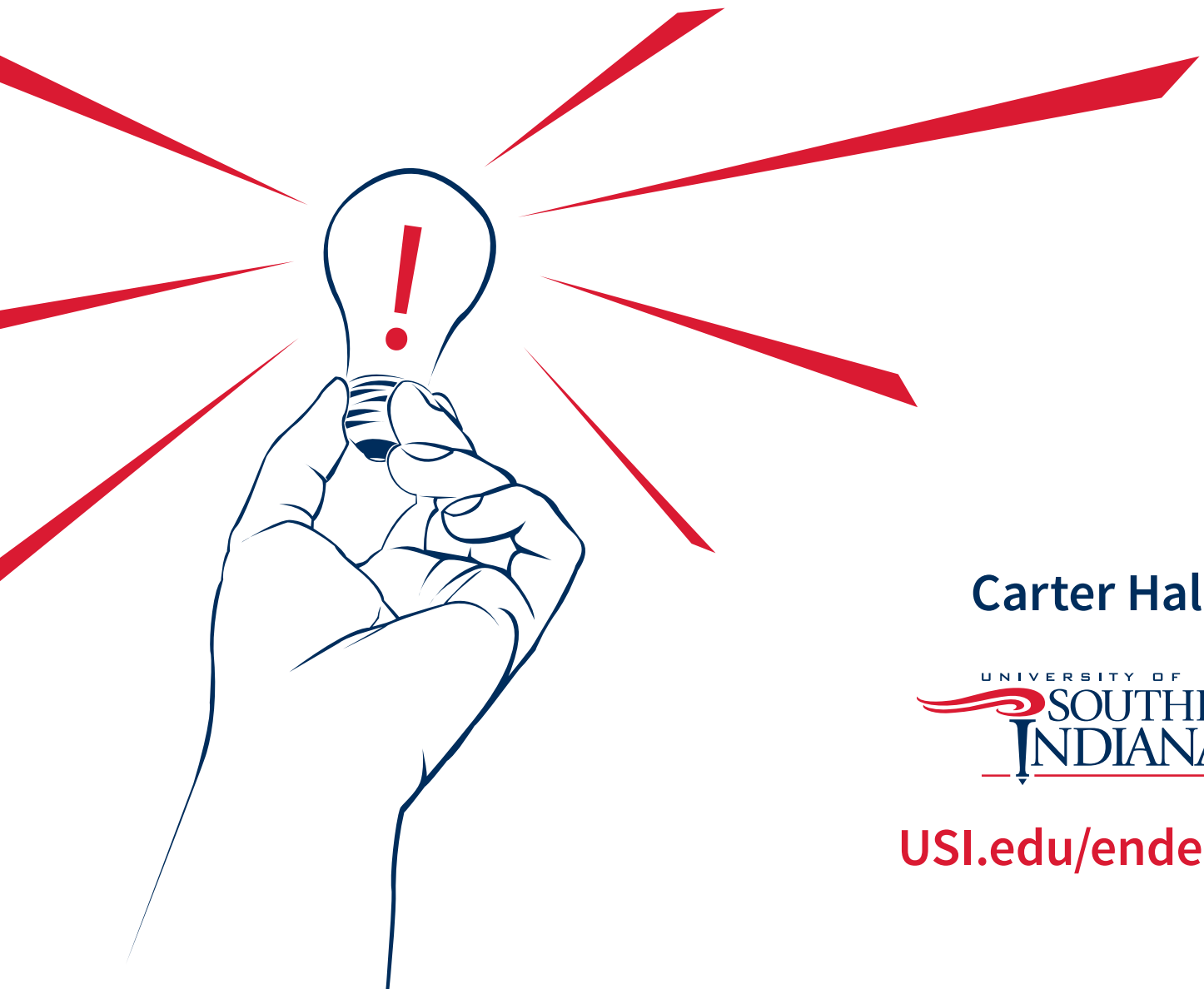


22nd Annual Symposium

2024

USI
ENDEAVOR

AWARDS *for*
RESEARCH & CREATIVITY



Carter Hall



[USI.edu/endeavor](https://www.usi.edu/endeavor)



April 11, 2024

Dear Endeavor Symposium Presenters, Sponsors, and Guests:

Welcome to the 2024 Endeavor Symposium. As I'm sure you've come to appreciate, combining research and learning is one of the best ways to get the most out of your time here at USI, and I hope that the experience has helped to develop strong ties to your education – ties that you will take with you after you leave the university.

You have worked hard on your projects, and we are proud to give you the chance to present the results of your work to the USI community.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Strezewski".

Michael Strezewski, Ph.D.
Associate Professor of Anthropology
Director, Endeavor Research and Creativity Awards

Endeavor Symposium Program

Thursday, April 11, 2024

Beginning at 8:30 **Check-in** is open for presenters and sponsors: Pick up your programs and ID badges at the registration table (located in the hallway outside Carter Hall).

9 a.m. – Noon **Poster Sessions**, *University Center, Carter Hall D*
(note: all posters must be removed from Carter Hall D by noon).

10 a.m. – 11:20 **Oral Presentations**, Rooms UC 226 and 227 (next to Carter Hall).

Noon – 1 p.m. **Endeavor Luncheon** for student participants and mentors, *Carter Hall A-C*. Your badge will serve as your lunch ticket.

Endeavor Research and Creativity Awards Committee

Dr. Michael Strezewski	Director of Endeavor Awards for Research and Creativity, Associate Professor of Anthropology, College of Liberal Arts
Dr. Ryan Butler	Associate Professor of Nursing, College of Nursing and Health Professions
Dr. Jeannie Collins	Associate Professor of Chemistry, Pott College of Science, Engineering, and Education
Ms. Rebecca Deeg	Grant Administrator, Office of Planning, Research, and Assessment
Dr. Ronald Diersing	Associate Professor of Engineering, Pott College of Science, Engineering, and Education
Mr. Rob Millard-Mendez	Professor of Art, College of Liberal Arts
Dr. Erin Reynolds	Associate Professor of Health Services Administration, College of Nursing and Health Professions
Mr. Peter Whiting	Professor of Library Science, Rice Library
Dr. Bohan Ye	Assistant Professor of Economics

Acknowledgements

The Endeavor Committee thanks the following for their support of the Endeavor Research and Creativity Award Program and Endeavor Symposium:

- Dr. Ronald S. Rochon, President, University of Southern Indiana
- Dr. Shelly Blunt, Interim Provost
- Dr. Jason Hardgrave, Interim Assistant Provost for Academic Affairs
- Michele Duran, Senior Administrative Associate, Office of the Provost
- Rhonda Woolsey, Special Events Supervisor
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- College of Nursing and Health Professions
- Pott College of Science, Engineering, and Education
- USI Honors Program

2023 - 2024 Endeavor Faculty Mentors

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- Dr. Srikanth Dandotkar
- Dr. Paul Doss
- Dr. Julian Davis
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- Dr. Tony Maria
- Dr. Alexandra Natoli

- Dr. Casey Pycior
- Mr. Thomas Rich
- Dr. Kelly Sparks
- Dr. Bohan Ye
- Dr. Susan Ely
- Mrs. Amanda Reddington
- Dr. Jessica Rick
- Dr. Michael Strezewski
- Dr. Stephanie Young

9-10 a.m. POSTER SESSION

Carter Hall D

Elijah Berger	Impulse Response of Female Midshipman Swim Bladder
Kyla Bower	Henderson History: An Archaeological Analysis of the Henderson Bridge Site
Kyla Bower and Nikita Fischer	How It's Made: An Analysis of Late Middle Archaic Fishhook Manufacture at Crib Mound
Riley Coffey and Alexis Updike	Synthesis of Reactive Tags for Liquid Chromatography Mass Spectrometry
Varuna Dhanabal	Exploring the Association between Diabetes and Pancreatic Cancer: A Retrospective Model
Eric Espino	USI Natatorium Truss Redesign
Gabriela Fernandez Gil	The Consequences of Facing the Unknown: Exploring Immigrants' Mental Health
David Graber	Investigation of Putative Parthenogenesis in the Vulnerable Jamaican Boa (<i>Chilabothrus subflavus</i>)
Eva Hubbard	Mind and Art: Understanding the Impact of Mental Illness in the Lives of Vincent van Gogh and Richard Dadd
Sydney Lawson	Developing a Classroom Management Catalogue
Christopher Memmer	See What's Open at USI Web Application
Meagan Miller	Second Language Acquisition: An Analysis of Language Teaching

