University of Missouri System

Undergraduate Research Day

Jefferson City, Missouri
April 4, 2019

MU UMKC Missouri S&T UMSL

Dear Legislators,

As the state's only public research university, our students are provided unique opportunities to work alongside our talented faculty to conduct cutting-edge and groundbreaking research on our four campuses every day. These experiences, which range from science to medicine to the humanities, help to prepare our students for graduate and professional studies at prominent universities as well as careers in leading industries.

Undergraduate Research Day at our state's Capitol illustrates these student accomplishments and allows our elected officials to see, firsthand, the exciting innovations taking place at the University of Missouri-Columbia, University of Missouri-Kansas City, Missouri University for Science and Technology and the University of Missouri-St. Louis.

Enhancing student success and outcomes are central to our commitment to excellence in higher education. Thank you for joining us for this event and learning more about our undergraduate researchers who will also serve as the next generation of leaders.

Sincerely,

Mun Y. Choi
President

MISSOURI

Madeline Clarke

Ashland, Missouri

Senate District 19
House District 50

Major
Political Science, Geography, & History

Faculty Mentor
Bill Horner

Mentor's Department
Political Science

Funding Source
A&S Undergraduate Research Mentorship Program

Poster Number 1

The Priming Effects of Political Dramas: *House of Cards* vs *The West Wing*

This study uses content analysis and an experiment to explore the priming effects of two popular political dramas: the idealistic *The West Wing* and the negative *House of Cards*. Subjects were shown a clip of one of the two shows and given a pretest and posttest to assess the clip's impact on their perceptions of real-life presidents Donald Trump and Barack Obama, specifically focused on character. Subjects were asked questions about the character of each president using the same character traits used for the content analysis: trustworthy, compassionate, just, humble, brave, patient, and generous for positive character traits and untrustworthy, indifferent, biased, arrogant, cowardly, short-tempered, and greedy for negative character traits.

Subjects responses were coded and summed to create accessories for each president per subject Pearson's r correlations were calculated to assess relationships in the results, revealing support that watching the positive portrayal of fictional President Josiah Bartlet in *The West Wing* correlated to more positive perceptions of former President Obama. With *House of Cards*, it became evident subjects may be less likely to have a shift in opinion based on the portrayal of fictional President Francis Underwood if their opinion of the real-life president was strong prior to the experiment.

Carolyn Culp

Missouri to the World: Developing Tools to Reduce Soybean Pod Shatter Globally

In Missouri alone soybeans account for $7.7 billion of output and provide approximately 20,700 jobs to the state. Soybeans are used across the world for a variety of human and animal foods and commercial products; they are one of the major exports in the United States and have a large economic impact. Pod shattering in soybeans is an ancestral trait that causes the pod to twist and throw its seeds on the ground. American scientists have eliminated the occurrence of soybean shattering by selecting against the trait. However in countries across the world, soybeans that shatter are still grown regularly, reducing the available harvest. Therefore research done in Missouri is utilized globally, especially in countries with fewer resources to improve research programs, and thus, yield potential.

Our research aimed to develop a molecular tool to implicate shatter susceptibility of the previously cloned gene Pdh1. We developed an identification assay to detect the status of shattering in individual samples, and used statistical analysis to find a highly associated marker to be used as a proxy. We contrasted the marker to known samples and found it was extremely accurate in predicting the status of the Pdh1 gene. This allows any breeder or farmer across the world to identify if the line is going to be susceptible to shattering, thereby reducing shattering and improving the overall yield. These improvements also impact smallholder soybean production and consumption, and allow for greater household food security in Africa and other countries where soybeans shatter.

Lenexa, Kansas
residing in Columbia, Missouri

Senate District 21
House District 54

Major
Biochemistry

Faculty Mentor
Kristin Bilyeu

Mentor's Department
Plant Science

Funding Source
USAID "Feed the Future Innovation Lab for Soybean Value Chain Research"

Poster Number 5

Kyra Florea

Columbia, Missouri

Senate District 19
House District 45

Major
Fisheries & Wildlife

Faculty Mentor
Rebecca North

Mentor's Department
Natural Resources

Funding Source
Honors College-Cherng Summer Scholars, Life Sciences Undergraduate Research Opportunity Program (LSUROP)

Poster Number 9

Dissolved Organic Matter and Carbon Cycling in Missouri Reservoirs: Implications for Harmful Algal Blooms

Reservoirs are important as they are the primary source of drinking water in parts of Missouri (MO) and are used for irrigation and recreation throughout the state. Water quality concerns include the formation of cyanotoxin producing harmful algal blooms (cyanoHABs). Cyanotoxins (e.g., microcystins) are detrimental to human health. Dissolved organic matter (DOM) is a reactive source of nutrients for algae. High quantities of DOM may facilitate cyanoHAB formation in aquatic systems however there is currently a knowledge gap about water quality implications of DOM quantity and quality (i.e., source and reactivity) in reservoirs. Our objectives were to determine 1) if the reservoir DOM quantity and quality varies across land use in MO and 2) if there are correlations between DOM and cyanotoxin production. Water samples were collected 4 times from 23 reservoirs during the summer of 2017. Dissolved organic carbon (DOC) concentration was measured as a proxy for DOM quantity. DOM quality was determined using optical absorbance by DOM molecules at 254 nm wavelength (a254; indicator of terrestrial DOM) and SUVA254 (a254/DOC; indicator of molecular weight). Our findings indicate that land use influences DOM quality and quantity, and that agricultural watersheds are a source of reactive, high molecular weight DOM. Microcystin was detected in some agricultural reservoirs (F-value=4.1, $p < 0.05$) which highlighted the potential linkage between DOM and cyanoHABs however further research is required. Some microcystin concentrations were above the EPA 10-day health advisory limit for young children (0.3 ug/L), which causes concern about the relationship between DOM and cyanoHABs.

Sai Gajagowni

Treatment of Cancer by Targeting New Proteins

Lymphoma is a type of cancer that affects an individual's immune system. It is estimated that 75,000 new cases of lymphoma will be diagnosed this year and that 20,000 people will die from the disease, making it the eighth leading cause of death in the U.S. In 2015, there were an estimated 686,042 people living with the disease and this number is expected to significantly increase in the coming years because of the aging American population. Therefore, research attempting to improve our understanding and treatment of the disease is extremely important.

To do this, our lab is looking at the role of a newly discovered set of proteins called tribbles (TRIB) in the growth and development of cancer. We looked at the gene and protein expression of the three variants of TRIB (TRIB1, TRIB2, and TRIB3) and studied their potential role in lymphoma using different cancer cells from patient samples.

We found that all three variants of TRIB are present in lymphoma cells, with TRIB2 being the most common. Cells that expressed high levels of TRIB had lower levels of important cell regulatory molecules. The absence of these molecules leads to the growth of cancerous tumors. This shows that these new proteins could play a role in the development of cancer. As the first lab studying these proteins in lymphoma, we hope that further understanding their role in the disease could make them targets for drug treatments that improve the lives of patients.

