UNDERGRADUATE RESEARCH DAY

APRIL 6, 2023

University of Missouri System

COLUMBIA | KANSAS CITY | ROLLA | ST.LOUIS

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.

The University of Missouri System Undergraduate Research Day at the 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 of 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, PHD

President
University of Missouri

C. MAULI AGRAWAL, PHD

Chancellor
University of Missouri-Kansas City

MOHAMMAD DEHGHANI, PHD

Chancellor
Missouri University of Science and Technology

KRISTIN SOBOLIK, PHD

Chancellor
University of Missouri-St. Louis

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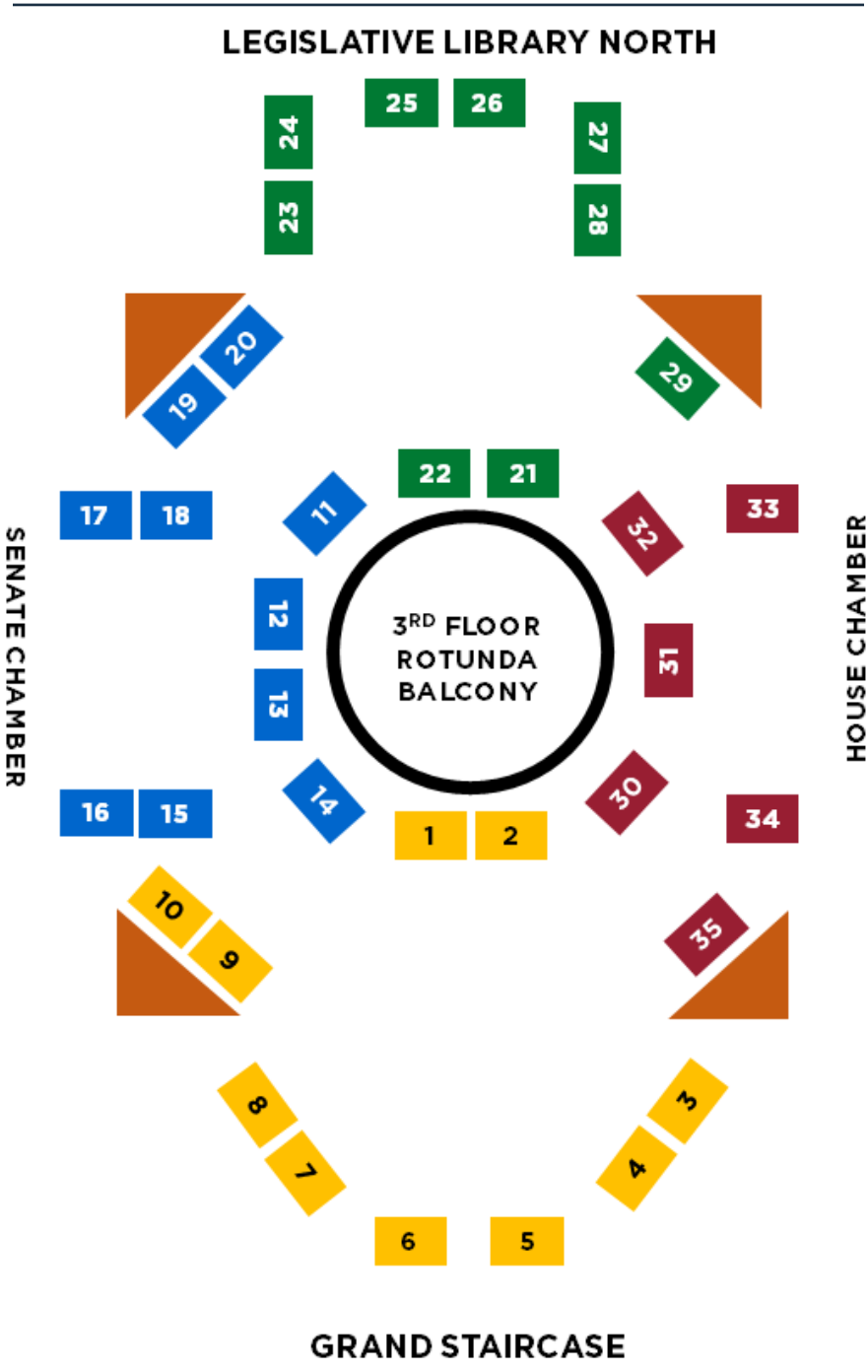
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HOUSE CHAMBER
GRAND STAIRCASE

POSTER NO. 1

Undergraduate Research of Autism Spectrum Disorder at the Thompson Center: Psychophysical Predictors of Response to Medications and Camouflaging

NOURA ALHACHAMI

Columbia, MO

co-author, poster no. 1

Senate District 1
House District 044

MAJOR
Psychology

FACULTY MENTOR
David Beversdorf

MENTOR'S DEPARTMENT
Psychological Sciences and Radiology

FUNDING SOURCE
McNair Program and TRIUMPH Grant

Autism spectrum disorder (ASD) is a condition that presents with deficits in social skills, language skills, and an increase in repetitive behaviors. There is also large overlap with other co-occurring conditions such as ADHD, anxiety, depression, and epilepsy. The Thompson Center for Autism and Neurodevelopmental Disorders is a center at the University of Missouri dedicated to improving the lives of those with ASD. Here, undergraduate students contribute to research that advances understanding of the causes of ASD through the ability to work with people in a wide range of ages and symptom severity while using a variety of techniques, such as neuroimaging, clinical assessments, and machine learning. One of the projects we are presenting studies heart rate variability as a predictor of the treatment response on propranolol, a cheap and generic beta-blocker, on core symptoms of ASD. Since most other pharmacotherapeutics for ASD target co-occuring conditions, propranolol's focus on core symptoms could be promising. The other project focuses on camouflaging, which is a combination of strategies used by autisic people to appear less autistic during social interactions. Current studies measure the association between camouflaging of autism and anxiety through subjective measures, such as self-reports. This study utilizes skin conductance levels as a psychophysiological measurement to understand the role of anxiety in camouflaging. These projects reveal the use of biomarkers to optimize treatment, better understand stressful behaviors, and harness precision medicine approaches at the Thompson Center. The center's undergraduate research is training future scientists and clinicians to continue the work of understanding ASD.

POSTER NO. 1

Undergraduate Research of Autism Spectrum Disorder at the Thompson Center: Psychophysical Predictors of Response to Medications and Camouflaging

ARAVIND KALATHIL

O'Fallon, MO

co-author, poster no. 1

Senate District 19
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Psychology and Biological Sciences

FACULTY MENTOR
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MENTOR'S DEPARTMENT
Psychological Sciences and Radiology

FUNDING SOURCE
Department of Defense- CDMRP, STAMPS Scholarship; Thompson Center for Autism and Neurodevelopment

Autism spectrum disorder (ASD) is a condition that presents with deficits in social skills, language skills, and an increase in repetitive behaviors. There is also large overlap with other co-occurring conditions such as ADHD, anxiety, depression, and epilepsy. The Thompson Center for Autism and Neurodevelopmental Disorders is a center at the University of Missouri dedicated to improving the lives of those with ASD. Here, undergraduate students contribute to research that advances understanding of the causes of ASD through the ability to work with people in a wide range of ages and symptom severity while using a variety of techniques, such as neuroimaging, clinical assessments, and machine learning. One of the projects we are presenting studies heart rate variability as a predictor of the treatment response on propranolol, a cheap and generic beta-blocker, on core symptoms of ASD. Since most other pharmacotherapeutics for ASD target co-occuring conditions, propranolol's focus on core symptoms could be promising. The other project focuses on camouflaging, which is a combination of strategies used by autisic people to appear less autistic during social interactions. Current studies measure the association between camouflaging of autism and anxiety through subjective measures, such as self-reports. This study utilizes skin conductance levels as a psychophysiological measurement to understand the role of anxiety in camouflaging. These projects reveal the use of biomarkers to optimize treatment, better understand stressful behaviors, and harness precision medicine approaches at the Thompson Center. The center's undergraduate research is training future scientists and clinicians to continue the work of understanding ASD.