Jada Paul	Methods Interactions between <i>Streptococcus mutans</i> and <i>Streptococcus pyogenes</i> on BHI Agar
Logan Reid, Tristan Lindall, and Missy Brown	Seize the Day: Opportunistic Undergraduate Research of Volcaniclastics Collected during a Field Trip to Crater Lake National Park, Oregon
Tegan Ruhl	The Stories We Tell and Why We Tell Them
William Shehorn	Soil Moisture Measurements to Characterize Climate Change and Ecosystem Restoration Impacts on Groundwater Temperatures and the Endangered Karner Blue Butterfly
Alexis Stafford, Emily Thomas, and Riley Beaman	The Battle Between Xylitol and Fluoride in Preventing Caries
Emma Williams	Workplace Violence

10-11 a.m. POSTER SESSION
Carter Hall D

Chaney Barrett and Sydney Yates	In the Loupe or Taking a Seat
Brooke Bassler	Method for Detection of Polyfluorinated Alkyl Substances by Solid Phase Extraction and Electrospray Ionization Mass Spectrometry
Elijah Berger	Impulse Response of Female Midshipman Swim Bladder
Peter Bittner	Monitoring Long-term Changes to the Groundwater Resource in SW Indiana
Kyla Bower	Henderson History: An Archaeological Analysis of the Henderson Bridge Site
Kyla Bower and Nikita Fischer	How It's Made: An Analysis of Late Middle Archaic Fishhook Manufacture at Crib Mound

Grace Buchanan	Exercise Prescription for Special Populations
Riley Coffey and Alexis Updike	Synthesis of Reactive Tags for Liquid Chromatography Mass Spectrometry
Varuna Dhanabal	Exploring the Association between Diabetes and Pancreatic Cancer: A Retrospective Model
Varuna Dhanabal and Jessica Nickens	Synthesis of Clickable BODIPY for Bioconjugation
Eric Espino	USI Natatorium Truss Redesign
Gabriela Fernandez Gil	The Consequences of Facing the Unknown: Exploring Immigrants' Mental Health
Benjamin Grubbs and Kasey Disbro	Analysis of Hide Processing Tools from the Caborn Site, Posey County, Indiana
Madeline Houston	GDP Differences Among US Regions
Eva Hubbard	Mind and Art: Understanding the Impact of Mental Illness in the Lives of Vincent van Gogh and Richard Dadd
Sydney Lawson	Developing a Classroom Management Catalogue
Uday Sekhar Lomada and Jessica Nickens	Strawberry DNA Extraction as a Student Activity
Madi Martin and Samantha Cardoza	The Relationships Between One's Gender Identity and One's Perception of Gender with Varying Gendered Characteristics
Christopher Memmer	See What's Open at USI Web Application
Meagan Miller	Second Language Acquisition: An Analysis of Language Teaching Methods
Sydney Parsons, Emily LeMasters, and Courtney Weisheit	Recommending an Interdental Aid
Ashley Patino and LaKiesha Wampler	Examining the Effect of Depth on Metal Ion Concentration in Local Surface Waters

Jada Paul	Interactions between <i>Streptococcus mutans</i> and <i>Streptococcus pyogenes</i> on BHI Agar
Alexis Reed	Femininity Is
Alexis Reed	Filling the Gap: Inclusive Sexual Safety for LGBTQ+ Middle and High Schoolers
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Alexis Stafford, Emily Thomas, and Riley Beaman	The Battle Between Xylitol and Fluoride in Preventing Caries
Lauren Stillwell	Synthesis of a Self-Assembled Zinc 12-metallacrown-4 Motif Utilizing a 5,6-chelate Ligand to Create Less Bowled Structures
Maxwell Stoll	It All Hinges on Water: The Structuring of Water by Lipids in the American Alligator Stratum Corneum
Brooke Terry	Increasing the Awareness of Homelessness in Allied Dental Students through Educational and Service-Learning Opportunities
Emma Williams	Workplace Violence

11 a.m. - noon POSTER SESSION
Carter Hall D

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Oral Presentations

Session 1, UC 226

- 10:00 – 10:15 **Emma Accomando** – Communication Between Politics and Community
- 10:20 – 10:35 **Emma Accomando** – Parental Leave in the United States
- 10:40 – 10:55 **Omar Elhanafy** – Developing an Interpretive Lens for Muslim Adolescent Identity in French Film
- 11:00 – 11:20 **Ashley Arauz** – Insect Diversity in an Urban-Rural Fringe

Oral Presentations

Session 2, UC 227

- 10:00 – 10:15 **Jacob Mills, Charlie Jackson, and Kyle Echert** – USI Solar Splash Boat Racing Team
- 10:20 – 10:35 **Jacob Winterheimer** – Wealth Distribution and Happiness
- 10:40 – 11:00 **James Hunnicutt** – Characterization of a Novel Terahertz Amplifier

Oral and Poster Presentation Abstracts

Communication Between Politics and Community

Emma Accomando

Faculty Mentor: **Dr. Jessica Rick**

This study provides insight on how to communicate politics with those in the community. An ethnography was conducted by spending time on an Evansville mayoral campaign, followed by a survey with Evansville voters. Ethnographic findings showed that community members are not publicly open about their political opinion, and would rather just soak in the information. Survey responses showed the great influence the campaign has on the individual, the impact of researching the candidate, and residents' comfortability in sharing about politics with others.

Parental Leave in the United States

Emma Accomando

Faculty Mentor: **Dr. Sidney Hall**

The United States is one of four countries in the world that does not offer paid parental leave. The Family Medical Leave Act was adopted in 1993, with fewer than half of Americans being eligible for this unpaid medical leave. Thirty years later, with even more women in the workforce today, there is a need for changes to be made. This research explores the benefits of offering paid leave, looks at what the United States currently offers, explains why paid leave is essential for both mothers and fathers, along with ways for the United States to improve.

Insect Diversity in an Urban-Rural Fringe

Ashley Arauz

Faculty Mentor: **Dr. Eric McCloud**

Insects are the most diverse group of organisms on earth. They are an essential part of food webs, providing ecosystem services such as organic matter decomposition, facilitation of soil nutrient cycling, natural pest control, pollination, and food for higher trophic levels. This study provides a six-month description, done from April to September of 2022, of the flying insects on the campus and farms owned by the Daughters of Charity (DOC) in Evansville, IN. It provides a baseline data set of the flying insect biodiversity of the property that will permit long-term monitoring of biodiversity in an urbanizing rural-urban fringe region.

In total 5467 specimens were collected during this study and insects were most abundant in May, June, and September. 57% of all insects collected were fly species (Order Diptera) followed by Hymenoptera and Hemiptera with a representation of 17% each. Diptera not only has the highest number of individuals collected but also the greatest diversity of families with 52 total families identified, followed by Hymenoptera with 28 and Hemiptera with 14. Even though both Hemiptera and Hymenoptera have a representation of 17% of all specimens collected Hymenoptera has a greater diversity than Hemiptera.