O'Fallon, Missouri

Senate District 2
House District 102

Major
Biological Sciences & Psychology

Faculty Mentor
Senthil Kumar

Mentor's Department
Veterinary Medicine & Surgery

Funding Source
Honors College-Cherng Summer Scholars

Poster Number 13

Catherine Gjerstad

Santa Cruz, California
residing in Columbia, Missouri

Senate District 19
House District 45

Major
Biological Engineering

Faculty Mentor
Judy Wall

Mentor's Department
Biochemistry

Funding Source
ENIGMA, U.S. Department of Energy

Poster Number 17

Uranium Transformation for Contaminated Groundwater and Soil Bioremediation

Uranium is a common contaminant of soil and groundwater due to human activities. One example is the superfund site at West Lake, MO where uranium contaminated soil has been used as landfill and a waste disposal site during the Manhattan project and the Cold War era. Uranium is radioactive, toxic, and affects one's kidneys. Desulfovibrio vulgaris Hildenborough (DvH) is an anaerobic bacterium that can transform uranium from U(VI) to U(IV). U(VI) is soluble and travels with groundwater flow, while U(IV) is insoluble and practically immobile. Therefore, the transformation of uranium is a potential means of removing uranium from contaminated groundwater.

Cytochrome c3, a protein, has been shown to be important for U(VI) transformation by DvH, like the heart is for blood flow. However other proteins working with cytochrome c3 are unknown. We hypothesize one or several of the seven hydrogenase enzymes in DvH drive the transformation when hydrogen is present. DvH has one hypothetical and six confirmed hydrogenases. Cultures of DvH wild type and various mutants lacking different hydrogenases or cytochrome c3 were created and evaluated to determine which proteins affect uranium transformation. Each culture was exposed to U(VI) with hydrogen in excess. Samples were collected over 24 hours to monitor uranium transformation rates and extents. We found that hydrogenases located in different compartments of the bacterial cell had different effects and that at least one of four hydrogenases in the outside layer of the cell are vital to U(IV) production when hydrogen is present. From these results we propose a model for uranium transformation in DvH.

Luke Guerdan

Augmented Resource Allocation in Disaster Scenarios

Late in the afternoon on Sunday, May 22, 2011, a catastrophic EF5 tornado struck Joplin, Missouri, leaving over 1,100 injured and causing nearly 2.8 billion dollars in damage. In disaster scenarios such as these that require real-time response to multiple incidents in a limited period of time, the importance of efficient allocation of resources such as paramedics and supplies becomes crucial. Yet, this need is often complicated by the dynamic nature of emergencies, with differing levels of patient priority and accessibility, damage to internet and radio infrastructure, and varying numbers of available responders all contributing to the complexity of the situation.

We present Augmented Resource Allocation (ARA), a computational framework for efficiently managing responders, supplies, and resources during disaster scenarios within a mobile cloud environment. Our framework leverages human knowledge of the situation, existing dynamic routing algorithms, and centralized information storage at the mobile edge network to augment disaster response coordination.

We apply our ARA methodology in a real-world mobile cloud computing application, Panacea's Cloud, using experiments and simulations to show how we streamline information flows for disaster response coordination. ARA is shown to be an effective framework for improving disaster management outcomes during a pilot test with Task Force Once, Missouri's leading disaster response team. Specifically, ARA is shown to decrease disaster response time by nearly fifty percent compared with current response practices.

St. Charles, Missouri

Senate District 23
House District 106

Major
Computer Science & Psychology

Faculty Mentor
Prasad Calyam

Mentor's Department
Electrical Engineering and Computer Science

Funding Source
NSF

Poster Number 21

Brittney Marshall

Republic, Missouri

Senate District 20
House District 140

Major
Biological Sciences

Faculty Mentor
Cheryl Rosenfeld

Mentor's Department
Biomedical Sciences

Funding Source
NIH, National Institute of Environmental Health Sciences

Poster Number 25

The Effects of Soy-Based Estrogens on Behavior and Gut Health

Soy and other foods contain compounds called phytoestrogens, whose molecules are shaped like estrogen and can mimic this hormone in the body. These compounds have shown benefits for metabolism and behavior. However, there are also concerns that these chemicals can disrupt the body's natural estrogen systems and affect gut health, similarly to the effects of BPA in plastics. These effects may contribute to rising negative outcomes such as autism-like social and cognitive deficits. Last year, the CDC increased their estimate of the prevalence of autism spectrum disorder by 15%, to a current incidence of 1 in 59 children.

Parental diet can have a significant impact on the gut health of offspring. This study used mouse models to examine the effects of chronic prenatal exposure to phytoestrogens on offspring behavior and gut health, compared with a control diet. Upon weaning, mouse pups were tested for sociable behaviors with novel "stranger" mice. The pups were then removed from the strangers and isolated, and their vocalizations were recorded. Fecal samples were also taken to examine the composition of bacteria and metabolic compounds.

Female pups were less likely to interact with novel mice, while male and female pups both had increased delays in their first vocalization after isolation, suggesting reduced sociability and similar to effects seen with BPA. Stark differences in the species and metabolites of fecal bacteria were also evident between diet groups. Understanding the relationships between these results could help agricultural engineers maximize the benefits of soy while reducing the risks.

Garren Powell

Improving Crop Nutrition and Research to Increase Iron in Corn Using Common Soil Bacteria

Malnutrition, especially iron deficiency in diets, is the cause of 11% of global illness, making it the number one risk factor impacting human health worldwide. On any given day, two billion people across the globe are afflicted with some form of malnutrition. It claims the lives of 2.6 million children each year where 45% of child deaths are under the age of 5. As the global population continues to rise, researchers around the world struggle to improve crop nutritional content to combat global malnutrition. This grim landscape drives plant scientists at the University of Missouri Research Reactor (MURR) to seek solutions. From out of the blue glow of this country's largest university-owned nuclear reactor comes research ingenuity and science discovery unparalleled by any other research facility in plant science. Our group examines the biological functions of several common soil bacteria such as Azospirillum brasilense, which colonize the surfaces of roots for many grasses including maize, this country's largest grain crop. We leverage MURR's unique capabilities in radioisotope production and nuclear-based technologies including imaging to gain insight into how these microorganisms influence their host's metabolic and physiological state while helping it assimilate more iron from the soil improving plant growth, crop yield and crop nutritional content. Our hopes are that science discoveries made in the laboratory today will reshape the future of farming, and in turn help solve global issues in food insecurity and nutrition.

Hughesville, Missouri

Senate District 28
House District 51

Major
Biochemistry

Faculty Mentor
Richard Ferrieri

Mentor's Department
MU Research Reactor (MURR)

Funding Source
Agriculture and Food Research Initiative from USDA National Institute of Food and Agriculture

Poster Number 29

Stephanie Scott

Jefferson City, Missouri

Senate District 6
House District 60

Major
Biochemistry

Faculty Mentor
Richard Ferrieri

Mentor's Department
MU Research Reactor (MURR)

Funding Source
Agriculture and Food Research Initiative from USDA National Institute of Food and Agriculture

Poster Number 29

Improving Crop Nutrition and Research to Increase Iron in Corn Using Common Soil Bacteria

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Alec Wilken

Why Do Lizard Skulls Matter?

