CURE

The NIU Conference on
Undergraduate Research and Engagement

Celebrating 15 Years of Undergraduate Research, Artistry and Community Engagement

Tuesday, April 29, 2025, 9 a.m. to 4 p.m.
Holmes Student Center, Main Level, Duke Ellington Ballroom

NORTHERN ILLINOIS UNIVERSITY
Office of Student Engagement
and Experiential Learning
Division of Academic Affairs

CURE

The NIU Conference on
Undergraduate Research and Engagement

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NORTHERN ILLINOIS UNIVERSITY

Office of Student Engagement
and Experiential Learning

Division of Academic Affairs

Letter from the President and the Executive Vice President and Provost

Greetings!

At Northern Illinois University, we strive to provide all our undergraduate students with opportunities to engage in hands-on learning, both in and out of the classroom, to promote their academic and career success. The Conference on Undergraduate Research and Engagement is a celebration of our students' intellectual and creative contributions to their disciplines.

The undergraduate students participating in this event have worked closely with talented members of NIU's faculty and staff to develop critical thinking skills, solve complex problems and create new knowledge. We commend their accomplishments as scholars, scientists, engineers, artists and inventors. We recognize the role of undergraduate research and engagement for paving the way to lifelong learning and informed and responsible citizenship.

Thank you for attending our students' presentations. Explore. Connect. Ask questions. Learn. And please join us in acknowledging the effort and accomplishments of students and their mentors. NIU is grateful for your interest and support.

President Lisa C. Freeman and
Executive Vice President and Provost Laurie Elish-Piper

What is Knowledge Creation?

For the past 14 years, our campuswide undergraduate symposium has showcased innovation and discovery of over 2,500 NIU undergraduate student projects. We reflected on those past years and asked ourselves: What is knowledge creation? How can we ensure that our processes encourage all forms of knowledge creation? And most importantly, how can we foster diverse representation at CURE?

Knowledge Creation Engagement Activities

The following activities were designed to spark creativity and intellectual curiosity:

- **Networking at the Undergraduate Research Month Kickoff**: Opportunities to reflect on the Council on Undergraduate Research's (CUR) definition of undergraduate research and share insights through an interactive survey.
- **Faculty involvement**: The new CURE faculty involvement page provided faculty members with resources to integrate knowledge creation activities into their courses.
- **Suitable app engagement**: Students can dive into the Suitable app to view diverse research posters and reflect on the vast scope of undergraduate research.

Exciting Changes to CURE

We've made several enhancements to make CURE 2025 more inclusive and engaging:

- **Expanded session formats**: Our new roundtable sessions were designed to offer flexible methods for presenting research.
- **Flexible poster requirements and options**: Posters are no longer required. New templates and resources were added, including examples from the arts and humanities.
- **Innovative exhibits**: Don't miss the "What is Knowledge Creation?" exhibit, featuring projects from undergraduates that examine how research is defined and barriers to participation, and doctoral students sharing a visual models of inquiry framework.
- **Inclusive judge's rubric**: Our revised rubric now uses more inclusive language to better reflect diverse research approaches.

Event Staff and Committees

Outreach and Faculty Engagement:
Andrea Radasanu, Honors Director, and Assistant Vice Provost for Student Enhancement

Conference Coordinator:
Emily Reilly, Associate Director, Office of Student Engagement and Experiential Learning

Conference Assistant:
Makyla Charles, Graduate Assistant, Office of Student Engagement and Experiential Learning

Connie Storey, Associate Director of Scholarships and Fellowships

Logistics:
April Buckley, Administrative Aide, Honors Program and Office of Student Engagement and Experiential Learning

Undergraduate Research Ambassadors:
Hannah Havel
Aleena Kallan
Leslie Munoz
Makayla Ritko
Isabelle Van Winkle
Emma Whitlock

CURE Partners

Division of Enrollment Management, Marketing and Communications

Holmes Student Center

NIU Alumni Association

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Schedule of Events

All CURE activities will be held at the Holmes Student Center. roundtable discussions will be located in the Capitol Room. All poster sessions will be located in the Duke Ellington Ballroom.

Presenter/Judge Check-in

Presenter and judge check-in is from 8:15 a.m. through 2:45 p.m. in the Duke Ellington Ballroom. All presenters and judges should arrive at least 15 minutes prior to their assigned session to sign in. Presenters are assigned to one time slot, but posters will be available for viewing the entire event.

Presentation Sessions

9 to 10 a.m.	Roundtable Discussions
10 to 11 a.m.	Poster Session I
11 a.m. to noon	Poster Session II
Noon to 12:30 p.m.	“What is Knowledge Creation?” Exhibit Talk
1 to 2 p.m.	Poster Session III
2 to 3 p.m.	Poster Session IV
3 to 4 p.m.	Poster Session V

Moderators and Judges

Moderators

Christina Abreu, History/Center for Latino and Latin American Studies
T. Ajewole Duckett, Center for Black Studies
Katy Jaekel, Center for Women, Gender and Sexuality
Laura Johnson, Nonprofit and NGO Studies
Andrea Radasanu, Political Science
Tom Skuzinski, Institute for the Study of the Environment, Sustainability and Energy

Faculty Judges

Peitao Ahu, Counseling and Higher Education
Stephanie Baker, Early and Special Education
Sheila Barrett, Health Studies
Shannon Becker, World Language and Culture
Heather Bergan-Roller, Biological Sciences
Barrie Bode, Biological Sciences
Melissa Burlingame-Greenhagen, Environmental Sciences
Sachit Butail, Mechanical Engineering
Niechen Chen, Industrial and Systems Engineering

Moderators and Judges (Continued)

Faculty Judges continued

Wonock Chung, Kinesiology and Physical Education
Gibson Cima, Theatre and Design
Shondra Clay, School of Interdisciplinary Studies
Purushothaman Damodaran, Industrial and Systems Engineering
Olivier Devergne, Biological Sciences
Ajewole Duckett, Center for Black Studies
Melissa Fickling, Counseling and Higher Education
Mark Frank, Earth, Atmosphere and Environment
Larissa Garcia, Founders Memorial Library
Kimberly Gatz, Communications
Rachel Gordon, Health Studies
Scott Grayburn, Biological Sciences
Gwen Gregory, Founders Memorial Library
Arnold Hampel, Biological Sciences
Anne Hanley, History
Michael Henson, Biological Sciences
Jim Horn, Chemistry and Biochemistry
Pi-Sui Hsu, Educational Technology, Research and Assessment
Courtnery Hughes, Health Studies
Farah Ishaq, Kinesiology and Physical Education
Darius Jackson, Center for Latino and Latin American Studies
Trude Jacobsen Gidaszewski, History
Holly Jones, Biological Sciences
Stacy Kelly, Special and Early Education
Anna Klis, Economics
Jennifer Koop, Biological Sciences
Colin Kuehl, Political Sciences
Eric Lee, Mechanical Engineering
Xiaohui Sophie Li, Family and Consumer Sciences
Yujun Liu, Family and Consumer Sciences
Bill Martin, Biological Sciences
Chris McCord, Mathematical Sciences
Ismael Montana, History
Molly Pasley, Special and Early Education
Julie Patterson, Health Studies
Brandon Perez, Early and Special Education
Dee Anna Phares, Founders Memorial Library
Nicholas Pohlman, Mechanical Engineering
Leila Porter, Anthropology
Nancy Prange, Health Studies
Ji-Chul Ryu, Mechanical Engineering
Karen Samonds, Biological Sciences
Michelle Sands, Special and Early Education
Anitha Saravanan, Nursing

Moderators and Judges (Continued)

Faculty Judges continued

Alicia Schatteman, Student Academic Success
Scot Schraufnagel, Political Sciences
Kimberly Shotick, Founders Memorial Library
Pallavi Singh, Biological Sciences
Wesley Swingley, Biological Sciences
Neal Ternes, Kinesiology and Physical Education
Kanjana Thepboriruk, Center for Southeast Asian Studies
Ches Thurber, Political Sciences
Stephanie Uhr, Nursing
Laura Vazquez, Communication
Douglass Wallace, Psychology
Patty Wallace, Compliance
Ziteng Wang, Industrial and Systems Engineering
Bradley Wiles, Founders Memorial Library
Rowland Winkler, Physics
Linda Yasui, Biological Sciences
Donald Zinger, Electrical Engineering

Graduate Student Judges

Pale Almissouri, History
Ishmael Amartey, Statistics
Rowan Carter, Anthropology
Daniel Curtis, Earth, Atmosphere and Environment
Viviane Dos Santos Rocha, Earth, Atmosphere and Environment
Adiba Ibnat Hossain, Computer Science
Haniyeh Jadidi, Chemistry and Biochemistry
Dorcas Joseph, Physics
Oluwaseun Joseph, Operations Management and Information Systems
Kimberly Krueger, History
Yuzhou Liu, Economics
Miftahul Jannat Mokarrama, Computer Science
Kari Mongold, Psychology
Yakubu Naporo, History
Ibtida Nishat, Sociology
Oluwatodimu Ogunade, English
Olabisi Olayinka, Physics
McKeown Owusu, Political Science
Marissa Pezdek, Biological Sciences
Lindsey Price, Biological Sciences
Daniel Reshadfar, Economics
Bethany Rohl, Kinesiology and Physical Education
Jennifer Schaumberg, Health Studies
Nicole Scheuermann, Biological Sciences
Teddy Schupack, Psychology
Sanjida Sultana Zerin, Sociology

Dr. Arnold Hampel and Dr. Denise Kennedy CURE Award Fund

The Office of Student Engagement and Experiential Learning is grateful for the contributions of Arnold Kennedy and Denise Hampel in making the Conference on Undergraduate Research and Engagement (CURE) an exciting annual event.

Students receiving high rankings on their presentation will receive monetary awards and the opportunity to have their posters published in Huskie Commons, thanks to $5,000 contributed annually by the Arnold Hampel, Ph.D. and Denise Kennedy, Ph.D. CURE Award Fund.

Kennedy and Hampel were professors and research scientists at NIU. A major part of their interests included introducing students to research and watching them blossom. They genuinely enjoyed seeing the enthusiasm of students learning, understanding and creating.

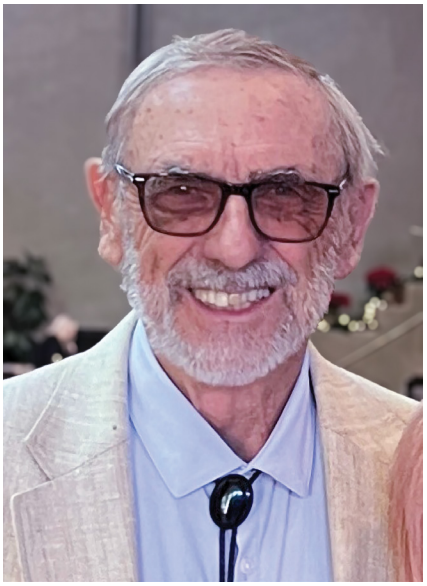
Kennedy earned her bachelor's degree and master's degree from NIU, before earning her graduate respiratory therapist degree from Northwestern University Medical School. Her allied health care career began at the bedside as a patient caregiver. Most recently she was a clinical professor in the College of Health Solutions at Arizona State University. She was loved by her students and instrumental in helping many of them launch successful careers.

Kennedy passed away in 2023, but her remarkable legacy centers around her life's dedication to health care and to helping others. Through her generous legacy gift, this namesake fund serves as a fitting tribute to her longstanding commitment to NIU and its students.

Hampel earned his bachelor's degree from NIU, then went on to obtain his Ph.D. in biochemistry from the University of Wisconsin-Madison. Ultimately, he returned to NIU to teach. He holds 15 scientific patents and has published 80 scientific publications.

Upon his retirement, Hampel received the distinction of emeritus professor in both the Department of Chemistry and Biochemistry and the Department of Biological Sciences at NIU. Perhaps what marked his career the most was his incredible love for teaching and for academically inspiring youth.

Denise Hampel.



Arnold Kennedy.

Celebrating Our Research Mentors

2025 CURE Faculty Mentor of the Year

The purpose of this student-nominated award is to appreciation and recognize exemplary faculty who provide undergraduate students access to research experiences and embody exceptional mentorship practices that help students reach their academic and career goals.

William (Bill) Martin, assistant professor
Biological Sciences

Bill Martin's commitment to providing access to undergraduate research experiences to all students and his ability to foster confidence and meet students where they are to maximize their growth as researchers is evident in his teaching methods and recognized by many students. Here are few highlights from his student nominations:

"Dr. Martin has helped me and our class curate our best work into our research. He has done this by being available for questions before and after class, giving feedback on our abstracts and generally pushing us to do our best in terms of our research and learning goals."

"His belief in me allowed me to contribute meaningfully to the biology community, despite my academic challenges." "He also gave me the confidence to present my research, something I once thought impossible."

2024 CURE Faculty Mentor of the Year

The purpose of this student-nominated award is to appreciation and recognize exemplary faculty who provide undergraduate students access to research experiences and embody exceptional mentorship practices that help students reach their academic and career goals.

Allison Gladfelter, associate professor,
Allied Health and Communicative Disorders

Allison Gladfelter's passion, knowledge, and ability to connect and encourage students are characteristics and practices that have made a positive impact not only on a Research Rookie this year, but on many students in previous years. Research Rookie Zoey Proper shared: "Even though we are from different departments, she has been great at relating to my future career as a physical therapist. She is extremely passionate about autism and neurodiversity which has allowed me to develop a passion for advocacy."

Celebrating Our Research Mentors (Continued)

Vincent Bratcher
Political Science
Ches Thurber

"Hey, boss! You're the coolest because you're on top of things, you're understanding, and you're intelligent as heck. I've become a better researcher and student because of your guidance."

Alyssa Bird
Biological Sciences
Heather Bergan-Roller

"Dr. Bergan-Roller has had a profound impact on my research journey, both as a mentor and an inspiration. As a research assistant, I've benefited greatly from her expertise across a broad range of topics. She consistently makes time to meet with me, providing thoughtful answers to my questions and guiding my research with patience and clarity. Her approachable and personable nature makes it easy to discuss ideas and challenges, fostering a collaborative and supportive environment. Dr. Bergan-Roller has not only enhanced my research skills but has also given me a clear vision of what a career in research can look like, for which I am deeply grateful."

Stephanie Drendel
Biological Sciences
Heather Bergan-Roller

"Dr. Bergan-Roller has been instrumental in forming my skills as a researcher. Her mentorship combines a passion for diverisity, equity and inclusion with the knowledge and expertise of conducting STEM-related research. Her dedication, compassion and intelligence are inspiring."

J.C LaBarbera
Mechatronics Engineering
Peter Lin

"Dr. Lin has taken the time to show me what the student research experience looks like and how it can fit into my career goals, and has always taken his mentorship role seriously; for that, I am incredibly grateful."

Lillian Garncarz
Biological Sciences
Heather Bergan-Roller

"Working under the mentorship of Liz Andreas and Dr. Heather Bergan-Roller has been one of the most transformative experiences of my time at NIU. These incredibly talented women have not only guided me through the complexities of research but have also inspired me with their unwavering passion and dedication. They are true team players who foster an environment of collaboration and growth, showing genuine care for each of us as individuals, both in and out of the lab. Their leadership has taught me the value of perseverance, critical thinking and compassion in science. I am deeply grateful for their support, which has fueled my confidence and shaped me into a more capable and enthusiastic researcher. Their belief in me has made a lasting impact, and I am honored to be part of their team."

Emma Bell
Anthropology
Dana Bardolph

"My mentor has helped me greatly. She has taught me not only how to engage in research, but how to grow as a student, a woman in STEM and a responsible archaeologist."

Celebrating Our Research Mentors (Continued)

Lydia Delk
Biological Sciences
Bethia King

"Dr. King has really encouraged me to explore what my research and career interests are, outside of what is done during our research. I feel like I finally have a community here at NIU, and I am so thankful for this experience."

Olivia Zapf
Anthropology
Anne Hanley

"Dr. Hanley, has been instrumental in teaching me the research process and the ways it can be applied to a wide variety of different topics and research questions. Additionally, she's helped me learn the parts of research that I really enjoy naturally and how to make my lesser favorites more enjoyable, which I've really enjoyed."

Madeline Martinez
Biological Sciences
Samantha Berk

"My mentor has helped integrate me into the scientific community, and created an environment where I felt like I could grow as a researcher and explore my own interests!"

Anaheid Rayzian
Public Health
Bill Martin

"Dr. Martin is a phenomenal mentor. He's clear, direct and helpful. As a student, it's been wonderful to work with him, as he's clearly passionate about students."

Gracia Watson
Electrical Engineering
Venu Korampally

"My faculty member gave good direction, but there was also a good degree of independence, allowing me to grow as a student and budding researcher. Thanks to him and the rest of the research group, I had a very positive first experience with research in an academic setting."

Lilliana Campbell
Psychology
David Valentiner

"Working with Dr. David Valentiner has been transformative. His expertise and encouragement have been invaluable in guiding my research journey. Dr. Valentiner took the time to provide me with helpful resources to deepen my understanding of clinical psychology and offered insights into the challenges of getting into graduate school. His mentorship has not only deepened my understanding of our field but also inspired me to pursue future research opportunities. I am extremely grateful for all of the help he has given me."

Charlie Vazquez Acosta
Mathematics and Applied Physics
Sien Deng

"Dr. Deng has been more than just a mentor — he has been a role model who I deeply admire. His patience and compassion helped me stay confident in my mathematical abilities, even when asking the right questions was challenging. I am truly grateful for his guidance and for helping me see new perspectives in mathematics."

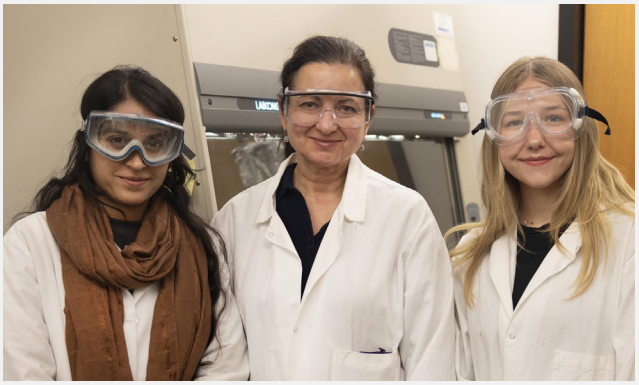
Celebrating Our Research Mentors (Continued)

Aleena Kallan
Biological Sciences
Pallavi Singh

"Dr. Singh welcomed me into her research lab during my freshman year, providing me with an invaluable opportunity to grow as a researcher. From day one, her unwavering support and encouragement helped me navigate this unfamiliar environment with confidence. Two years later, I have developed independence in my work and mentor peers new to research, continually guided and inspired by her mentorship."