In the Loupe or Taking a Seat

Chaney Barrett and Sydney Yates

Faculty Mentor: **Mrs. Emily Holt**

Physically and mentally demanding procedures are part of dental professionals' everyday life. Musculoskeletal disorders are injuries of the muscles, nerves, tendons, joints, cartilage, or localized blood circulation in upper and lower limbs, shoulder, back, and neck. To prevent the occurrence of musculoskeletal pain, cognitive, physical, and organizational domains of ergonomics have been suggested. In a dental hygienist's career will the use of loupes or an ergonomic stool result in fewer reports of musculoskeletal pain compared to not using either of those options? A systematic literature review was completed to evaluate the results of various dental products that were said to improve ergonomics and reduce musculoskeletal disease and pain. The results showed that the ergonomic stool could help the clinician maintain the natural curvature of the lower back. Loupes significantly reduced the symptoms of musculoskeletal disorders among dental hygienists. This showed the positive effect of loupes on the symptoms of musculoskeletal disorders in the study. The research showed that both dental loupes and ergonomic stools had a positive impact on clinicians' ergonomics and reduced musculoskeletal diseases and pain. Dental loupes have been shown to significantly improve posture when clinicians begin using them at the start of their education program. To reduce musculoskeletal pain throughout hygienists' careers, dental hygiene schools should make purchasing dental loupes mandatory from the beginning of the program. A saddle stool can be easily adjusted and customized to each clinician, making it available to each individual within a practice. Including these stools will improve dental hygienists' duration of practice by reducing the incidence of musculoskeletal pain and disorders.

Method for Detection of Polyfluorinated Alkyl Substances by Solid Phase Extraction and Electrospray Ionization Mass Spectrometry

Brooke Bassler

Faculty Mentor: **Dr. Mark Krahling**

Polyfluorinated alkyl substances (PFAS) are man-made chemicals used commercially in industry on products such as nonstick cooking supplies, waterproof clothes, and other waterproof products. Most PFAS compounds remain in the environment since they are not easily degraded. These compounds can leach into water, soil, and air. The most common PFAS are perfluorooctanoic acid and perfluorohexane sulfonic acid. The EPA is developing ways municipal water providers can measure PFAS in water beginning

in the next few years. One method to extract and analyze PFAS in Ohio River water is solid phase extraction.

Water samples were run through a HyperSep C18 cartridge (size 2.8mL) to isolate the PFAS. The PFAS solution is analyzed by electrospray ionization mass spectrometer (ESI-MS) to provide analysis of PFAS at low concentration (at approximately 10ng/L). Our results will be compared to results of the Ohio River Valley Water Sanitation Commission. They have been monitoring PFAS in the Ohio River, and are currently measuring perfluorooctanoic acid, perfluorobutanoic acid, perfluorobutane sulfonic acid, hexafluoropropylene oxide dimer acid. Perfluorooctanoic, perfluorobutane sulfonic acid, perfluorinated butyric acid are the compounds seen consistently in the Ohio River.

Impulse Response of Female Midshipman Swim Bladder

Elijah Berger

Faculty Mentor: **Dr. Julian Davis**

During the mating season, nesting male plainfin midshipman fish (*Porichthys notatus*) produce multi-harmonic advertisement calls to attract females to their nests by vibrating their swim bladders. These advertisement (mate) calls contain fundamental frequencies can range from 80 to 100 Hz with harmonics (integer multiples) up to 1000 Hz. In addition, the female midshipman swim bladder is also known to play a significant role in hearing and is hypothesized to act as a resonance chamber, amplifying sound pressure signals. We modeled eight female swim bladders, analyzing their natural frequencies, mode shapes, and response to pressure impulses from eight different orientations (45 degrees apart in the frontal plane) around the bladder. By measuring displacement of the rostral projections of the swim bladder (the horns) to pressure impulses, we identified dominant frequencies potentially transmitting motion to the particle motion sensitive saccule through swim bladder horn displacement.

Monitoring Long-term Changes to the Groundwater Resource in SW Indiana

Peter Bittner

Faculty Mentor: **Dr. Paul Doss**

Since 2004, the University of Southern Indiana (USI) has monitored groundwater altitude in the Inglefield Sandstone aquifer in Southwestern Vanderburgh County, IN, an important domestic water source. A shallow well (EMW) and deep well (WMW) penetrate the aquifer to depths of 18m and 34m respectively. Pressure transducers record hourly groundwater altitude in two groundwater monitoring wells and manual measurements confirm instrument measurements. Manually collected data from the USI Groundwater Monitoring Lab are contributed to the USGS Groundwater Levels for the Nation program.

Groundwater levels in the Inglefield Sandstone Aquifer fluctuate as much as 15cm on a scale of hours in response to barometric pressure changes, up to 3cm daily from Earth tidal stresses, and up to 30cm yearly from responses to annual recharge and discharge. Our monitoring of the groundwater resource also reveals a long-term secular variation which overlies those smaller-scale groundwater altitude

fluctuations. Groundwater levels in the Inglefield Sandstone aquifer have risen by more than a meter since 2004.

All components of the water cycle (e.g. precipitation, evapotranspiration, etc.) can substantially influence groundwater levels. Evaluating changes to these hydrologic variables illuminates the cause of the long-term groundwater level rise. Recent climate change induced increase of Midwest US precipitation and modifications to local groundwater use are likely drivers for the observed groundwater level changes in the Inglefield Sandstone. Increased regional precipitation supplies additional water to the aquifer. Over the past twenty years, hundreds of nearby residents have switched to the local public water source, abandoning their domestic well supply. As a result of this transfer, Evansville public water, drawn from the Ohio River, is available to recharge the local aquifer through septic systems which are still in use. Manipulation, and subsequent alteration, of local and regional water cycles is evident from long-term, high-resolution environmental monitoring of hydrologic variables.

Henderson History: An Archaeological Analysis of the Henderson Bridge Site

Kyla Bower

Faculty Mentor: **Dr. Michael Strezewski**

Charlie Lacer was a well-known amateur archaeologist whose collection now resides at the University of Southern Indiana's archaeology laboratory. Among this collection there are artifacts from the Henderson Bridge #1 site, located in the floodplain just north of Henderson, Kentucky. Lacer collected artifacts from Henderson Bridge #1 between 1962 and 1976 but never organized or cataloged his collection. Materials present in Lacer's collection consist of ceramic sherds, chipped and ground stone tools, and a variety of other miscellaneous materials. The current project involved cataloging the ceramics in this collection, so that we can begin to understand the variety of Woodland period cultures that resided there. Analysis of the ceramics indicates that they span a wide period, ca. 400 B.C. to A.D. 1400. Ceramics from the Crab Orchard, Yankeetown, and Mississippian cultures are represented.

How It's Made: An Analysis of Late Middle Archaic Fishhook Manufacture at Crib Mound

Kyla Bower and Nikita Fischer

Faculty Mentor: **Dr. Michael Strezewski**

This study concerns late Middle Archaic fishhooks and fishhook blanks from the Crib Mound site. The site is located in Spencer County, Indiana, adjacent to the Ohio River, and radiocarbon dates suggest the Middle Archaic occupation occurred ca. 4300-3700 B.C. The large amount of fishhook making debris from Crib suggests that this was an important activity for the site's residents. A total of 69 completed fishhooks (both whole and fragmentary) were identified in the collections at the University of Southern Indiana, as well as 141 fragments of fishhook making debris, which allows us to reconstruct how these tools were made. Previous work by Moore (2010) and Scheidegger (1963) indicates that Middle Archaic peoples utilized three main methods for making fishhooks. These differ depending on the manner in which the

fishhook blank was cut, and can be identified when examining the remains of the blank left behind when the finished fishhook was removed. They have been deemed the Green River, Madisonville, and Crib Mound techniques. Our analysis indicates that the Crib Mound type was found to be the most utilized at the site, making up more than 40% of the debitage. Green River was the second most common technique, comprising nearly 37% of the debris, and Madisonville was the least utilized method, at only 5.7%. There was also a number of blanks on which the manufacturing process was indiscernible; we classified upwards of 16% of studied blanks as unknown.