During the 2016-2017 athletic season, 3,868 MO students suffered from traumatic head injuries. Although many vertebrates, like mammals and crocodiles, evolved a rigid, immobile skull to protect the brain, several animals, like lizards and birds, evolved more flexible skulls capable of cranial kinesis, or movement between bones of the skull other than at the jaw joint. Much remains to be learned about how these flexible skulls evolved, how they protect the brain, and the potential application to issues such as traumatic head injuries.

While all lizards possess the mobile joints used for cranial kinesis, not all lizards seem to be capable of cranial kinesis, making them an ideal animal for studying cranial form and function. To do this, we created an engineering model to simulate different joint tissue and muscle forces in a lizard skull. We found that different joint tissues behave mechanically the same and palatal muscles work to stabilize cranial joints.

Understanding the evolution of these complex systems in lizards provides new insights into the function and evolution of joints. Lizards and other animals challenge our ideas of how anatomical structures are meant to behave. Studying the evolution of the rich diversity of vertebrate life provides innovative ways to understand our anatomy and the medical problems facing our society.

Sedalia, Missouri

Senate District 28
House District 52

Major
Biological Sciences

Faculty Mentor
Casey Holliday

Mentor's Department
Pathology & Anatomical Sciences

Funding Source
NSF, Life Sciences Undergraduate Research Opportunity Program (LS UROP)

Poster Number 33

Julie Youngers

Kansas City, Missouri

Senate District 157
House District 38

Major
Psychology

Faculty Mentor
Yuyan Luo

Mentor's Department
Developmental Psychology

Funding Source
Honors College-Discovery Fellows, A&S Undergraduate Research Mentorship Program

Poster Number 37

Language Development in Infancy: Individual Differences Matter

Any parent can attest that one of a toddler's favorite words is "Mine". But why is this word used by some children earlier than others? In this study, we looked for factors that affect 19-month-old infants' ability to understand an experimenter's claim that an object belongs to her. Identifying these factors can inform our knowledge of normal language acquisition and thus allow us to diagnose atypical language development.

Infants, like adults, tend to look relatively longer at events they find surprising than events they find unsurprising. In our experiment, infants first watch an experimenter reach for a toy and say, "It's mine!" Next, a second toy is introduced and the experimenter alternates between reaching for this new toy and the original toy. If infants understand the original toy belongs to the experimenter, they should be surprised (and thus look longer) when she chooses the new toy.

We find that 19-month-old infants, on average, are not surprised when the experimenter reaches for the new toy, indicating that they do not yet understand the phrase "It's mine!" at 19-months. However, 19-month-old infants do seem to understand the phrase when they have larger vocabularies than their peers, have a toy they are particularly attached to (for example, a security blanket), or do not have older siblings. Thus, it is important to consider factors that may create individual differences in children's development.

Joe Bean

Regulation of the Sleep Cycle by an Unexpected Yet Common Biological Process

The sleep cycle, or circadian rhythm, is an important biological process conserved between many higher order animals. While it normally ensures that we sleep at consistent times day to day, this cycle can be inexplicably disrupted in a number of neurodegenerative diseases, including Parkinson's, Alzheimer's, Huntington's, and Spinocerebellar Ataxia-7 (SCA7)- the focus of our lab. Understanding what controls the circadian rhythm allows us to draw closer to ameliorating these sleep disturbances in individuals afflicted with such diseases. While researching SCA7 and some of the proteins that cause this disease, we found a common protein modification and control system- ubiquitination- to be changing with the circadian rhythm. Ubiquitination is a process wherein small proteins called ubiquitin are attached to a protein in order to initiate the break down of that protein. Further, it was found that flies with a mutation which affected their ability to regulate their ubiquitination process had abnormal circadian activity patterns. Our work suggests that ubiquitination serves to control the circadian rhythm, and provides a possible understanding for why many neurodegenerative disease may include sleep disturbances as secondary symptoms. By better understanding the circadian rhythm, we can come to a fuller understanding of these sleep disturbances and, eventually, the diseases that include them.

Omaha, Nebraska
residing in Kansas City, Missouri

Senate District 21
House District 54

Major
Biology and Medicine

Faculty Mentor
Ryan Mohan

Mentor's Department
Biology

Poster Number 2

Alexandra Cutter

St. Louis, Missouri

Senate District 22
House District 2

Major
Biological Sciences

Faculty Mentor
Leonard Dobens

Mentor's Department
Biology

Poster Number 6

Investigation of Structural Requirements for Proper Trafficking of Drosophila Tribbles

Using the model organism Drosophila melanogaster, otherwise known as a fruit fly, our lab is studying the gene Tribbles. Tribbles is a highly conserved pseudokinase that plays roles in cell migration, differentiation, proliferation, and metabolism. Previously, we mutated a unique, strongly conserved SLE motif and observed a strong redistribution of the protein from the nucleus to the cortex of larval fat body tissue with a concurrent increase in Trbl protein stability. In addition, structural work on human Trib1 suggest that this motif interacts with a conserved alpha C helix in the protein structure. This led us to design a complementary mutation on the alpha C helix we expected will mimic the SLE mutant phenotype. However, our alpha C helix mutants failed to copy the original phenotype. Going forward, we plan to design different alpha C helix mutants using online protein databases, structural analysis, and Tribbles sequence alignments. Further investigation of this phenotype will help us understand Trbl protein function, trafficking, and stability, possibly shedding insight on autoimmune and prion illnesses.

Sami Gul

How Do Education Levels Affect Public Perception of Corruption?

How does education level impact a person's perception of corruption within their state? In this study, we draw on cross-national and cross-temporal survey data of 30 European states which was produced by the Inter-University Consortium for Political and Social Research (ICPSR) and Leibniz Institute for the Social Sciences (GESIS). We examine the relationship between education levels and perceived corruption in 24,276 responses. We find that there is a statistically significant negative relationship between a respondent's level of education and the corruption that they perceive in their state. Moreover, we found that there is no significant effect of education on perceived political corruption.

Ankara, Turkey
residing in Kansas City, Missouri

Senate District 9
House District 26

Major
Political Science & Math and Statistics

Faculty Mentor
Debra Leiter

Mentor's Department
Political Science

Funding Source
UMKC Search Grant

Poster Number 10

Anum Khalid

Lee's Summit, Missouri

Senate District 8
House District 35

Major
Psychology

Faculty Mentor
Oh-Ryeong Ha

Mentor's Department
Psychology

Funding Source
UMKC Search Grant

Poster Number 14

The Effect of Self Regulation Development on Prosocial Decision Making of 5-8 Year Old Children

Children who have efficient and flexible self-regulation skills are more proficient in regulating their behavioral repertoire (Campos et al., 2004; Carver & Scheier, 2012; Eisenberg & Spinrad, 2004). Efficient self-regulation skills are related to a good quality of social interaction such as high interpersonal sensitivity and prosociality in adults (Lopes, Salovey, Cote, & Beers, 2005). In contrast, aggression and behavioral problems were negatively related to prosociality in young children (Yarrow et al., 1976). To better understand the effect of self-regulation development on young children's prosocial behaviors, this study examined how children's self-regulation development, indicated by emotional and behavioral competence, was related to prosocial decision-making in 5-8 year old children. It was hypothesized that children with higher behavior problems (inefficient self-regulation skills) are more likely to make more egocentric, less prosocial decisions.