POSTER NO. 2

Designing a Biochemical Tool to Confirm the Presence of Cellular Components for Plant Defense Against Bacterial Infection

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House District 147

MAJOR
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Antje Heese

MENTOR'S DEPARTMENT
Biochemistry

FUNDING SOURCE
American Society of Plant Biologists Summer Undergraduate Research Fellowship; NSF; MU CAFNR Alexander Research Internship; Wayne L. Ryan Fellowship

Plants play a vital role in our society. To feed the increasing world population of 10 billion by 2050, total crop production needs to double while maintaining nutritional value. Unfortunately, 10-16% of the world's global harvest is lost each year to plant diseases caused by pathogens. A growing area of research is to create more disease-resistant plants by investigating how key proteins help protect plants from bacterial infection.

My research uses the model plant Arabidopsis to determine how key proteins are positioned on the cell surface to properly fight off bacterial infection on a cellular level. If these key proteins are moved to incorrect locations or produced in incorrect quantities, they will not be able to perform their defensive roles. Many cellular components help move these key proteins to the cell surface, but we need to assess whether cellular components are present in plants to understand their roles in defense.

To study a potentially important plant-defense protein, I devised a method to ascertain if the cellular component is present in Arabidopsis. First, I engineered a cell line to produce the defensive protein. Next, I purified enough of this protein to create a biochemical tool that detects the specific anti-bacterial molecules in plant cells. This tool will help members of our research group to determine which portions of the cellular component helps move key proteins to the plant cell surface for effective defense responses. I will also use this tool in future experiments in corn, a major crop source of food and income in Missouri and worldwide.

POSTER NO. 3

Developing Biocompatible, Shape-Memory Tissue Scaffolds Using 3D and 4D Printing

GRAHAM BOND

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Jian Lin

MENTOR'S DEPARTMENT
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FUNDING SOURCE
National Institute of Health; Department of Defense; SMART Schoalrship; Honors College Discovery Fellowship; College of Engineering Undergraduate Research Fellowship

Current biomedical implants such as soft tissue supports and vascular stents tend to have significant limitations. Often, they are one-size-fits-all, require removal or monitoring, have the potential for immune rejection, and use invasive surgical procedures. To kickstart the next generation of personalized and adaptive biomedical devices, my research focuses on using cutting-edge 4D printing and tissue engineering techniques. While 3D printing creates rigid products, 4D printing is a new method to manufacture structures that can change shape over time, typically from the addition of heat. Our lab has developed a novel shape-memory polymer, PGDA, which can change shape simply by being placed in the warmth of the human body. My work is to improve PGDA further by making it porous and biocompatible. Sugar is mixed with PGDA, the 3D structure is printed, and then the sugar is dissolved in a water bath which leaves behind a matrix of pores for tissues to grow upon. By varying the size and concentration of sugar particles, I have been able to alter the porous texture to match the intracellular network of different tissues. With this method, I have printed highly complex shapes with PGDA, characterized the mixture's mechanical and fluid properties, demonstrated the biocompatibility of printed devices, and confirmed its shape memory. This construction method can be used to precisely control mechanical strength, porosity, transition temperature, and shape, allowing for biodegradable, comprehensive, and personalized biomedical devices. The next steps of this research would be in vivo animal studies, with the eventual goal of clinical use.

POSTER NO. 4

Using Carbon to Combat Historic Mining Pollution in an Urban Stream in Joplin, MO

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Civil Engineering

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FUNDING SOURCE
Preparing Future Faculty - Faculty Diversity Postdoctoral Program; MU CAFNR Faculty Council Research Grant; College of Engineering Undergraduate Research Fellowship; : USDA NIFA McIntire-Stennis Project 1016163

Pit mining historically took place in Joplin, MO for over 100 years and resulted in waste piles, abandoned underground mines, and heavy metal pollution by cadmium and lead. Exposure to heavy metals can cause long-term health effects and can lead to developmental issues in children. It is known that adding carbon sources to polluted streams, such as charcoal (biochar) or engineered soil, is an effective technique to improve the natural microbial populations which naturally help remove metal pollution; however, it is not well understood how such added carbon sources compare to existing carbon in an urban, mining area. My project analyzes dissolved organic carbon in a polluted urban stream in Joplin. We collected water samples and analyzed the quality of carbon in the samples via optical spectroscopy, a technique that characterizes carbon using light scattering. We quantified how in-stream samples absorbed ultra-violet and visible light and then compared the results to those of run-off collected from lab experiments with carbon additions: biochar and engineered soil. My results showed that the carbon in the treated and untreated water samples were significantly different. In the amended run-off, the carbon was found to be larger and thus a longer-lasting food source for the bacteria removing heavy metals. The carbon measured from the stream in Joplin is a smaller and more degraded food source for bacteria. The overall goal of my work is to demonstrate how engineered carbon amendments could facilitate heavy metal removal via healthy bacterial growth in urban streams. Future work includes the development of a remedial solution for this stream using locally sourced materials.

POSTER NO. 5

Cities for Bees: Reviewing Global Municipal Policies for Insect Pollinator Conservation

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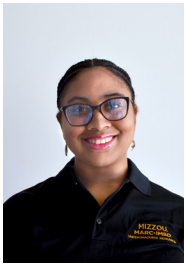
School of Natural Resources

FUNDING SOURCE
N/A

Insect pollinators (bees, flies, moths, etc.) face increasing stressors on their health from habitat degradation and rising temperatures. With changing public awareness of the importance of insect pollinators to food security and ecosystem health, governments are taking action to help these animals. Research on pollinator conservation policy is often focused on international, national, and regional laws, yet much can be learned about effective policy innovations at local scales by examining municipal-level actions. Municipalities are uniquely positioned to provide tailored conservation programs for pollinators due to the small spatial requirements and urban/suburban land uses that meet pollinators' habitat needs (e.g., municipal parks, residential gardens, commercial campuses, etc.). Municipalities also house large, diverse populations of pollinators compared to other land types. Through systematic searches of databases for press releases, we gathered municipal policies designed to support pollinator populations. Globally, policies vary widely in scale, impact, and specific policy action. We catalogued a total of 575 actions from 512 municipalities that we then categorized according to stated goals and types of action. Each action fell into one of four groups: single purpose projects, membership programs, municipal ordinance changes, and multipurpose projects. Our analysis showed that small-scale projects were most common, but larger projects tended to be unique and encompassed more municipal needs. Our goal for this study is to provide a resource for municipal leaders by highlighting examples of policies to implement. This study also serves as a starting point for future research into the effectiveness of various policies on pollinator health.

POSTER NO. 6

Exploring Maize Heirloom Varieties for Whiskey and Tortilla Flavor



DANNY DAVIS

Shakopee, MN

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House District 45

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FACULTY MENTOR
Sherry Flint-Garcia

MENTOR'S DEPARTMENT
USDA-ARS and Plant Sciences and Technology

FUNDING SOURCE
USDA-ARS; NIH MARC program

Less than 1% of corn grown in the United States is used for human consumption. Despite this low percentage, there is a growing demand for corn food in the United States as distilleries and restaurants recognize the effect of ingredients on flavor. Commercial corn lines are used for livestock feed and fuel production and thus not a lot of attention has been put toward breeding for taste. Heirloom corn varieties are especially suited to culinary uses because they possess high genetic diversity for traits which can be used in culinary settings. Heirloom varieties have been explored for whiskey and masa-based products such as chips and tortillas. Because there is a wide range of heirlooms to choose from, it can be hard to choose heirlooms best suited for certain culinary contexts; for example, what a distillery looks for in corn is different from what a tortilleria desires. In addition to different consumers seeking different characteristics, crossing varieties together results in new combinations of characteristics. My project evaluated the protein and starch content of corn from 360 crosses between 180 heirloom varieties. Protein and starch are the primary factors in determining the quality of corn used in cooking and distilling. We use Near Infrared Spectroscopy to measure grain protein and starch content in intact kernels, which allows for downstream taste testing, e.g. tortillas. Because the metabolites underlying flavor are unknown, the taste testing can be used to establish a relationship between protein and starch content and flavor. The database resulting from this project will serve as a searchable resource for consumers and processors with various needs.

