact of Literacy Rates on Democratic Desire

Katherine S. Volandt

Faculty Mentor: Dr. David C. Kimball

There has been a recent global shift away from democracy and towards authoritarian forms of government. Much attention has been given to analyses of the social and economic trends that feed this decline in democracy, with further attention paid to the missteps of the global powers as they navigate shifting economic dominance and populist movements worldwide. My research arose from questioning whether certain factors might exist that are reliably predictive of democratic support or political participation and can be affected through nongovernmental avenues. I began with the idea that higher levels of education will produce a greater desire for being governed democratically.

This paper explores the relationship between literacy rates and democratic desire in countries worldwide. My research finds that there exists a significant, strong, and positive relationship between literacy rates and enlightened democratic desire in democratic countries that is not reflected in nondemocratic countries. The absence of this relationship in nondemocracies may be due to the large range of nondemocratic regime types. Nondemocratic governments may also socialize their constituencies to prefer nondemocratic governance. Further research could look more closely at the effect of regime type through multiple democracy scores or through measures of freedom; possible effects of ethnic tension; and the effects of adherence to traditional gender roles.

Alzheimer Disease: Effects on Caregivers

Abigail L. Wiese

Faculty Mentor: Dr. Rob Wilson

Alzheimer's disease affects the caregivers just as much as the patient. There are roughly 110,000 people living with Alzheimer's disease in the United States. The caregivers experience symptoms of their own when taking care of Alzheimer patients. Including symptoms of anxiety, depression, fatigue, and a weakened immune system. Caregivers are put under a lot of stress financial as well with having to call out of work, taking a leave of absence, and even quitting their job. The cost of physician care, diagnostic test, pharmaceuticals, and personal nursing care can be overwhelming. There are many options for caregivers to receive help with their mental, physical, and

financial state. The caretaker of someone with Alzheimer's is a strain on many aspects of the caregiver's life and can be hard to handle and it is highly recommended that the caregivers take care of themselves just as much as they care for the patient.

Muscular Dystrophy: Society's Stigmatization of Victims

Bailey D. Witterholt

Faculty Mentor: Dr. Rob Wilson

Famous charity events have familiarized the public with muscular dystrophy. Some of the most well-known efforts are the Jerry Lewis Telethon and firefighters' yearly "Fill the Boot" campaign. However, interest in the disease and its effects past that point often goes unrealized. This paper utilizes informative websites such as The Mayo Clinic, as well as scientific articles, to determine the physical and social effects that muscular dystrophy can create for its victims. Additionally, this paper analyzes articles from websites like the *Washington Post* that discuss negative consequences that can arise out of popular charity events for muscular dystrophy. Muscular dystrophy refers to a group of diseases that cause gradual weakening of muscles, which can negatively affect physical functioning. Other less visible consequences may include bullying in school or harassment in the workplace. The Jerry Lewis Telethon garnered a significant amount of controversy, especially concerning its employment of pity to raise money, as well as through Lewis's depiction of victims of muscular dystrophy as dependent on the healthy members of society. Overall, detractors staunchly opposed the telethon's infantilization of those afflicted with muscular dystrophy. The analysis in this paper exhibits some of the devastating consequences of muscular dystrophy, both from disease symptoms and well-intentioned charity. It is important that future research address these concerns more thoroughly so that non-affected citizens become educated about stigma that victims of muscular dystrophy can encounter. Furthermore, society will be better equipped to truly make a positive impact on the lives of those affected with muscular dystrophy.