Vrinda Brahmbhatt
Biological Sciences
Pallavi Singh

"I am incredibly grateful to Dr. Singh for her unwavering support and guidance throughout my research journey. She welcomed me into her lab a year ago, providing me with an invaluable opportunity to develop my skills and passion for microbiology. As both my professor and research mentor, she has fostered an environment where curiosity is encouraged, always taking the time to answer questions with patience and enthusiasm. Her kindness, mentorship and dedication have truly made a lasting impact on my academic and personal growth, inspiring me to approach science with confidence and curiosity."



Heather Matenaer
Chemistry
Irina Nesterova

"Dr. Nesterova has given me a very positive start to my research journey. I started out a little nervous and inexperienced, but Dr. Nesterova and her team have made me feel welcome. I look forward to continuing in my current research and my future studies here at NIU."

Gia Gurgone
Communicative Disorders
In-Sop Kim

"Dr. Kim has helped me by being a proactive communicator and a supportive presence throughout the past year! Additionally, he has helped direct me to many of the resources we have here at NIU to support the growth and research of undergraduate students. It has made all the difference during the times when it has been especially busy to have a faculty mentor that I know will support me and point me in the direction of help when I need it!"

Ally Coker
Manufacturing Engineering Technology
Brianno Coller

"Dr. Coller has made undergraduate research an experience tailored to my fascinations and methods for learning. He breaks down concepts and jargon into easily understood topics when I have a question. He truly cares about making sure undergraduate research not only exposes new researchers to knowledge, but is a learning experience starting from the foundations and building up into a project."

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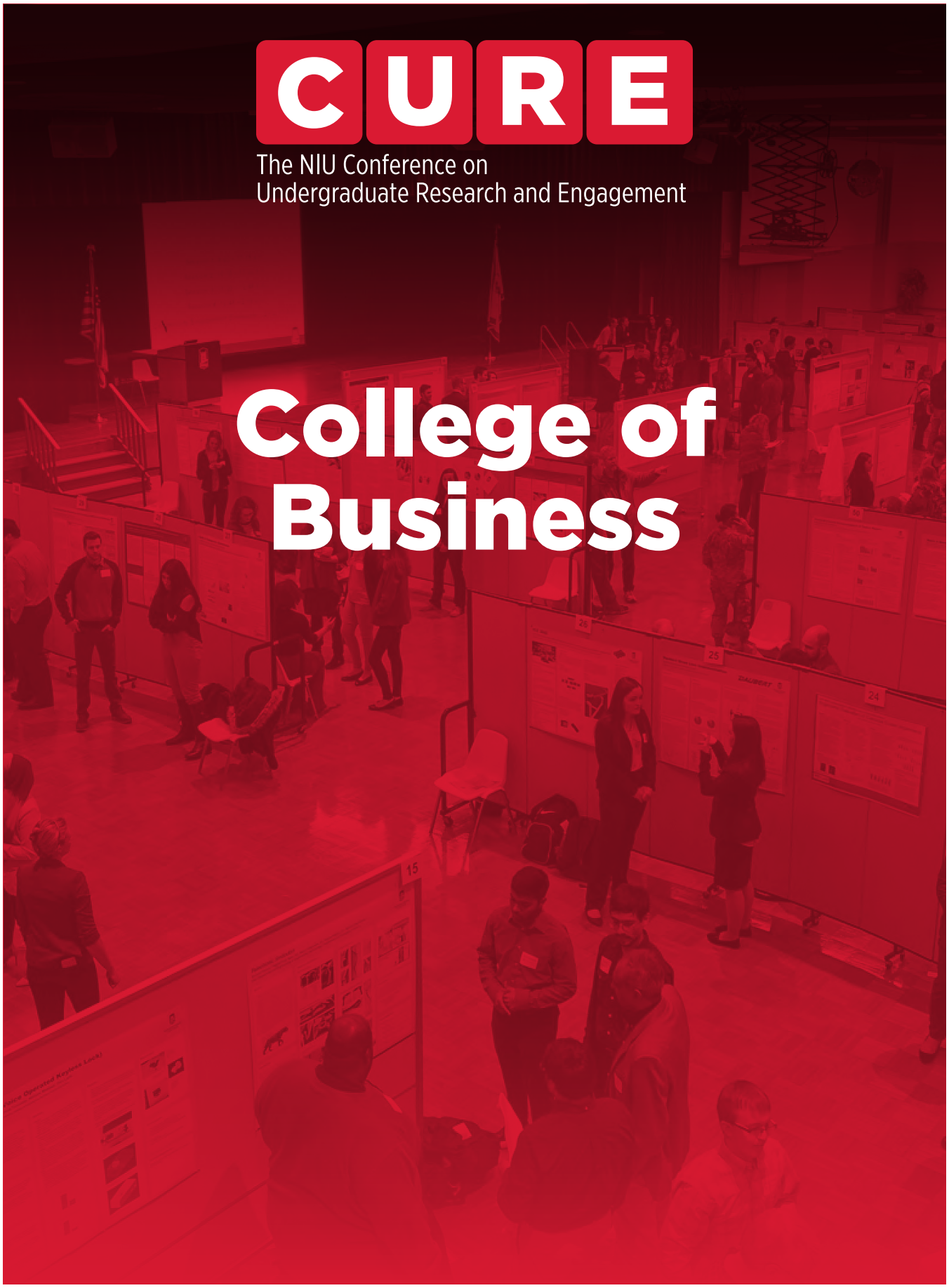
College of Business



Undergraduate Research Opportunities in the College of Business and What They Look Like

Presenter(s): Matthew Tangorra
Faculty Mentor(s): Andrea Radasanu
Honors Capstone

This project is part of the Knowledge Creation exhibit at CURE, which takes stock of how undergraduate research is perceived in different disciplines. For this investigation, the author conducted interviews with College of Business faculty and administrators and compared opportunities that exist in this college with those outside of the college.

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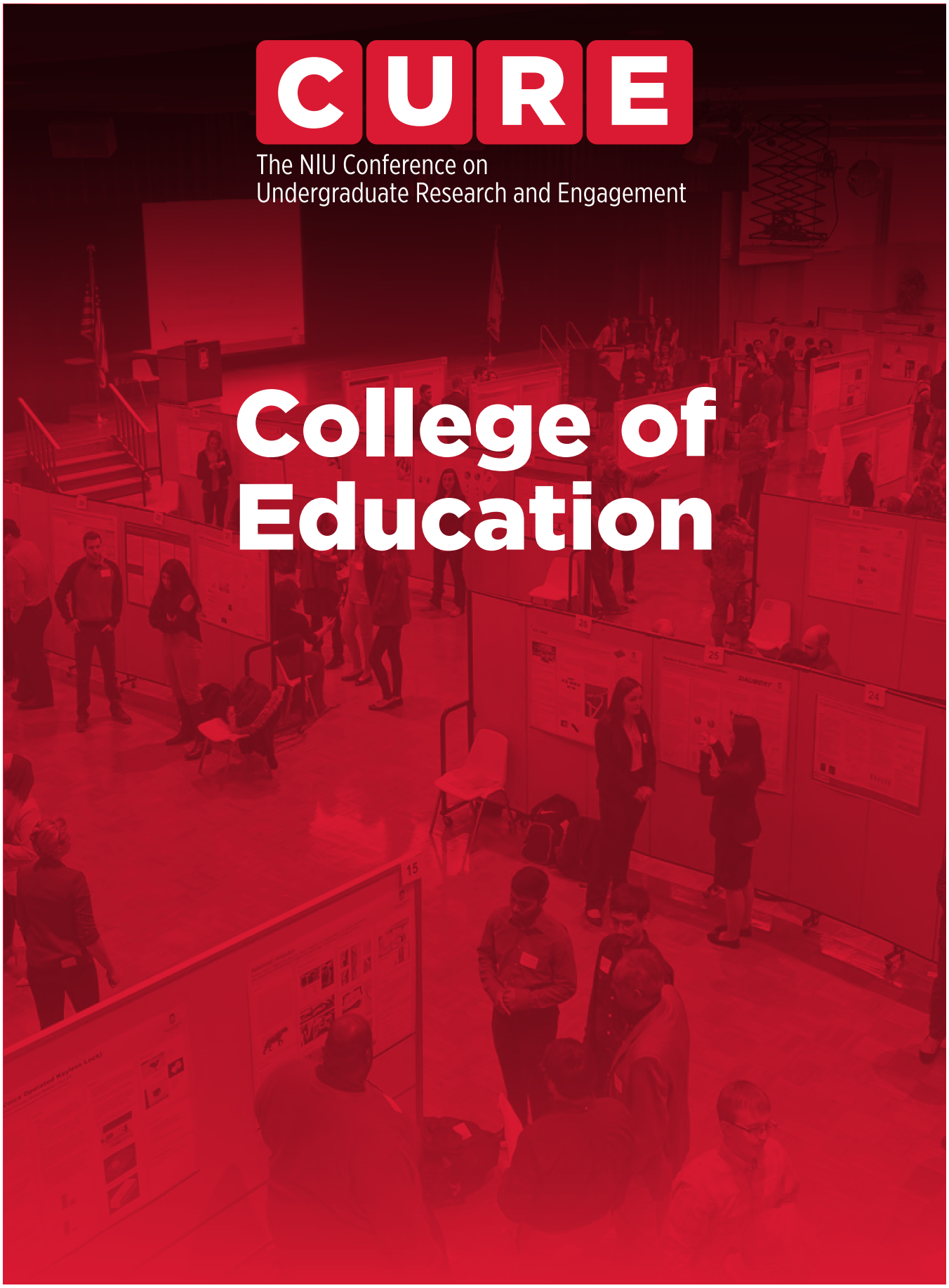
College of Education



A Descriptive Cross-Sectional Survey on Risk for Prediabetes Among NIU Staff and Students
Presenter(s): Tracy Bowen
Faculty Mentor(s): Sheila Barrett
Research Rookie

According to the CDC, the rate of obesity (defined as a BMI of more than 30%) of individuals over 20 years of age in the United States between August 2021 and August 2023 was 40.3%. The main goal of this study is to determine (1) if students are aware of the possible long-term health risks associated with obesity, (2) their perceptions on the obesity epidemic, and (3) ways in which they would be willing to accept help to reduce their risk of having a long-term health problem. Participants were asked to complete an online Qualtrics survey of 42 questions focusing on their perceptions on obesity and related health risks, and their preferred methods of prevention and treatment.

Validation and Inter-Device Reliability of the OTBeat BurnTM Monitor to Estimate Heart Rate During Exercise
Presenter(s): Matteo De Leon
Faculty Mentor(s): Clayton Camic
Independent Study

The purpose of this study was to determine the accuracy and reliability of a fitness heart rate (HR) monitor during cycle ergometry. 20 male volunteers completed a test to exhaustion on a cycle ergometer. A fitness HR monitor was placed on the forearm and upper arm of each subject with an electrocardiogram (ECG) used as the criterion. Heart rate was recorded every 30 seconds and averaged across each two-minute stage. The accuracy of each monitor was assessed through mean absolute percent error (MAPE), simple linear regression, and Bland-Altman plot. An intraclass correlation coefficient (ICC) was used to assess inter-device reliability. MAPE (± SD) values were 0.9 (± 0.6) % and 0.8 (± 0.5) % for the forearm and upper arm HR monitors, respectively. The ICC for inter-device reliability between the forearm and upper arm monitors was R = 0.999. Our findings indicated the fitness HR monitors placed on the forearm and upper arm provided highly accurate and reliable values when compared to ECG across exercise intensity.

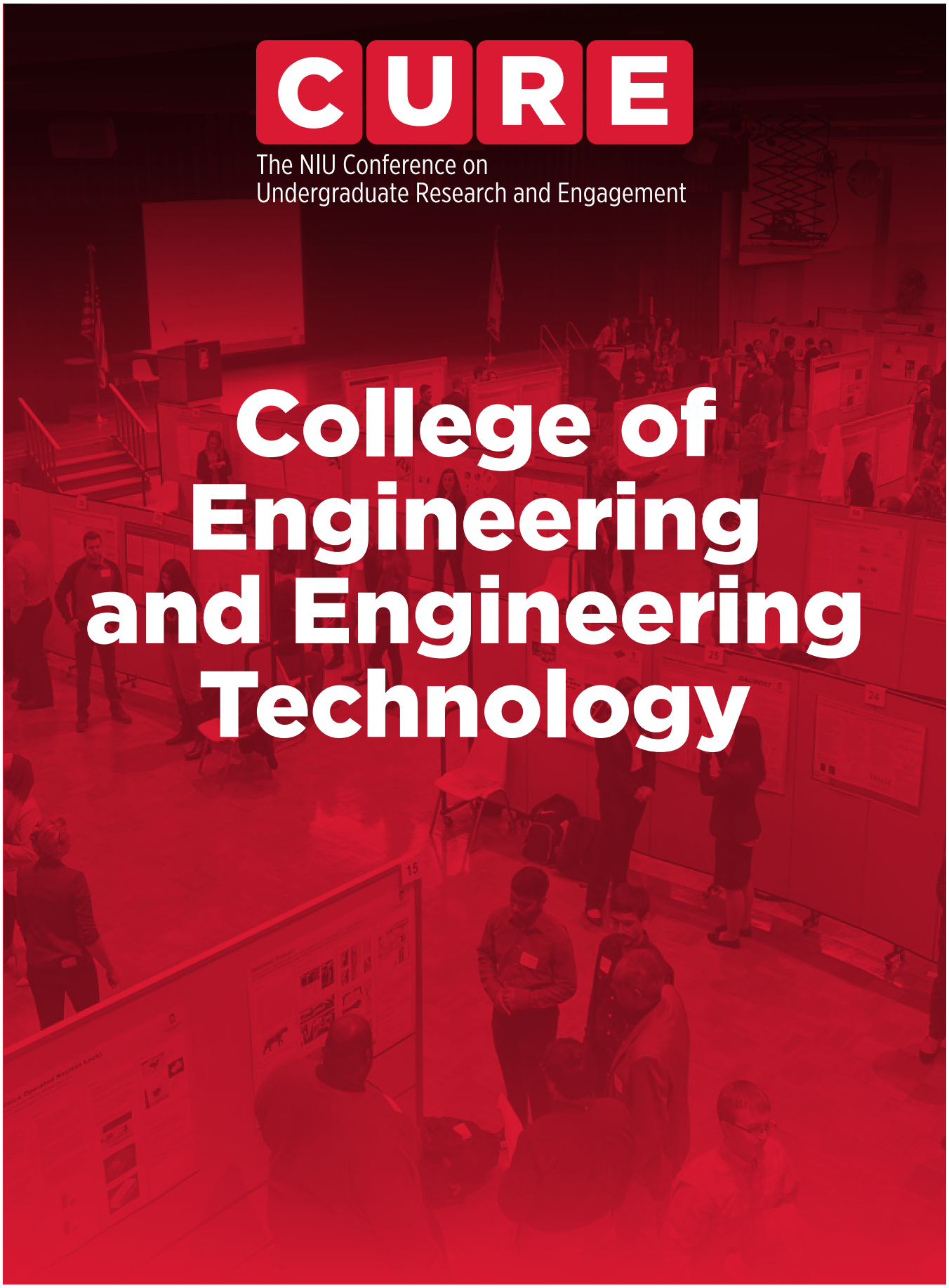
Federalism in Education
Presenter(s): Alexis Koehl
Faculty Mentor(s): Arielle Cassiday
Class Project POLS 100

The focus of this project is to analyze the impact of federalism on education, highlighting important legal precedents and federal policies that have significantly impacted state-level education systems. While this project was undertaken prior to the Trump administration efforts to dismantle the Department of Education, the relevance of the topic is heightened as a result.

Books: The Dying Art in Education

Presenter(s): Evelyn Orellana
Faculty Mentor(s): Melanie Koss
Diversity, Equity and Inclusion
Honors Capstone

Reading is a core subject in any child's educational experience. What is the impact of the book ban for future generations? This project will delve into the possible consequences and options for resistance.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College of Engineering and Engineering Technology

Energy and Sustainability for Montgomery Hall
Presenter(s): David Balderas, Benjamen Druse, and Jared Rivera
Faculty Mentor(s): Ji-Chul Ryu
Senior Design Project

This project involved the conduction of an energy audit on Montgomery Hall, which is home to the NIU's Department of Biological Sciences. An energy audit employs energy usage data to generate an image of the building's energy usage in the form of a metric called Energy Usage Intensity (EUI). The EUI allows for the creation of a benchmark to apply to comparable buildings and gives an indication of whether the building is consuming energy efficiently relative to like structures. Montgomery Hall was found to have a very high EUI, far above similar buildings. Following the establishment of the benchmark, a list of Energy Conservation Measures are pursued to facilitate greater energy usage efficiency and a monetary return on investment. These measures include updates to lighting, HVAC and Building Automated Systems, lab hoods, and pipe insulation.

All Printed, Low Temperature Processed Organic Electrochemical Transistors for Sensing Applications
Presenter(s): Austin Biel
Faculty Mentor(s): Venumadhav Korampally
Student Engagement Fund

Organic electrochemical transistors (OECTs) have emerged as promising candidates for chemical and biological sensing due to their high transconductance, enabling sensitive detection of target analytes. Unlike traditional field-effect transistors, OECTs operate in aqueous environments, making them particularly well-suited for biosensing applications. In our lab, we are developing fully printed OECTs using screen printing, a scalable and cost-effective fabrication method that allows for flexible and disposable sensor designs. By optimizing the electrode and device layout, choice of conductive and semiconducting inks, as well as electrolyte formulations, we aim to enhance the device's stability and sensitivity. These printed OECT sensors can be adapted for various applications, including healthcare diagnostics and environmental monitoring. Our approach leverages the inherent advantages of OECTs, such as their ability to amplify small biological and chemical signals, to create highly responsive and low-cost sensing platforms. This work advances printed electronics toward practical, real-world sensor deployment.

Vespamode, 71 North
Presenter(s): Brayden Blomer, Daniel McSweeney and Derek Richardson
Faculty Mentor(s): Sachit Butail
Senior Design Project

Our team set out to develop a mechanical motion simulator to replicate the experience of driving a Vespa, enhancing player immersion through realistic lean motion. Extensive research was conducted on existing products, exploring various design approaches and

analyzing the typical lean angles of motorcycles. Initial prototypes constructed from wood allowed for the evaluation of this research and general rider feel. Based on these insights, a metal frame with integrated springs was fabricated, with the spring constant determined from the forces experienced during simulated rides. The result significantly improved gaming experience with responsive and realistic motion feedback. The modular design also supports future enhancements, such as actuator integration, to induce lean motion more accurately using in-game physics data outputs.