Exercise Prescription for Special Populations

Grace Buchanan

Exercise and physical activity are incredibly important in living a healthy lifestyle. Everyone should be provided the opportunity to take part in regular exercise and special populations should be no exception. For this project, I wanted to look into how special populations are able to participate in regular exercise programs. I looked into different populations including those with cardiovascular disease, coronary artery disease, pulmonary disease (COPD), and spinal cord injury and how they are able to participate in regular exercise and physical activity. For each disease or injury, I explored the pathophysiology and learned about different exercise tests that can be performed with the individual and special considerations that should be taken into account when exercising. Finally, I concluded that there are exercise prescriptions that these special populations can follow and provided these exercise programs. Despite their limitations, individuals with these specific diseases or injuries are still encouraged to participate in physical activity. By taking into account how they can exercise safely, the road to exercising can become a reality.

Synthesis of Reactive Tags for Liquid Chromatography Mass Spectrometry

Riley Coffey and Alexis Updike

Faculty Mentor: **Dr. Scott Grady**

We are proposing a way to synthesize a reactive tag to identify selenium metabolites. Selenium metabolites are hard to track with methods such as mass spectrometry because they are so sparse in concentration amongst the cells as well as needing to have a charge to show up in the mass spectrum. Selenoproteins are important to the human body; they can act as antioxidants for thyroid regulation, aid in male-fertility enhancement, have anti-inflammatory actions and can aid in wound healing as an oxidative stress reducer. Selenium is the only semi-metal that is encoded in the human genome. Twenty-five selenoproteins have been found in the human proteome with their functions being unknown due to a lack of ways to track selenium-based components of human cells, however, it is theorized that selenium can be a biomarker for some diseases including diabetes and some forms of cancer.

Exploring the Association between Diabetes and Pancreatic Cancer: A Retrospective Model

Varuna Dhanabal

Faculty Mentor: **Mr. Thomas Rich**

Pancreatic cancer remains one of the rarest and deadliest forms of cancer in the United States. With survival rates of 5-10%, its prognosis can be attributed to most diagnoses occurring at later stages. Therefore, the need to consider early detection methods is necessary as no single diagnostic tool exists yet. Diabetes, a disease in which the body struggles to maintain insulin production/response, has long been considered a major risk factor, such that 1 in 4 people diagnosed with pancreatic cancer are first diagnosed with diabetes. This project explores a retrospective epidemiological model to further understand whether racial/ethnic variation exists in the association between pancreatic cancer and diabetes. A nationwide study will be proposed to examine whether race is another predominant factor in determining who is at highest risk for developing pancreatic cancer following a diabetes diagnosis. The preliminary model will consider the extent to which race/ethnicity plays a role in the pancreatic cancer/diabetes association, in which follow-up research in genetic biomarkers and environmental factors can be used to help develop a detection method for high-risk individuals.

Synthesis of Clickable BODIPY for Bioconjugation

Varuna Dhanabal and Jessica Nickens

Faculty Mentor: **Dr. Priya Hewavitharanage**

A highly fluorescent organic molecule known as BODIPY (4,4-difluoro-4-bora-3a,4a-diaza-s-indacene) has shown remarkable success in biomedical applications such as fluorescence-based bioimaging, chemical sensing, and biosensing. Due to its superior photophysical properties, it is a promising candidate for an alternative cancer therapy called photodynamic therapy (PDT). PDT uses light sensitive BODIPY molecules to generate toxic singlet oxygen, killing cancer cells. One major drawback of the BODIPY molecule is its poor water solubility; however, the BODIPY molecule can be chemically modified to change its properties. Our research aims to chemically modify the BODIPY molecule by attaching water soluble groups, such as polyethylene glycol, sugars, or amino acids to the BODIPY core via click chemistry. Click chemistry is a powerful tool that can combine two molecules through a reaction between an azide and an alkyne. Our research group synthesized two clickable BODIPY molecules, one with an azide terminal and the other with an alkyne terminal. These terminal functional groups can be used to conjugate BODIPY molecules with various biological molecules for a wide range of biomedical applications including photodynamic therapy.

Developing an Interpretive Lens for Muslim Adolescent Identity in French Film

Omar Elhanafy

Faculty Mentor: **Dr. Alexandra Natoli**

The Muslim Francophone community is numerous, thanks to the French colonialism of Western Africa and the Maghrebi region. Due to immigration from these countries, France has the highest proportion of the Muslim population in Europe. Muslims living in France must encounter and adapt to an obstacle: secularity. This secularity stems from the anticlericalism that was a key theme of the French Revolution; in 2004 France banned the wearing of Muslim head scarfs and symbols at schools and the public sectors. This ban has caused an ever-lasting conflict between the expressive Muslims and the stringent secularism seen in France. It is for this reason that we see numerous films highlighting how Muslims navigate the Francophone world. Two films: *Casablanca Beats* by Nabil Ayoush and *Divines* by Uda Benyamina provide thought-provoking case studies on how Muslim adolescents adapt to their situations in the slums of Morocco and in the housing projects of France respectively. In *Casablanca Beats*, a movie where kids try to fulfill their dreams of pursuing hip hop, religion is seen as a highly valued element in society but an obstacle restricting adolescents artistically. While this documentary-style movie accurately portrays the diversity of opinion and the complex lives seen in Muslim adolescents, it is surface-level in its depiction, attempting to juggle too many elements concurrently. The movie ultimately encourages the adolescents to “raise their voices” and to prioritize their dreams despite the resistance that religion can impose. The film *Divines*, however, highlights the importance of religion as a moral framework and baseline for faith and good behavior. This film follows two Muslim girls who resort to drug dealing to get out of the cycle of poverty. An essential theme in this film is the “call of the return” as these girls had signs to leave their sinful ways. While this film beautifully portrays the story with religious symbols and enticing conversations, it is a gloomy take on the situation. By analyzing and discussing these two films, viewers can get a better understanding of the Muslim adolescent experience in the Francophone world, while being aware of some of the films’ limitations.

USI Natatorium Truss Redesign

Eric Espino

Faculty Mentor: **Dr. Kerry Hall**

The USI Natatorium Truss Redesign examines both the originally proposed and constructed design of the University of Southern Indiana's natatorium facility. While the current layout features four trusses positioned 30 feet apart, an alternative spacing of 21 feet with the addition of two extra trusses is explored for potential efficiency improvements. Design loads, including 15 pounds per cubic foot and 20 pounds per square foot, are taken into account, encompassing both dead and roof live loads. The findings of this investigation, conducted using RISA 2D structural analysis software, are presented in poster format for dissemination within the university community.

The Consequences of Facing the Unknown: Exploring Immigrants' Mental Health

Gabriela Fernandez Gil

Faculty Mentor: **Dr. Urska Dobersek**

In the last two decades, the number of immigrants has been increasing significantly – in 2020, there were 281 million immigrants worldwide (McAuliffe & Triandafyllidou, 2022). Given that immigrants face many traumatic experiences when entering new territories (e.g., discrimination, language barrier), they can experience increased anxiety and depression levels and poor quality of life (American Psychiatric Association, 2021). Previous literature showed that adapting to unknown territories is related to increased post-traumatic stress disorder (PTSD), major depression, and generalized anxiety disorder (American Psychiatric Association, 2021; World Health Organization, 2021). However, the problem seems to worsen and go unnoticed due to the lack of information about it, unqualified clinicians, limited services, and mental health stigma. Therefore, it is important to replicate previous research and examine the relations among anxiety, depression, and PTSD in immigrants. People who were born in another country and were living in the U.S. temporarily or permanently were recruited through the researcher's social media and word of mouth. A total of 338 immigrants participated in the study. A one-way multivariate analysis of variance (MANOVA) was conducted to examine how the immigration process has affected immigrants' mental health, especially their anxiety, depression, and PTSD symptoms. Immigrants who were diagnosed with a mental disorder before coming to the U.S. reported higher levels of anxiety, depression, and PTSD, $F(3, 332) = 7.47, p < .001, Wilks' \Lambda = 0.936$. Most results were not statistically significant ($p > .05$). Because of the inconsistency of the results with previous literature, further research is needed to understand how the immigrant experience affects their mental health.