Brandon Landaverry

Characterization of Aeolian Source Material from the Al-Jafr Basin, Jordan Using Grain Size, X-Ray Diffraction, Geochemical Analysis and SEM

This research project characterizes the texture, morphology, composition, mineralogy and geochemical of dune sediments from the Al-Jafr Basin, Jordan. The research consists of the first dune samples to be analyzed from the largest basin on the Jordan Plateau. Using various analytical methods reveal the paleoenvironmental processes dominating landscape formation at this location. Microscope examination revealed presence of vegetation and fossils. Grain size results throughout the sand dune samples identified the sediment as predominately silt size particles, predominately fine silt. This indicates moderate and steady wind energy to transport these particles.

Lee's Summit, Missouri

Senate District 9
House District 26

Major
Environmental Engineering

Faculty Mentor
Caroline Davis

Mentor's Department
Geosciences

Funding Source
Summer Undergraduate Research Opportunity Program

Poster Number 18

Celine Lim

Selangor, Malaysia
residing in Kansas City, Missouri

Senate District 9
House District 26

Major
Mechanical Engineering

Faculty Mentor
Sarvenaz Sobhansarbandi

Mentor's Department
Civil and Mechanical Engineering

Funding Source
UMKC Search Grant

Poster Number 22

Heat Transfer Enhancement of Phase Change Materials for Thermal Energy Storage Systems

Solar water heaters (SWHs) are a well-established renewable energy technology that has been widely adopted around the world. The most important component of the SWHs is the solar collector that absorbs the solar radiation from the sun and transfers it to some transfer medium such as water, which delivers the heat as hot water to a house or to a heat storage unit. Among different types of solar collectors, one example of an advanced and highly effective type of solar collector is the Evacuated Tube solar Collectors (ETCs). In the recent work of Dr. Sobhansarbandi, my supervisor and director of UMKC Renewable Energy Research Laboratory, a novel method of integrating phase change materials (PCMs) within the evacuated solar tube collectors for solar water heaters (SWHs) has been studied which show efficiency improvement of 26% for the normal operation and 66% for the stagnation mode, compared with standard solar water heaters that lack phase change materials. Phase change materials are latent heat storage materials. The thermal energy transfer occurs when the material changes from solid to liquid, or liquid to solid phase. By performing thermal analysis of PCMs, we are able to monitor their phase change process, as well as their thermophysical properties variation. In order to overcome the shortcoming of PCMs, we are planning to incorporate some materials with high heat transfer capacity and high thermal conductivity in conjunction with PCMs which can lead to a fast energy transfer to the PCM layers.

Carrie Merritt

Midwestern Climate Modelling and Analysis: An Examination of the Impact of Mitigation on Future Climate

This study is a continuation of Midwestern Climate Modelling and Analysis: An Examination of Climate Patterns, Trends, and Sensitivities. The aim of the study is to examine what the change could be globally, and in the Midwest, if humans made a collective effort through collaborations and agreements across countries to mitigate and reduce fossil fuel emissions (and other major sources of GHGs) by focusing on RCP4.5 temperature changes. This project will expand on the "business-as-usual" (RCP8.5) warming projections through comparative temperature change analysis for a "mitigation" GHG scenario (RCP4.5). The Fifth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (IPCC-AR5) outlines four Representative Concentration Pathways (RCPs) that represent greenhouse gas (GHG) emissions. Phase one of this project demonstrated that the Midwest is sensitive to climate change and will see significant warming in the future. Examining the differences between the projected warming when humans do curtail GHG emissions and when we do not, will allow Midwesterners and policy makers to encounter the clear and concise facts that will represent what the Midwest may likely experience in our imminent future.

Archie, Missouri

Senate District 31
House District 55

Major
Environmental Science

Faculty Mentor
Fengpeng Sun

Mentor's Department
Geosciences

Funding Source
SUROP, Search, & NSF
Mo Transcet/EPSCoR

Poster Number 26

Rhiannon Minster

Chesterfield, Missouri

Senate District 24
House District 89

Major
English, Creative Writing

Faculty Mentor
Michael Pritchett

Mentor's Department
English

Funding Source
Students Engaged in the Arts and Research Grant

Poster Number 30

Wilden Arts High School: a Young Adult Novel

Much of young adult literature does not touch on the intricacies of high school life. For my first novel I wanted to create a realistically stressful environment for students in multiple artistic disciplines. I set my novel in Chicago and traveled there in March to see the fine art community for myself. While there I saw A Bronx Tale, the Chicago Symphony Orchestra perform Beethoven and Wagner, and visited several museums. With four main characters, all in different disciplines, I am able to show them from different angles and perspectives through the eyes of the other characters. All of them suffer different mental health problems, and for today's teens, for whom suicide is the second-most common cause of death, it is vital to create a dialogue in which they can discuss their emotions. If a novel does not have a realistic environment or characters, then teens are easily able to avoid difficult topics rather than engaging with them.

At Wilden Arts High School (WAHS) in Chicago, the fall semester sees dozens of talented new students come to campus. Bassist Summer Fulk, pianist Mike Wang, actress Carrie Jackson, and actor Edger Smith all join a play produced by the Theater Club. Though they try to begin with a fresh start, none of them are able to leave their troubled pasts behind them.

Inspirations for this novel include Ferris Bueller's Day Off, The Breakfast Club, Your Lie in April, Your Name, Looking for Alaska, and The Fault in Our Stars

Samuel Nelson

The Effect of Stress in Eating Behavior

According to the Centers for Disease Control and Prevention, 70.7% of Americans over the age of 20 are overweight (National Center for Health Statistics, 2016). Being overweight can lead to a multitude of serious health complications; therefore, identifying risk factors for obesity is an important avenue for public health research. Stress has long been shown to be one of the factors that influences eating behavior (Wallis & Hetherington, 2004). To better understand the influence of stress on eating behaviors, my research explored how stress resulting from social exclusion influenced eating behavior. Participants used a computer program to make choices about food regarding taste, preference, health and consumption. In order to induce stress, participants were then asked to introduce themselves via a three-minute introductory video to a potential partner, who would either reject the participant or accept them as their partner. After the aforementioned stress induction procedure, participants made more food choices on the computer. Food choices from time one and time two were then compared.