Controlling an invasive forest pest, the Asiatic oak weevil (Cyrtepistomus castaneus), using prescribed fire

Nicole J. Wolff and Dr. Laura Bhatti-Catano

Faculty Mentor: Dr. Robert Marquis

Invasive species are non-native species whose presence isalready or is likely to cause harm to the local ecosystem or economy, or human, animal, and plant health (Beck et al, 2006, p.415). The invasive Asiatic oak weevil is the primary leaf-feeding insect on oak trees in the Missouri Ozarks with larvae feeding on the roots of trees and the adults on the leaves (Marquis and Bhatti-Catano, 2017). The goal of this study was to determine if prescribed burns lower the abundance of adult and larval weevils. Eight pairs of 200 m x 200 m plots in the oak-hickory forest at the Tyson Research Station near Eureka, MO were used for the experimental environment. One of each plot pairs were surface-burned in early Spring 2018. In June 2018, mesh emergence traps with jars secured on top were placed under four white and four black oak trees on each plot. From late June-August 2018 the weevils were counted as they emerged and analyzed to determine effects of the sampling date, tree species, aspect, slope, weight, and ultimately weevil density in burned versus unburned plots. Notable differences in the density of weevils on burned vs. unburned plots were observed in favor of the hypothesis. These findings support the need for prescribed fire in the management of Missouri's forests.

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Oral Presentations

The Effect of Popular Distrust On Biological Disaster Preparedness in St. Louis

Nicholas E. Braun, Brian Hong, Abby Marler, Brittany Kertz, and Sara Ibrahim

Faculty Mentor: Dr. Susan Brownell

This research will evaluate the current relations between the state and society it governs by analyzing disaster preparedness. The question we will attempt to answer is how will people react to biological disasters in St. Louis, such as bioterrorism and infectious disease epidemics. The St. Louis Department of Public Health likely made the assumption that when they implement their disaster plans, St. Louis citizens will attempt to follow them. However, there is popular resistance to certain measures that might be implemented, such as vaccinations. This project will assess the plans in the St. Louis area and address the validity of this assumption. To accomplish this we will use ethnographic methods such as semi-structured interviews, spatial mapping and participant observation. We will also analyze media, social media, and popular culture, as well as utilize quantitative methods such as surveys. This will be important because if the residents of St. Louis resist these plans the St. Louis DPH will need to be address this issue. We know because of popular distrust of government, media, and medical professionals, when these plans are implemented parts of the St. Louis community may resist and ignore them. It is important to be aware of these attitudes.

Understanding Alienation among Veterans: Implications for Mental Health & Treatment

Joshua Evans

Faculty Mentor: Dr. Matthew Taylor

Ever since the military became an all-volunteer force there has been an ever-increasing amount of research on the growing differences between the military and civilian world. Both groups are becoming less and less knowledgeable of each other. As these two different cultures become more and more distinct consideration should be given to how we transition military members leaving the service back into the civilian world. We offer a lot in terms of transition assistance for military members to reintegrate them into the civilian world, but a question needs to be answered as we implement these programs. Do they want to be a part of the civilian world, or rather, are they willing to assimilate into civilian culture? This study is looking to answer that. By creating a scale to measure alienation among veterans, we also tailored the scale to measure how much of it is self-imposed. Additionally, we included measurements of several other mental health items to look at the relation they have with this self-imposed alienation scale. Many of the programs and treatment models offered to veterans attempt to integrate them into civilian culture. We believe that if they identify themselves first as veterans or they do not want to be a part of civilian culture this not only makes our current methods less effective, but can create more serious mental health issues in the long-term.

Role Play: A Teaching Strategy that is out of this World

Lindsey L. Gevers

Faculty Mentor: Gerianne Friedline

Teachers are constantly looking for innovative teaching methods to better reach their students. One teaching method that makes both teachers and students step outside of the box and challenge their ideas about education is the method of role play. Several teachers tend to fall back on the traditional lecture style of teaching, however role play offers teachers a more diverse and fun method to engage students of all ages. Through my work at the St. Louis Challenger Learning Center, I have seen first-hand the effects of role play on both elementary and middle school students. Through observations and academic readings, I have seen how the method of role play reaches students in multiple different aspects of their lives. Role play enhances learning not only academically, but it also increases a student's engagement, develops life skills, furthers social skills, enhances classroom community, and promotes mental health. This method of teaching makes learning more relevant for students and teaches them skills that can not be taught through traditional lessons. This presentation encourages the implementation of role play in the classroom and shows the numerous benefits students can gain through it.