Vision Guided 6 DOF Robot Arm
Presenter(s): Amit Chaudhary, Harshil Kaneria and Kenneth Kramer
Faculty Mentor(s): Ji-Chul Ryu
Senior Design Project

This 6-DOF robot arm with a gripper is designed for autonomous color-based sorting and offers a low-cost solution for industrial automation. Powered by a Raspberry Pi, it uses an “eye-on-hand” camera–mounted directly on the robot’s end-effector– with an OpenCV-based vision program to detect and classify RGB-colored blocks in real time. The arm, 3D printed with PLA, is driven by six servo motors controlled via a Pololu servo controller. With real-time feedback, it ensures precise pick-and-place operations, enhancing efficiency and accuracy. Developed on a budget of under $500, it provides an affordable alternative to commercial cobots for warehouse automation, material handling, and quality control. The system prioritizes safety by operating at controlled speeds and minimizing collision risks. Future improvements include integrating machine learning for enhanced object recognition and expanding its adaptability to handle diverse items, making it a scalable and practical solution for industrial applications.

Self-Balancing Robot: Programming an ESP32 Using IMU Feedback
Presenter(s): Ally Coker
Faculty Mentor(s): Brianno Coller
Research Rookie

This research project focuses on programming an ESP32 microcontroller for the purpose of building a triangle-shaped robot that balances itself on one of its corners. The project was inspired by a YouTube video posted by content creator Rem-RC. The ESP32 microcontroller is connected to an inertial measurement unit (IMU) which continuously measures how far the robot is leaning to the left or to the right of the desired orientation. The program written for this project then determines how much torque the on-board electric motor should provide to spin a reaction wheel. When the motor turns the reaction wheel, it provides a counteracting twisting action to the rest of the robot in the opposite direction that it can use to upright itself. By constantly monitoring the lean and taking immediate corrective action, the robot can balance itself. This process is called feedback control, which plays an important role in modern technology.

Analysis of Brain Signals Using Machine Learning Algorithms
Presenter(s): Maria Corzo Roberti
Faculty Mentor(s): Kyu-Taek Cho
Student Engagement Fund

This study analyzes brain activity using signal processing and machine learning to understand neural responses during various tasks. Brain wave data is collected via a headband sensor and preprocessed using Python-based open-source tools, including MNE, Scikit-Learn, SciPy, NumPy, and Pandas. Signal processing techniques refine the data by reducing noise, and machine learning models are then developed to classify and interpret brain activity associated with different tasks. By identifying patterns in neural responses, this research provides insights into the relationship between cognitive performance and brain signals. The findings may contribute to advancements in fields such as brain-computer interfaces, cognitive research, and education, enabling improved learning methods and assistive technologies.

Brain-Controlled Motorized Wheelchair: Enhancing Mobility Through BCI Technology
Presenter(s): Joseph Cuprak, J.C. LaBarbera and Nick Summerfelt
Faculty Mentor(s): CS Nam

Brain-Computer Interfacing (BCI) is an emerging technology with a wide range of useful applications. In our research, we have focused on medical applications, motorizing a standard wheelchair to enable EEG-based BCI control. Our wheelchair enables individuals to control their direction purely by thought, without requiring the use of the arms or hands, making it promising for cases of quadriplegia or atrophy.

Centrifugal Pump Impeller Optimization
Presenter(s): Sophia Durbin, Susie Johnson and Thomas Lulinski
Faculty Mentor(s): Kyu-Taek Cho
Senior Design

Centrifugal pumps are used in aerospace applications to help deliver jet fuel to the engine in an aircraft. They function as “boost pumps” that create an initial pressure rise to feed to a main fuel pump. This project involves computational fluid dynamics analysis of a centrifugal fuel pump in ANSYS CFX. Simulations of 13 different impeller geometries of varying wrap angle, discharge height, and constant trailing edge length are analyzed. Key results from the simulation include pump pressure rise, efficiency, and cavitation. Minitab statistical software is used to systematically analyze the results from the different impellers and provide a new optimal geometry from these specifications. Implementing the results of the design of experiments process for optimization of aerospace components with CFD can improve fuel efficiency and contribute to lowering carbon emissions in aircraft.

Investigating the Impact of Generative AI Training on Human-AI interactions
Presenter(s): Kellisyn Gersich
Faculty Mentor(s): Jaejin Hwang and CS Nam

This study aims to explore how different training methods affect Human-AI interaction (HAI) in tasks with varying levels of complexity and creativity. How does training in Generative AI impact HAI, and how do factors like task difficulty and an individual's personality and AI usage play a role?
For this study thirty undergraduate students will be split into three groups. Each of these groups will go through a different training plan, including passive, active and no training. After this training, participants will complete three tasks with varying levels of complexity and creativity. While completing the tasks, participants performance, satisfaction, eye movements, and text logs will be measured and analyzed. The results of this study could lead to improvements in AI training programs and help make AI tools more effective for different users.

Feasibility of Robotic Guide Dogs in Replacement of Traditional Guide Dogs
Presenter(s): Han Ju
Faculty Mentor(s): Trude Jacobsen Gidaszewski and Nicholas Pohlman
Research Rookie

Guide dogs provide essential mobility support for visually impaired individuals. Breeding, raising, and training a single guide dog, however, can cost over $50,000 and take up to 18 months. Despite their benefits, only about 5% of legally blind individuals utilize guide dogs. This study explores the feasibility of robotic guide dogs as an alternative platform, focusing on key requirements: navigation efficacy, and human-machine interaction. Through collaboration with blind professionals, we identified non-negotiable user needs and conducted controlled simulations comparing robotic and traditional guide dog navigation. Future work plans include design and fabrication of a prototype harness mounted to a robotic dog to act as a guide. Preliminary results indicate potential for robotic guide dogs with a new the harness that manages mobility while reducing stress on the visually impaired user. Further research is necessary to refine intelligent disobedience and voice assistance capabilities, ensuring a safer and more intuitive user experience.

Electron Beam Irradiation for Water Treatment of Per- and Poly-fluoroalkyl Substances (PFAS)
Presenter(s): Caleb Maue, Scott Mueller and Coltin Prentice
Faculty Mentor(s): Eric Lee
Senior Design

Per- and poly-fluoroalkyl substances (PFAS) have been widely used but are now considered a water contamination risk. Fermi National Accelerator Laboratory's A2D2 group has demonstrated that passing water through electron beam radiation can destroy PFAS contamination. The purpose of this project is to develop a process to scale the system for bulk water treatment. The key to scaling this concept is efficient

radiation usage, ensuring that all water receives only the minimum dose. Software was developed for this purpose consisting of a computational fluid dynamics model (CFD) in COMSOL, which calculates particle trajectories through the radiation area. A MATLAB script integrates the radiation dose of these particles and statistical analysis is performed to evaluate the radiation utilization efficiency. These models are validated with a flow test where colored dye is injected and optically tracked, and radiation dose by testing under e-beam to measure degradation of a PFAS analog.

Bio-inspired Sampling of Aquatic Microorganisms
Presenter(s): Boga Mzila-Ndlovu
Faculty Mentor(s): Sachit Butail
Independent Study and Student Engagement Fund

Can a filtering device inspired by manta rays provide less drag and more efficiency for robotic sampling of aquatic microorganisms than zooplankton nets? Efficiently sampling invasive species like the spiny water flea (Bythotrephes longimanus) is crucial for Great Lakes conservation. Traditional sampling methods are slow and labor-intensive. This study proposes a bio-inspired solution: a filtering device for autonomous underwater robots, mimicking the manta ray's filter-feeding system. The design features gill-like slits, allowing water to pass while capturing flea-sized particles in a net. Computational fluid dynamics (CFD) simulations, flow-tank tests, and water tank sampling experiments were conducted. These evaluations aimed to assess the device's hydrodynamic performance and its effectiveness in capturing the target species, offering a potentially faster and less labor-intensive alternative to traditional methods.

Enabling Collaborative Vehicle Routing by Mechanism Design
Presenter(s): Jack Rissman
Faculty Mentor(s): Ziteng Wang
Student Engagement Fund

A fundamental question when looking at collaborative vehicle routing is whether the participating logistics providers will benefit from the coalition. These benefits can be in the form of cost reduction, efficiency improvements, environmental benefits, enhanced service levels, and room for innovation. This research aims to design an efficient mechanism for allocating cost savings in order to incentivize logistics providers to join the grand coalition. The research began with revealing Shapley value-based allocation and proportional allocation are not efficient because the core of the underlying cooperative game could be empty. Therefore, some outside source of support is necessary to enable the grand coalition. The next steps consist of optimizing the slack of each allocation savings to find a minimal value of necessary outside support. The research aims to find a mechanism to decide the outside support to better incentivize the collaboration of stakeholders. Results will be generalized to collaborative vehicle routing problems involving any number of logistics providers.

Optimizing Intake Manifold Geometry for Mass Flow Rate Enhancement in a 2005 Yamaha YZF-R6 Engine: A CFD-Driven Analysis
Presenter(s): Sam Schroeder
Faculty Mentor(s): Bobby Sinko
Research Rookie

Internal Combustion Engines function by converting chemical energy from fuel to mechanical energy through combustion in the presence of atmospheric air. Delivery characteristics of air and fuel to the engine are dictated by the Intake Manifold. This study aims to characterize the relationship between simulated Intake Manifold geometry and the performance of a 2005 Yamaha YZF-R6 engine. Using SOLIDWORKS Flow Simulation, transient computational fluid dynamics (CFD) analyses were conducted to model real-world engine conditions while running at 13,000 RPM. The Intake Manifold's geometry, particularly the plenum volume, runner length, and runner transition profiles, were iteratively modified. The key performance metric, air mass flow rate, was evaluated for each iteration. Preliminary results show that there is a relationship between air mass flow rate and the Intake Manifold geometry parameters plenum volume, runner length, and runner transition profiles.

Portable Human Powered Whirligig Generator
Presenter(s): Alex Schwarz
Faculty Mentor(s): Venumadhav Korampally
Research Rookie

Handheld power generators are essential in regions with limited electrical infrastructure. However, prevalent methods like hand cranks are physically strenuous and can limit sustained power generation. This research introduces a whirligig-based power generator as a more ergonomic and potentially efficient alternative. The design leverages the rotational inertia of the whirligig to achieve high spin rates, potentially reaching 100,000 RPM, with minimal physical exertion. This high rotational speed is crucial for maximizing current output and overall efficiency. The study focuses on optimizing the whirligig design for both current generation and portability. Key parameters under investigation include center hole placement, magnet configuration, and coil dimensions. The results of testing these parameters will determine the optimal configuration for an improved, user-friendly handheld power generator.

The Effectiveness of Kinesio taping for Pain Perception in Patients with Knee Osteoarthritis: A Topical Literature Review of Recent Randomized Control Trials
Presenter(s): Jayla Scott
Faculty Mentor(s): Ting Xia
Research Rookie

Kinesio tape as a therapeutic treatment option for knee osteoarthritis has gained increasing popularity. However, evidence of its effectiveness is limited. To examine the effectiveness of Kinesio tape in treating knee osteoarthritis, a topical literature review on related randomized control trials conducted in the last 10 years was carried out using

PubMed with following keywords: Kinesio tape, Knee Osteoarthritis, and exercise. The search yielded nine results. A total of 658 patients, with mean percentage of 58 % female participants across all studies, and an average age of 50.52. The overall conclusion of these studies showed no significant improvements in using Kinesio to reduce pain in patients with knee osteoarthritis. There was an indication, however, of improved proprioception and mobility as secondary outcomes in these studies. Future studies may focus on the use of Kinesio tape for the management of knee osteoarthritis.

Estimating Pedestrian Crossing Times at Scramble Crossings via Machine Learning and Agent-Based Modeling
Presenter(s): Sho Takami
Faculty Mentor(s): Kyu Cho
Honors Capstone

Scramble crosswalks differ from conventional crosswalks in their ability for pedestrians to cross diagonally. This research compares the average crossing times in the two crosswalk configurations. It also investigates the walking behaviors that pedestrians adopt to produce the speediest times in each configuration. The most efficient combination of four walking behaviors is determined through an agent-based model. Additionally, mathematical formulae relating crossing times to each of the walking behaviors at both configurations are done through regression algorithms in machine learning. By combining these two approaches, it is revealed that pedestrians must adopt a relaxed walking style to make each crosswalk configuration as efficient as possible. It is also revealed that of the two configurations, scramble crosswalks lead to lower crossing times.

Frequency Domain Study of Battery Health Characteristics
Presenter(s): Aditi Venkatesh
Faculty Mentor(s): Donald Zinger
Independent Study and Student Engagement Fund

With innovations in electronics, automobiles, and energy storage, there is an increased need for optimized Lithium-Ion batteries. However, understanding of a batteries performance in different conditions is necessary to achieve this. One technique used is Electrochemical Impedance Spectroscopy (EIS), which studies electrochemical systems by measuring the current response to an applied sinusoidal voltage at different frequencies. EIS provides information about the internal processes and properties that affect its operation. This was done on a variety of batteries with different nominal voltages, capacities, and states of charges. It's shown that a lower state of charge for any nominal voltage causes the battery to have an increase internal resistance.

Microfluidic Diode Valves for Point of Care Diagnostics
Presenter(s): Gracia Watson
Faculty Mentor(s): Venumadhav Korampally
Student Engagement Fund

This study looks at how microfluidic diode valves can be used to create point of care (POC) testing devices with similar efficacy to PCR tests. The goal is to develop POC testing devices capable of performing more complex detection methods. The devices are composed of an inlet and drain made of conjugate pad with a channel in between, which are then covered by mylar on the top and bottom. A major part of this research is examining the feasibility of scalable time delays in the channel, which help control the timing of reactions. Preliminary results show that while it is possible to create them, keeping them consistent is challenging. Further analysis will be presented, including steps being taken to help improve the reliability of these time delays, as well as what it could mean for the future of POC testing in a resource limited setting.

Wave Propagation in Aluminum-Steel Cylindrical Structures Under Dynamic Impact: A Mathematical and Numerical Analysis
Presenter(s): Ryan Welch
Faculty Mentor(s): Jenn-Terng Gau
Research Rookie

This research investigates how elastic waves propagate through a structure comprising an aluminum cylinder in contact with a steel cylinder. The goal is to understand how the wave propagates in the aluminum and steel cylinders once one of them is hit by a dynamic impact. To achieve this, we will develop a mathematical model to predict the displacement fields of solid materials under the application of an impact force. This model will enable the numerical simulation of composite materials under dynamic impact. This research has practical applications in structural engineering, sports armor, non-destructive testing, and potential defense applications, among others.

Reducing Noise, Enhancing Life: Signal Processing in Neonatal Care
Presenter(s): Caleb Wyssbrod
Faculty Mentor(s): Lichuan Liu
Research Rookie

Signals are all around us. We constantly interpret them without consciously thinking such as turning toward the sound of our name or showing a reaction to a baby's cry. Anti-noise technology can be used to reduce unwanted sound by using a microphone to capture the incoming auditory wave in which the resulting signal waveform is collected in the time domain. Then adaptive signal processing techniques can be used to generate the anti-noise which has the same amplitude but opposite with phase. Therefore, undesired noise is reduced physically. In neonatal intensive care units, newborns who experience higher sound levels tend to suffer from sleep disturbance, behavioral changes, language development issues, and up to 52% hearing loss. By

applying anti-noise techniques, harmful noise can be reduced and make the environment safer for the young child.

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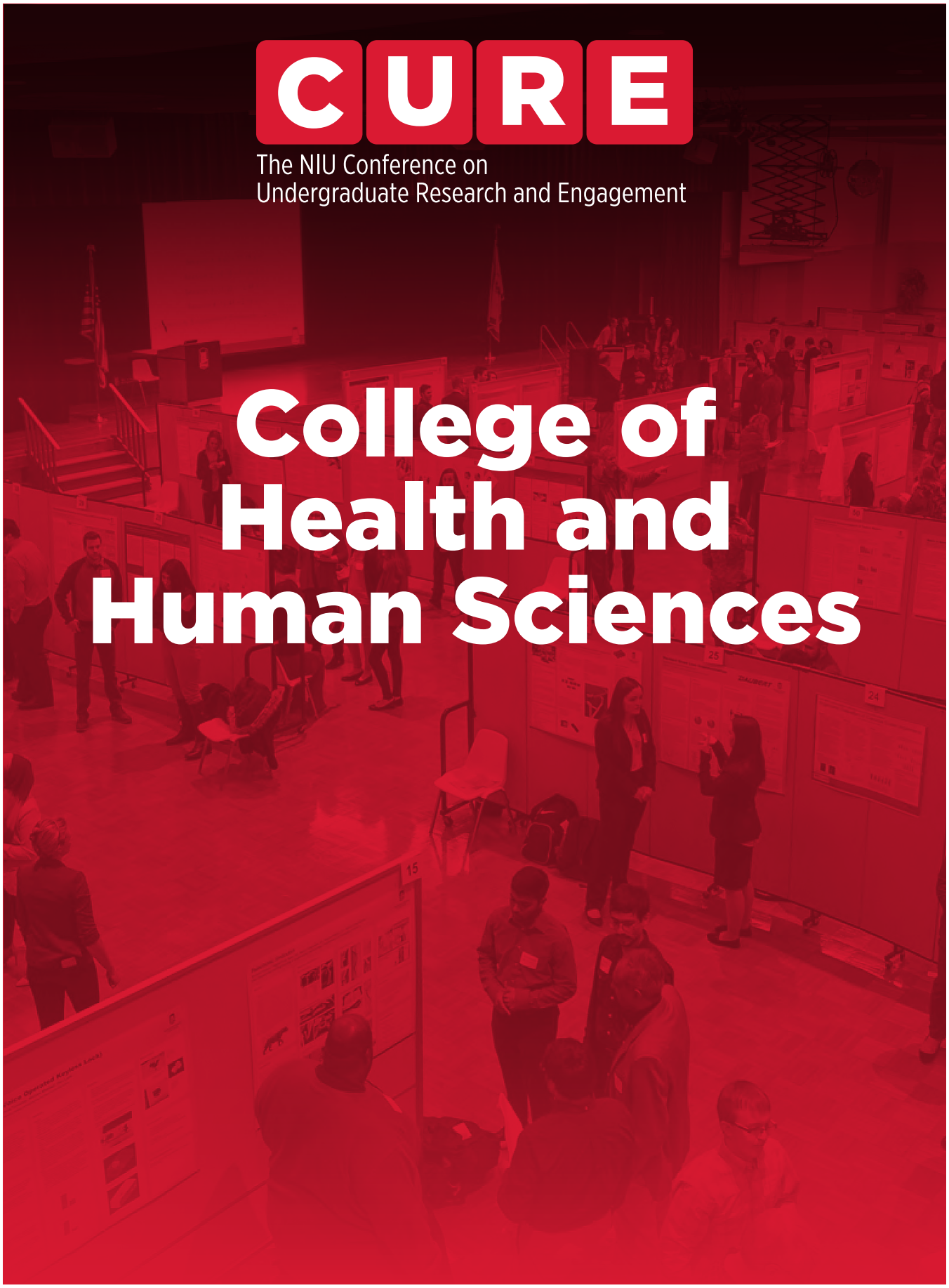

College of Health and Human Sciences

Early Detection of Sepsis
Presenter(s): Precious Aina
Faculty Mentor(s): Cristan Sabio
Honors Capstone

Sepsis is a life-threatening condition caused by an infection, which can lead to shock, SIRS, organ failure, and other serious complications. This literature review focuses on the early detection of sepsis, examining its early symptoms, the importance of prompt diagnosis, and the impact on patient safety and treatment. Several studies have utilized early warning scores (EWS) and machine learning models with patient information, vital signs, prehospital data, and physician assessments to identify patients at risk for sepsis. One study incorporated a Computerized Clinical Decision Support System (CCDDS) to alert healthcare teams about the risk of sepsis. The studies highlight significant variability and the need for improved sepsis detection tools. Early intervention can greatly reduce the morbidity and mortality associated with sepsis, directly benefiting patient safety and health. By detecting sepsis early, healthcare providers can also reduce the costs associated with this life-threatening condition, as well as lessen the emotional and physical toll on patients and their caregivers.