Investigation of Putative Parthenogenesis in the Vulnerable Jamaican Boa (*Chilabothrus subflavus*)

David Graber

Faculty Mentor: **Drs. Kim Delaney and Kyle Mara**

Facultative parthenogenesis (FP) has been demonstrated in numerous animal taxa such as: sharks, varanid lizards, birds, and snakes. There are multiple mechanisms by which a female of a dioecious species can produce offspring asexually without genetic material from a male mate including central fusion automixis, terminal fusion automixis, and gamete duplication. While FP via terminal fusion automixis or gamete duplication has been demonstrated in multiple boa species resulting in homozygous offspring, the Jamaican boa (*Chilabothrus subflavus*) has not previously demonstrated FP. An eight-year-old captive female Jamaican boa, housed in a private collection, gave birth to two living and multiple nonliving offspring after a period of isolation lasting her entire adult life. This female was separated from all other individuals from at least six months of age and any previous contact with males came from her own clutch. We isolated DNA samples from the maternal specimen, a viable offspring, and the male clutch mate she was housed with the longest before isolation. Allelic states of each individual specimen at four nuclear microsatellite loci previously described in this species were visualized on a 2.5% agarose 1x TBE gel. Allelic

states of the offspring displayed alleles only found in the maternal genome, with the offspring homozygous at every discernible locus even when the mother was heterozygous at the same locus. The male clutch mate was eliminated as a possible sire to the offspring due to the results at a locus in which the offspring displayed neither of the two alleles displayed by the male clutch mate. These results support a parthenogenetic origin of this reproduction event via terminal fusion automixis or gamete duplication to produce homozygous offspring as documented in another species of *Chilabothrus* and members of the closely related *Epicrates*. This reproduction event represents the first documented case of FP in this species. Events of this nature may have significant implications for the genetic diversity of the endemic population of this vulnerable species and the captive breeding programs in the US and Europe in place to preserve the genetic diversity of the species.

Analysis of Hide Processing Tools from the Caborn Site, Posey County, Indiana

Benjamin Grubbs and Kasey Disbro

Faculty Mentor: **Dr. Michael Strezewski**

Our research focuses on 563 hide working tools (end scrapers) from the Caborn site in southwestern Indiana (AD 1400-1600), part of the Charles R. Lacer collection, housed at USI. End scrapers are thought to have been used in hide processing, though little previous research has been conducted on the tool type. It has been suggested that they were involved in processing bison hides, though there is little direct support for this assertion. The Caborn site tools were made from nine different chert types, most of which originate from outside the southwestern Indiana area. We measured the dimensions of each artifact, and noted the presence or absence of cortex, shape, wholeness, and if it was retouched. Each tool was also sorted into one of five different planview shapes: triangular, rectangular, ovate, convergent, and undetermined. End scrapers of this type are atypical for the late precontact cultures of Indiana. They are, however, found at Oneota sites of the western Great Lakes (e.g., Wisconsin, Iowa, and Minnesota). By comparing the Caborn end scrapers' dimensions and planview shapes with those from a published collection in Minnesota (Boszhardt and McCarthy 199), we were able to make comparisons between these two cultures to get a better understanding of how they may have been used.

We concluded that while there were numerous similarities between the end scrapers of these two cultures, some differences were noted. Most of the specimens we studied were whole, lacked cortex, were triangular, and had retouch flakes on at least one side of the end scraper. On average the Caborn-Welborn end scrapers were much larger than those from Oneota contexts. While the Oneota end scrapers were comprised of Prairie du Chien and Grand Meadow chert, Wyandotte was the most prevalent in the specimens we observed.

GDP Differences Among US Regions

Madeline Houston

Faculty Mentor: **Dr. Cathy Carey**

In this paper, I first analyze the GDPs of each of the four US regions. These regions are graphed and forecasted forward. These forecasts themselves are then analyzed independently of each region to ensure the best model is produced. I then move into a discussion of the differences each region has seen in GDP from 1977 to 2022. I find that there are several differences in each region and how they react to situations throughout history. Finally, I analyze several other factors including population and average income to determine if it is a cause of GDP differences. While more research needs to be conducted, this I give a baseline for future GDP research.

Mind and Art: Understanding the Impact of Mental Illness in the Lives of Vincent van Gogh and Richard Dadd

Eva Hubbard

Faculty Mentor: **Dr. Sidney Hall**

For this project, I analyze four different mental health aspects: symptoms, diagnosis, treatments, and pre-hospitalization vs. post-hospitalization in the art of Vincent Van Gogh and Richard Dadd. Depressive symptoms started at an early age for both artists and led to them being hospitalized for most of their lives. Van Gogh was diagnosed with epilepsy and interictal dysphoric disorder while Dadd was diagnosed with Capgras syndrome. Through these struggles, both artists were advised to still paint and draw, which is where most of their well-known artwork was created. However, their pre-hospitalization and post-hospitalization works were not all that different from one another mainly due to the limited materials that the artists were given. With this, Vincent van Gogh and Richard Dadd are similar in a variety of ways, however, the individual stories of their struggles with mental health are very unique.

Characterization of a Novel Terahertz Amplifier

James Hunnicutt

Faculty Mentor: **Dr. Jenna Kloosterman**

The University of Southern Indiana (USI) is partnering with the Jet Propulsion Laboratory (JPL) to design, build, and test a new amplifier at 2700 GHz. No amplifiers currently exist anywhere near this frequency. The USI student research team designed an optical testbed to measure amplification from this new type amplifier built from a quantum cascade metasurface (QCMS). The QCMS is a specially designed semiconductor material that resonates photons producing amplification of a monochromatic source. The

main design component of the optical testbed was the design and fabrication of an elliptical mirror block. The reason an elliptical mirror was chosen is that it allows for the source, amplifier, and detector to be positioned at the foci of the mirror and for the source to be reflected into the amplifier, and then the amplified light beam reflected onto a detector.

The team has taken two trips to JPL. In first trip during the summer of 2023, they used a frequency multiplier chain (FMC) that operates at ~2500 GHz as the source and using the QCMS amplifier they successfully measured ~2 dB. Building on this result, JPL and USI decided to try a different source called a quantum cascade laser (QCL) that operates similarly to the QCMS amplifier. The advantage of the QCL is that it has more initial power than the FMC, but a different radiation pattern. Based on this new radiation pattern, the team designed a second mirror block that was tested in spring 2024. They also characterized the frequency and radiation pattern of the QCL. During this presentation, I will present on the design and fabrication process, the measurement setup, and results of both the QCMS amplifier from summer 2023 and QCL from spring 2024.

Developing a Classroom Management Catalogue

Sydney Lawson

Faculty Mentor: **Dr. Simone Nance**

For my Honors Capstone, I have created a catalogue of classroom resources collected from my practical observation for Elementary Analysis: Curriculum and Instruction. This project was created with the intention of collecting a wealth of knowledge on classroom management, organization, and resources based in real-world experiences. While there are plenty of published resources available with useful guidance on these topics, I felt that it would be a unique opportunity to see how such practices and tools are applied realistically in a public school setting. I was able to compile information about 15 classroom management resources and strategies, as well as conduct an interview with an Indiana teacher regarding tips for first-year teachers. I have created a resource that I will be able to utilize for years to come, and have learned much about classroom management in the process.

Strawberry DNA Extraction as a Student Activity

Uday Sekhar Lomada and Jessica Nickens

Faculty Mentor: **Dr. Jacob Lutter**

The strawberry DNA extraction demonstration aims to visualize the DNA molecules that store the information necessary to perform the chemistry of life. Strawberries produce enough DNA to be visible to the naked eye once extracted. After the strawberries are smashed to open the cells, the DNA will be extracted using an extraction buffer consisting of dish soap, water, and salt. The cell lysate will then be filtered, and isopropyl alcohol will be added to the lysate to create a liquid-liquid boundary. Finally, the DNA will precipitate and be visible between the two layers. Various chemistry concepts will be covered throughout this demonstration, including acid/base chemistry, solubility, and polymer properties. Smashing the strawberries is required to break the cell walls and help isolate the cells containing the DNA.