Disabled Gods: A Critical Disability Studies Analysis of Ancient Greek Myths

Haley R. Graham

Faculty Mentor: Gerianne Friedline

For the most part, literary analysis has focused on schools of criticism such as Marxist, gender, and post-colonial criticism. However, critical disabilities studies recently has gained ground as a vital pillar of literary theory. As a literary field, disability studies examines how representations of disability and the norm have changed by analyzing texts. Disability studies also investigates examples of prejudice against disabled people and how disability directly interacts with narratives. Many ancient Greek myths present opportunities to explore how disability was once seen and understood. This paper examines the ways that Greek mythology's prevalence in Western narratives perpetuates a regressive view of disabled people. How ancient Greece categorized and defined disabled people differently than today's society is key to analyzing disabled Greek characters. Using a critical disability studies lens, I will look at the myths of Larunda, Tiresias, and Hephaestus. These three figures in Greek mythology all have impairments, two by extraordinary circumstances and one by natural causes. In each of these myths, normalcy is defined and reinforced by brutal language and behaviors. These myths are the basis of harmful motifs in modern literature such as demonizing, "overcoming" disability, and sexual impotency. The myths also engage

in narrative prosthesis by reducing characters to only their disability. Exploring how these portrayals of disability persist and continue to pervade our modern narrative surrounding disability in literature can teach us to check our unconscious biases, be critical of worshiping mythology as all-wise, and to be more mindful when writing disabled characters.

The dimensional relationship between age of first traumatic exposure and perceptions of control: A pilot study

Ellen L. Gruebbeling and Miranda Jany

Faculty Mentor: Dr. Carissa L. Philippi

An earlier age of onset of trauma (before 16 years old) has been associated with greater psychological impairments, such as increased risk of psychopathology and greater psychological distress in adulthood (Kaplow & Widom, 2007; Mueller et al., 2010; Teicher et al., 2009). Furthermore, trauma exposure has been linked to deficits in control (Fraizer, 2003; Ataria, 2015). However, the association between age of first trauma and perception of control are unclear. The present study aimed to define the relationship between age of first trauma and perception of control, or self-agency. Self-agency is defined as the sense of control of one's actions and/or thoughts (Gallagher, 2000). Participants (n = 14, Mage = 24.00 ± 9.54; Male = 2) first completed online questionnaires which examined exposure to traumatic and stressful events (e.g. jail time, neglect, and natural disasters) and measures relating to psychopathologies (i.e. depression, anxiety, and posttraumatic stress disorder (PTSD)). Participants then completed a computer based Self-agency Judgement Task, where they were asked to rate their perceived control after moving a box on the computer in various noise conditions (0%, 30%, 75%, 90%, 100%). Preliminary results show that there were statistically significant differences between age of trauma and agency ratings, such that earlier age of trauma predicted higher ratings of average control within all five conditions, $t(12) = -2.30$, $p = .040$. Interestingly, earlier age of trauma did not predict depression ($t(12) = -1.06$, $p = .311$), anxiety ($t(12) = -1.06$, $p = .312$), or PTSD psychopathology scores ($t(12) = -0.02$, $p = .981$). As data collection is ongoing, we will continue to examine the relationship between age of first trauma and perceptions of control, and its relationship to psychological disorders.

Missing the 'B' in LGBTQ+

Jenna C. Haddock

Faculty Mentor: Dr. Jennifer Siciliani

With the emergence of the awareness of the LGBTQ+ community, there has been more research done with individuals who identify as such. However, an analysis of articles claiming to utilize and/or involve LGBTQ+ individuals has shown that a vast majority of this research lacks the objective inclusion of individuals deriving from populations specific to each orientation, especially bisexuality. This review focuses on the exclusion of bisexual individuals within scientific articles claiming to involve LGBTQ+ populations. Specifically, although some statistical results are shown for gay and lesbian populations, experimental data derived from individuals who identify as bisexual are either not specified as such, or these data are relegated to being lumped in with gay or lesbian subgroups, or with the LGBTQ+ population at large. An examination of the antecedents of this and some possible means for addressing it are discussed.