Nicotine Education for Junior High Students
Presenter(s): Katie Ashton
Faculty Mentor(s): Eleanor Evins
Honors Capstone

This project explores how to prevent nicotine use, particularly e-cigarette use, among adolescents. Nicotine use has been on the rise since e-cigarette devices have been created. This makes it convenient to use nicotine products rather than going outside to light a cigarette. Nicotine use in adolescents is increasing as it is more convenient to use, and many may not understand the adverse health effects of using these devices. Any nicotine use can cause brain, heart, and lung damage. This project explores the factors that encourage adolescents to use nicotine such as the variety of flavors that e-cigarettes are made of and peer influence. It also investigates what can be done to prevent adolescents from using nicotine products such as educational programs in schools. By identifying effective prevention strategies and understanding the psychological and social influences this project will provide insight to how nicotine use can be reduced in adolescents.

Breastmilk Feeding Awareness Level (BAL) Measurement Tool
Presenter(s): Kara Carr
Faculty Mentor(s): Stephanie Uhr
Diversity, Equity and Inclusion

Measurement tools give healthcare workers important insight into a patient's awareness level, guiding healthcare workers in patient education. Breastmilk feeding is a heavily researched and discussed topic within the obstetrics community, but within the patient population, it may not be addressed before their first experience. This research study

aims to better understand a person's awareness of breastfeeding behaviors and how they may determine their breastmilk feeding awareness level. With this study, the BAL(Breastmilk Feeding Awareness Level) tool was refined, tested, and validated by exploring the phenomenon of breastmilk feeding awareness in two phases. Phase one qualitatively evaluated the BAL scale utilizing focus groups in the NIU community. Phase two quantitatively pilot-tested the BAL within the same population to determine psychometric analysis. The ongoing final stages of the study consist of a comprehensive literature review, data analysis, and manuscript creation.

Men's Preconception Health: Impact on Pregnancy and Awareness Strategies
Presenter(s): Kara Carr
Faculty Mentor(s): Jennifer Sharp
Honors Capstone

Men's preconception health plays a critical factor in pregnancy outcomes, but it remains under-talked about in healthcare discussions and education. While women receive guidance on nutrition, lifestyle, and medical conditions affecting fertility, men often lack similar support. This project explores the impact of limited awareness and engagement in men's preconception health through a literature review, community surveys, and healthcare professional interviews. Preliminary findings suggest that cultural norms, healthcare priorities, and lack of accessible education contribute to this gap. By identifying these barriers, the research aims to develop strategies to increase awareness and encourage a more inclusive approach to preconception care. The ultimate goal is to integrate paternal health into routine preconception counseling and public health initiatives to improve pregnancy outcomes.

A Pathway to Commitment: Exploring the Steps and Stages Proceeding Commitment and Marriage
Presenter(s): Kalilah Chears, Pelin Keceli, and Jordyn Saddler
Faculty Mentor(s): Scott Sibley

Many emerging adults utilize this time for romantic and sexual exploration with ambitions and expectations for marriage. Scholars have argued that the pathway to marriage has become increasingly ambiguous with fewer clear markers of relationship progression and commitment. Research has indicated that having these important conversations about clarifying the relationship has resulted in emerging adults remaining in long-term, committed relationships versus relationship ambiguity. Unfortunately, current ambiguity in romantic relationship transitions may make it difficult for partners to agree on when the relationship began due to multiple types of soft beginnings during which commitment is not clarified.

Fuel for Fitness: A Tabling Demonstration
Presenter(s): Scott Conro, Catherine Newberry, Steffi Stefanova
Faculty Mentor(s): Melani Duffrin
Class Project NUTR 410

Given that accurate nutrition knowledge amongst college students is inadequate, the need for education is urgent. This group project examines the nutrition knowledge of NIU students. A survey was conducted amongst students who attend the Rec Center to determine their pre/post workout nutrition knowledge and behaviors. Results indicate a lack of pre-workout consumption. Based on our findings, our behavior change goal was to educate and encourage students to consume pre-and-post workout snacks. The tabling demonstration will be conducted on April 10, with results to follow.

Harmonic Healing: Exploring Music as a Therapeutic Resource
Presenter(s): KaLilah Chears
Faculty Mentor(s): Mary Doherty
Honors Capstone

Mental health concerns among college students are increasing, especially in the post-Covid pandemic era. These issues could negatively affect students' academic, social, and emotional well-being. Additionally, research illustrates that there are accessibility challenges for students who seek traditional counseling resources; campuses are struggling to meet this rising demand. The authors' background in music ensembles inspired an exploration of music as an informal therapeutic resource. This systematic review investigates one main question: How can an alternative mental health resource such as music serve college students experiencing barriers to traditional mental health resources? Initial findings suggest active and passive music strategies can be promising avenues for low-intensity mental health concerns in students. Implications of this review will be shared with students in the campus community to promote emotional well-being and social connection through music.

The Study of Black Hair: Oppression in the Mainstream Media
Presenter(s): Kia Clair
Faculty Mentor(s): T. Ajewole Duckett
Diversity, Equity and Inclusion and Honors Capstone

Can I touch your hair? A seemingly harmless five-word question that so many African Americans know it too well. To understand "Black Hair" you must first understand the history. Prior to the diaspora of African people, African people took pride in their hair as a representation of their unique culture. African tribes would use hairstyles to indicate martial and social (rank/wealth) status, age, religion, and, most importantly, the geographical location of their tribe. As a direct result of slavery, Africans displaced from their homeland were stripped from their hair customs and forced to assimilate into a western society. Various modes of oppression (including Tignon and Jim Crow laws, colorism, and assimilation) played essential roles in informing the view of Black hair in mainstream media.

Healthy Eating in Campus Dining: A Tour to Identify and Learn Nutritious Foods in Dining Halls at Northern Illinois University
Presenter(s): Miya Clay and Paige Weidert
Faculty Mentor(s): Melani Duffrin and Julie Patterson
Class Project NUTR 409/410

Most freshmen in university lack the confidence and knowledge to create a healthy meal. An introductory survey was conducted and showed 56% of students of all years feel confident that they can build a healthy meal. A few students notably claimed that there were no healthy options available at the dining halls. Using the DESIGN framework and the reasoned action approach, this online tour aims to engage students in identifying what makes foods healthy and learning how to incorporate these foods into their diet. A survey was administered to determine confidence levels and eating patterns amongst students with a meal plan. A formative assessment amongst a student panel was conducted to determine the effectiveness of the video tour. The video tour supports healthy eating in dining and students' health and wellness more generally. Future adaptations can be made each decade to ensure relevance.

The Impact of Type 1 Diabetes on Pregnancy: Risks, Challenges, and the Role of Nursing Interventions
Presenter(s): Sydney Edwards
Faculty Mentor(s): Stephanie Uhr
Class Project NURS 317 and 319

Complications associated with pregnancy, such as preeclampsia, preterm birth, congenital abnormalities, and neonatal hypoglycemia, are more prevalent among women with Type 1 Diabetes (T1DM) than those without diabetes. Maintaining glycemic control during pregnancy is crucial but challenging due to hormonal changes and insulin resistance. Despite advances in diabetes care, unplanned pregnancies remain common, often due to inadequate preconception care, leading to poor maternal and neonatal outcomes. This literature review examines the risks associated with T1DM pregnancies, the significance of glycemic management, and the role of nursing in improving outcomes. Research indicates that nurse-led interventions, including glucose monitoring support, preconception counseling, and patient education, can reduce complications. However, gaps in standardized nursing protocols persist. Implementing systematic, evidence-based nursing care can improve pregnancy outcomes and reduce diabetes-related suffering. This review highlights the need for a multidisciplinary approach, where nurses collaborate with obstetric and endocrinology teams to enhance maternal and fetal health.

Edible Campus Meal-Prep Program: Designing a Nutrition Intervention for College Students
Presenter(s): Dawn Folliard, Jersey Lefaver, and Chloe Start
Faculty Mentor(s): Melani Duffrin
Class Project NUTR 409/410

This project focuses on curriculum development for the preexisting Edible Campus Meal-Prep Program. The current program allows students to prepare five meals for free each week for takeaway. The new curriculum incorporates nutrition education, grocery shopping and budgeting skills, and food preparation skills, with an emphasis on building healthy habits around constructing well-balanced meals on a college student budget. This is expected to save time, limit stress, and improve students' overall health and well-being.

Brain Activation in Balanced and Unbalanced Spanish-English Bilinguals during Conversational Speech
Presenter(s): Gia Gurgone
Faculty Mentor(s): In-Sop Kim
Research Rookies

Throughout the past two decades, there have been many research studies done on bilingualism and brain activation. However, few studies have examined how the level of fluency in a second language impacts brain activation. In this study, the brain activation was compared between monolinguals, balanced bilinguals, and unbalanced bilinguals, specifically for the languages of Spanish and English. 17 participants completed two conversational speech tasks for five minutes each. For all bilinguals, one task was completed in English and one task was completed in Spanish. Data was collected using a functional near-infrared spectroscopy (fNIR) machine. Data was then refined and analyzed for each participant and compared among the three groups. It is hypothesized that unbalanced bilinguals will have a greater mental load than balanced bilinguals and monolinguals. The information gained from this study could help inform future research and practice in the communicative disorders field.

Overturning Roe v. Wade and Pre-medical Students' Views and Medical School Choices
Presenter(s): Emma Hastings
Faculty Mentor(s): M. Courtney Hughes
Research Rookie

This study investigates the relationship between personal views on abortion and medical school choices among pre-medicine students following the overturn of Roe v. Wade (1973) in the Dobbs v. Jackson Women's Health Organization (2022) supreme court case. A survey was sent to the two largest four-year schools in each state and WA D.C., except for Wyoming, which has only one four-year school. There were 167 completed responses from 20 states, and included collected demographic data, political affiliation, intended medical specialty, and personal stance on abortion. The results

showed that students who believe abortion is acceptable and should be legal were significantly less likely to be willing to attend medical school in a state where abortion is illegal except to preserve the life or health of the mother.

Growing Deeper Roots: Investigating Perennial Crops to Improve Sustainability
Presenter(s): Taylor Hennessee
Faculty Mentor(s): William Martin
Community Engaged Research

The world's food system currently relies on massive annual efforts. Through input of fossil fuels in spring, summer and fall, field crops are planted, maintained and harvested leaving a massive carbon footprint and an unsustainable ecological impact to water and soil. The Land Institute is leading research into perennial crops that break this annual cycle thereby reducing frequency of crop planting and maintenance. Water use efficiency, soil health, and financial resiliency of agricultural cropping systems are concurrently improved. NIU partners, the Biology Department and Edible Campus, have joined the Land Institute's citizen science effort to expand crop knowledge in three target crop classes (sunflower, lentil and flax). This research, established in summer 2024 in plots to the west of Montgomery Hall, collects and contributes data critical to the success of the Citizen Science, Perennial Atlas project.

The Effects of Nail Enhancements on Hospital Acquired Infections
Presenter(s): Sydney Johnson
Faculty Mentor(s): Cristian Sabio
Honors Capstone

Hospital-acquired infections (HAIs) are a significant concern, with studies showing that they affect approximately 1 in 31 hospital patients daily. These statics highlight the concern for patient safety. This project explores how institutional policies around nail enhancements affect patient health outbreaks in various hospital settings, the effectiveness of registered nurses maintaining hygiene while wearing nail enhancements, and the impact of educational interventions in promoting proper nail hygiene. Registered nurses were surveyed through a Qualtrics survey that was posted on various Facebook group chats dedicated to registered nurses. Results from the survey will be used to discuss educational interventions on proper nail hygiene for registered nurses working in a hospital facility.

More Than a Disease: A Qualitative Study on Mental Health in Cancer Care
Presenter(s): Imani Jones
Faculty Mentor(s): Cristan Sabio
Community Engaged Research and Honors Capstone

This study explores the mental health outcomes of cancer survivors after treatment and how their views on survivorship affect their well-being. The main research question of the project is: What mental health challenges do cancer survivors face, and how do their perceptions of survivorship impact their overall well-being? A focus group with cancer

survivors was conducted to gather insights into their mental health experiences during and after treatment. Early data analysis shows that an effective and empathetic healthcare team is key to the wellbeing of survivors.

Expanding "Brain Games": What Have We Learned from a Program Designed to Support Healthy Brain Aging for Older Adults?
Presenter(s): Ella McKinney
Faculty Mentor(s): Jamie Mayer
Community Engaged Research, Honors Capstone and Independent Study

This study examined the feasibility and impact of "Brain Games," an intergenerational program providing brain health education and cognitive training to healthy aging adults in two DeKalb senior living centers. This project explored whether the effects of "Brain Games" were tempered by demographic variables, including cognitive self-efficacy and socioeconomic factors. Participants received cognitive training and brain health education via "Brain Games," a small-group format (5-10 participants + 5 student volunteers) weekly (60 min.) over eight weeks. Outcome measures included the Brief Cognitive Assessment Test (BCAT) and self-efficacy questionnaires, administered pre- and post-course. The BCAT indicated no significant results. Questionnaires reported improvements in attitudes toward aging and metamemory, indicating higher satisfaction, attendance, and memory strategy usage rates particularly in the lower socioeconomic group. This study supports using this curriculum across various settings to improve external variables for optimal brain function. Future steps include adding monthly booster sessions and a multi-disciplinary approach emphasizing physical and cognitive exercise.

FoodMASTER: A Nutrition Workshop
Presenter(s): Anna Moore
Faculty Mentor(s): Melani Duffrin
Class Project NUTR 410

This nutrition workshop is based on the educational framework of The FoodMASTER Initiative, combining hands-on demonstrations and verbal nutrition education. The Barb City STEAM team will engage in identifying various vegetables and their nutritional benefits, along with participating in a hands-on nutrition science experiment that explores the process of creating an emulsion. The workshop supports the continuation of The FoodMASTER Initiative within after school programs in collaboration with the Barb City STEAM team. Information gathered from this workshop will contribute to a better understanding of the current nutrition knowledge of students in DeKalb, IL, particularly in grades 6-8.

The Effectiveness of Telehealth for the Management of Chronic Disease
Presenter(s): Mariam Odunewu
Faculty Mentor(s): Jennifer Sharp
Honors Capstone

Telehealth made a wide appearance in the medical industry during the Covid-19 pandemic due to the necessary decrease in physical interaction. It has continued to thrive and serve more patients since. The benefits of telemedicine include quick and reliable one-on-one sessions with a healthcare provider virtually and is overall less costly compared to in person visits. Seeing a medical provider online is helpful in aiding patient recovery and management of chronic diseases. It is used to improve the quality of life in the patients seen today. A literature review was conducted using databases such as PubMed and ScienceDirect. Papers that were included discussed whether telemedicine was effective in the case of recovery from a chronic disease. 15 reliable sources were included in this research review. Results concluded that telemedicine is an efficient and effective tool in the management of specific chronic diseases.

Remission of Multiple Sclerosis Symptoms in Pregnancy: A Neurological Mystery of Chronic Disease
Presenter(s): Brandon Olsen
Faculty Mentor(s): Stephanie Uhr
Honors Capstone

Multiple Sclerosis (MS) is defined as an autoimmune disorder of the central nervous system being attacked by the immune system leading to the destruction of the protective myelin cells around nerves. Pregnancy wages a high level of stress on the female body with changes in regulation of many body systems, stress is one of the major precursors to having a “flare-up” of symptoms of MS, and women are three times more likely than men to experience multiple sclerosis. Assumptions would suggest that pregnancy with MS would cause constant experience of symptoms including pain and loss of ability to use senses or movement. A literature review was performed to determine a clear picture of current research on the impact pregnancy has on multiple sclerosis. Studies have found that during pregnancy, women with MS can experience significantly less symptoms and “flare-ups” than they would while not being pregnant.

Separated: The Growing in Going
Presenter(s): Jacob Perez
Faculty Mentor(s): Deborah Koons-Beauchamp
Honors Capstone

Childhood divorce can have long-lasting effects on individuals, shaping their emotional development and perceptions of adversity. This study explores the resilience outcomes of adults who experienced childhood divorce by comparing those raised in varying parental structures. Utilizing qualitative research, data was collected through semi-structured interviews, allowing participants to share personal experiences. Data analysis focuses on key themes such as emotional development, stress management, and long-

term relationships. Findings suggest that while childhood divorce presents challenges, many individuals develop resilience shaped by social support, self-reflection, and adaptive coping. The study highlights differences in resilience-building across family structures. By examining these insights through a four-episode podcast, this research fosters public awareness and provides validation for individuals with similar experiences. Future research may expand these findings by exploring resilience interventions for children of divorce to support long-term well-being.

From Reach to Withdraw: Tracing Developmental Differences During String-Pulling Tasks
Presenter(s): Zoey Proper
Faculty Mentor(s): Allison Gladfelter and Douglas Wallace
McKearn Fellow

This study investigated two motor tasks which elicit behavior that relies on fine motor control and bimanual coordination. The string-pulling task, completed second, uses both hands to pull a string. The pantomime task mimics the string-pulling movement without string. Acquired and genetic mouse models of neurological conditions have been observed to disrupt the organization of string-pulling behavior; however, the neurotypical sequence of development associated with these behaviors has yet to be investigated. This study used a cross-sectional design to examine age-related changes in topographic and kinematic characteristics. Child and adult participants were recorded during each task. DeepLabCut was used to track hand position and movements were segmented into reach and withdraws. More group differences in performance were observed with the string-pulling task than pantomime, which suggests that goal-directed movement is sensitive to development differences. These results establish a foundation to evaluate translational models of developmental disability in fine motor control.