POSTER NO. 7

Using Augmented Reality Innovation to Improve College Student Learning

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FUNDING SOURCE
National Science Foundation

One of the many emerging technologies is Augmented Reality (AR). AR headsets can be used to add virtual elements into a student's field of view, while not replacing all the physical surroundings. This can create useful visual aids that can aid students in their learning. The concept of force in a physics class can be difficult to visualize. In our study, we use AR as a teaching aid to create a 3D visual for students to see. Numerous research studies concentrate on metacognitive skills, or self-evaluation of learning, academic performance, and workload in traditional classroom settings. However, only a few metacognition studies focus on an augmented reality environment in a college classroom. This study investigated the effect of self-evaluations judgments and student confidence in an augmented reality learning environment. We collected metacognitive monitoring questionnaires from two groups exposed to the same augmented reality learning environment. One group reported their retrospective confidence judgments (RCJ) and the other group reported their judgment of learning (JOL). The results showed that metacognition and self-evaluations, as well as performance in the AR learning environment, were positive. However, there was a considerable effort difference reported between RCJ and JOL. The findings so far indicate that when evaluating a students learning awareness, questions in the style of RCJ result in students predicting their performance with a higher accuracy. Metacognition theories operate similar inside of a virtual environment, as they do in a traditional one. This indicates that college students can learn in an AR environment, similarly to how they would learn in a traditional classroom.

POSTER NO. 8

Shortened Blood-Pressure Variability Recording are Effective for Individuals with Type 2 Diabetes

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FUNDING SOURCE
University of Missouri Research Council; University of MIssouri Alumni Association Richard Wallace Research Incentive Fund; Undergraduate Research and Creative Activity Mentorship Program

Cardiovascular disease is the leading cause of death in the United States. A contributing factor to cardiovascular disease is elevated blood pressure. In the healthy state, blood pressure is kept in a tight range and remains relatively stable. In instances where blood pressure varies a lot, this increases risk of cardiovascular complications associated with too high (e.g., heart failure, kidney disease) or too low (e.g., syncope, fainting) blood pressure. Previous studies that record blood pressure over a 24-hour period have shown that individuals with type 2 diabetes exhibit greater blood pressure variability compared to adults without diabetes. However, recording blood pressure for 24-hours is burdensome and expensive. For this reason, we hypothesized that individuals with type 2 diabetes would exhibit greater blood pressure variability compared to adults without diabetes when blood pressure was monitored for only 5 minutes. We observed 9 individuals with type 2 diabetes and 9 individuals without diabetes, measuring blood pressure and pulse rate during a 5-minute quiet rest. To determine the variability of their blood pressures, we analyzed the standard deviation as well as the coefficient of variation of blood pressure values measured during each heartbeat. Our results showed that a short 5-minute recording could identify greater systolic blood pressure variability in individuals with type 2 diabetes compared to adults without diabetes. Using a 5-minute blood pressure recording (compared to a 24-hour recording) can reduce healthcare costs and inconvenience for patients. This research finding has the potential to be directly translated into a clinical setting.

POSTER NO. 9

Adapting to Chaos During COVID: Telehealth in Nursing Homes

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Kimberly Powell

MENTOR'S DEPARTMENT
Sinclair School of Nursing

FUNDING SOURCE
Agency for Healthcare Research and Quality Grant

Ensuring the safety of the over 1.7 million nursing home residents in the United States while maintaining access to care led to the rapid adoption of telehealth (TH) during the COVID-19 pandemic. Researchers at the Sinclair School of Nursing wanted to explore what solutions each nursing home came up with during this unprecedented period of telehealth expansion and how adoption of these new solutions impacted their work systems.

To gather our data, we conducted interviews with 21 administrators and clinicians from 16 different nursing homes across the United States. I contributed to this project by processing interview transcripts and coding responses into the five categories of our human factors model. We found common barriers encountered by nursing homes to be challenges using smartphones, lack of knowledge about billing for TH visits, interoperability concerns (e.g., no connection between TH system and electronic medical record), and increased staff burden. Common facilitators that helped improved telehealth use were training, use of integrated equipment, having staff present during TH visit, and using TH for different types of visits.

Telehealth is a valuable tool that can be used to keep vulnerable patients safe from infectious disease while providing quality care. However, in recent years, numerous pieces of federal legislation have been introduced potentially impacting sustainability of TH in nursing homes. With the recent announcement of the Biden administration to end the public health emergency on May 11, 2023, policy makers should consider how allowing temporary changes in TH regulation to expire could impact sustained use for nursing home residents.

POSTER NO. 10

The Effective and Efficient Creation of Radiation-Based Pharmaceuticals

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MENTOR'S DEPARTMENT
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FUNDING SOURCE
NIH/NCI and MU Department of Chemistry

Every year, the number of people who die from cancer decreases due to the progress being made in cancer therapies, surgeries, and testing. "Theranostics" is a growing approach which aims to create a single drug which can be used for both diagnostic and therapeutic purposes. These drugs use a radioactive isotope to generate the radiation needed for medical imaging of tumors. Following the imaging, a different isotope will be bound to the same drug and given to the patient to destroy their tumor. The University of Missouri – Columbia is arguably the best place in the world to perform theranostic research. The MU Research Reactor produces isotopes that are not made anywhere else in the world, the Roy Blunt NextGen Precision Health Institute helps blend the line between the lab bench and the clinic, and field-leading mentors such as Dr. Carolyn Anderson are drawn to our university. Using these resources, our project aims to create a method by which radiopharmaceuticals can be rapidly and efficiently created. This will hopefully lead to a larger library of radiopharmaceuticals which can be used to treat patients. To do this, the project utilizes click-chemistry. Click-chemistry was awarded the 2022 Nobel Prize in chemistry. By combining these field leading techniques and the resources available at University of Missouri–Columbia, we hope to push the field of theranostics forward.

POSTER NO. 11

Modifying Fruit Fly Protein Expression Through Sleep Deprivation

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Ryan Mohan

MENTOR'S DEPARTMENT
Division of Biological and Biomedical Systems

FUNDING SOURCE
NIH NINDS

In Missouri, there are 17,000 active-duty military personnel, 200,000 healthcare workers, and countless shift workers, all of whom experience sleep disruption. Sleep is a physiologically necessary process for most animals and is characterized by temporary immobility, reduced responsiveness to stimulation, and regulation by homeostasis. Extensive research has shown inadequate sleep is implicated with poor health outcomes. For instance, chronic sleep disruption may increase the risk of neurodegenerative disorders like Alzheimer's disease and Parkinson's disease. Previous work has shown how sleep deprivation influences protein levels in the brain which may be involved in the aforementioned diseases, but the exact molecular underpinnings are still largely unknown. In the Mohan laboratory, we seek to investigate these questions within the context of neurological disease. Understanding these complex biochemical processes can offer insights into how to protect against the negative consequences of sleep deprivation. Though just a fruit fly, Drosophila Melanogaster was the animal model used to characterize the circadian clock and can be used to conduct research that is translational to humans. Using mechanical sleep deprivation, we can manipulate the biochemical makeup of fruit fly brains and measure those changes through advanced laboratory techniques. Here, we present our work on showing the efficacy of the model. These insights will be some of the first steps to understanding the extent of how sleep deprivation impacts the human brain and how we can protect against its consequences.