The contents of the DNA extraction buffer each function to help further isolate the DNA from the cells. The dish soap acts as a base to break down the cellular and organelle membranes by dissolution of the phospholipid bilayers. Detergent monomers containing both hydrophobic and hydrophilic regions are inserted into the bilayers to cause strain until, eventually, the bilayer forms pores and breaks apart into micelles to release cellular contents. The salt acts to denature the proteins binding the nucleic acid in DNA by stripping the layer of water from the protein surface. The DNA is then filtered off from the strawberry remnants via the coffee filter, and the isopropyl alcohol precipitates the DNA from the cell lysate. DNA readily dissolves in water along with ionic salts, but DNA is not as soluble in isopropyl alcohol. DNA is visible to the naked eye due to its polymeric structure and length. DNA is a polymer of thousands of repeating monomer units called nucleotides. The chains of nucleotides, called nucleic acids, then coil around each other to form a double helix. Because DNA molecules are extremely long, they are visible when isolated and condensed.

This experiment is an apt visualization of DNA and the properties of nucleic acids in an organism while simultaneously giving students between ages 7-16 a safe, hands-on activity. All of the information above can be taught at varying levels depending on the audience of the activity. We intend to present a poster with details of the demonstration alongside the activity itself at the Endeavor symposium.

The Relationships Between One's Gender Identity and One's Perception of Gender with Varying Gendered Characteristics

Madi Martin and Samantha Cardoza

Faculty Mentor: **Dr. Srikanth Dandotkar**

We examined whether one's self-identified gender identity influenced their gendered perception of others and whether this effect was different when presented with feminine, masculine, and androgynous/mixed characteristics. Participants viewed images of illusory and human faces, then scored them on various characteristics and filled out demographic questions. A 2 Gender Identity (cisgender, non-cisgender) x 3 Gendered Characteristics (feminine, masculine, androgynous) Mixed Design was used. Results suggested that there was no difference in the perception of others' gender between cisgender and non-cisgender participants and no difference in the average scores for gendered characteristics for cisgender and non-cisgender participants. Varying gendered characteristics were rated differently, however not how we predicted.

See What's Open at USI Web Application

Christopher Memmer

Faculty Mentor: **Mr. Joshua McWilliams**

For this project, I have created a web application using HTML, CSS, and (mainly) JavaScript that has the user enter a time and date. Then, then the program will show them what around campus is open (such as the library, dining, offices, public safety, etc.). There is a filter function so the user can pick out categories they do not want to see.

Second Language Acquisition: An Analysis of Language Teaching Methods

Meagan Miller

Faculty Mentor: **Dr. Kelly Sparks**

This Honors Capstone project reviews common language teaching methods within second language acquisition (SLA), with a focus on content-based instruction (CBI), total physical response (TPR), and comprehensible input (CI). The paper first outlines the evolution of language teaching approaches from the traditional grammar translation method to communicative approaches, exhibiting improved effectiveness due to an increase in research surrounding SLA. The study notes the use of explicit and/or implicit grammar instruction for each approach as well as any communicative functions involved. Observational research completed during a clinical practice placement in a secondary school classroom allows for an analysis of the practical application of these methods. The analysis shows predominant usage of TPR in addition to small amounts of CBI, highlighting the instructor's priority of vocabulary and grammar practice. Additionally, the paper considers the role of comprehensible input in language learning, noting its significance in supporting language acquisition by providing understandable yet challenging input. While the observed teacher primarily utilized comprehensible input through target language immersion, students demonstrated proficiency through comprehension and engagement.

USI Solar Splash Boat Racing Team

Jacob Mills, Charlie Jackson, and Kyle Echert

Faculty Mentor: **Drs. Paul Kuban and Susan Ely**

Solar Splash is an international organization for collegiate solar powered boat racing events. USI competed last year with help from the Endeavor Awards for our travel expenses. The team had shrunk dramatically in 2021 due to seniors graduating so we took that as an opportunity to take a year off of competition to develop a new boat from the ground up. We returned to competition in the summer of 2023 with a drastically improved boat with a new lighter hull and all-around better electronics system. Before 2021 USI had never finished any event in the competition, but in 2023 we placed 3rd in the world, cementing USI as a force to be reckoned with in Solar Splash. In 2024 we have been redesigning and improving every part of the boat we had found issues with during the competition to improve our top speed, handling, efficiency, durability, and comfort.

Recommending an Interdental Aid

Sydney Parsons, Emily LeMasters, and Courtney Weisheit

Faculty Mentor: **Mrs. Emily Holt**

It is the dental hygienist's responsibility to provide adequate and relevant oral health education to clients. Clients that present gingival bleeding and high plaque scores are in need of dental hygiene instruction on how to prevent dental disease. There are a couple options to prevent these conditions, such as an oral irrigator, string floss, or interdental brushes. The oral irrigator uses water to flush out biofilm in between teeth. On the other hand, string floss and interdental brushes are two oral care products that can reach in between teeth and can clean the biofilm without a powered mechanism. When biofilm is not removed in between teeth, this can cause destruction of supportive structures in the oral cavity leading to a condition termed periodontitis. The purpose of this research is to determine which interdental aid a dental hygienist should recommend to his/her clients to prevent periodontitis.

In adults, will the Water Flosser reduce biofilm more than string flossing and interdental brushes? In order to find reliable information to support the clinical question, key words were used to search through the PubMed database. Keywords included adults, plaque scores (226 results), adults, oral irrigator (57 results), and water pik and floss (5 results), interdental brush and oral irrigator (8 results). There are 7 peer reviewed journal articles, 1 scoping review, and 2 systematic reviews being used for this table clinic poster.

Regular use of an oral irrigator along with a toothbrush could be an appropriate alternative to other oral hygiene products, such as dental floss and interdental brush, for the management of peri-implant mucositis by preventing the accumulation of dental plaque. Oral irrigators should only be recommended to orthodontic patients who cannot use interdental brushes and are not compliant with dental flossing when the efficacy of an oral irrigator was tested in orthodontic patients. As adjuncts to toothbrushing, oral irrigators demonstrated significantly better efficacy in controlling dental plaque and gingival inflammation with no substantial safety hazards. Dental practitioners recommend patient-specific interdental cleaning devices that enable patients to achieve a safe and high standard of interdental cleaning. The option of an appropriate interdental cleaning aid is also influenced by the ease of use, size of interdental space, acceptability, dexterity, and motivation of the individual.

There is no single cleaning aid that works best for all patients. The option of an appropriate interdental cleaning aid is also influenced by the ease of use, size of interdental space, acceptability, dexterity, and motivation of the individual. The oral irrigator shows inconsistent effectiveness in comparison to interdental brushing, string floss, and brushing alone in regard to overall oral health. The interdental brush more consistently showed greater effectiveness at interdental plaque removal when compared to the oral irrigator and string floss.

Examining the Effect of Depth on Metal Ion Concentration in Local Surface Waters

Ashley Patino and LaKiesha Wampler

Faculty Mentor: **Dr. Brian Bohrer**

High concentrations of certain heavy elements in lakes can have various and often negative ecological and environmental implications. As Kailasa, S., and Hussain, C state, “Heavy metal contaminants, which are counted to be a severe trouble in modern society, accumulate inside organisms, which are responsible for many diseases.” This project aims to investigate the elemental concentration of mercury (Hg), copper (Cu), lead (Pb), and manganese (Mn) in local bodies of surface waters and their impact in the surroundings. Previous studies evaluated whether water in the lakes and pits at the Blue Grass Fish and Wildlife Area to the northeast of Evansville contained elevated levels of hazardous metals which would pose concerns regarding the suitability of the reclaimed area for public recreation and wildlife preservation. These studies assessed metal ion concentration from samples collected at surface depth for reasons of ease of sampling and comparison. Concentrations of these elements, however, may vary at different depths; factors such as pH, dissolved oxygen concentration, and sulfate concentrations which can strongly influence the solubility of minerals might vary significantly along the depth of a still body of water. Water samples will be collected systematically from multiple depths, including surface (0-2 meters), intermediate, and deep, to represent distinct ecological zones with varying physical and chemical characteristics. The collection process will employ specialized equipment to minimize contamination and ensure the integrity of the samples. Microwave-based Plasma Atomic Emission Spectrometry (MP-AES) will be employed to quantify the concentrations of Hg, Cu, Pb, and Mn in the collected water samples. This technique offers high precision and accuracy in detecting trace elements, making it ideal for environmental monitoring. In summary, the study seeks to determine the saturation levels of toxic metals such as Hg, Cu, Pb, and Mn and shed light on their environmental dynamics within the lake ecosystem.