Navigating Politics and Public Health: Analyzing Health Perspectives, Political Identity, and Vaccine Views Among College Students
Presenter(s): Molly Schmidt
Faculty Mentor(s): Tomoyuki Shibata
Honors Capstone

Vaccine hesitancy remains a pressing public health challenge, with political identity playing a growing role in shaping health perspectives. This study investigates the relationship between political identity and vaccine attitudes among college students to better understand factors influencing hesitancy. A cross-sectional survey conducted at several universities collected data on demographics, political identity, trust in information sources, and vaccination attitudes. Quantitative analysis identified associations between political affiliation and vaccine hesitancy, controlling for variables such as religious affiliation and political engagement. Findings revealed politically conservative students expressed higher vaccine hesitancy, with trust in public health institutions and media sources varying across affiliations. Political engagement and religious affiliation also shaped health perspectives. Understanding these factors is essential for developing public health interventions and communication strategies that

address vaccine hesitancy and other public health concerns effectively in college-aged populations.

The Effects of Polycystic Ovarian Syndrome and Pregnancy
Presenter(s): Haylee Schultz
Faculty Mentor(s): Eleanor Evins
Honors Capstone

The purpose of this research is to investigate the effects of polycystic ovarian syndrome on pregnancy from a nursing standpoint. Nearly 5-10% of women in the United States are affected by polycystic ovarian syndrome during the reproductive years. This research aims to investigate how this condition impacts fertility and pregnancy risks. This initial research was completed through a review of existing literature accessed through databases such as CINNAHL and PubMed. Once all data is collected, the goal is to seek nursing interventions to lessen the effects of polycystic ovarian syndrome and increase positive pregnancy outcomes. This research is critical as there is a deficit in research regarding polycystic ovarian syndrome and how nurses can better support these patients.

The Lifelong Impact of Parental Mental Health on Children's Mental Health in Mid and Later Adulthood: A Systematic Literature Review
Presenter(s): Chloe Steffel
Faculty Mentor(s): Yujun Liu
Student Engagement Fund

Through reviewing and examining existing literature on parental mental health and children's mental health in mid and later adulthood, this project aims to examine two areas: (1) the various ways that parental mental health affects an offspring's mental health, and (2) factors that are associated with the relationships between parental mental health and children's mental health in mid to later adulthood. In terms of the scope, both the biological/genetic and environmental/social influences were included in this project to detect factors that play vital roles in contributing to the development of certain mental health disorders among children. These adverse exposures and mental health were further analyzed and applied to the development of mental health issues in mid and later adulthood. Through this project, readers will be informed of the potential factors that influence specific childhood adversities and mental health disorders which contribute to later cognitive decline, and readers will gain knowledge and understanding in controllable and uncontrollable factors across the lifespan.

The Psychological Effects of Domestic Violence and Nurse's Role
Presenter(s): Cindy Tran
Faculty Mentor(s): Eleanor Evins
Honors Capstone

This research highlights the significance of domestic violence and how the detrimental effects on psychological health can lead to negative coping mechanisms and severe

injuries that ultimately lead to death if unaddressed. Healthcare professionals as well as healthcare facilities have an important role in treating and identifying victims of domestic violence. This research seeks to answer the question, “Do individuals who experience domestic violence abuse have an increased risk of developing negative psychological health concerns and what is the nurse’s role in the care for these victims?” Through a review of literature accessed through databases such as EBSCO, there is evidence that domestic violence has prevalent correlation to depression, anxiety, substance abuse, and post- traumatic stress disorder. These key findings suggest that the severity of domestic violence can have long-term consequences and require effective interventions as well as proper training for early identification for healthcare professionals such as nurses.

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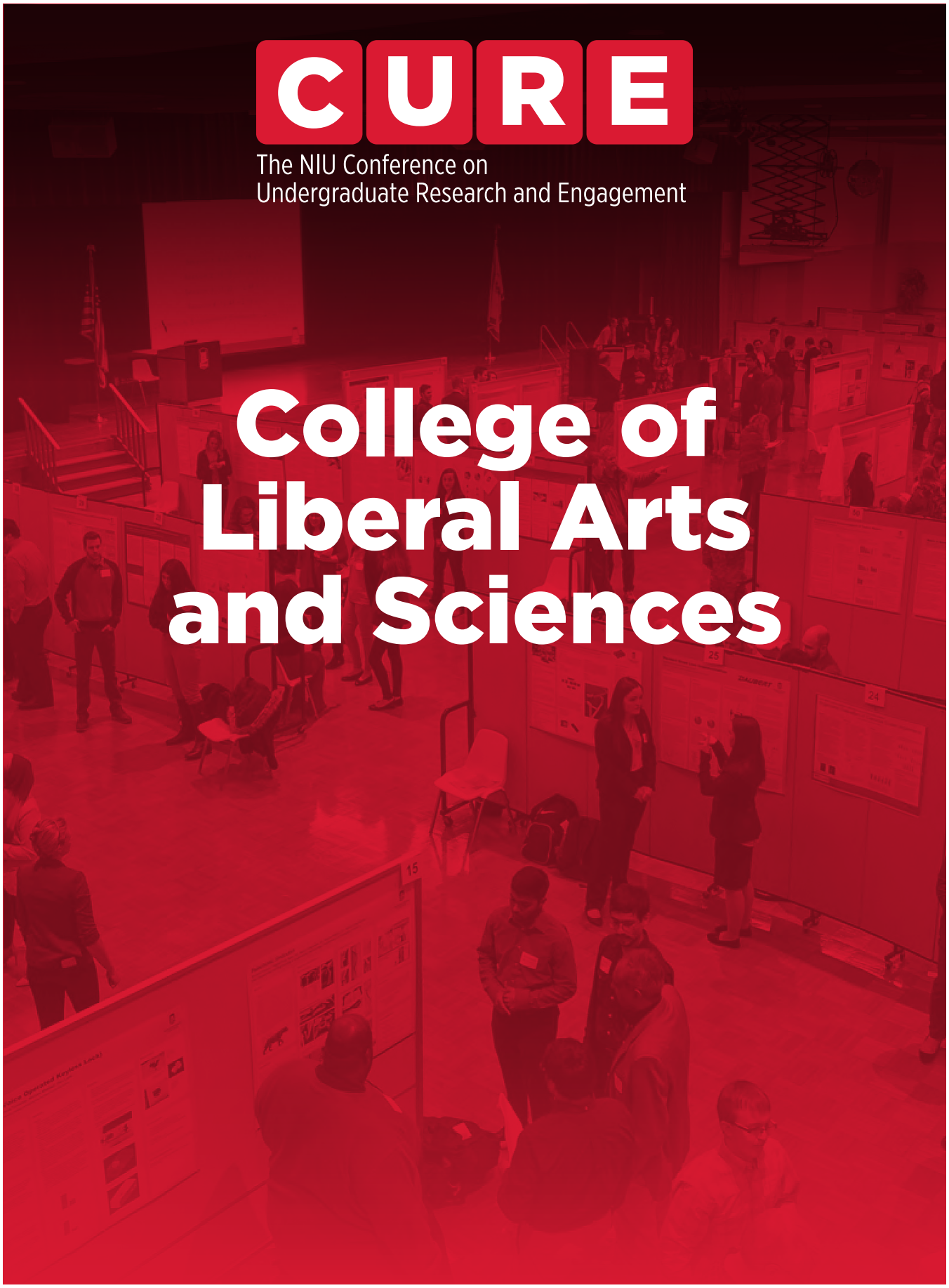

College of Liberal Arts and Sciences

Quantifying and Normalizing the RNA to DNA ratio among representative samples in the community
Presenter(s): Ally Abdallah
Faculty Mentor(s): Barrie Bode and Syed Hyder
Senior Thesis

Normalizing and quantifying the RNA to DNA ratio in wastewater samples processed in the King Fischer Apex lays the foundation for obtaining reliable and credible data for public health monitoring. By fostering consistent results from the King Fischer Apex, the RNA to DNA ratio can be normalized, accounting for any variations between the samples. To normalize this data, the results produced by the King Fischer apex need to be assessed for consistency and reliability. These results are then measured by utilizing the Qubit Fluorometer and Nanodrop where the RNA to DNA ratio is quantified. By obtaining a stable ratio, changes in viral shedding can be more accurately detected, allowing for a better comparison and more precise tracking between different viral strains. This ultimately provides a better refined and holistic picture that reflects the ambient viral pathogens in the community. Viral strains including SARS-CoV-2, Influenza, and RSV serve as the targets for the WWSL at NIU. With consistent normalization, true changes in viral loads are better identified across different locations.

Exploring Genotypic Variation in *Arabidopsis thaliana*: Implications for Future Environmental Stress Adaptations
Presenter(s): Ahmed Abdulaziz and Mohamad Ajaj
Faculty Mentor(s): William (Bill) Martin
Class Project BIOS 305

Arabidopsis thaliana, a model organism in plant biology and genetics, can offer invaluable insights into genetic mechanisms that allow plants to survive in extreme environments. This study investigated the phenotypic variation across 20 genotypes, including 10 wild-type and 10 mutant lines, subjected to two temperatures 20°C and 24°C. This research aimed to understand how genotypes and temperature interact to shape phenotypic traits such as rosette size, fruit count, and biomass. A randomized complete block design was utilized to minimize bias and assess how genetic variation influenced plant responses to thermal stress. The hypothesis proposed that temperature variation will affect mutant and wild-type genotypes differently, supporting previous research that certain knocked-out genes show altered physical expression under specific environmental conditions. By comparing genotypes, this research aimed to uncover how genetic mutations influence plants, contributing to the understanding of temperature-dependent phenotypic plasticity with implications for agriculture in a changing climate.

Restructuring Brand Identity and Commercial Growth
Presenter(s): Sergio Acosta
Faculty Mentor(s): Laura Vazquez
Diversity, Equity and Inclusion and Student Engagement Fund

The purpose of this project is to increase brand awareness and commercial success of the student independent film festival *Reality Bytes* by reinforcing its brand identity. This entails a process of increasing the appreciation of the art and power of film to communicate important human themes.

Small Insects, Big Impact: Bringing *Wolbachia* Research into the Classroom
Presenter(s): Zachary Adams, Angel Perez and Christopher Salgado
Faculty Mentor(s): William (Bill) Martin
Diversity, Equity and Inclusion

Wolbachia is a unique bacterium that lives inside many insects. To assess its prevalence in local insect populations, insects were collected and studied throughout the active insect season. Traps containing organic matter and yeast were deployed weekly to attract a diverse range of specimens. Collection times and locations were recorded, and a detailed catalog was maintained. The preserved specimens were then utilized in undergraduate biology courses at Northern Illinois University (NIU), providing students with hands-on experience in molecular techniques. DNA extraction and polymerase chain reaction (PCR) analysis were performed to detect the presence of Wolbachia, allowing students to develop practical laboratory skills while contributing to a broader effort to map the bacterium's distribution. This project adapted an existing research model to align with NIU's curriculum, integrating experiential learning with scientific investigation.

Mapping Changes in Bison Gut Microbiota Interactions Over Time
Presenter(s): Luke Ademoski
Faculty Mentor(s): Pallavi Singh
Student Engagement Fund

The gut microbiome is a living, changing ecosystem where microbes interact with each other and the host. This study seeks to map the change in interactions between microbes over time in wild bison gut from 2019 to 2021. Network analysis software SpiecEasi was used to generate significant correlations between microbes and track them over time. Results based on 16S rRNA gene sequencing indicate microbial interactions changed annually as well as seasonally at the genus and phylum level. There was a maximum of 66 interaction changes from fall to winter and a minimum of 3 from spring to summer for fecal samples (n=249). Results indicated there were significant changes in microbial interactions which suggest seasonal variation of diet plays a major role in the Bison gut microbiome composition. Future work would involve the analysis of these interactions with the goal of determining the mechanisms of microbe-microbe interactions.

The Water Quality of NIU and It's Environmental Impact

Presenter(s): Taoheed Adeoye, Brenden Davis and Aiden Roschi
Faculty Mentor(s): William (Bill) Martin
Research Rookies

This research monitored water quality on the NIU campus because it can have substantial impacts to the aquatic life, human infrastructure, and human uses. Water samples were collected from Watson Creek and the South Branch of the Kishwaukee River to compare the water quality between a relatively stagnant body of water and a more mobile body of water. Samples were collected every other week from November 2024 to April 2025. The observed samples were analyzed to determine any trends in composition and nutrient concentrations caused by natural processes and human activities. Extra nutrients in water are known to cause an imbalance of living organisms in these ecosystems. Observations thus far show every time there was heavy snow or rain there seemed to be a higher concentration of nutrients in the water.

On Death and Disease: How Physicians' Perspectives Compare Across Specialties Through Written Work
Presenter(s): Stephanie Alkonga
Faculty Mentor(s): Alexandra Bennett
Honors Capstone

Narrative medicine is a tool which the medical field is increasingly utilizing to teach doctors patient-centered care, cultural competency, and to reflect on lived experiences through texts focusing on psychosocial best practices. This study aims to examine the language used in these physician-written works that tackle how physicians in different medical specialties treat the aging and the terminally ill, and how they view the deceased. Qualitative data will primarily be used in the analysis and comparison of these texts' tone, rhetoric, diction, format, and similar literary devices to uncover if certain patterns arise across such specialties. Preliminary findings show that different specializations do have different attitudes regarding death in correlation with their role in medicine, as shown by, fundamentally, what they constitute as death and the language they employ surrounding the idea of it. Further analysis between more texts shall follow along with the study's implications about the medical community.

Globelly: The Travel App
Presenter(s): Diana Alvarez
Faculty Mentor(s): Geoffrey Decker
Honors Capstone

This project consisted in creating Globelly: The Travel App, which is a feature-rich travel companion designed to simplify trip planning, inspire exploration, and foster community sharing. Users can pin locations they visit or want to visit, upload photos, and view or contribute recommendations for each destination. The app integrates with APIs like Google Maps, Yelp, and TripAdvisor to offer real-time suggestions for nearby attractions, restaurants, and activities. An interactive map displays travel history and plans through color-coded pins. Users can add notes, photos, and control visibility with

flexible privacy settings. Gamification features reward users with badges for exploration and sharing, while a social feed highlights trending destinations and photos. Developed in Android Studio using Firebase for cloud storage and Google Maps API for location services, Globelly follows agile development and modular design principles. Key features include responsive UI, input validation, and secure authentication, making it a meaningful and engaging tool for connecting global travelers.

Mice on a Mission: The Effects of Radiation on String Pulling Behavior
Presenter(s): Anabela Arrieta
Faculty Mentor(s): Douglas Wallace

Radiation is a therapeutic intervention used to treat a variety of diseases, with cancer being the most commonly treated condition. One known side effect of radiation therapy for brain tumors is brain fog, which can interfere with the ability to perform simple daily tasks. This study investigates and addresses the effects of therapeutic radiation levels on fine motor control in mice, six months after exposure using string-pulling tasks. DeepLabCut is a machine learning tool used to track hand movements and analyze topographic and kinematic characteristics, and it was applied to data collection and analysis for eleven mice. Results will be presented at the time of the poster presentation. These findings may provide further insight into temporal characteristics of therapeutic radiation on spatial orientation. It also establishes a foundation to investigate treatments that could attenuate these effects.

Prevalence of Shiga Toxin-Producing E.coli in Illinois Bison Herds
Presenter(s): Adam Baldocchi
Faculty Mentor(s): Pallavi Singh
Student Engagement Fund

Shiga toxin-producing *Escherichia coli* (STEC) is an etiological agent for numerous foodborne outbreaks in humans due to the presence of toxins (stx1 and stx2). Ruminants like bison can serve as important reservoirs. Our research aimed to detect the incidence of STEC in fecal samples collected from 4 bison herds in Illinois (n=320). Samples were confirmed for E. coli presence by using the uidA gene detection. Fecal samples were enriched for STEC isolation followed by confirmation by polymerase chain reaction (PCR) for the detection of the toxin genes. Of the total samples tested thus far, 35.2% were positive for STEC, with 8.77 % stx1 and 56.14% stx2 indicating stx2 distribution in STEC in the bison population. Furthermore, herd-specific distribution ranged from 10% to 90%. Understanding STEC reservoirs contributes to prevention strategies and addressing public health concerns. This research adds to the limited data available on the prevalence of STEC in bison.

Repeated Brain Injuries, Open Fields, and the Battle of the Sexes: Who Runs the Dark?

Presenter(s): Mykia Bates
Faculty Mentor(s): Douglas Wallace
Independent Study

Studies have shown that cognitive and behavioral outcomes of Traumatic Brain Injury (TBI)vary between men and women. Rodent models provide a more controlled approach to examine sex differences in the effects of repeated mild TBI on behavioral outcomes. In the current study, Long-Evans rats received sham (female=8; male=8) or repeated mild TBI (female=10; male=10). Both groups were tested in the open field (exploration and home base establishment on a circular table) under dark conditions 14 days post rmTBI. Noldus software system was used to analyze progression and stop characteristics of movement paths during open field testing. Results of this work will be shared at the time that the poster is presented. This work will demonstrate whether rmTBI produces sexually dimorphic disruptions in the organization of open field behavior. These results may contribute to a better understanding of the connection between sex-specific responses and brain injury resulting in the development of sex-specific treatments and improved prognosis.

The Differential Effects of Disgust Propensity and Disgust Sensitivity on Behavioral Approach
Presenter(s): Ana Bogdanovich
Faculty Mentor(s): Kevin Wu

Disgust is a feeling of revulsion aroused by something unpleasant. Whereas some research considers disgust one broad emotion, other evidence suggests it may be divided into two facets: Disgust Propensity (DP; tendency to experience disgust across situations) and Disgust Sensitivity (DS; intensity of disgust experiences). This study investigated whether DP and DS differentially predict behavioral approach toward disgusting stimuli. In a sample 115 of undergraduate students, DP and DS were evaluated using the Disgust Propensity and Sensitivity Scale-Revised. Participants completed a 6-step Behavioral Approach Task that consisted of a mixture of dirt, dead insects, and animal hair, intended to elicit disgust. Consistent with the hypothesis, results indicated that DP significantly predicted participants' number of BAT steps completed, whereas DS did not. Results support a dual-faceted conceptualization of disgust and contribute to understanding how DP and DS uniquely affect behavioral approach.

Paleoethnobotany at the Fandel Site: A Preliminary Case Study on Ancient Illinois Foodways
Presenter(s): Emma Bell, Skye McCord, and Jennifer McPeak

Faculty Mentor(s): Dana Bardolph
McKearn Fellow and Student Engagement Fund

This project presents a case study from the Fandel site, an Early Mississippian mound center dating to ca. 1000-1050 AD in Woodford County in west-central Illinois. Early Mississippian is an archaeological term referring to ancient Indigenous mound-building societies living in what is now the Midwest and Southeast. The goal of this study is to understand the roles plants played in Mississippian lifeways at the Fandel Site using paleoethnobotanical methods, the study of plant remains from archaeological sites, to provide insight into the relationship between people and plants in the past. Plant remains including maize, nutshells, and other native cultigens were recovered using flotation, a process used to separate soil and archaeological material, which were then identified under a microscope. Preliminary analysis of this material considers the roles of plant resources in Fandel lifeways as related to the emergence of Mississippian culture, ceremonialism, and social structure in the Illinois Valley.