POSTER NO. 12

Diagnosis Differences in Childhood Mental Disorders

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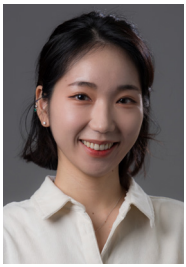
FUNDING SOURCE
N/A

In both mental and physical health, it is well known that early detection and treatment of problems is best. This is especially true when diagnosing and treating childhood mental disorders (Fineburg, 2019). Some common childhood mental disorders are Autism, ADHD, and Specific Learning Disorders (SLD). While these are normally diagnosed in early childhood or adolescence, rates of early diagnosis likely differ amongst the demographics. For example, Autism and ADHD are more likely to be diagnosed in boys. Not because there are fewer girls with ADHD and Autism in the world, but because symptoms display differently in girls making it harder to detect (Wood-Downie, 2021). Black children have lower rates of diagnosis for ADHD than White children even though symptoms appear at similar rates (Coker, 2016). Black children are more often diagnosed with disorders such as Oppositional Defiant Disorder and Conduct Disorder than their White counterparts (Fadus, 2019). Studies that analyze signs and symptoms of these disorders aren't diverse. Participants in these studies typically come from the western culture which prevents researchers from accounting for global differences. In studies that do ask for race, the participants are majority White. Studies are more likely to not ask for race, which prevents researchers from identifying and analyzing potential trends among races (Qu, 2020). Because of these factors, I hypothesize that Black women/ girls are at higher risk for delayed accurate diagnosis of mental health problems that typically first appear during childhood, such as Autism, ADHD, and SLD.

POSTER NO. 13

Development of Weed Detection Robot Using Deep Learning



SUHA CHO

Seoul, South Korea

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House District 27

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Information Technology

FACULTY MENTOR
Jejung Lee

MENTOR'S DEPARTMENT
Division of Natural and Built Environment

FUNDING SOURCE
SEARCH Grant

Weeds are one of the most important factors affecting agricultural production. They are aggressive, competing for light, water, nutrients and space for crops, garden plants or lawn grass. Globally, weeds have become responsible for 45% of the agricultural industry's crop losses due to the competition with crops. In the United States, harvest yield loss due to weeds has been estimated to exceed $8 billion annually. These hard-to-control weeds can also introduce bacteria, fungi, and nematodes. Site-specific weed control system and selective application of herbicides can minimize cost and maximize crop yields. This eco-friendly technique can reduce the consumption of chemical pesticides and their environmental impact on farms as well.

The purpose of this project is to generate a weed detection robot using Deep Learning(DL) techniques to support local farmers in Missouri to grow crops in more efficient ways. The work presented suggests DL techniques with image processing-based framework and aims at identifying, classifying the weeds from the desired crop using the learning algorithm. Missouri had 95,320 farms, second in number only to Texas, and these farms covered 27.8 million acres, 63% of the state. With this techno-efficient method for weed detection, it will result technological improvements in Missouri's agriculture production, and allow the residents to have better green environments.

POSTER NO. 14

Music Therapy as a Nonpharmacological Treatment for Post-Stroke Depression: A Scoping Review

HANNAH EDWARDS

Independence, MO

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House District 29

MAJOR
Music Therapy

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Dawn Iwamasa

MENTOR'S DEPARTMENT
Music Therapy

FUNDING SOURCE
N/A

Nearly 8,000 Missourians had a stroke in 2020 according to the CDC. Post-stroke depression (PSD) is a well-documented phenomenon which affects upwards of 30% of stroke survivors. Stroke survivors with PSD experience reduced outcomes from rehabilitation, increased healthcare costs, and higher mortality rates. The primary treatment for PSD is pharmacological, and research on nonpharmacological intervention is limited. Music therapy uses music to achieve nonmusical goals, such as physical wellness or emotional regulation. While music therapy is often used to address other areas of stroke recovery, research on using it to treat PSD is also limited. PSD increases post-stroke healthcare costs and mortality rates while decreasing the benefit from rehabilitation services. A scoping review was conducted to evaluate current research on nonpharmacological interventions for PSD. Implications for the application of music therapy for PSD, including a clinical framework for using music therapy to treat PSD, is discussed along with further research needs.

POSTER NO. 15

The Clio: Your Guide to the History and Culture Around You

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House District 33

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David Trowbridge

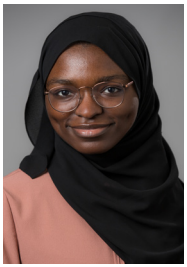
MENTOR'S DEPARTMENT
History

FUNDING SOURCE
N/A

Across Missouri, there are hundreds of museums, historic sites, and historical buildings. From small museums to large, sites of battle to sites of protest, or grand historic buildings to log cabins, Missouri is rich with a history that reflects the nation's growth during westward expansion, the Civil War, black American history, and more. In my research for The Clio, a free non-profit app bringing people closer to their local history, I have created and contributed to over 50 entries, a majority of which covers Kansas City or St. Louis history. My research has included the use of documents from the National Register of Historic Places and primary documents such as newspapers, birth certificates, death certificates, and military records. I have also conducted interviews with employees from different archives, museums, and historical societies in order to learn more about the history I'm covering and create audio files in which those close to the history can contribute their voice to the conversation. In working on this project, my research has included a vast array of different subjects regarding Missouri's history including, but not limited to, LGBT history, black history, the Civil War, and German immigrant history. I've even created entries highlighting notable Kansas Citians such as the Hall family. Through virtual tours and guides, The Clio makes all this history (and more) accessible to the public.

POSTER NO. 16

Foxg1a regulates craniofacial development in the zebrafish



NUSAYBAH IBRAHIM

Kansas City, MO

co-author, poster no. 16

Senate District 7
House District 36

MAJOR
Biology with Chemistry Minor

FACULTY MENTOR
Hillary McGraw

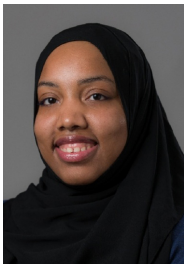
MENTOR'S DEPARTMENT
Division of Biological and Biomedical Systems

FUNDING SOURCE
SEARCH Grant

Many human developmental disorders are related to genetic mutations and a critical method for understanding these mutations is through the study of biological model organisms. Our project uses the zebrafish as a model to study the development of the jaw and how this relates to human development. Foxg1 is a gene that is critical for embryonic development. In particular, Foxg1 regulates the development of the forebrain as well as ear and eye formation. Foxg1 regulates cellular proliferation, differentiation and morphogenesis. Our work focuses on a zebrafish foxg1aa266 mutant line, which was generated using CRISPR-Cas9 genome editing (Thyme et al. 2019). Preliminary analysis of the foxg1aa266 mutants reveals defects in cartilage elements of the developing jaw. The mutants have abnormal joint development, narrow heads, and early lethality. In humans, Foxg1 mutations are linked to Foxg1 syndrome, which is defined by defects in neural development, intellectual disability, disrupted circadian rhythm, and social withdrawal. Our research focuses on the craniofacial abnormalities, specifically in the lower jaw in a Zebrafish with a foxg1 mutation. Understanding these connections of craniofacial defects and the foxg1 mutation will help in uncovering how the mutation affects human development.