Consent in the Classroom: The Inclusivity of Sexual Education in the St. Louis Area

Cassidy D. Kilgore, Shawn Denton, Allison Hall, Maggie Magnetti, and Morgan Tanner

Faculty Mentor: Dr. Susan Brownell

A team of undergraduate researchers at the University of Missouri St. Louis will determine the inclusivity of sex education programs within the region. Sex education is a particularly important issue due to the high rate of STIs and teen pregnancy within St. Louis, as well as the conservative nature of St. Louis. This team defines inclusivity to be the practice of sexual educators in discussing LGBTQ+ issues, consent, and alternative lifestyles. Our research will include a literature review, ethnographic methods such as observations and interviews, and surveys. Surveys will be geared towards college age students and pertain to their sexual education prior to high school graduation. Interviews will be with sexual education expert informants within the field area of St. Louis. Our data analysis will attempt to determine the breadth of inclusive sexual education within the St. Louis community.

Deep learning for predicting the number of inter-residue contacts in protein molecules

Patrick Kong and Anthony Ackah-Nyanzu

Faculty Mentor: Dr. Adhikari Badri

Proteins do most of the work in cells and are required for the structure, function, and regulation of our body's tissues and organs. They function because of their specific three-dimensional (3D) structures. Just the way we cannot use a hammer to paint, a protein that carries oxygen cannot control blood glucose levels. Knowing the precise 3D shape of proteins is key to understand how they function and why they fail sometimes. Computationally predicting 3D shapes of proteins is a fundamental interdisciplinary problem. Predicting the number of interactions inside a protein, also known as contacts, is understood to be a key towards solving this problem. In this work, we investigate if artificial intelligence methods such as deep convolutional neural networks, widely used for face recognition and skin cancer detection, can be used to predict the number of contacts in a protein. Our current deep learning model achieves a mean absolute error of 40.5 when we predict the number of long-range contacts on a validation dataset of 196 proteins, after training on a set of 1200 proteins. An average prediction difference of 40 is reasonably good because a protein can contain hundreds

of long-range contacts. Since our initial results obtained from our prototype development are promising, we are currently developing our full software

The Affects of Gentrification on St. Louis

Claire L. McCroary, Kathryn Fraley, and Amber Schroeder

Faculty Mentor: Dr. Susan Brownell

In this research, we are exploring how the people who live in communities at risk of gentrification feel about gentrification. Gentrification has long been a hot issue in St. Louis due to the fact that many communities have been going through it. Do rising housing costs and the loss of cultural heritage have a negative effect on the community? Research methods will include interviews with people who live in areas that are undergoing gentrification, literary analysis, collection of statistics on housing costs, observation, and mapping. Gentrification is a way to increase economic growth, but in reality, this growth can come at the cost of local communities. As housing prices rise as trendier developers come in, community members can be forced to leave due to being unable to afford living there. Those community members take their community's original culture and history with them as they leave, and cultural heritage such as architecture and landscape may be destroyed. This loss can be especially significant in communities that had been established for years.

Water Person: an International Travel Memoir

Abby N. Naumann

Faculty Mentor: Gerianne Friedline

お水の方に慣れ
O-mizu no kata ni nare
Water Person
An international travel memoir by Abby Naumann

This autobiographical account of a year traveling and studying overseas in East Asia, originating from my 2018 online travel blog, explores the complex and rewarding experience of becoming a global citizen, embracing one's own definition of femininity, and identifying personal strengths. The narrative chronicles my experiences living in Japan, taking brief detours during my short-term adventures to places such as Vietnam and Iceland during the same time period. The memoir flows between parallel tales of love and self-discovery divided into 22 chapters, diving into culture shock and its depth and peculiarities, and resurfacing in the aftermath of the journey home. The memoir also explores relationships formed with international individuals along the way, contrasting American and Japanese culture and identity in order to highlight elements of shared humanness. The work ties both tangents together to present a rich and multi-perspective view of self-actualization while abroad; asserting that above all to be global is to be fluid.

The presentation will offer shared experience of global fluidity from two chapters of the autobiography: the Introduction and "A Profoundly Female Experience," accompanied by images taken abroad in selected locations.