Adenoid Cystic Carcinoma: Rare Cancer, Real Impact
Presenter(s): Alyssa Bird
Faculty Mentor(s): Linda Yasui
Class Project BIOS 450

Adenoid cystic carcinoma (ACC) is a rare and aggressive cancer that most often develops in the salivary glands. Although it grows slowly, ACC frequently returns, spreads along nerves, and can metastasize to distant organs, leading to poor long-term outcomes. Limited research exists due to its rarity. This project, completed in a Molecular Biology of Cancer (BIOS 450) course, explored ACC by examining its causes, symptoms, and treatments. Key findings show that ACC affects 3 to 4.5 people per million annually and represents a significant portion of malignant tumors in both major and minor salivary glands. Symptoms vary by location but often include painless lumps, numbness, and difficulty swallowing or breathing. Long-term survival rates decline significantly over time due to recurrence and metastasis. Molecular research highlights abnormal cell growth signals that drive tumor progression. Continued study of ACC may contribute to better awareness, earlier detection, and future treatment improvements.

Love Is Love, Except in Your Textbooks – Why A&P Needs More Sexual Diversity
Presenter(s): Alyssa Bird
Faculty Mentor(s): Heather Bergan-Roller
Research, Engagement and Academic Diversity Grant

High attrition rates among marginalized STEM students make this research relevant. Diverse body representation in Anatomy and Physiology (A&P) curricula can foster belonging and improve retention. This research examined intersectional identity representation in commonly used undergraduate A&P textbooks, guided by two questions: (1) How are intersectional identities represented? and (2) When and how often are sexual identities depicted? A thematic content analysis was conducted, coding

images and descriptions to identify patterns, frequency, and contexts. A standardized codebook was developed in summer 2024 to ensure consistency. Preliminary findings show sexual identity is rarely represented and, when present, is predominantly heterosexual. This reveals a critical gap and heteronormative bias in A&P textbooks. By highlighting areas for improvement and providing examples of inclusive text, this research offers insight for professors seeking to integrate broader representations into their courses, ultimately supporting marginalized students in STEM.

The Unofficial Volunteer - Exploring the effect of indirect support on a Midwestern nonprofit
Presenter(s): Maren Blakeney
Faculty Mentor(s): Laura Johnson
Honors Capstone
Community Engaged

Nonprofit research extensively examines the impact of direct volunteering on organizations, volunteers, and communities. However, the role of indirect volunteering and community support remains underexplored. This Capstone project investigates Safe Families for Children, a nonprofit in Rockford, IL, which provides a support network for children lacking traditional foster care options. The nonprofit connects children with volunteer families for short-term housing. Crucial to the nonprofit's success is the indirect support these families receive from their own networks—friends and family who provide meals, donate essentials, and offer financial aid. This research delves into how such indirect support systems enhance the nonprofit's mission, despite not being directly affiliated with the organization.

***Arabidopsis thaliana* unPAK project: Effects of temperature**
Presenter(s): Rylee Block, Karolina Czerepko and Cobra Small
Faculty Mentor(s): William (Bill) Martin
Class Project BIOS 305

The unPAK (Undergraduate Phenotyping of *Arabidopsis* Knockouts) project provides undergraduates with hands-on research experience by studying how *Arabidopsis Thaliana* responds to environmental stress. This study involves a blind experiment with three plant groups: a classic lab strain (Columbia), ten natural populations, and a knockout mutant line. Plants were grown at two temperatures, 20ºC and 24ºC, to observe how genotype and environmental conditions influence phenotype. The primary goal was to determine whether temperature stress affects plant appearance or survivability, particularly in the knockout mutants. Randomized planting helps to ensure unbiased results. While observable physical changes are unlikely, given the vast number of genes, any observed changes due to mutations will contribute to a better understanding of plant adaptation due to climate change. This research is important for predicting plant responses to rising global temperatures, ultimately informing future agricultural and environmental strategies.

Understanding Practices and Perceptions of Teaching Sexual Pleasure in Undergraduate Anatomy and Physiology Courses
Presenter(s): Julia Bogunia
Faculty Mentor(s): Heather Bergan-Roller
Diversity, Equity and Inclusion and Honors Capstone

Sexual health is a crucial aspect of overall wellbeing. The WHO defines sexual health as positive sexual experiences with the absence of negative sexual health outcomes. It's important for students entering health fields to understand sexual pleasure. Not educating students about this topic can lead to misinformation and inadequate patient care. Many of these students take Anatomy and Physiology (A&P) courses, making it critical to include accurate and inclusive information about sexual pleasure. In the classroom, instructors play a vital role in helping students learn. This study investigated instructors' practices and perceptions of teaching sexual pleasure in undergraduate A&P courses. We used the Teacher-Centered Systemic Reform Model adapted for the context of sexual pleasure to develop semi-structured interviews, which were analyzed using thematic coding; coding was conducted by two researchers. Findings revealed that instructors recognize the benefits of teaching sexual pleasure yet struggle to integrate this topic.

Achieving Green Energy: Downers Grove Communication Plan
Presenter(s): Skyler Brackett and Ava Johnson
Faculty Mentor(s): Melissa Burlingame
Community Engaged Research and Class Project ENVS 491

As part of its 2023 commitment to the Greenest Region Compact (GRC), the Village of Downers Grove has prioritized environmental stewardship by maximizing future efforts through performance management and communication plans. Present research focused on the energy section of Downers Grove's sustainable goals, where the benchmarking of green practices by five neighboring municipalities leverages regional collaboration that can be applied to stakeholder engagement. We anticipate Downers Grove to adopt at least two communication mechanisms to strengthen its transition into a greener, more sustainable region.

Climate Cabbage: An Analysis of *Arabidopsis Thaliana* Mutants in Response to Warming Conditions
Presenter(s): Skyler Brackett and Jack Heuschel
Faculty Mentor(s): William (Bill) Martin
Class Project BIOS 305

In collaboration with the unPAK project, our study aims to expand upon the project's information library on the structure and function of *Arabidopsis thaliana* genes. Despite being a common weed, *A. thaliana* is invaluable in research due to its efficient cultivation and concentrated genome (27,000 genes). By using Salk-TDNA insertion lines created with *Agrobacterium tumefaciens*, genes were deactivated to detect mutation activity in phenotypic expression. Under two temperature conditions (20°C and

24°C) that represent current and predicted spring temperatures, this experiment tested 21 genotypes including 10 wild variants, ten Salk-TDNA mutants, and a control group from a common lab line known as Columbia. This research, crucial in the context of global warming, aimed to detect heat-adaptive genes to better understand ecological impacts of climate change and enhance the literature on the *A. thaliana* genome.

Beneath the Hooves: Shiga toxin-producing Escherichia coli and antimicrobial resistance in Bison Herds
Presenter(s): Vrinda Brahmbhatt
Faculty Mentor(s): Pallavi Singh
Honors Capstone

Bison herds are being reintroduced across Illinois for prairie conservation and as an important food source. They can be reservoirs of pathogens like Shiga toxin-producing Escherichia coli (STEC) and antimicrobial resistance (AMR) genes, posing food safety and public health risks. STEC can cause severe illness in humans through contaminated meat or environmental exposure, and AMR genes may complicate treatment. We examined the prevalence of AMR in STEC, found in commercial and conservational bison herds to evaluate transmission risks. STEC was detected in fecal samples using specific enrichment and isolation techniques. Polymerase Chain Reaction and gel electrophoresis were used to detect target DNA and resistance gene parC, which influences fluoroquinolone efficacy by reducing drug binding. A t-test will compare the prevalence of AMR genes between herd types. Preliminary results indicate 21 STEC isolates from conservation and 36 from commercial herds. These findings will help enhance food safety standards and risk mitigation strategies.

Color War, Militarized Interstate Disputes, and Deterrence Theory: A Case Study on Libya
Presenter(s): Vincent Bratcher
Faculty Mentor(s): Ches Thurber
Research Rookies

This work examines the motivations behind the United States' military intervention in Libya in 2011, analyzing the political, humanitarian, and strategic factors that influenced the decision to intervene. The intervention was framed as a response to the massacre of civilians by Muammar Gaddafi's forces. This study examines whether strategic objectives also played a role, including “deterrence theory” or the idea that states intervene to dissuade audiences from attempting regime change via color revolution (a series of peaceful protests that lead to governmental change). Through a qualitative analysis of personal memoirs and academic articles, this study concludes that the U.S.'s intervention in Libya was based on a combination of factors, but “deterrence theory” was not a key factor in the decision to intervene. However, in the broader context of this study, “deterrence theory” could yield results indicating its usefulness in international politics.

Detection of Carbapenem-Resistant Bacteria from Freshwater Environments in DeKalb County and Normal Illinois
Presenter(s): Kylie Bresley
Faculty Mentor(s): Pallavi Singh
Student Engagement Fund

The prevalence of antimicrobial resistance (AMR) in livestock and humans threatens antibiotic effectiveness. The objective of this study is to detect carbapenem-resistant bacteria (CRB) and their genes from waterways. Sampling was conducted from urban and agricultural regions in DeKalb and Normal counties in Illinois. The 1 Liter water samples were filtered through a 3-step filtration process including a 2.7-micron, 1-micron and 0.22-micron filter papers. Bacteria captured on the filter papers were cultured for detection of CRB. On average, 5.9×10^4 CFU/mL CRB were recovered from 131 samples collected in July, September, November, and January. Plates were washed with sterile PBS to capture all CRB for future PCR detection of blaKPC, a crucial carbapenem-resistant gene. Detection of blaKPC in environmental water samples will indicate the presence of AMR mechanisms outside clinical settings. These discoveries prove managing the expansion of antimicrobial resistance in freshwater environments is crucial to minimize the impact on human health.

Quantitative analysis using G – quadruplex Biosensing System
Presenter(s): Janae Brown
Faculty Mentor(s): Irina Nesterova
Class Project CHEM 498

Biosensors play a crucial role in detecting and measuring biological markers for disease diagnosis and monitoring. However, many current diagnostic measures require expensive equipment or trained personnel, limiting accessibility in point-of-care, do-it-yourself, and limited-resource settings. This project aims to develop an equipment-free readout platform that will be accessible to a wide range of potential users. The platform is based on artificial catalases that are activated in response to the presence of a pathogen. Catalases produce an observable signal in the form of bubbles. The signal can be used for an easy yes/no equipment-free readout. To design the catalases the use of guanine-rich short chain oligonucleotides which form a quadruplex structure (G-quadruples) in certain conditions; and in the presence of a cofactor like hemin it acts as a catalyst were explored Preliminary findings indicate the potential of this system. Future research will focus on refining these constructs for greater sensitivity and expanding their use in quantitative analysis of various targets.

The Wisconsin Community's Actions and Reactions to the German Bund Challenge in the 1930's
Presenter(s): Gavin Busby
Faculty Mentor(s): Taylor Atkins

Through the mid to late 1930s an organization known as the German-American Bund attempted to spread the influence of German Nazism within the United States. The state of Wisconsin with its large population of German immigrants saw the Bund attempting to gain favor and influence within their community, but it faced setbacks and resistance from within the German community, political enemies, and those who feared being targeted. This research focuses on the protests from the Wisconsin community in response to the rallies, meetings, and a Nazi-themed summer camp arranged by the Bund. Many within the German community of Wisconsin found the Bund and its members to be nothing more than a hateful and vocal minority which in no way represented the true values of the German-American community.

Walk It Like You Talk It: HSI's and Undocustudents
Presenter(s): Michelle Carbajal Hernandez and Yesenia Ramirez
Faculty Mentor(s): Ibette Valle
Diversity, Equity and Inclusion

There are more than 600 Hispanic Serving Institutions (HSIs) in the U.S. HSI's enroll at least 25% Latine undergraduates. Within this enrollment are students with varying immigration backgrounds (i.e., deferred action childhood arrivals, undocumented, and mixed status) who navigate shifting political actions that can create additional educational pressures. HSI's started to measure liberatory outcomes, like increased social agency and ethnic-racial identity development as valuable indicators of serving a diverse student body. Liberatory experiences allow students of diverse backgrounds to feel respected, valued and seen. Our literature review examined if and how HSIs foster liberatory outcomes for Latine students navigating immigration concerns. Emerging themes included removing legal threats, creating identity-affirming climates, and adopting fewer performative practices. We discuss the need for HSIs to move beyond theoretical discussions and take concrete steps to implement policies and programs that promote the academic and psychological well-being of undocumented and mixed-status Latine students.

Parental Management in Relation to Adolescents' Positive and Negative Social Outcomes
Presenter(s): Maggie Carey, Natalie Cassaday and Sydney Kuhn
Faculty Mentor(s): Nina Mounts
Independent Study

Parental management styles have been linked to adolescent social outcomes (Mounts, 2007). This investigation studies the influence of maternal consulting and guiding on five positive outcome variables and five negative outcome variables. Two research questions were of interest. First, are there gender differences in the variables of interest? Second, controlling for age and gender, are consulting and guiding related to the major outcome variables? Participants were 64 mother-adolescent dyads (64.1% girls; Mage=12.37 years) from an ethnically diverse sample. Participants completed questionnaires. Using t-tests, girls reported higher levels of parental guiding, prosocial

behavior towards strangers, prosocial behavior towards friends, and positive friendship quality. Hierarchical regression analyses were used to examine the relationship between maternal management variables (i.e., consulting and guiding) and the dependent variables, while controlling for sex and age. Consulting was related to prosocial behavior towards friends and empathic concern, while guiding was related to relational victimization and relational aggression.

How the Media and Society Impact the Treatment of Black Women
Presenter(s): Malia Carpenter
Faculty Mentor(s): Kristie Crane
Diversity, Equity and Inclusion

Social media and our society have shaped an image of how black women are supposed to be loved, influencing the mistreatment and abuse of black women as something they deserve. Movies, television, media, and even our favorite celebrities have shaped our perception of stereotypes. Over the years we have seen curated images used perpetuated stereotypes (the mammy, the jezebel, and the mad black woman). Further findings exist on how the brain perceives images to change our behaviors to interact with these narratives. Analysis of how stereotypes are conveyed is an important step in avoiding the continuation of prejudice. Representation matters.

Strategic Sustainability: Developing a Performance Management Plan for Downers Grove
Presenter(s): Kylie Chase
Faculty Mentor(s): Melissa Burlingame
Class Project ENVS 491
Community Engaged Research

As part of their new sustainability initiatives, Downers Grove has partnered with students from the Environmental Studies capstone course for a multi-step research project with the end goal of creating a performance management plan and an education and communication plan. This partnership aims to create actionable recommendations to improve sustainability efforts by leveraging best practices from similar municipalities via a baseline benchmark comparison for Downers Grove. In this research, there was a focus on objectives regarding materials and resources, including green infrastructure, waste management, and resource-efficient practices. Students identified policy improvements, key performance indicators, and environmental best practices aligned with the Greenest Region Compact (GRC) to develop a performance management plan. This research will assist the municipality with implementing its sustainability plan by providing resources to establish priorities, create a timeline, and track progress efficiently.

Expression of bacterial genes encoding metalloproteases with potential as therapeutics for human Alzheimer's Disease
Presenter(s): Uday Kiran Chigurupati
Faculty Mentor(s): Scott Grayburn

Student Engagement Fund

This research focused on metalloprotease gene expression levels in Pseudomonas 20ei1 (P. 20ei1), a locally isolated bacterial strain. The study employed six bacterial genes including the pitrilysin gene which shared similarities with human insulysin. These genes encode proteins that could degrade Amyloid beta plaque (Aβ), implicated in Alzheimer's Disease (AD). The research utilized bioinformatics to compare P. 20ei1 genes with human and other bacterial genomes. Other methods included bacterial cell culture, RNA isolation, and cDNA synthesis. Quantitative real-time PCR analysis revealed higher expression of selected genes consistently in bacteria grown in medium with insoluble phosphate. The findings of this study could contribute to exploring microbial Aβ degrading enzymes, particularly pitrilysin and related proteins. Future research may uncover new insights into Aβ degradation mechanisms and potentially develop more effective AD combination treatment strategies.

Social Exclusion and Prosocial Behaviors
Presenter(s): Jennifer Clayton and Sania Leiva
Faculty Mentor(s): Randy McCarthy
Independent Study

Have you ever wondered why do we do nice things for other people? Prosocial behaviors are actions that benefit others, but factors like social exclusion alter the extent to which one will be prosocial. Research on social exclusion and prosocial behaviors found that threats to a person's belongingness can reduce prosocial behavior (Twenge et al., 2007). This study examines how feeling socially excluded impacts one's willingness to engage in prosocial behaviors. Participants complete a personality inventory and are randomly assigned to a statement about their life trajectory. They are then asked to volunteer their time to participate in three unpaid studies. We predict those who are told that they will be alone in life will be less likely to engage in prosocial behavior. This study will identify factors that affect people's willingness to behave prosocially and highlight the negative effects of social exclusion. Data collection will conclude in March 2025.

The Cultivation of Environmentally Relevant Bacteria from the Florida Keys During a Marine Heatwave
Presenter(s): Krista Cooper and Daisy Mendez
Faculty Mentor(s): Michael Henson
Student Engagement Fund

Marine heatwaves disrupt ecosystem functions like nutrient cycling, carbon sequestration, and water quality by altering microbial metabolism and physiology. As key responders to environmental disturbances, heterotrophic bacterioplankton play a crucial role in maintaining ecosystem balance, yet their adaptive responses to thermal stress remain poorly understood. Many remain uncultured, limiting research into their ecological functions. This study used high-throughput cultivation to isolate microorganisms from the 2023 Florida Keys Marine Heatwave, selecting two

strains, NIUCC0104 and NIUCC0112, for further analysis. Phylogenetic analysis identified them as Gammaproteobacteria clades OM252 and OM60/NOR5, with doubling rates of 0.045 and 0.119/h at 28°C, respectively. Future work will sequence their genomes to explore metabolic potential, advancing understanding of microbial resilience and biogeochemical roles under climate stress.

Flotillin 1 is Required for the Polarized Deposition of Basement Membrane Proteins in Epithelial Cells
Presenter(s): Vana Dakarian
Faculty Mentor(s): Olivier Devergne
McKearn Fellow and Student Engagement Fund

Epithelial tissue is among the most abundant tissues found in humans, composing the skin and mucous membranes, lining body cavities and hollow organs, and assisting in hormonal, sensory, and excretory functions. Epithelial cells are characterized by their organized architecture. The basement membrane (BM) is an essential component of epithelial architecture that lines one side of epithelia. This research focuses on Flotillins — well-conserved genes involved in proper placement of BM proteins secreted by the epithelial cells to form the BM. We identified Flotillin 1 as having a significant role in BM protein secretion. The follicular epithelium of the Drosophila melanogaster ovary is used to study the epithelial polarized architecture and the secretion of BM proteins. This project sheds light on the mechanisms important for proper BM placement and epithelial architecture, which will impact understanding of various diseases caused by the loss of epithelial structure in humans, such as cancers.