POSTER NO. 16

Foxg1a regulates craniofacial development in the zebrafish



LAYLAH LIWARU

Kansas City, MO

co-author, poster no. 16

Senate District 11
House District 23

MAJOR
Biology

FACULTY MENTOR
Hillary McGraw

MENTOR'S DEPARTMENT
Division of Biological and Biomedical Systems

FUNDING SOURCE
SEARCH Grant

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POSTER NO. 17

Developing Skills with Big Data: Colonel Greene's Anthiphonal Collection as a Resource

MAAH KYI

Kansas City, MO

Senate District 7
House District 19

MAJOR
History and English

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MENTOR'S DEPARTMENT
English

FUNDING SOURCE
SEARCH Grant

During the Spanish Civil War, a mob of protestors attacked a monastery and was burning its books. Colonel Howard Greene, a native of Wisconsin, was outraged when 12 volumes of antiphonals (choir books of Gregorian chant) were to be destroyed, so he purchased them and brought them to the US in 1931. He spent many years studying the books, applying chemicals to them to preserve them and transcribing their contents. He later donated this collection to Marquette University in Milwaukee, Wisconsin. My research project includes digitizing, measuring, and recording data on these antiphonals that were made in 1562. In addition, I am working to transcribe the lyrics of the antiphonals and make inventories of them in CANTUS: A Database for Latin Ecclesiastical Chant (https://cantus.uwaterloo.ca/). The importance of inventorying the antiphonals is to make them accessible for research by musicologists, historians, and others invested in cultural heritage, and eventually all of the antiphonals' images will be uploaded in the CANTUS database. This research project not only helps preserve the legacy of the these books, but it also allows me to develop key skills as a researcher: working in archival environments, researching and identifying key historical resources, and developing transferable skills in working with big data.

POSTER NO. 18

The effects of visual and circadian proteins on BDBT and of BDBT on visual proteins

TINH NIM

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co-author, poster no. 18

Senate District 11
House District 18

MAJOR
Blology

FACULTY MENTOR
Jeffrey Price

MENTOR'S DEPARTMENT
Division of Biological and Biomedical Systems

FUNDING SOURCE
SEARCH Grant

Circadian rhythms are biological cycles that regulate an organism's mental, physical, and behavioral state throughout the day. According to the National Center for Chronic Disease Prevention and Health Promotion, 30% of Missouri residents report getting insufficient rest or sleep. Understanding the proteins that govern circadian regulation is critical for developing treatments for insomnia and various other diseases. In fruit flies, Bride of Doubletime (BDBT) is a crucial circadian protein that interacts with other circadian proteins to regulate circadian rhythms. Disruptions to BDBT can lead to altered circadian rhythms, which have been linked to numerous health problems in humans. In this study, we aimed to determine how two known circadian proteins, Arrestin-1 and ninaE, interact with BDBT. We observed that Rhodopsin-1 was necessary to suppress BDBT foci and that BDBT foci were not a product of an Arrestin endocytic pathway. These results helped us to narrow down the mechanism by which circadian proteins affect BDBT. In the absence of light, BDBT is expressed highly and broadly in photoreceptor foci. Conversely, in the presence of light, BDBT is expressed in low amounts. Our findings shed light on the complex interactions between circadian proteins and suggest that Rhodopsin-1 may be an important mediator of BDBT function. Overall, our work highlights the importance of BDBT in regulating circadian rhythms and provides insights into the mechanisms by which circadian proteins interact with BDBT. These findings could have significant implications for developing new treatments and therapies for various diseases associated with disrupted circadian rhythms.

POSTER NO. 18

The effects of visual and circadian proteins on BDBT and of BDBT on visual proteins

CHRIS VIERMANN

Lee's Summit, MO

co-author, poster no. 18

Senate District 9
House District 55

MAJOR
Biology

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Jeffrey Price

MENTOR'S DEPARTMENT
Division of Biological and Biomedical Systems

FUNDING SOURCE
SEARCH Grant

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POSTER NO. 19

A New Regulator of Ataxin-7 Cleavage in Spinocerabellar ataxia type 7

LINDSY TODD

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FUNDING SOURCE
NIH NINDS

People diagnosed with a genetic neurodegenerative disorder called spinocerebellar ataxia type 7 (SCA7) experience loss of motor function and blindness. Current treatments are limited to the treatment of symptoms as they develop. We must understand that in the presence of SCA7, it is the polyglutamine expansion in the Ataxin-7 gene that we think causes symptoms. Ataxin-7 (Atxn7) anchors the deubiquitinate module (DUBm) to the SAGA chromatin modifying complex, which is a critical regulator of gene expression. However, pathways regulating the DUB module entry and exit from SAGA remain mysterious. In humans, caspase 7 cuts Atxn7 and we hypothesize that polyglutamine expanded Atxn7 is more prone to being cut. Preventing caspase-mediated cleavage of Atxn7 can reduce cytotoxicity. Therefore, our working model is that the cutting of Atxn7 and the release of the DUBm causes SCA7, presumably by allowing the DUBm to target other proteins. We developed an unbiased method to discover novel interactors of Atxn7 and successfully identified a protein possibly responsible for preventing caspase cleavage of Atxn7. In our follow-up studies we tested the cleavage pattern of Atxn7 in the presence and absence of this factor and we are currently testing how this factor can modulate SCA7.

POSTER NO. 20

A Secondary Data Analysis of the Child Obesity and Health Messaging Preferences among Missouri Policymakers (CHAMP) Study

JUDY VUN

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House District 24

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Anita Skarbek

MENTOR'S DEPARTMENT
School of Nursing and Health Studies

FUNDING SOURCE
SUROP Grant

Enacting policy changes which promote nutrient-dense foods and daily physical activity can play an important role in addressing childhood obesity. Little is known how the framework and delivery of health messaging to policymakers influences the development of obesity-related policies.

One hundred and fifteen surveys were completed by Missouri policymakers. The parent analysis of the CHAMP survey had a 65.3% response rate (64% male), and the majority were members of the Republican party and serving in the House of Representatives. Members of the Democratic party who received a visual media were more likely to perceive the food industry and different levels of the government as more responsible for preventing childhood obesity than those who did not receive a visual media. Participants who received a visual media overall were more likely to support the following prevention strategies: sidewalks and crosswalks, policies on advertisements, healthy items at concession stands, healthy items at food pantries, improving breastfeeding abilities for moms, healthy items in vending machines, more fresh fruits and vegetables at school, and increasing physical activity in schools compared to those who received no visual media.

These findings indicate the inclusion of visual media in health policy messaging may positively impact the promotion of child and obesity-related policies. In particular, the use of schools in the visual media was most influential.

MISSOURI S&T

POSTER NO. 21

Learning the principles of aging from worms

ERIK BERGSTROM

Riverside, MO

co-author, poster no. 21

Senate District 25
House District 12

MAJOR
Biological Sciences

FACULTY MENTOR
Andrea Scharf

MENTOR'S DEPARTMENT
Biological Sciences

FUNDING SOURCE
N/A

Nearly every organism on Earth experiences an age-related decline. However, this decline is not universal and occurs differently across species. It is unknown how the interplay of different reproductive and aging traits impacts the way aging occurs in populations. Understanding why aging occurs in populations can help us understand aging in humans and to find potential cures for age-related diseases. Our project aims to answer this question: what is the effect of different lifespans and varying reproduction on population dynamics? To answer this question, we have analyzed wild type and mutant populations of the nematode Caenorhabditis elegans in a laboratory ecosystem and in the corresponding computational simulation wormPOP, which mimics the laboratory ecosystem. C. elegans is a popular model organism with many strains that have varying lifespans and reproductive rates. We found that decreasing nematode lifespan had little effect on worm population dynamics, although the small changes it caused led to differences in initial behavior. We had originally planned to use a strain of worms that had faster reproduction, but found that this strain instead produced more offspring later in life, leading to similar reproductive rates to the wild-type worm. Current experiments involve simulating several populations of varying lifespans and reproductive rates and analyzing populations of long-lived worms in the laboratory ecosystem.