Interactions between *Streptococcus mutans* and *Streptococcus pyogenes* on BHI Agar

Jada Paul

Faculty Mentor: **Ms. Stephanie Bush**

Streptococcus is a genus of medically significant, gram-positive bacteria. *Streptococcus mutans* is often part of the human microbiota and inhabits the oral cavity. *S. mutans* forms biofilms known as plaque on the tooth surface. This virulence factor has helped *S. mutans* become the primary causative agent of dental caries in humans. *Streptococcus pyogenes*, also known as Group A streptococcus, is a human bacterial pathogen that most commonly causes strep throat, impetigo, and necrotizing fasciitis. *S. mutans* is found in the oral cavity and *S. pyogenes* on the skin or nose and throat.

Femininity Is

Alexis Reed

Faculty Mentor: **Dr. Jessica Rick**

Femininity is a deeply personal experience that varies between individuals. It is practiced in all genders and may present as an internal feeling, outward expression, or ritualistic activity. The feminine experience is powerful, awe inspiring, emotional, happy, sad, and nerve wrecking. It is a juxtaposition of positives and negatives, joy and despair, bravery, and fear. Femininity, such as individuals themselves, is beautiful and complex. The Key to Femininity is a series of photographs taken of USI students which displays their personal experience of femininity. To extract details about the feminine experience I dispersed a survey through my social media to willing participants within my social network. The survey was optional and asked questions regarding what makes the individual feel feminine, their favorite part of femininity, words to describe femininity, and what activities or routines make them feel feminine. Men, women, and nonbinary individuals completed this survey and created a compilation of beautiful descriptions and experiences of femininity. My photo essay, The Key to Femininity, visually displays fragments of the feminine experience according to the individual in the photograph. Accompanying my photo essay is a poem titled "Femininity Is" inspired by survey answers. This poetry explores the juxtaposition and complexity of the feminine experience and how it varies among individuals whether male, female, nonbinary, or other. Femininity Is in combination with The Key to Femininity illustrates a visual and verbal narrative displaying the multifaceted spectrum of femininity and its various manifestations among individuals spanning the gender spectrum.

Filling the Gap: Inclusive Sexual Safety for LGBTQ+ Middle and High Schoolers

Alexis Reed

Faculty Mentor: **Dr. Stephanie Young**

Greater Evansville Youth (GEY) offers youth groups for queer kids in the area twice a week: once for middle school and once for high school. In this project, I have conducted multiple trainings with this organization teaching Inclusive Sexual Safety related trainings to middle and high school kids in a digestive and queer-focused way. In Indiana, it is currently mandated that schools cannot teach anything but abstinence other than HIV and AIDS education. Most kids in our area won't receive comprehensive sex education until their adult years, if at all. I have been providing Inclusive Sexual Safety and Consent trainings on our campus for the last three semesters. Seeing how uneducated my adult peers are inspired me to reach out to the community about starting this education sooner. In the GEY trainings, I teach via a multi-part series educating kids on sexual safety including basic anatomy (trans and intersex/DSD inclusive), internet safety, consent, and evaluating emotional readiness for intimacy.

Seize the Day: Opportunistic Undergraduate Research of Volcaniclastics Collected during a Field Trip to Crater Lake National Park, Oregon

Logan Reid, Tristan Lindall, and Missy Brown

Faculty Mentor: **Drs. James Durbin and Tony Maria**

A research opportunity arose during a GEOL390 field course trip to the US Pacific northwest at a site along OR230 in the Rogue River valley due west of Crater Lake National Park, Oregon. A fresh roadcut offered a chance to describe characteristics and depositional structures of 2 volcaniclastic units, collect samples for microscopic and macroscopic examination of clasts for insights to deposition, write a funding proposal for C14 age determinations, and to hypothesize about modes of emplacement for the strata and rates of post-eruption incision of the Rogue River. Unit 1, at the base of the roadcut, was identified as an ignimbrite based on field and lab observations and the literature (Bacon and Wright, 2017). Unit 1 lacks bedding, extends below the road, possibly to the river, consists of a mixture of fine-ash to bomb-size clasts, including glass shards, lithic fragments, and pumice, and large (25-100 cm) chunks of charred wood. Unit 2 overlies Unit 1 and is similar in clast composition but is distinguished by an erosional contact with Unit 1, north to south trending cross beds, graded-bedding, and lenses of coarse clasts up to a meter thick. While volcanic surge deposits have been reported near this location (Bacon and Wright, 2017), characteristics of clasts and depositional structures within Unit 2 strongly resemble those associated with fluvial deposits. Both units have C14-dates of $7,700 \pm 30$ yr BP, consistent with origins from the climactic Mount Mazama eruption. Volcaniclastics exposed in mass-wasting scars and cutbanks along the east side of the Rogue River valley, coupled with topographic profiles across the valley, indicate infilling by volcanics from the current valley floor to at least road level, a 68 m elevation difference. Assuming Unit 2 represents streams immediately reforming and reworking volcanic fill, a simple calculation yields an 8.8 mm/yr average incision rate.

The Stories We Tell and Why We Tell Them

Tegan Ruhl

Faculty Mentor: **Dr. Casey Pycior**

My presentation is a creative nonfiction essay about why humanity puts an important value on storytelling. My central idea is that we tell stories as a way to connect, to understand ourselves, and the world around us. I begin the essay with stories I've heard from others, whether it be oral or through another medium. I then go into the cultural importance of storytelling with some "famous" examples, tell my own story of why I value storytelling, and then go into how storytelling has ingrained itself into modern culture. My poster explains how I went about writing this essay and why I wanted to write it. I'll include some copies of my essay and or a QR code so other people can read it as well.

Soil Moisture Measurements to Characterize Climate Change and Ecosystem Restoration Impacts on Groundwater Temperatures and the Endangered Karner Blue Butterfly

William Shehorn

Faculty Mentor: **Dr. Paul Doss**

The Pines Point Semi-Primitive Area of Manistee National Forest, Michigan sits over a dynamic, linked groundwater-surface water system along the White River, a designated Michigan State Natural River and a candidate Federal Wild and Scenic River. Three drilled monitoring wells (PPW1, PPW2, PPW3) installed in 2010, record high-resolution groundwater elevation and temperature data in an active savanna restoration area. These long-term monitoring data indicate changes in groundwater temperature resulting from savanna restoration and climatic changes in air temperature, precipitation, and the timing of snowmelt.

Since the 1840s, 98% of oak savanna ecosystems have been lost to habitat alterations throughout the Midwest, including Michigan and Indiana. Savanna ecosystems are essential to the endangered Karner Blue Butterfly (KBB) and its larval host plant, wild lupine. The Karner Blue Butterfly is sensitive to phenological shifts in snowmelt patterns and air temperature observed in the Midwest, since the KBB needs 80 days of continuous snowpack for overwintered egg survival.

Groundwater in the Pines Point savanna restoration area has experienced a pronounced increase in temperature since data collection began in 2010. Groundwater temperature at PPW1 has increased 0.5 degrees C over the period of study. Groundwater temperature increase is comparable at other measured sites (PPW2, PPW3) with both sites having increases of approximately 0.4 degrees C over the same period. Reductions in insulation due to a loss of snowpack are the likely causes of increased groundwater temperature. Soil moisture data, along with precipitation data, can be used to track the magnitude and timing of snowmelt events. This investigation seeks to understand how changes in groundwater temperature are linked to savanna restoration and climate change. Furthermore, groundwater temperature changes are indicative of widespread changes to environmental variables that could have impacts on recovery efforts for the endangered Karner Blue Butterfly.