Participants who were rejected by their partner chose to eat healthy and unhealthy foods less. Per the literature surrounding stress research, rejected participants were expected to eat more unhealthy foods; however, they demonstrated restricted eating behaviors after stress exposure. It was likely that the nature of the stress in this experiment, the stress stemming from the social rejection by first impression, might have guided the individuals to turn their attention inward, causing them to self-consciously restrict their eating.

Kansas City, Missouri

Senate District 21
House District 54

Major
Psychology and Economics

Faculty Mentor
Oh Ryeong Ha

Mentor's Department
Psychology

Funding Source
SUROP

Poster Number 34

Vy Ngo

Kansas City, Missouri

Senate District 9
House District 26

Major
Chemistry

Faculty Mentor
Ryan Mohan

Mentor's Department
Biology

Funding Source
SUROP & SEARCH

Poster Number 39

Drosophila Flies' Brains Might Help Save Humans with Spinocerebellar Ataxia

The project we are doing research on helps to find more information about Spinocerebellar ataxia (SCA), a neurodegenerative disease caused by mutations in DNA, affecting patient's movement and tend to get worse over time. There are many types of spinocerebellar ataxia found in humans, each affecting distinct sets of neurons. SCA 7 is a type of spinocerebellar ataxia, but it results in visual problems rather than poor body coordination. In statistic, the disease affects more than 150,000 people in the U.S., included Missouri. There's no cure for this disease yet due to the lack of information about the mechanism behind the disease. In the lab, we use drosophila models to reveal insights into mechanism underlying neurodegeneration. My responsible in the lab is to perform the circadian entraining project on the flies and performing dissection on flies' brains. Through my work, flies' brains were harvested for immunofluorescence. The images reveal the amount of proteins in wild type flies. Once we understand how the amount of the protein in the wild type flies fluctuate throughout specific time of the day, we can compare the data to the mutant types to find some results.

Hannah Nguyen

Mammalian Comparative Anatomy of Larynges and Their Correspondence to Various Sounds Produced

This study focuses on comparing the physical anatomy of the larynx across different mammals, such as felines, canines, bovine, and more. A bulk of the mammals are typically sourced from farms. Given that the larynx is one of the principal players to producing sound in a mammal, including humans, this motivates one to determine what morphological characteristics of the given animal's larynx correspond to the cry or sound they produce. Few studies have focused on the shape of a mammal's larynx that help govern the sound the animal creates. Of the available studies to help guide this research, credits are given to the following authors with their respective works: Saigusa (Comparative Anatomy of the Larynx and Related Structures), D. F. N. Harrison (The Anatomy and Physiology of the Mammalian Larynx), Saachi, et. al. (Larynx Morphology and Sound Production in Three Species of Testudinidae), and many more. Given this literature has helped inform, guide, and shape this study on the morphological characteristics and functional understanding of the larynx and how its performance varies on different mammalian species. By conducting this study, one can appreciate the shape and size of a mammal's larynx to determine what kind of sound they produce.

Kansas City, Missouri

Senate District 9
House District 26

Major
Biology

Faculty Mentor
Rachel Allen

Mentor's Department
Biology

Funding Source
SEARCH Grant

Poster Number 40

Minh Nguyen

Kansas City, Missouri

Senate District 9
House District 26

Major
Biology

Faculty Mentor
Ryan Mohan

Mentor's Department
Biology

Funding Source
SUROP and SEARCH

Poster Number 41

Experiment on the biotechnique: The Game Changer

Spinocerebellar ataxia is a genetic disease affecting about 150,000 people in the United States. There are many types of spinocerebellar ataxia found in humans, each affecting distinct sets of neurons. Spinocerebellar ataxia type 7 leads to degeneration of the retina and cerebellum of patients, resulting in blindness and loss of motor control. On a molecular level, this disease is characterized by expansion of CAG trinucleotide repeats in the ataxin 7 gene, leading to an expanded polyglutamine tract at the N-terminus of the Ataxin-7 protein. Ataxin-7 is part of the larger Spt Ada Gcn5 Acetyltransferase (SAGA) chromatin modifying complex. Here it uses its N-terminus to anchor a deubiquitinase enzyme called Non-stop to SAGA. However, in SCA7 the polyglutamine expansion may disrupt this interaction. In the Mohan laboratory, we use Drosophila melanogaster as a model system to understand the normal function and regulation of Ataxin-7 and Non-stop so that we can understand what processes are misregulated in SCA7 disease, potentially leading to the identification of a drug target. Part of understanding function requires knowledge of where Ataxin-7 and Non-stop are in the brain. My role in the Mohan lab is to find out which biotechniques work best to keep the brains form stable in determining the subcellular and sub-neural localization of Ataxin-7 and Non-stop using immunofluorescence. We dissect larval brains of Drosophila, let the brains stay in blocking buffer containing BSA. I apply different techniques: slow freeze, fast freeze and basic technique. Each technique has a specific way of keeping the brains in blocking buffer. Then I stain the brains with primary antibody, then stain with secondary antibody. Finally, we use a confocal microscope to do imaging. Then based on the images, we determine to see which biotechnique work best.

Christopher Croft

Additive Manufacturing of Aluminum Alloys

This research focuses on developing an additive manufacturing (AM) process for aluminum alloys, to produce components for the Navy. It is part of a Small Business technology Transfer (STTR) project with Product Innovation and Engineering, LLC that links the gap from university research to industry. This is a growing research area that will produce parts that were not possible to make with conventional manufacturing methods. AM processes for certain steel and titanium alloys have already been developed and implemented in some applications. Aluminum presents unique challenges that make it more difficult to develop an AM process for, but it also has unique advantages. Aluminum components made from AM processes can reduce weight and complexity of designs and could be a very beneficial tool to the aerospace industry and other areas. The research project includes development of an aluminum AM process, design and manufacture of a system to perform the process, and testing material properties of samples produced by the system. Goals of this research include developing a system and implementing it, to manufacture aluminum alloy components for industrial applications.

Jackson, Missouri

Senate District 27
House District 146

Major
Mechanical Engineering

Faculty Mentor
Frank Liou

Mentor's Department
Mechanical and Aerospace Engineering

Funding Source
Product Innovation and Engineering, LLC

Poster Number 3

Lynell Cunningham

Wentzville, Missouri

Senate District 2
House District 102

Major
Chemistry

Faculty Mentor
Katie Shannon and
David Westenberg

Mentor's Department
Biological Sciences

Poster Number 7

BTree: Protecting Ash Trees from Emerald Ash Borers

To provide trees with protection from EABs, we investigated Bacillus thuringiensis (Bt) toxins. These are toxins created by Bt, which makes the plants it infects resistant to a specific species of beetle. The bacteria produces a protein which binds and perforates a gut receptor in its target, causing mortality. This receptor varies slightly between species, so a specific toxin is only deadly to a single type of beetle and occasionally its close relatives. Cry8Da toxin had been shown by the USDA Forest Service to have had up to 89% toxicity against adult EABs when sprayed topically on leaves. We planned to make a possibly more toxic Cry proteins which could also be sprayed on trees, while also creating trees able to produce the toxin inherently.