MISSOURI S&T

POSTER NO. 21

Learning the principles of aging from worms

MOLLY RIPPER

St. Louis, MO

co-author, poster no. 21

Senate District 9
House District 101

MAJOR
Biological Sciences

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Andrea Scharf

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Biological Sciences

FUNDING SOURCE
N/A

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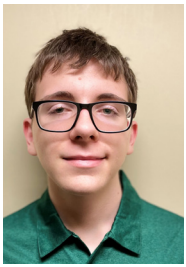
MISSOURI S&T

POSTER NO. 22

Carbon Aerogels for High Capacity and Selective Absorption of Carbon Dioxide



SAMUEL HACKETT

O'Fallon, MO

Senate District 12
House District 103

MAJOR
Chemistry

FACULTY MENTOR
Chariklia Sotiriou-Leventis

MENTOR'S DEPARTMENT
Chemistry

FUNDING SOURCE
National Science Foundation

Carbon aerogels are light, highly porous materials with high surface areas. Their applications have been demonstrated in a wide range of areas, one of which is carbon capture. We have synthesized a new carbon aerogel that specializes in the selective adsorption of CO2 (carbon dioxide), which was previously synthesized from a new THQ (tetrahydroquinazoline) monomer. This monomer was polymerized to form a PTHQ (polymerized THQ) aerogel, which was then oxidized, carbonized, and etched to form a carbon aerogel. This process has several steps, which affect the characteristics of the derived aerogel. PTHQ-derived carbon aerogels were evaluated for their CO2 adsorption capacity and selectivity towards other gases. CO2-etched carbon aerogels showed very high CO2 uptake (11.2 ± 0.9 mmol g−1 at 273 K, 1 bar). The high selectivity of CO2 versus hydrogen in the range of (407 ± 104) is attractive for pre-combustion capture of CO2 and the high selectivity of CO2 versus nitrogen in the range of (52 ± 18) is attractive for post-combustion CO2 capture from flue gases.

POSTER NO. 23

Generating Strains of Brady rhizobium japonicum for Improved Crop Yields Under Drought Conditions

GABRIELLE HIGHTOWER

Kansas City, MO

co-author, poster no. 23

Senate District 16
House District 26

MAJOR
Biology & Psychology

FACULTY MENTOR
David Westenberg

MENTOR'S DEPARTMENT
Biology

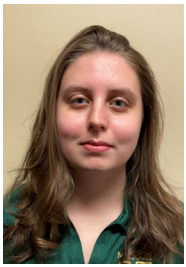
FUNDING SOURCE
Missouri S&T Department of Biological Sciences; Opportunities for Undergraduate Research Experiences (OURE) and OURE Fellows

Nitrogen-fixing bacteria form a symbiotic association with legume plants and play a key role in crop health and productivity. This process is sensitive to drought and desiccation and the increasing challenge of climate change impacts agricultural productivity. Our lab is exploring the development of drought-tolerant strains of Brady rhizobium japonicum, which forms a nitrogen-fixing symbiosis with soybeans. We are cloning genes from a marine bacterium that are known to increase salt tolerance in Escherichia coli and plants and introducing the genes into B. japonicum. This project will generate data that will be used to investigate strategies to increase drought tolerance. Once drought-tolerant strains are developed it will be critical for the bacteria to efficiently infect the host plant by effectively competing with native bacteria in the soil. To improve the competitiveness of drought-tolerant strains, we are studying cell-cell communication which is believed to play a role in competitiveness. B. japonicum uses small signal molecules called acyl-homoserine lactones (HSLs) to communicate with each other in a process known as quorum sensing. We are characterizing the HSLs produced by various strains of B. japonicum to identify which HSLs play a role in competition and develop strategies to manipulate the quorum sensing process to improve competitiveness.

MISSOURI S&T

POSTER NO. 23

Generating Strains of Brady rhizobium japonicum for Improved Crop Yields Under Drought Conditions



SHAY PELFREY

Rolla, MO

co-author, poster no. 23

Senate District 3
House District 122

MAJOR
Biological Sciences

FACULTY MENTOR
Dave Westenberg

MENTOR'S DEPARTMENT
Biological Sciences

FUNDING SOURCE
Missouri S&T Department of Biological Sciences; Opportunities for Undergraduate Research Experiences (OURE) and OURE Fellows

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POSTER NO. 24

Analysis of Detonator Efficiency in Initiating Sheet Explosive Based on Fragmentation Energy

ISABELLA KESTLE

Rolla, MO

Senate District 16
House District 122

MAJOR
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FACULTY MENTOR
Catherine Johnson

MENTOR'S DEPARTMENT
Mining and Explosives Engineering

FUNDING SOURCE
Missouri S&T Energetics Research Team

Missouri S&T's Energetics Research Team has developed a novel sensitivity test for evaluating the impact energy necessary to initiate insensitive explosive material. This research reports the velocity, size, and kinetic energy necessary to initiate a charge when impacted by fragmentation generated from electric, non-electric, electronic and exploding bridgewire detonators. This study used a high speed camera to observe and record the effect the distance and orientation of the denotators had on charge initiation. The footage from the high-speed camera provided the necessary data for the calculation of the velocity of the fragmentation pieces. The mass of the fragmentation pieces from each detonator were measured and applied to the velocity calculations to produce the kinetic energy of the detonators. These findings provide insight into which detonators would be best to use for the new sensitivity testing method.

MISSOURI S&T

POSTER NO. 25

Novel Supercritical Biodiesel Plant Design and Process Scale-Up

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Ballwin, MO

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House District 98

MAJOR
Chemical Engineering

FACULTY MENTOR
Joseph Smith

MENTOR'S DEPARTMENT
Linda and Bipin Doshi Department of Chemical and Biochemical Engineering

FUNDING SOURCE
Wayne L. Laufer Charitable Foundation

By reducing the net anthropogenic (man-produced) carbon emissions from burning fossil fuels, biodiesel remains an attractive alternative to petroleum-derived diesel fuels. However, currently, the production of biodiesel remains impractical and is generally not profitable without government subsidies, limiting biodiesel's production and use in society. By applying Process Intensification to a non-catalytic supercritical biodiesel process, a novel transportable modular refinery has been conceptually developed through prior work at Missouri S&T by Dr. Joseph Smith, Dr. Shyam Paudel, and Dr. Aso Hassan. Compared to conventional facilities, this refinery reduces cost and limits environmental impact in biodiesel production by its 1) modular design, 2) transportable configuration, 3) novel reactor technology, and 4) improved separation and purification technology. In order to make this proposed solution an operational plant, I have worked to develop a comprehensive design package for this refinery. This includes a 1) piping and instrumentation diagram (P&ID), hazard and operability study (HAZOP), 3) bill of materials, 4) control narratives, and 5) ASPEN model. The P&ID was extensively reviewed and was essential in completing the HAZOP study and bill of materials. A capital expense of the refinery was estimated, and a complete control scheme was formulated on control narratives. Further, a preliminary ASPEN model has been developed for the optimization of the process design. Establishing this innovative technology for the biodiesel industry will support a better, more sustainable future.

POSTER NO. 26

Biogas Production from Industrial Wastewater Using Anaerobic Digestion

JACKSON OGLESBY

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co-author, poster no. 26

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House District 30

MAJOR
Chemical Engineering

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FUNDING SOURCE
Missouri S&T Laufer Endowed Chair

Missouri is home to beautiful lakes with a variety of aquatic life. These habitats are threatened when industries dump their waste water into naturally forming rivers and lakes. The aim of this research is to treat the wastewater and make it safer to release into bodies of water using a two-step anaerobic digestion process. The process starts in a heated stirred tank reactor where the feedstock is held and pH is maintained. The feedstock then flows into an upflow sludge-bed reactor where microorganisms feed off of the organic waste from the waste water. The process not only treats the pH of the waste, but also produces biogas. Biogas is a valuable alternative to traditional fossil fuels. The biogas contains a high methane content and can be used to power electricity, heating, cooling, and more. Using the waste water from breweries and distilleries as the primary feedstock in a two-step anaerobic digestive process within a sludge-bed reactor produced a high quality biogas of approximately 50-75% methane. As research progresses, a variety of feedstocks have been considered as alternatives to use in the anaerobic digestion process. Future works consist of using vegetable waste from campus dining services and exploring the efficacy of other feedstocks such as algae and fruit waste.