Reaching for Research
Presenter(s): Brittany Davidson
Faculty Mentor(s): Tracy Ash
Honors Capstone

Marriam-Webster Dictionary defines research as “investigation or experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or laws in the light of new facts, or practical application of such new or revised theories or laws.” Comprehending, composing, and articulating research is a powerful and necessary skill for physician’s to be effective with their patients. This Honors Capstone project explores the world of information, both public insight and empirical works. As an aspiring physician, the goal of this research is to sharpen comprehension speed and depth, efficiency in composing a research inquiry, and ability to take information and articulate it to others in a way that makes the knowledge applicable in their lives. The product of this exploration will be a 2–3 page written review of what I learned, and how I’ve grown from it.

Response of a Parasitic Wasp (Muscidifurax raptor) to a Bittering Agent in Fly Baits
Presenter(s): Lydia Delk
Faculty Mentor(s): Bethia King

Student Engagement Fund

The house fly Musca domestica is known as a pest to humans and livestock, and insecticides are used in controlling them. Some of these insecticides include the bittering agent denatonium benzoate, to protect non-targeted organisms like children and pets. But whether denatonium benzoate can help protect the natural enemies of house flies, like Muscidifurax raptor, a parasitic wasp, is unknown. This research aims to improve the understanding of the response of Muscidifurax raptor to denatonium benzoate by studying the response of the wasp to different concentrations of denatonium benzoate in two different solutions, 50% honey and 10% sucrose. Treatments tested included 0, 10, 100, and 200 ppm of denatonium benzoate in each solution, along with water. No-choice assays were conducted to study the feeding behavior of wasps within a 10-minute interval.

Bullying Participant Role Behaviors: Investigating the Associations with Social Anxiety and Social Support
Presenter(s): Grace Doyle, Chris Jauregui, Morgan Krouse and Madeleine Little
Faculty Mentor(s): Michelle Demaray
Independent Study

Bullying remains a prevalent issue in U.S. schools, with social anxiety acting as a potential risk factor and social support serving as a protective factor for students involved in bullying. Traditionally, research has focused on perpetrators and victims, but limited research exists on defenders of victims, assistants to the bully, and outsiders who ignore the situation. The current study examined associations among bully participant role behaviors, social anxiety, and social support. A total of 655 middle schoolers completed a Qualtrics survey with rating scales to assess these variables. Results revealed a negative association between the perpetrator and defender, and a positive association between victim and outsider with social anxiety. Similarly, the roles were significantly associated with classmate and teacher social support. These findings suggest that many youth involved in bullying may experience social anxiety and lack social support.

Do Educators Recognize Student Struggles? A Look into Mental Health Perceptions and Knowledge in Biology
Presenter(s): Stephanie Drendel
Faculty Mentor(s): Heather Bergan-Roller
Diversity, Equity and Inclusion and Independent Study

Due to the high rate of students who experience mental health issues, support from educators is critical. Educators' mental health literacy, or their ability to recognize mental health struggles, could impact students' perceptions about their own mental health and willingness to seek help. Since research shows that students' mental health literacy is lower in STEM fields, our study explored the following questions: 1. How do biology educators perceive mental health? 2. How knowledgeable are biology educators about mental health? To answer these questions, we conducted a pilot study consisting

of two 20–30-minute zoom interviews with graduate teaching assistants. Afterwards, the interview transcripts were coded and qualitatively assessed. Preliminary results suggest that instructors recognized mental health as a concern, but in vague terms of everyday stressors. Additionally, accommodation was also spoken about in general ways, such as giving extensions. Overall, this suggests an incomplete foundation of knowledge regarding mental health.

1967 & 2020: Understanding Protesting between the Long, Hot Summer and George Floyd
Presenter(s): Jon Dunlap
Faculty Mentor(s): E. Taylor Atkins
Civic Engagement

In 1967, a series of violent protests broke out across the United States in a period now known as the Long, Hot Summer. 53 years later, in the summer of 2020, a similar event occurred with millions of people across the country participating in the George Floyd protests. Through researching the tactics and rhetoric used by protestors in both these periods, expressed in organizational guidelines, newspapers, and interviews with activists, we can gain an understanding of how and why strategies for protesting have changed over time. So far, research has indicated that protestors in 1967 were far more radical in their demands and centralized in organization than protestors in 2020, though research is still ongoing.

Lives in Ruins? Assessing College Tuition and Wage Prospects for Careers in Archaeology
Presenter(s): Mirella Duron and Angie Gutierrez
Faculty Mentor(s): Dana Bardolph
Diversity, Equity and Inclusion and Student Engagement Fund

The pressures of rising college tuition are raising questions about whether a degree in higher education is worth the return on investment in today's society and economy. This study aims to acknowledge the issues of affording college, and the opportunities granted in the face of college wealth premiums from the perspective of the field of archaeology. The college wealth premium is understood as additional opportunities and increased salaries offered to those with a degree in higher education compared to those without. Using the Midwestern United States as a case study, literature was reviewed on the gender/race wage gap, college debt, loan inequity, and general employment opportunities and compiled data on university tuition, job postings, and salary ranges in archaeology. This data was examined to determine the value of a college degree for those entering the job market in archaeology and how this issue can impact future generations of students.

From Combat to Comradery: How Arnis Shapes Filipino Communities in The United States
Presenter(s): Jaeden Ellasus
Faculty Mentor(s): Micah Morton and Paul Wright

Diversity, Equity and Inclusion
Independent Study

This project explores how the martial art of Arnis serves as a cultural symbol for Filipinos living in the United States. Information was collected through interviews, field observations, participant observation, a literature review, and archival research. This study focused on the role of Arnis not only as a physical discipline but also as a living tradition that sustains and adapts Filipino culture across diverse spaces. The project will also investigate how Arnis, the skills taught through it, and the mindset it embodies, cultivates a sense of belonging and transmits Filipino philosophical values. Lastly, it explores how Arnis acts as a unifying activity for diaspora communities, strengthening ties between older and younger generations and preserving regional identities.

Expanding Scientific Access: A Research-Grade UAV for Autonomous Water Sampling
Presenter(s): Andy Fernandez
Faculty Mentor(s): Melissa Lenczewski
Research Rookie

Unmanned Aerial Vehicles (UAVs) are a useful, rapidly evolving tool that many different fields of study can utilize for the purpose of research and data collection. The project aims to create an open-source, cost-effective, and reproducible UAV capable of autonomous and manual water landings, enabling researchers to access previously unreachable locations. Unlike many similar research UAVs, this one features a larger payload capacity of at least one liter and an extended flight time, allowing for the collection of larger sample sizes and more extensive data gathering. By addressing these challenges, this research seeks to expand UAV utility in scientific studies, making aerial sampling technology more accessible to institutions and researchers worldwide.

Fixing the Broken Branch
Presenter(s): Eli Freet and Gabriella Viveros
Faculty Mentor(s): Scot Schraufnagel
Research Rookie
Civic Engagement

The research tests whether the age of congressional leaders matters with respect to legislative effectiveness. My hypothesis is that leaders of Congress who become very old will be less effective lawmakers. Specifically, I use Legislative Effectiveness Score (LES) developed by the Center for Effective Lawmaking to test whether leaders who are older obtain lower scores. The LES scores are based on a 3x5 matrix that taps the initiation of new legislation and whether a member's initiatives become law. Results affirm my primary hypothesis that as leaders get older their legislative effectiveness decreases. Importantly, I can control for other considerations and learn that the number of years that leaders practiced law before becoming a member of Congress associates with higher LES scores. Whether they serve in a state legislature prior to serving in

Congress does not seem to associate either positively or negatively with the LES scores.

Bilingual Broadcasting and Journalism: Translation in a Pre-Professional Setting
Presenter(s): Alondra Gamez
Faculty Mentor(s): Frances Jaeger
Honors Capstone
Community Engagement Showcase

This Capstone project uses translation skills to serve WNIJ's Spanish-speaking community through bilingual broadcasting and journalism. It involves translating "Perspectives," 90-second oral essays, from English to Spanish for the WNIJ HOLA website. This addresses the demand from the Spanish-speaking audience. The project also provides hands-on experience in bilingual broadcasting and journalism. Weekly station visits, participation in WNIJ fundraisers, and reporting and writing articles in Spanish are key components of this experience.

Evolution of House Fly Behavioral Resistance to a Bittering Agent Used in Toxic House Fly Baits
Presenter(s): Lillian Garncarz
Faculty Mentor(s): Bethia King
Student Engagement Fund

House flies are a common pest found in livestock facilities. Insecticides used against flies sometimes contain denatonium benzoate (DB), a bittering agent. There are studies on insects evolving behavioral resistance to inactive ingredients in insecticides, but not to a bittering agent. Thus, this study tests whether house flies can evolve behavioral resistance to DB. Two fly lines, denatonium benzoate aversive (DBA) and a control, were established from a single fly strain collected from a dairy farm in Florida. The DBA flies were provided with a 10% sucrose solution with 1000 ppm of DB and a 10% sucrose only solution for 2 h. Flies that avoided the DB were used to start the next generation. The control line was provided with the same treatments, but with no DB. Selection continued for 10 generations, a period in which house flies can evolve resistance to other chemicals.

Downers Grove Environmental Sustainability Plan Implementation: Benchmark Analysis and Performance Management Plan
Presenter(s): Allison Gazda and Jude St. Clair
Faculty Mentor(s): Melissa Burlingame
Community Engaged Research and Capstone Project

The Village of Downers Grove is in the ongoing process of drafting their first sustainability plan based on its commitment to the Greenest Region Compact (GRC). In September 2024, the village approved a preliminary outline and engaged with NIU to involve students to develop plans for performance management and communications. As part of the process, a comparative analysis has been completed by benchmarking neighboring municipalities and evaluating their local policies, programs, and executive

strategies. Throughout the process, a focus on green transportation, relative decarbonization, and energy efficiency improvement has been placed under the broader context of municipal leadership. Included is the development of a Performance Management Plan to prioritize, provide timelines, and determine how to best assess and track progress toward achieving the objectives set in the Environmental Sustainability Plan.

Expression of Genes from Pseudomonas 20ei1 for Possible Control of Fungi and Cyanobacteria
Presenter(s): Brianna Glees
Faculty Mentor(s): Scott Grayburn
Honors Capstone and Student Engagement Fund

Some fungi, such as Aspergillus, can cause significant economic losses in food production and produce mycotoxins that are carcinogenic to humans. Cyanobacteria are often present in harmful algal blooms, which can kill animals and produce toxins that are harmful to humans. The purpose of this study is to determine if living Pseudomonas 20ei1 bacteria and cell free extracts inhibit the growth of Aspergillus nidulans and cyanobacteria. Molecular studies were performed to find correlations between gene expression and growth inhibition. Plating experiments, cDNA synthesis, and quantitative polymerase chain reaction (qPCR) procedures were used to address these questions. Plate assays showed growth inhibition of fungi and cyanobacteria. A gene in Pseudomonas 20ei1 involved in iron accumulation was expressed at elevated levels in a coculture with 20ei1 and A. nidulans. Cell free extracts are more useful as control agents than living bacteria. The next steps of research will be to continue studies of extracts and gene expression.

Investigating Environmental Factors Associated with Hail in Left-Moving Supercell Thunderstorms
Presenter(s): June Graff
Faculty Mentor(s): Victor Gensini
Research Rookie

Left-moving supercells are a type of thunderstorm known to produce severe hail, often larger than two inches in diameter. This project aims to better understand how various environmental factors relate to the size of hail produced by these thunderstorms. Using a dataset of 889 left-moving supercells provided by Van Den Broeke et al., different LM cases were matched with hail reports, Maximum Estimated Hail Size (MESH) data and ERA5 reanalysis. The maximum hail size of each case is estimated and then compared to environmental data. While the environmental data is a work in progress, storm reports suggest a mean hail size of 1.8 inches (of storms that received reports), ranging from 0.75 to 5.5 inches. Environmental factors that are found to relate to larger hail sizes should warrant special attention on days when conditions are favorable for left-moving supercells.

Response of the Parasitoid Wasp Spalangia cameroni (Hymenoptera: Pteromalidae) to Different Concentrations of Denatonium Benzoate
Presenter(s): Megan Gray
Faculty Mentor(s): Bethia King
Honors Capstone and McKearn Fellowship

Toxic baits used to control Musca domestica L., house flies, sometimes contain denatonium benzoate (DB), a bittering agent, to deter humans and pets from ingesting baits. Spalangia cameroni are parasitoid wasps and are natural enemies of house flies. This research investigates the wasp's response to 0, 10, 100, and 200 ppm of DB in 50% honey, and to water. Finding a concentration of DB that S. cameroni show an aversive response to may support that concentration being added to more toxic baits for flies. No-choice assays were conducted to test for duration of consumption of the treatments by wasps within a 10-minute interval. Male wasps fed on the treatments with DB significantly longer compared to water. Females did not show any significant difference in feeding duration among treatments. Thus, DB might not help protect S. cameroni. Further testing is recommended with longer observation periods and with other fly parasitoids.

A Little Bird Told Me "Bird Songs Save Lives"
Presenter(s): Lea Guelde and Oscar Herrera
Faculty Mentor(s): William (Bill) Martin
Diversity, Equity and Inclusion and Independent Study

Access to field-based (outdoor) observation and learning experiences can be limited for students with disabilities. The goal of this research is to reduce barriers by developing an alternative experience to field-based bird identification. Over the summer, recordings of bird vocalizations were captured from three distinct locations using AudioMoth recording devices. Recordings were processed via Adobe Audition to isolate a single bird call and then verified by Merlin, a bird call identification app. Multiple bird calls and different mixes of bird calls were placed within a Qualtrics survey. The survey aimed to evaluate Merlin's effectiveness in helping students associate bird calls with specific species. The survey expected outcome suggested that the app functions reliably and enhances auditory learning. Student responses will directly impact the application of alternative learning experiences. Future alternative experiences include using Merlin in structured assignments to quantify biodiversity and population densities.

Effect of Trematode Infection Status on Snail Host Food Consumption
Presenter(s): Anthony Hanks
Faculty Mentor(s): Jennifer Koop

Independent Study

Invasive species are a concern in preserving ecosystems due to their ability to cause harm. The aquatic faucet snail (*Bithynia tentaculata*) and the trematode parasites it vectors. Waterfowl are impacted by these trematodes and large-scale die-offs have been recorded. These trematodes encyst as metacercaria in snails. While many have investigated relationships with waterfowl, little information focuses on how the parasites affect their snail host. This study investigates food consumption and infection intensity in faucet snails. We predicted food consumption would increase with higher infection intensities. Snails were collected from the Mississippi river, near Fulton IL, and housed individually. The amount of food was measured before and after a week. Snails were then crushed to count trematode metacercariae abundance. A positive relationship was observed between the abundance of metacercariae and food consumed. This suggests infected snails may spend time eating more food than uninfected snails.

Exploring a Mindfulness Virtual Reality Game as a Tool for Health Promotion
Presenter(s): Macy Harris and Matthew D'souza
Faculty Mentor(s): Lynn Hermann and Federico Bassetti

In this project, an experiment was conducted to answer the research question: "Does virtual reality have a positive impact on mindfulness among college students?" The TRIPP virtual reality app was utilized, which allows users to escape to a relaxing setting and engage in activities that promote mindfulness. Pre and posttest surveys were given to NIU students to measure the effectiveness of virtual reality using 20 variables regarding affect from a validated survey tool. Two sample t-tests were used to analyze the data (p-value <0.05). Most of the study population indicated that mindfulness is "very important" (39%) or "moderately important" (37%). Significant positive differences (improvements) from pre to posttest were found for the following variables: feelings of distress, upset, scared, enthusiastic, proud, jittery, and afraid.
The findings will be shared with colleges across campus in hopes to integrate virtual reality in classrooms to promote mindfulness and the well-being of students in an innovative way.

Electronic Recycling in Thailand as a source of Microplastics
Presenter(s): Samantha Harrison
Faculty Mentor(s): Melissa Lenczewski and Chit Wityi Oo
Independent Study

Microplastics and heavy metals in electronics can significantly pollute the environment. While recycling prevents landfill waste, improper handling can allow pollutants to escape. Many countries importing recyclables lack proper facilities, leading to contamination. For example, electronic recycling in Thailand raises health and environmental concerns. Dust samples from a Thai facility were analyzed for pollutants. Samples were sieved at 50 mm, then filtered through 20 μm and 0.8 μm gold filters. Microplastics were identified using Agilent Laser Direct Infrared Spectroscopy (LDIR), and heavy metals were detected via Inductively Coupled Plasma Mass Spectrometry

(ICP-MS). Results confirmed the presence of both microplastic and heavy metal particles. This contamination threatens public health and ecosystems. Findings could help local governments recognize risks and enforce stricter regulations to mitigate pollution from electronic recycling facilities.

Crowded or Comfortable? How Plant Spacing and Competition Effect Chlorophyll Levels in the Three Sisters
Presenter(s): Shahkar Hatef
Faculty Mentor(s): William (Bill) Martin
Research Rookie

Chlorophyll is more than just a green pigment; it is a major indicator of plant health, and its levels can indicate environmental stress. A two-part study was conducted. First, chlorophyll levels were measured in the leaves of nine species across three plant families in the NIU greenhouse. The Apogee MC-100 chlorophyll meter verified that chlorophyll levels vary detectably between plant families. The second phase examined how plant competition influenced chlorophyll content under controlled environmental conditions. Chlorophyll levels were evaluated in species representing three plant families (corn, beans, and squash - three sisters) while varying plant spacings (3,6, and 9 inches) and plant culture (monoculture or three sisters polyculture). Since inter- and intraspecific competition can induce plant stress, the study aimed to examine the impact of plant competition on chlorophyll levels, providing insights on optimal planting strategies in agriculture.

Differential Evolution-Based Estimation of Nuclear Structural Material Properties
Presenter(s): Hannah Havel
Faculty Mentor(s): Alexander Heifetz (Argonne)
McKearn Fellow

As advanced nuclear reactors with higher efficiency are expected to replace the current fleet, the increased operational stress necessitates non-destructive evaluation (NDE) techniques to assess structural materials without altering their properties. Differential evolution (DE) optimization is an NDE method used to estimate the thermal diffusivity of materials like stainless steel that are important to reactor design. Changes in thermal diffusivity can indicate material degradation, such as mechanical creep, providing information on material state. Our approach utilizes pulsed infrared thermography (PIT), where a rapid thermal flash is applied to a material's surface, and its temperature response is captured with a fast frame infrared camera, pixel by pixel. Preliminary results validate the DE algorithm's effectiveness in estimating thermal diffusivity using computer-simulated PIT data, demonstrating its potential for assessing nuclear materials as we transition into using experimental PIT data.