Beyond the Buildings: Bernie Hayes

Christina T. Richardson

Faculty Mentor: Dr. Rob Wilson

There are individuals in St. Louis who faced oppression during the Civil Rights Movement because of the color of their skin. Preserving stories of African Americans in St. Louis acknowledges their achievements, as well as connects with the community as a whole. In the class "Beyond the Buildings" the video produced shows heartfelt stories of a black talk radio host, Bernie Hayes, along with his goals for African Americans and radio in the future. These videos create a dialogue with the community about the Civil Rights Movement in St. Louis, and people, like Bernie Hayes. Through conducting multiple interviews with Bernie Hayes, to gathering supplemental video content, even the lengthy editing process, the finished four minute documentary presents an overall feeling of celebration for the African American community. Mr. Hayes discusses his first hand experiences with racism, but also all the great individuals he worked alongside. He stresses the importance of recording and remembering African American history with his own National Black Radio Hall of Fame at Harris Stowe State University. This video represents Bernie Hayes stories and experiences he had as a black man in St. Louis. Other videos created by students in Beyond the Buildings resonate similar feelings as this, all preserving stories of important individuals in St. Louis. These videos will connect with the community on May 2nd at the Missouri History Museum, for one final presentation.

Comparing two species: historical phylogeography and species delimitation of Myiarchus flycatchers in the West Indies.

Emily L. Staden, Meghann Humphries, Dr. Leticia Soares, and Dr. Kasey Fowler-Finn

Faculty Mentor: Dr. Robert Ricklefs

In a recent expedition to the Bahamas, the morphological observations of many of the individuals captured bore plumage with coloration that was characteristic of M. stolidus. A species that has up to this point, been considered allopatric. Documented distributions in the West Indies for Myiarchus flycatchers are indicative that while the M. stolidus inhabits Hispaniola and Jamaica, the Bahamas are the native habitat of M. sagrae. In a report from Joseph et al., questionable boundaries were discussed between the two species by highlighting that within a comprehensive Myiarchus phylogeny, M. sagrae is shown as paraphyletic, yet M. stolidus forms a polyphyletic grouping by sharing the most recent common ancestor with M. sagrae. Preliminary analyses here further support these questionable boundaries between M. stolidus and M. sagrae, both genetically and morphologically. Our objective is resolving this taxonomic discrepancy and in doing so, allowing for a better understanding of

the demographic history and distributions of these species to assess comprehensively, the avian phylogeography in the West Indies. Morphological variation found among specimens from the same region measured and sampled at the Field Museum of Natural History in Chicago, along with sequence data at one mitochondrial marker procured from recent field work form the basis for the preliminary analyses. Proposed analyses include sequence capture of ultra-conserved elements (UCEs) both of contemporary and historical specimens, along with results in data from many loci across the genome. Furthermore, recordings acquired from the Macaulay audio library at Cornell University will be included as well so as to provide an assessment of vocal variation.

Measuring and Comparing the Stress Levels of Student Leaders to Students Living On-Campus

Maddie Woodham

Faculty Mentor: Dr. Kate Votaw

It is well-accepted that college students are under a tremendous amount of stress from academic, social, and work pressures. However, Residential Life Staff may be a particularly vulnerable population and have yet to be studied. Unlike other college students, the boundaries between home, work, and school are blurred for this student staff. The current study looks to examine potential differences in hopes of decreasing stress in these indispensable members of the campus community. A stress assessment was designed and will be administered to two student populations: Residential Life Staff and working students who live on-campus. The results will be compared to discover if Residential Life Staff are more stressed than students with similar responsibilities. If results show Residential Life Staff are more stressed, it is very likely because of specific factors pertaining to their leadership position on-campus. If Residential Life Staff are more stressed, they could experience poorer academic performance as well as a host of negative physical and emotional effects. Furthermore, Residential Life Staff are vital to the success of our state campuses. Stress in these students could potentially negatively influence other students on-campus and their living environments, ultimately limiting students from choosing to live on-campus. This could lead to dramatic outcomes that can impact public perceptions of state universities and ultimately potential income that universities receive from on-campus housing departments.

Notes:

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