Lucas Dyer

BTree: Protecting Ash Trees from Emerald Ash Borers

To provide trees with protection from EABs, we investigated Bacillus thuringiensis (Bt) toxins. These are toxins created by Bt, which makes the plants it infects resistant to a specific species of beetle. The bacteria produces a protein which binds and perforates a gut receptor in its target, causing mortality. This receptor varies slightly between species, so a specific toxin is only deadly to a single type of beetle and occasionally its close relatives. Cry8Da toxin had been shown by the USDA Forest Service to have had up to 89% toxicity against adult EABs when sprayed topically on leaves. We planned to make a possibly more toxic Cry proteins which could also be sprayed on trees, while also creating trees able to produce the toxin inherently.

Jefferson City, Missouri

Senate District 6
House District 20

Major
Biochemistry

Faculty Mentor
Katie Shannon and
David Westenberg

Mentor's Department
Biological Sciences

Poster Number 7

Zachary Foulks

Imperial, Missouri

Senate District 22
House District 113

Major
Chemistry and Biological Sciences

Faculty Mentor
Honglan Shi

Mentor's Department
Chemistry

Funding Source
Ozark Biomedical Initiative

Poster Number 11

Identification of Brown Recluse Spider Pheromone Using SPME-GC-MS and Novel Bioassay Techniques

Brown recluse spider (BRS) bites can lead to deep wounds persisting for months, blood loss that can be severe enough to need treatment in intensive care units, and they can be life-threatening for children. Additionally, studies have found that these spiders are present in around 70% of Missouri households. Because of this, our research team has been investigating the sexual pheromones of BRS in order to develop enhanced spider traps capable of more effectively targeting BRS. We test this by sampling the air around both sexually active and sexually inactive spiders. We then analyze this sample to determine unique chemicals being emitted by sexually active spiders, and we then perform behavioral tests on any identified chemicals to attempt to confirm that chemical's use as a pheromone. Once confirmed, this pheromone is applied to a trap designed by our research group and compared to a trap without the pheromone to test the effectiveness in the field.

Heather Hingst

A Study of Redeposited Conodonts From Polymict Breccia in the Decaturville Structure, Missouri, USA

The Decaturville structure is a confirmed, 6-km-diameter, impact structure located in Missouri between the towns of Camdenton and Lebanon. The time of structuring has not been resolved with certainty. The purpose of this study is to determine the chronostratigraphic range of conodonts that occur in polymict breccia of the ring-graben and establish a time before which structuring could not have occurred. This information would facilitate reconstruction of the post-Ordovician Ibexian lithostratigraphic column in the area prior to structuring and which has since been removed by erosion. Towards this end, at least 30 kilograms of polymict breccia will be processed for the recovery of conodonts. The breccia will be digested in a buffered formic acid solution for at least three weeks to maximize dissolution of limestone and dolomite clasts. Shale residues from the acid digestion will be processed to recover additional conodonts. Conodonts will be identified. This study is an extension of a pilot study the Missouri Geological Survey did in 2011 on a selected clast that recovered conodonts tentatively identified as Silurian. It is possible that younger conodonts are present in the polymict breccia.

Hermann, Missouri

Senate District 6
House District 61

Major
Geology and Geophysics

Faculty Mentor
John Hogan

Mentor's Department
Geology

Funding Source
Dept of Natural Resources – Missouri Geological Survey

Poster Number 15

Emily Johnson

Fenton, Missouri

Senate District 15
House District 96

Major
Chemical Engineering

Faculty Mentor
Manashi Nath

Mentor's Department
Chemistry

Funding Source
NSF

Poster Number 20

Discovering Mixed Transition Metal Based Selenides as Novel Oxygen Evolution Electrocatalysts

The growing demand for energy and the increased concerns about burning fossil fuels has prompted a need for an alternative renewable energy source. Water splitting has long been considered an effective way to generate sustainable and renewable energy resources in the form of hydrogen gas in fuel cells and other energy conversion devices. Exploring electrocatalysts to expedite the oxygen evolution reaction (OER) is crucial in boosting the practical application of water splitting in industry. Today, the cost of water splitting is considered high, due to of the rare earth metal based catalysts currently used in industry, resulting in impracticality. Intensive efforts have been devoted to develop mixed transition metal based chalcogenides as effective OER electrocatalysts, because of their abundance and low cost. In this research we have used combinatorial electrodeposition to deposit a series of mixed metal selenide films and systematically investigated how the metal composition affects the OER catalytic activity.

Cameron Lerch

Disorder and dynamics in quantum materials

Hexagonal ferrites not only have enormous commercial impact ($2 billion/year in sales) due to applications that include ultrahigh-density memories, credit-card stripes, magnetic bar codes, small motors, and low-loss microwave devices, they also have fascinating magnetic and ferroelectric quantum properties at low temperatures. We investigate the effects of tuning the magnetic ordering temperature in these materials to zero by chemical substitution. We find that this produces a form of compositionally tuned, insulating, ferrimagnetic quantum criticality. Close to the zero-temperature phase transition, we observe the emergence of a new electric dipole glass phase induced by magnetoelectric coupling. These quantum-mechanical properties, along with the multiplicity of low-energy states near the zero-temperature phase transition, are likely to greatly extend applications of hexaferrites into the realm of quantum and cryogenic technologies.

Lee's Summit, Missouri

Senate District 8
House District 35

Major
Physics

Faculty Mentor
Thomas Vojta

Mentor's Department
Physics

Funding Source
NSF

Poster Number 23

Samuel Merriman

St. Louis, Missouri

Senate District 1
House District 83

Major
Biological Sciences

Faculty Mentor
David Westenberg

Mentor's Department
Biological Sciences

Funding Source
OURE

Poster Number 27

Testing the Antibacterial Properties of Borate-based Bioactive Glass

Subjected various bacteria to different permutations of borate based glasses prepared by the materials engineering department. The glasses would cause bacterial termination and the causes of such termination were explored.

Ana Messmer

Influence of Pumping on the Scaling Resistance of Flowable Concrete

This project's goal is to determine how pumping parameters affect the freeze-thaw and scaling resistance of self consolidating concrete (SSC). 16 different concrete mixtures were pumped with different parameters, including flow rate, pumping boom configuration (flat or A), the pipe diameter at the end of the boom (5" or 4"), and whether the end of the boom was submerged or not. Samples for scaling resistance were fabricated on-site from pumped samples and samples from the truck, and comparative analysis is performed to determine the most influential factors. To date, samples reveal different patterns of scaling, which can be attributed to the air-void distribution, but also to the finishing and homogeneity of the sample (or the lack thereof). It appears that segregation or bleeding of the concrete may have an additional influence on the scaling resistance, and these negative effects may be provoked or amplified by the pumping process.