POSTER NO. 26

Biogas Production from Industrial Wastewater Using Anaerobic Digestion

JUSTIN PENN

Bonne Terre, MO

co-author, poster no. 26

Senate District 15
House District 117

MAJOR
Chemical Engineering

FACULTY MENTOR
Joseph Smith;
Haider Al-Rubayeh

MENTOR'S DEPARTMENT
Linda and Bipin Doshi Department of Chemical and Biochemical Engineering

FUNDING SOURCE
Missouri S&T Laufer Endowed Chair

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POSTER NO. 26

Biogas Production from Industrial Wastewater Using Anaerobic Digestion

SARAH RILEY

Arnold, MO

co-author, poster no. 26

Senate District 2
House District 122

MAJOR
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FACULTY MENTOR
Joseph Smith;
Haider Al-Rubayeh

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Linda and Bipin Doshi Department of Chemical and Biochemical Engineering

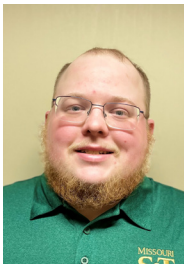
FUNDING SOURCE
Missouri S&T Laufer Endowed Chair

Missouri is home to beautiful lakes with a variety of aquatic life. These habitats are threatened when industries dump their waste water into naturally forming rivers and lakes. The aim of this research is to treat the wastewater and make it safer to release into bodies of water using a two-step anaerobic digestion process. The process starts in a heated stirred tank reactor where the feedstock is held and pH is maintained. The feedstock then flows into an upflow sludge-bed reactor where microorganisms feed off of the organic waste from the waste water. The process not only treats the pH of the waste, but also produces biogas. Biogas is a valuable alternative to traditional fossil fuels. The biogas contains a high methane content and can be used to power electricity, heating, cooling, and more. Using the waste water from breweries and distilleries as the primary feedstock in a two-step anaerobic digestive process within a sludge-bed reactor produced a high quality biogas of approximately 50-75% methane. As research progresses, a variety of feedstocks have been considered as alternatives to use in the anaerobic digestion process. Future works consist of using vegetable waste from campus dining services and exploring the efficacy of other feedstocks such as algae and fruit waste.

MISSOURI S&T

POSTER NO. 27

Technological Innovations and Human Factors for Effective Miner Self-Escape from Underground Mine Emergencies



DUSTIN PETERSON

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FUNDING SOURCE
NIOSH

Robots are being used all over the world to help inspire, improve, and advance many industries forward. In almost every industry you can pinpoint what robotics have done to help further that mission. The mining industry is at the forefront of parts of technological advances but has not advanced far with respect to robotics; there are significant opportunities to utilize robotics in the health and safety aspects of mining.

How can robots help underground during a mine disaster? How can they help underground on a day-to-day basis? These were some of the questions asked to different focus groups made up of underground miners working in these conditions every day. Robots, like SPOT, have the opportunity to be utilized for underground mapping, exploration, analysis of mine conditions, and plenty more. This project covers various uses, ideas, and limitations that the underground miners described during the focus groups.

POSTER NO. 28

Symbiotic Plant – Microbial treatment of 1,4-Dioxane

SHELBY PLY

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House District 122

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FACULTY MENTOR
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MENTOR'S DEPARTMENT
Civil, Architectural, and Environmental Engineering

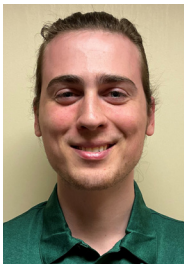
FUNDING SOURCE
Opportunities for Undergraduate Research Experiences (OURE); CEC-Undergraduduate Research Scholars Program; DOD ESTCP

The research project investigates plant-chemical interactions for concurrent identification and clean-up of a recalcitrant pollutant, 1.4-Dioxane (dioxane). Dioxane is a persistent groundwater pollutant often found comingled with chlorinated solvents (e.g., trichloroethylene, dichloroethylene, and trichloroethane), and particularly prevalent and problematic industrial and defense facilities. Because of dioxane's high mobility in groundwater, dioxane plumes tend to be large and dilute. State-issued clean-up guidelines for dioxane are usually 1 µg/L or less. Reaching these low clean-up guidelines through remediation has proven to be particularly difficult and costly. Dr. Burken's lab is starting a new project with collaborators and will be looking at novel methods to analyzing dioxane in plant tissues for delineating these large areas, and then will be looking at methods to degrade dioxane prior to uptake with root-colonizing, dioxane-degrading bacteria. Analytic methods have been developed in the Baker Greenhouse and environmental engineering analytic laboratories and will be applied at the first field site for engineered rhizodegradation as part of a Department of Defense - Environmental Security Technology Certification Program(ESTCP) demonstration project at the Twin Cities Army Ammunition Plant.

MISSOURI S&T

POSTER NO. 29

Where the Rubber Meets the Road



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Klaus Woelk

MENTOR'S DEPARTMENT
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FUNDING SOURCE
Opportunities for Undergraduate Research Experiences (OURE)

Asphalt is a relatively inexpensive material commonly used for road pavements. However, asphalt pavements age through exposure to air and UV radiation, causing them to lose elasticity. This increase in brittleness can lead to cracks and potholes. Several pavement treatments are in use for rejuvenating aging asphalt to reduce cracking and increase the pavement lifetime . Modern, sustainable treatments include the use of pyrolysis oils from used car tires. However, it is not clear whether pyrolysis oils truly rejuvenate asphalt or whether they provide a superficial treatment without a long-term effect. Nuclear Magnetic Resonance (NMR) relaxometry is a scientific area that provides insight into the molecular environment of organic materials. NMR relaxometry will be used to investigate the organic binder in asphalt to establish a performance measure for the quality and durability of road pavements. Because NMR relaxometry probes into the molecular environments, the results of this project will be different from current asphalt performance tests that measure bulk properties such as strength, elasticity, or viscosity. It is expected that NMR relaxometry results provide an advanced, complimentary predictor for the long-term stability of new, aged, and rejuvenated asphalt.

UMSL

POSTER NO. 30

Evaluating Dimensionality Reduction Parameter Effects on Feature Partitioning

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FUNDING SOURCE
The National Geospatial-Intelligence Agency

The Office of Geomatics at the National Geospatial-Intelligence Agency (NGA) maintains the Earth Gravitational Model (EGM) used globally in navigation for referencing mean sea level and correcting the ellipsoidal height measurement given by GPS to the orthometric height (height above/below sea level). EGM is produced by a combination of actual gravity measurements collected over several decades and forward modeling processes to estimate gravity values to create Earth's free-air gravity anomaly field. Continued collection of gravity values is important because of the irreplaceable nature that actual high-accuracy measurements provide. However, there are many barriers that arise with measurement collection including hard to reach terrain, expense issues, and time constraints. A possible solution is to utilize artificial intelligence (AI) methods, such as feature partitioning using a Deep Convolutional Neural Network (DCNN). This project is focused on the clustering aspect of an AI pipeline designed to predict gravity anomalies, which ultimately aids in partitioning the Earth through a data-driven approach by distinct features embedded within the data. The outputs of the DCNN are feature vectors with thousands of dimensions. Datasets with many features are difficult to visualize, quantify cluster quality, and computationally expensive. Here, we will evaluate a dimensionality reduction algorithm called Uniform Manifold Approximation and Projection (UMAP). Approved for public release NGA-U-2023-00579.