The Battle Between Xylitol and Fluoride in Preventing Caries

Alexis Stafford, Emily Thomas, and Riley Beaman

Faculty Mentor: **Mrs. Emily Holt**

A review of available research was completed to compare the effects of fluoride and xylitol related to their abilities to prevent dental caries. Xylitol is a sugar alcohol that has been discussed in recent years as an alternative method of caries prevention, while fluoride has been the gold standard of caries prevention for many years with studies proving its effectiveness. Research on xylitol and fluoride in the forms of varnishes related to the prevention of caries has been divided and ambiguous at best. After reviewing available literature, xylitol varnish was not proven to be more effective than fluoride varnish at preventing dental caries. Thus, fluoride remains the gold standard of caries prevention. Dental professionals should

continue to recommend fluoride varnish as the primary method of caries prevention. Xylitol supplementation in the form of other dental products can aid in caries prevention.

Synthesis of a Self-Assembled Zinc 12-metallacrown-4 Motif Utilizing a 5,6-chelate Ligand to Create Less Bowled Structures

Lauren Stillwell

Faculty Mentor: **Dr. Jacob Lutter**

Metallacrowns (MCs) are a class of coordination compounds in which the repeating unit of $[-M-N-O-]_n$ is observed in the same manner as $[-C-C-O-]_n$ unit is observed in crown ethers. Zinc(II) based MCs open a wide door of structural diversity including distorted trigonal bipyramidal and square pyramidal geometries. This array of structural diversity from self-assembly within solution using a wide variety of ligands with Zn^{2+} ions includes many compounds that have interesting properties, namely magnetism and lanthanide luminescence. Near infrared (NIR) emitting trivalent lanthanides are a promising practical application due to the current interest in NIR emission for bioimaging and nanothermometry.^{6–8} Some Zn-based MCs are known to be bright chromophores for NIR emitting trivalent lanthanides in which their sensitization can be achieved in the visible regime.

The 12-MC-4 structure with Zn^{2+} ions traditionally leads to a bowled structure. These frameworks utilize 5,5-chelate hydroximates such as 2-quinaldic hydroximate (quinHA2⁻) as the ligands with the hydroximate at the 2 position. This bowling creates issues regarding the angles between the bridging ancillary ligands with an increased distance between two oxygen atoms on a carboxylate to both Zn and the central Ln. To redesign the ligand from 5,5- to a 5,6-chelate, the hydroximate is shifted to the 8 position. This shift is hypothesized to create a less bowled, flatter structure that will shorten the distance for binding to the ancillary ligands to mirror the structural characteristics of Ga-based MCs further. This motif should expand known zinc structures to include additional structures that resemble other MCs with 5,6-chelating hydroximates such as salicylhydroximate due to the modification options for functionality in both the carboxylate and hydroximate groups. An initial structure of $ZnII[12-MCZn(II) N(quin8HA)-4]$, the all zinc structure has been obtained previously.

It All Hinges on Water: The Structuring of Water by Lipids in the American Alligator Stratum Corneum

Maxwell Stoll

Faculty Mentor: **Dr. Alex Champagne**

The stratum corneum (SC) is the outermost layer of skin and provides a barrier to the outside environment. Critical components of the SC are lipid molecules that prevent water permeation while sometimes binding with water molecules to sequester them in the SC to hydrate the skin. The exact composition of lipids in the SC varies with evolutionary history and environment. Recently, lipids in the SC of the American Alligator (*Alligator mississippiensis*) were found to share many similarities in composition with those of birds, reflecting their shared ancestry as Archosaurs. Among the most notable similarities

was the presence of a lipid called a cerebroside, a polar lipid that forms strong hydrogen bonds with water molecules in birds. However, it is not known whether cerebroside interact with water similarly in alligator SC. In this study, we investigate the effects of hydration on lipids in alligator SC by exposing pieces of SC (n=9) to 0%, 75%, and 100% relative humidity (RH) at 33°C for 24 hours. We then used infrared spectroscopy to analyze the relative strength of hydrogen bonding and the prevalence of gauche defects in lipid chains. We found that the strength of hydrogen bonding in the SC decreased only after exposure to 100% RH, indicating that cerebroside in alligator skin form strong hydrogen bonds with water even at moderate levels of hydration, whereas birds exhibit weaker hydrogen bonding at moderate levels. Additionally, the number of gauche defects in lipid chains did not change in response to hydration. Taken together, our results indicate that cerebroside sequester water molecules outside lipid layers in a manner similar to their role in bird SC, and the greater abundance of cerebroside we observe in alligator SC compared with many birds may enhance the role these lipids play in hydrating the skin.

Increasing the Awareness of Homelessness in Allied Dental Students through Educational and Service-Learning Opportunities

Brooke Terry

Faculty Mentors: **Mrs. Amanda Reddington, Dr. Jennifer Fehrenbacher, and Dr. Kimberly Hille**

Homelessness affects people across the globe, the United States, and within the Evansville Tri-state area. Those experiencing homelessness face unsafe living conditions, are vulnerable to communicable diseases, face various health disparities, and are often inaccurately judged by the community. Negative perceptions, feelings, and biases, often unconscious, are held by the general public and many health care professionals. These negative attitudes act as barriers for homeless seeking healthcare services. The purpose of this project was to increase awareness of dental health profession students' knowledge of local demographics through educational and community service-learning opportunities. Educational opportunities included a lunch and learn session where local homelessness experts came to the University of Southern Indiana (USI) campus and provided education on regional statistics, available resources, and how students, as future health care professionals, can make a difference. Service-learning opportunities included volunteer shifts at local resources, coordinating, and facilitating a college-wide (College of Nursing and Health Professions) supplies drive, and creating 'street' and 'hygiene' kits. These were constructed by allied dental students and were to be distributed directly to those in the Tri-State area experiencing homelessness by Aurora Evansville.

Workplace Violence

Emma Williams

Faculty Mentor: **Dr. Shellye Davis**

For this project I evaluated the effectiveness of education and training interventions in an effort to decrease workplace violence in the healthcare field. I compared the literature to what Deaconess Health System has implemented to address the issue of workplace violence. The literature suggests that

education and training programs implemented are helpful with increasing the staff's awareness, communication, and empowerment to report workplace violence occurrences but does not decrease the prevalence of workplace violence on its own. Education and training would be a beneficial tool to utilize for workplace violence prevention paired with another intervention. My research showed that Deaconess Health System has implemented a Rave Guardian app on cell phones to promote prompt responses to emergencies from in house security in the event that a workplace violence situation was to occur. They have also begun placing behavior alert flags on high-risk patient's electronic medical records based off a policy that was created by risk management with the goal of improving communication and awareness among staff. I conclude with a discussion of the significance of workplace violence and implications for practice in the healthcare field such as the importance of communication, prompt reporting, and increasing awareness of risk factors.

Wealth Distribution and Happiness

Jacob Winterheimer

Faculty Mentor: **Dr. Bohan Ye**

This research project aims to understand how wealth redistribution policies can influence happiness across different participants in an economy. While there has been some past research on this topic, none has used lab simulations to analyze how the inclusion of a wealth redistribution study can affect happiness. Participants recruited for the student are given a randomly generated starting balance of wealth and are asked to make investment decisions in an attempt to increase their wealth. After the final round, ending balances are compared and those with the highest are paid the most for their participation. This aspect allows control for relative wealth while the chance element of the game simulates real-life randomness that can affect one's wealth. While the control group ends their sessions here, the experimental groups have their ending income taxed at 30% and the tax revenue is then evenly redistributed across all participants in the session. All participants are recorded and facial expressions are analyzed using computer software. Using the computer analysis and the survey responses, happiness is compared across both groups to assess which is ultimately happier.

Plan to Attend

The 2025 Endeavor Undergraduate
Research and Creative Work Symposium
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Thursday, April 10, 2025



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