Festus, Missouri

Senate District 22
House District 114

Major
Civil Engineering

Faculty Mentor
Dimitri Feys

Mentor's Department
Civil, Architectural and Environmental Engineering

Funding Source
American Concrete Institute & US DOT through RE-CAST UTC

Poster Number 31

Jason Nguyen

Chesterfield, Missouri

Senate District 24
House District 89

Major
Biology

Faculty Mentor
David Westenberg

Mentor's Department
Biological Sciences

Funding Source
OURE

Poster Number 35

A Synthetic Biology Approach for Anaerobic Digestion of Glycerol to make Ethanol

Biofuels are an important economic driver in the state of Missouri. Biofuels provide an environmentally friendly and renewable energy. However, a considerable amount of glycerol, a waste product, is produced when making biofuels. This project aims at using the bacterium *E. coli* to metabolize glycerol into ethanol, a valuable commodity. *E. coli* naturally produce enzymes that convert glycerol into ethanol but only do so under very specific conditions. By synthetically producing many copies of the genes that make the enzyme and inserting them into plasmids, *E. coli* can be made to readily and consistently convert glycerol to ethanol.

Arthur Schneider

Mapping Slave Uprisings Across the Eighteenth-Century British Atlantic

In one of the first projects of its kind, this study examines the influence of news of slave rebellions on the colonies of the British America during the eighteenth century. Using newspapers from both England and colonial America, this project traces the speed and direction of specific reports of insurrection across the British Empire. It also seeks to understand whether printers changed reports of slave unrest as they shared stories between colonies and to explore the impact of news upon specific towns and colonies. The poster includes the text of a specific newspaper report of slave rebellion, a map illustrating the movement of news reports between colonies, and evidence of the influence of the reports on colonial slave codes. In addition to these graphics on the poster, there is text included to provide insight to the results uncovered and to give some additional background information to the project as a whole.

Hermann, Missouri

Senate District 6
House District 61

Major
History

Faculty Mentor
Justin Pope

Mentor's Department
History and Political Science

Funding Source
First Year Research Experience Program

Poster Number 38

Drake Anderson

O'Fallon, Missouri

Senate District 23
House District 106

Major
Psychology

Faculty Mentor
Bettina Casad

Mentor's Department
Psychological Science

Funding Source
NIH

Poster Number 4

Undergraduate Research Opportunities: Paving the Way for the Next Generation of Scientists

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.

UMSL

Kristin Briggs

How a Small Plant Can Make a Big Difference in Agriculture

Arabidopsis thaliana, like many plants, have seeds that contain fatty acids. This is the main source of nutrients for the plant before photosynthesis occurs. The fatty acid that I'm interested in is a trans-fat; trans-fats contain double bonds which make them difficult to metabolize. The enzymes involved in the two pathways that break down these double bonds are also involved in other important processes. Like humans, plants contain hormones that help them grow. The conversion of the hormone IAA to IBA helps the seedling grow strong lateral roots. It is important to note that not all plants respond to this hormone. The two pathways that a trans-fat can undergo in order to lose its double bond are the hydratase pathway and the reductase pathway. Mutated enzymes in the hydratase pathway, shown in prior research, interrupt the conversion of IAA to IBA. This causes the seedling to have smaller leaves and thinner, long roots. However, the importance of the reductase pathway and its relation to IAA/IBA is yet to be discovered. By disrupting enzyme activity in the reductase pathway, I will be able to characterize the function of this pathway and gain insight on how plants convert IAA to IBA. This information can be applied to plants that do not normally respond to IBA, potentially providing alternative ways to produce larger plants and crops.

St. Peters, Missouri

Senate District 23
House District 106

Major
Biochemistry

Faculty Mentor
Bethany Zolman

Mentor's Department
Biology

Poster Number 8

Joshua Evans

St. Louis, Missouri

Senate District 22
House District 2

Major
Psychology

Faculty Mentor
Matthew Taylor

Mentor's Department
Psychological Science

Poster Number 12

Is Self-Imposed Alienation Among Veterans Real and What Does it Mean?

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.

Stephanie Faulkingham

Individual Differences in Neural Rhyme Effects

Reading is complex, and requires us to connect letters and sounds. Studies have shown us humans read through two different processes, one using spelling to recognize whole words (orthography) and one using rules to sound out words letter-by-letter (phonology). Understanding how these processes interact is important for creating accurate models of how reading works in the brain and improving reading education. It is thought that there are differences between people in how these processes are used, with some people relying more heavily on orthography and others relying more heavily on phonology. When words look and sound similar (for example, ever and lever), the brain processes the information quickly. However, there are words that sound similar, but do not look alike, (for example, heard and word), and the brain responds differently to those pairs. This is called the "conflict effect." We used an electroencephalogram (EEG) to pick up the electrical currents the brain makes when it is hearing word pairs. In this study, participants heard word pairs with matching spelling and sound and word pairs with a conflict. University students who struggle with reading show a conflict effect in the opposite direction from students who read well. Specifically, students who struggle to read show a stronger influence of orthography, or word spelling. This information tells us that readers of different ability process how word sound and look differently. When we better understand how the reading process works, we can work to find better ways to help people who struggle with reading.

St. Louis, Missouri

Senate District 24
House District 72

Major
Psychology

Faculty Mentor
Suzanne Welcome

Mentor's Department
Psychological Sciences

Poster Number 16

Melissa Growney

Jefferson City, Missouri

Senate District 6
House District 60

Major
Psychology

Faculty Mentor
Suzanne Welcome

Mentor's Department
Psychological Sciences

Poster Number 20

Does how words sound influence judgments about how they are spelled?

Some researchers think that reading involves making automatic connections between letters and sounds. There is evidences that when words look different, it takes people longer to recognize that they rhyme. In this study, we investigated whether these connections are bi-directional. In other words, are people slower to recognize that pairs like "catch and watch" share word endings because they do not rhyme? We collected accuracy, reaction time, and EEG (brain wave) data to investigate this effect in people of different reading skill. This line of work has the potential to influence our understanding of how spoken and written language are processed.

UMSL

Elizabeth Koellner

Undergraduate Research Opportunities: Paving the Way for the Next Generation of Scientists

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.

St. Louis, Missouri

Senate District 2
House District 22

Major
Psychology

Faculty Mentor
Bettina Casad

Mentor's Department
Psychology

Funding Source
NIH

Poster Number 24

Heather Lange

UMSL

Jefferson City, Missouri

Senate District 6
House District 60

Major
Psychology

Faculty Mentor
Bettina Casad

Mentor's Department
Psychology

Funding Source
NIH

Poster Number 24

Undergraduate Research Opportunities: Paving the Way for the Next Generation of Scientists

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.

UMSL

Alan Scheibel

Glow Chemistry: Fluorescent Metallofluorenes in Materials Chemistry and Biochemistry

Fluorescent materials as sources of lighting and electrical components have been studied extensively in the past several decades. More recently, however, silicon and germanium-containing molecules have shown significant improvements to fluorescence emission colors and intensities due to their unique ability to lower energy barriers for excited electrons to relax and fluoresce.