UMSL

POSTER NO. 30

Evaluating Dimensionality Reduction Parameter Effects on Feature Partitioning

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MENTOR'S DEPARTMENT
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FUNDING SOURCE
The National Geospatial-Intelligence Agency

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UMSL

POSTER NO. 31

Finding the Most Cost Effective Prescription Smoking Cessation Method

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MENTOR'S DEPARTMENT
College of Nursing

FUNDING SOURCE
N/A

Smoking is one of the leading causes of death and disability in the US due to the development of complications such as COPD and lung cancer. Stopping smoking eliminates major risk factors for disease, increasing health and wellness. However, lower income smokers lack access to successful and affordable smoking cessation options, prompting our article analysis. Our project goal was to find the most cost effective prescription for smoking cessation, and this was found to be varenicline (Chantix). In combination with therapy, varenicline (Chantix) was found to be more effective and less costly than other prescriptions such as bupropion (Wellbutrin). In addition, an alternative smoking cessation therapy, cystine, has shown promise in Eastern European and Asian countries. It is not yet approved by the FDA but is a potential area for further research, as it is undergoing preliminary testing in the US.

Our analysis revealed that it is difficult to judge and determine cost effectiveness. We found in our analysis that "cost effectiveness" was hard to determine due to ever changing variables, for instance length of time abstained from smoking, costs of medications, age, and incidence of smoking related disease. General challenges that patients may face when trying to access smoking cessation therapies, regardless of cost, would be finding a provider to prescribe, accessing insurance to cover medications, and social determinants of health. Possible solutions to improve access to smoking cessation would be improved patient education on benefits of cessation, increased access to healthcare resources in low income and rural areas, further development of new smoking cessation medications, and expansion of affordable insurance options to cover prescriptions. Smoking cessation ultimately needs to be more appealing than smoking in order for patients to quit; as future nurses, we hope our project has shed light on the challenges and potential solutions to helping smokers quit smoking.

UMSL

POSTER NO. 31

Finding the Most Cost Effective Prescription Smoking Cessation Method

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Senate District 10
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MAJOR
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FUNDING SOURCE
N/A

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UMSL

POSTER NO. 31

Finding the Most Cost Effective Prescription Smoking Cessation Method

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College of Nursing

FUNDING SOURCE
N/A

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UMSL

POSTER NO. 31

Finding the Most Cost Effective Prescription Smoking Cessation Method

LINDSEY MARSKE

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Kimberly Werner

MENTOR'S DEPARTMENT
College of Nursing

FUNDING SOURCE
N/A

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UMSL

POSTER NO. 31

Finding the Most Cost Effective Prescription Smoking Cessation Method

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Kimberly Werner

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FUNDING SOURCE
N/A

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UMSL

POSTER NO. 32

Public Opinion on the Use of Sidewalk Autonomous Robots for Last-Mile Deliveries

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House District 100

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FACULTY MENTOR
Trilce Encarnacion

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FUNDING SOURCE
N/A

Due to the rise in online shopping, the number of items being delivered daily has seen an almost exponential rise. The ever-expanding scope of what can be delivered to your doorstep, has led to companies and consumers looking for better ways to deliver. Developments in robotics and sensors made Autonomous Delivery Robots (ADRs) possible. Over the past three years the interest and demand for ADRs has come to an all-time high as COVID-19 pushed companies to come up with contactless ways of delivery products to their customers. Some hotels and Universities also turned to ADR technology for inter campus deliveries of food and necessities.

Due to the possibly large impact that ADRs could have on daily life, we felt it is important to gauge public sentiment thus far regarding the technology. This will help us understand the consumer demand for this technology and the intricacies as to why consumers want ADRs. It will also help us understand how communities are reacting to ADRs on their sidewalks.

In this research we collected tweets that were related to ADRs. We analyzed these tweets that ranged over an almost three-year period using JSON and python NLTK libraries to break down the sentiment held within each tweet. We were able to see that chatter has been steady over the past three years with certain peaks surrounding large events. The volume of positive tweets was greater however the intensity of negative tweets had a huge impact on final data.

UMSL

POSTER NO. 33

The Effect of Variation of N-Substituents on Oxidopyridinium Ions in (4+3) Cycloadditions

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FACULTY MENTOR
Michael Harmata, MU

MENTOR'S DEPARTMENT
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FUNDING SOURCE
Stevens' Summer Research Fellowhsip and the National Science Foundation

Natural Products Synthesis is the artificial production of chemicals similar to ones that occur in nature. There are a few reasons why chemists would need to do this whether it be that the natural chemical is becoming scarce or if it has biological potential but is harmful in its natural state.

Daphnicyclidin A is part of a larger class of naturally occurring chemicals and is the focus of this project. It is an important chemical to study because it shows promise for medical research. Daphnicyclidin A is comprised of multiple parts and some can be generated through a cycloaddition reaction. A cycloaddition reaction is a method used to generate seven-membered rings in organic chemistry. For our research, we wanted to see if we could recreate the cycloaddition reaction using two different chemicals in order to create Daphnicyclidin A cycloadducts. We found that using different chemicals did not hinder our ability to produce these cycloadducts. While testing the purity of one of our products, however, we noticed that it started to degrade when left out signaling that it could be air sensitive which may have had an effect on its final yield.

In conclusion, using different chemicals to make cycloaddition products proved to be possible. While the chemicals used here were not as high yielding as the ones produced from the source literature, further improvements of reaction conditions would be required for each unique chemical used to increase the amount of product made.

UMSL

POSTER NO. 34

An Investigation of the Sublethal Effects of a Biopesticide on Bumblebee Colonies

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Aimee Dunlap

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FUNDING SOURCE
Whitney R. Harris World Ecology Center

The agricultural needs for a growing population require balancing safe pesticide application to control destructive insects against promoting the health of beneficial insects, such as pollinators. One variety of pesticides, biopesticides, are marketed as and believed to be safe for pollinators, while still targeting agricultural pest species. An example of this is the popular biopesticide Botanigard, containing the fungus Beauveria bassiana that specifically targets insects, claiming no lethal impacts to vertebrates or pollinator species. However, recent honeybee studies revealed that Botanigard can cause changes to cognition and mortality. Serious longevity implications can limit the pollination services that insects provide to surrounding environments. Since most pesticide risk assessments investigate honeybees, we are testing this biopesticide on Bombus impatiens, which are a social bumblebee species that are native to most of the temperate regions of North America, including Missouri. They are critically involved in the pollination of a number of important crops and flowers. We aim to highlight any effects Botanigard may have on the cognition and mortality of these pollinators. Preliminary results reveal that treated bees have lower scores on cognitive tests, as well as a lower willingness to participate in those tests. These results suggest that cognitive health is negatively correlated with exposure to Botanigard. Preliminary results also reveal that treated bees tend to be smaller than control bees, and this would have implications for negative effects on pollination. Further experiments on more colonies will provide statistical significance and clearer trends.

UMSL

POSTER NO. 34

An Investigation of the Sublethal Effects of a Biopesticide on Bumblebee Colonies

JAKE VENEGONI

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MAJOR
Biology, minor in Sports Management

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MENTOR'S DEPARTMENT
Biology

FUNDING SOURCE
Whitney R. Harris World Ecology Center

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UMSL

POSTER NO. 35

Population surveys of Aphonopelma hentzi in Missouri: Conservation Efforts through Genetic Mapping

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FUNDING SOURCE
UMSL's Office of Research and Economic and Community Development

Over the summer of 2023, tarantula molts from the Texas Brown tarantula were collected from glades in Jefferson County, MO. These molts were then used for DNA extraction. DNA extraction from tarantula molts has yet to be documented, and most of the previous genetic work on tarantulas has been done through the removal of "toes", which harms the organism. This new method allows us to gather the genetic information needed for genetic analysis and alleviates the concern of harm for the spider. We have also tracked and tagged all found tarantulas and used this to better understand the populations of tarantulas in Missouri. We are currently undergoing the process of extracting DNA from the molts and determining the genetic variance between the populations of tarantulas that have been found. We are working in tandem with the MCD. Knowing the levels of genetic variance can allow the Missouri Department of Conservation to know the best ways to protect Missouri's parks.

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