Silicon- or germanium-containing rings collectively called "metalloles" provide a fundamental understanding of how chemical structure and electronics influence fluorescence. Expanding on this idea, the Wilking Lab has developed novel extensions to metalloles, where multiple-ring structures, based on metalloles, have shown fluorescence that is tunable in both emission color and intensity. This is attributed to the outfitting of metalloles with additional rings and several electron-donating or -withdrawing groups which allow for easily-modifiable fluorescence properties. These redesigned molecules are the metallofluorenes—namely sila- and germafluorenes—whose potential use in lighting systems and as explosives and chemical sensors have gathered modern interest in the materials chemistry field. Both species emit blue fluorescent light (that is, with wavelengths generally between 400-450 nm) very efficiently, with a quantum yield (percentage of light emitted to absorbed) between 65-89%.

Today, in collaboration with the Dupureur group at UMSL, our work on silafluorenes in particular has expanded to include their investigation as non-toxic fluorescent biological dyes. Prior research has been conducted on silole derivatives in bio-imaging which encourage this exploration with silafluorenes, whereby significant improvements to efficiency are possible.

Florissant, Missouri

Senate District 13
House District 67

Major
Chemistry

Faculty Mentor
Janet Braddock-Wilking

Mentor's Department
Chemistry

Funding Source
NSF

Poster Number 28

Evan Stephenson

UMSL

Transition Metal Complexes: a New Wrench for the Toolbox

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.

Lake St. Louis, Missouri

Senate District 2
House District 108

Major
Chemistry

Faculty Mentor
Eike Bauer

Mentor's Department
Chemistry

Poster Number 32

Madilynn Woodham

Stress in Student Leaders and its Potential Effect on Universities and Students

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 has 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. Residential Life Staff are vital to the success 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

Hillsboro, Missouri

Senate District 22
House District 118

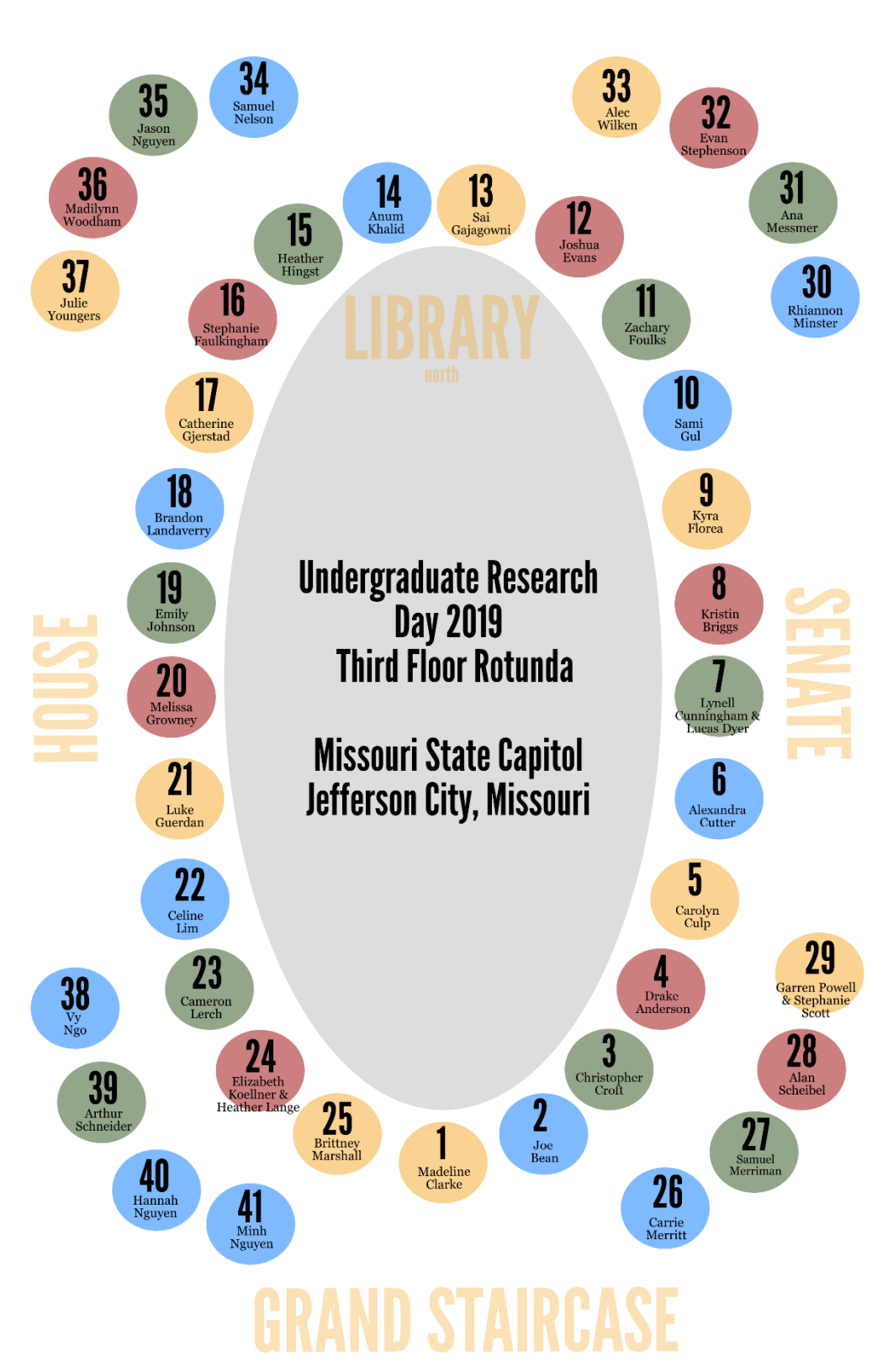
Major
Psychology

Faculty Mentor
Kate Votaw

Mentor's Department
Honors College

Funding Source
College of Arts and Science Undergraduate Research Grant

Poster Number 36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Undergraduate Research Day 2019
Third Floor Rotunda
Missouri State Capitol
Jefferson City, Missouri
1 Madeline Clarke
2 Joe Bean
3 Christopher Croft
4 Drake Anderson
5 Carolyn Culp
6 Alexandra Cutter
7 Lynell Cunningham & Lucas Dyer
8 Kristin Briggs
9 Kyra Florea
10 Sami Gul
11 Zachary Foulks
12 Joshua Evans
13 Sai Gajagowni
14 Anum Khalid
15 Heather Hingst
16 Stephanie Faulkingham
17 Catherine Gjerstad
18 Brandon Landaverry
19 Emily Johnson
20 Melissa Growney
21 Luke Guerdan
22 Celine Lim
23 Cameron Lerch
24 Elizabeth Koellner & Heather Lange
25 Brittney Marshall
26 Carrie Merritt
27 Samuel Merriman
28 Alan Scheibel
29 Garren Powell & Stephanie Scott
30 Rhiannon Minster
31 Ana Messmer
32 Evan Stephenson
33 Alec Wilken
34 Samuel Nelson
35 Jason Nguyen
36 Madilynn Woodham
37 Julie Youngers
38 Vy Ngo
39 Arthur Schneider
40 Hannah Nguyen
41 Minh Nguyen

MU UMKC Missouri S&T UMSL