Personality and Forgiveness
Presenter(s): Madison Henkelman and Eli Huffman
Faculty Mentor(s): Randy McCarthy

Independent Study

Agreeableness is best described as a personality trait that defines the extent to which an individual can get along with others. Someone who is high in agreeableness is typically someone who greatly values social harmony and close relationships. One of the most important facets of sustaining harmony in a social relationship is being able to forgive someone for a transgression. Therefore, due to the fact that maintaining social harmony is significant to an agreeable person, it is likely that an agreeable person has more of a desire to forgive others after a transgression. In an online experimental study, we looked at the role that the sincerity of an apology plays in the relationship between agreeableness and the likelihood to forgive. This study also looks at emotional (internal or feelings-oriented) forgiveness versus decisional (behavioral or outward) forgiveness in this model.

Exploring Protective Social Strategies using an Animal Model: Insight into the Link Between Poly Cystic Ovarian Syndrome and Stress
Presenter(s): Mercedes Hernandez
Faculty Mentor(s): Angela Grippo
Senior Thesis and Student Engagement Fund

Stress exacerbates symptoms of several psychological and physical disorders in humans including depression, anxiety and polycystic ovarian syndrome (PCOS). This study aims to explore the effects of social buffering on stress using the prairie vole model. Paired female voles with pre-established social bonds were assigned to one of five groups and were exposed to varying levels of stress for two weeks. This study evaluated depression and anxiety behaviors with a swim task and open field task, respectively. Voles paired without additional stress showed the lowest anxiety and depressive behaviors, and being paired with a less stressed sibling protected against depressive behaviors in stressed animals. Further research with this animal model could be used to create strategies for stress management, including preventive care for those with PCOS, depression or anxiety. This research also highlights the importance of social support in promoting health and stress recovery.

Inspiring Future Innovators: Showcasing STEM's Impact at NIU STEM Fest
Presenter(s): Zaira Hernandez
Faculty Mentor(s): Angelica Mendoza
Community Engagement Showcase
Diversity, Equity and Inclusion and Huskie Service Scholar

NIU STEM Fest is an annual event that promotes science, technology, engineering, and mathematics (STEM) through interactive exhibits and hands-on activities. As a volunteer, I contributed to biology and chemistry demonstrations, guiding attendees through experiments and explaining scientific concepts. The event inspires curiosity and promotes diversity by showcasing role models from various backgrounds, and encourages underrepresented groups to explore STEM careers. It also strengthens community bonds by fostering collaboration between NIU, local schools, and

businesses. Increasing public awareness of STEM fields and supports regional growth by inspiring future innovators.

Gender Differences in Student Self-Reported Social-Emotional Skills Using the SSIS SEL Brief Scales
Presenter(s): Mackenzie Hodge
Faculty Mentor(s): Kara Styck
Diversity, Equity and Inclusion

Gender differences in social-emotional competence have important implications for assessment and intervention. This study examines whether adolescent students' self-reported social-emotional skills differ by gender. Specifically, the Social Skills Improvement System Social-Emotional Learning Brief Scales - Student Form (SSIS SELb-S) will be used to assess five domains aligned with the CASEL-5 framework: Self-Awareness, Self-Management, Social Awareness, Relationship Skills, and Responsible Decision-Making (Collaborative for Academic, Social, and Emotional Learning [CASEL], 2020). Mean scores for each subscale will be compared across male and female students using independent samples t tests. Results will inform whether gender differences exist in students' perceptions of their own social-emotional competence. Understanding such differences is critical for evaluating the generalizability and equity of SEL assessments. Data analysis is ongoing, and findings will be presented at the CURE conference.

Comparison of the Locomotor Biomechanics of the Forelimbs of the Extinct American Cheetah, Miracinonyx, with Living Cursorial Felids
Presenter(s): Elizabeth Hofemann
Faculty Mentor(s): Virginia Naples
Independent Study

The extinct American cheetah, Miracinonyx, discovered in 1895, is considered among the fastest cursorial felids. This is supported because the cat's preferred prey is suggested to be pronghorn antelopes, which are the speediest North American ruminants. These species occur together in Natural Trap Cave, Wyoming. To test these ideas, forelimb morphology was studied, beginning with analysis of the scapula, the bone that supports forelimb extension and flexion, which impacts stride length and speed. Scapular dimensions vary among felids with different hunting strategies, ranging from generalist predators such as the mountain lion, Puma, to the extremely specialized African cheetah, Acinonyx. We employed geometric morphometric methods to reveal proportional differences that reflect varying movement patterns that correlate with hunting styles of the living cats for which we could observe locomotor capabilities. Scapular morphology predicts that Miracinonyx is among these fast-running animals; therefore, the conclusion is this cat was an excellent cursor.

Maternal Mental Health as a Predictor of Child Mental Health During the COVID-19 Pandemic
Presenter(s): Kat Huber

Faculty Mentor(s): Elizabeth Shelleby
Independent Study

It is well established that parent and child mental health are related, as parents are highly influential in children's development (Hancock et al., 2013). However, the impact of the COVID-19 pandemic on this relationship is less understood. This study investigates whether higher levels of parent anxiety and depression, as measured by the Depression, Anxiety, and Stress Scale (DASS-21), predict higher levels of child anxiety and depression, as measured by the Revised Child Anxiety and Depression Scale (RCADS-Parent). The sample consisted of (N = 209) maternal caregivers who completed the surveys. Maternal anxiety significantly predicted both child anxiety (β = 0.36, $p < .001$) and depression (β= 0.27, $p = .002$). Maternal depression also significantly predicted child anxiety ($\beta = 0.18$, $p = .029$) and depression ($\beta = 0.19$, $p = .028$). This suggests that while all aspects of parent mental health impact children, some aspects may be more influential than others.

The Mississippi River Microbiome: Balancing Structural Stability and Nutrient-Driven Variability in Microbial Community Assembly
Presenter(s): Shelby Huffington
Faculty Mentor(s): Michael Henson
Student Engagement Fund

The Mississippi River (MSR) basin is the 10th largest river-by-volume and provides critical infrastructure, water services, and industry for over 20 million people. A better understanding of the distribution of the MSR microbial constituents will benefit restoration strategies, water quality management, and research on eutrophication. Towards this effort, samples were collected from 157 sites across 2340 miles of the MSR in 2014 and 2016 and used for 16S rRNA gene community sampling and biogeochemical analysis. Broadly, the microbial communities from the 157 sites were partitioned between particle-associated (>2.7 μm; PA) and free-living microorganisms (0.22-2.7 μm; FL) [$R=0.661$, $P<0.001$]. When each fraction was examined independently, while FL communities were separated by location and year [Location: $R=0.417$, $P<0.001$; Year: $R=0.321$, $P<0.001$], PA communities were more predominantly differentiated by location [Location: $R=0.316$, $P<0.001$]. Additional work will highlight important taxonomic shifts along the MSR driven by biogeography, physical structure, and environmental parameters.

Equipment-free Detection of Biomolecular Targets Using DNAzymes
Presenter(s): Abdul Hussain
Faculty Mentor(s): Irina Nesterova

Equipment-free detection of biomolecular markers is critical for at-home and point-of-care diagnostics and limited-resource environments. Over the past decade, nucleic acids emerged as scaffolds for design calorimetric detection schemes. In this work, we use special nucleic acid scaffolds, DNAzymes, that act as protein enzymes but are less expensive, more stable, and easier to obtain. We design and evaluate DNAzymes that

catalyze the decomposition of hydrogen peroxide into water and oxygen, producing visible bubbles as a straightforward and accessible signal readout. Our work addresses structure refinement and characterization, establishing structure/property correlation, and strategies for interfacing with biomarker recognition functionalities. Overall, our approach expands the utility of DNAzymes and presents a low-cost strategy for molecular detection. Future developments aim to enhance sensitivity and optimize target-induced activation for broader applications in diagnostics.

Neglect as a Moderator of Childhood Trauma and Depressive Symptoms
Presenter(s): Jack Igoe and Tavio Lares
Faculty Mentor(s): Holly Orcutt
Independent Study

Childhood trauma is a situation where a child's emotional or physical needs are not being met (Eggert et al., 2024). This situation can happen in many ways including emotional and physical neglect during childhood which can present major risks towards mental health. Although the connection between childhood trauma and mental health disorders has been acknowledged, there aren't many studies that focus on emotional and physical neglect and its possible effects. The aim of this study was to examine how childhood neglect impacts the relationship between childhood trauma and depressive symptoms. Using a sample of undergraduates (n=461) it was found that experiencing neglect strengthened the relationship between childhood trauma and depressive symptoms as measured by the IDAS-II subscale.The findings of this study highlight the importance of early interventions for neglect in the prevention of later depressive symptoms.

The Role of Experiential Avoidance in Discrimination and PTSD
Presenter(s): Jack Igoe and Tavio Lares
Faculty Mentor(s): Holly Orcutt
Class Project PSYC 485

Everyday discrimination is part of the day-to-day hardship that people experience due to their identity as a member of a minority class. Post-traumatic stress disorder (PTSD) is a mental health condition that is caused by a stressful or terrifying event and can present major risks to a person's mental health. While there have been studies done that show a connection between PTSD and discrimination (Ellis et al. 2008) there aren't many studies that focus on the potential links between everyday discrimination and PTSD such as experiential avoidance (EA). The aim of the current study was to examine the role of EA in the relationship between discrimination experiences and PTSD symptoms. In a sample of undergraduates (n=465) it was found that EA mediates the relationship between discrimination and PTSD symptoms. This finding is important in understanding how minority groups may respond differently to PTSD, especially when it is associated with discrimination and EA.

Imperfectly Matched: Managing Incompatibilities in Kink Relationships
Presenter(s): Aleah Janae

Faculty Mentor(s): Brad Sagarin
Honors Capstone

Prior research has shown that long-term BDSM (Bondage, Discipline, Dominance/Submission, Sadomasochism) partners rarely share identical kink interests, making a perfect match in preferences unlikely. However, studies indicate that compatibility in dominance and submission roles often outweighs alignment in specific BDSM activities. Additionally, individuals tend to accurately identify their partners' perceived kink interests, making it easier for them to know what activities are on the table or not, but also making it easy for them to rate partner perceptions for a study. While negotiation is widely regarded as essential within the BDSM community, some research suggests that individuals may need multiple partners to fulfill their diverse needs. Given the existing gaps in research, this study explores compatibility within BDSM relationships to provide further insight into how partners navigate differences and maintain fulfilling dynamics.

Influence of Temperature on Fruit Count, Rosette Growth, and Leaf Count in Arabidopsis thaliana
Presenter(s): Juniper Jankowski
Faculty Mentor(s): William (Bill) Martin
Class Project BIOS 305

Arabidopsis thaliana, a versatile model plant found globally, is adapted to various climates, raising the question of how it has responded to changing temperatures. This study explored how temperature influenced growth to maturity by testing six known plant populations grown with two different temperatures: 20°C and 24°C. The growth was measured by fruit count, rosette diameter, and leaf count. Previous research focused on stress responses to temperature changes, but here, the plants' overall growth patterns were examined. Plants from colder climates showed diminished growth at higher temperatures, while those from hotter climates thrived in warmer conditions. As global temperatures rise, plants adapted to warmer climates are likely to experience more favorable growth, while those from colder regions may struggle. This suggests that the future of plant distribution will likely favor species adapted to higher temperatures.

Cellular Assay for Inhibitors of Epidermal Growth Factor Receptor
Presenter(s): Nadiyah Johnson
Faculty Mentor(s): Irina Nesterova
Honors Capstone

This study builds on ongoing efforts to refine a near-infrared (NIR) fluorescence assay for evaluating small molecule kinase inhibitor interactions with EGFR in living cells. At its core, the method employs a phthalocyanine-based sensor, which fluoresces upon de-aggregation and binds specifically to the ATP-binding pocket of kinases. The sensor displacement by kinase inhibitors leads to measurable changes in fluorescence, shedding light on the competitive binding dynamics between the sensor and the

inhibitors. This assay offers a powerful approach for studying tyrosine kinases, known for their critical role in driving cancer cell proliferation. By enabling the differentiation of inhibitor efficacy, the method holds promise in precision medicine by guiding the selection of therapeutic inhibitors, especially as responses can vary across different populations. While initial findings underscore the assay's potential, further investigation is required to establish a foundation of the observed phenomena.

Evaluation of Phenotypic Antimicrobial Resistance from Bacterial Pathogen Isolates in Bison
Presenter(s): Aleena Kallan
Faculty Mentor(s): Pallavi Singh
Honors Capstone

Bison, the American buffalo, are increasingly utilized for food consumption due to their high protein content. Shiga toxin-producing Escherichia coli (STEC) is an important food-borne pathogen that leads to severe clinical infections and becomes antimicrobial-resistant (AMR). Specifically, enrofloxacin antibiotics can complicate human treatment plans when infected with resistant STEC. This study aims to determine the presence of STEC in bison reservoirs and their antimicrobial resistance. Fecal samples (n=320) from bison herds were collected, followed by specific culture-based isolation for STEC. Polymerase chain reaction (PCR) was employed for pathogen confirmation with 25.6% prevalence. PCR targeting gene, gyrA (resistant to fluoroquinolone), will be tested for AMR confirmation, and phenotypic confirmation of resistance to enrofloxacin antibiotics will be confirmed by the Kirby-Bauer method. Our findings will provide insight into the potential public health risks posed by bison as carriers of AMR pathogens, calling for monitoring and mitigating bacterial transmission in the food supply.

Invalidating Childhood Experiences and Alcohol Use Problems: The Role of Experiential Avoidance
Presenter(s): Kacy Kernberger
Faculty Mentor(s): Holly Orcutt

Past research suggests invalidating childhood experiences (Musser et al., 2018) and experiential avoidance (EA; Levin et al., 2012) are associated with subsequent alcohol use problems. However, the role of EA in the relationship between invalidating childhood experiences and adult alcohol use problems warrants further study. The current study tested a simple moderation model in a sample of 284 undergraduate students, with EA (moderator) hypothesized to be associated with a stronger positive relationship between invalidating childhood experiences (IV) and subsequent alcohol use problems (DV). Moderation analyses demonstrated invalidating childhood experiences predicted alcohol use, moderated by EA, such that greater EA was related to a larger positive effect of invalidating childhood experiences on alcohol use problems, $F(3, 281) = 7.761$, $p < .001$, $R2 = .08$. Findings suggest experiencing an invalidating childhood environment is especially associated with an increased likelihood of alcohol use problems in those with high levels of EA.

Analysis of Theft Trends from 2022 to 2024 in Chicago and Their Variations Across Income Groups
Presenter(s): Huaxi Kou
Faculty Mentor(s): Xuewi Chen
Civic Engagement and Class Project EAE 361

This study examines trends in theft crime rates in Chicago from 2022 to 2024, focusing on the impact of Illinois' 2023 bail reform policy and variations across income groups. Using a paired t-test, we compare theft rates before and after the policy change to assess its effects. Additionally, ANOVA analysis is applied to explore differences in theft rates among different income groups. We expect the paired t-test to reveal a significant change in theft rates post-reform, possibly indicating a reduction in theft crimes. The ANOVA analysis is likely to show higher theft rates in lower-income areas, suggesting that socioeconomic factors significantly influence crime trends. The findings will provide valuable insights into the relationship between bail reform and socioeconomic disparities in criminal behavior, contributing to policy discussions on crime prevention and informing future research on economic factors influencing crime rates.

The Effects of Multiplanar High Intensity Resistance Training on Increasing Bone Mineral Density on Middle Aged Females. The Stop Protocol.
Presenter(s): Ava Krall
Faculty Mentor(s): Rachel Kowal
McKearn Fellow

Menopausal women typically transition between the ages of 47 and 51. Within that time, there is a quick loss of bone density during pre- and post-menopausal period. Using high intensity resistance training allows mechanical loading that grows the bone to stimulate formation. Over a fourteen-month period, females within the ages of 45 and 60 years old completed exercise intervention. Subjects visited the lab a total of 4 times for intake, testing, end of testing and maintenance phase. All groups worked out in various spaces two times a week. The intervention group was supervised by an exercise physiologist, the control group was supported virtually with weekly check-ins. This was an organized assigned control and experimental group, based off health history from their questionnaire and intake testing subjects were assigned to evenly distributed groups. Our results showed an overall increase in T-scores for both STOP groups and the LIFTMOR groups resulted in decreases on the average T-scores for both femoral neck and L1-L14.

Overview of the Access in Undergraduate Research for Undocumented Students
Presenter(s): Sam Lee
Faculty Mentor(s): Andrea Radasanu

This project explores the various research opportunities available for undocumented students, with a particular emphasis on undergraduate research and mentorship programs. It aims to provide a comprehensive overview of the resources and support systems that Northern Illinois University (NIU) has established specifically to assist undocumented students in their academic endeavors.

A Rodent Model of Depression in a Motivational Task: The Impact of Chronic Unpredictable Stress and the Role of Dopamine
Presenter(s): Sydney Kuhn
Faculty Mentor(s): Leslie Matuszewich

Those with depression struggle in many areas, including initiating and sustaining motivated behaviors. Because of the link between depression and stress, a useful way to study depression is the chronic unpredictable stress (CUS) rodent model. Prior research demonstrates dopamine's importance in pursuing rewards and that disrupting dopamine signaling disrupts reward-seeking behaviors (Errante et al., 2021). This project tested male and female rats following exposure to CUS in a progressive ratio (PR) task for sucrose rewards after saline and the dopamine antagonist haloperidol injections. Rats were trained in PR, then randomly assigned to either control or CUS conditions for 10 days. After CUS, rats were tested in PR following injections of haloperidol or saline. Haloperidol decreased lever pressing for rewards; however, exposure to CUS had no impact. This research demonstrates dopamine's role in the pursuit of rewards, but that CUS did not disrupt pursuits of rewards in male and female rats.

Temperature and its Effects on Plant Growth
Presenter(s): Trent Lange and Kevin Seefurth
Faculty Mentor(s): William (Bill) Martin
Class Project BIOS 305

This research investigated how environmental and genetic factors impact plant growth and are affected specifically by differing temperatures. The research utilized Arabidopsis thaliana from wildtype and mutant populations. This plant was selected because of its genetic relation to many other agriculturally important plants. The experiment, a randomized complete block design was used. Plants were either grown at 20°C or 24°C and the data collected included rosette diameter, leaf count and seed pod count. The populations that are from warmer regions were expected to grow more at 24°C and the ones from cooler regions were expected to grow more at 20°C. Lines that are genetic knockouts may struggle. Results confirm that different temperatures affected plant growth, which provides insight into the effects of genetic modification on plant resilience and how this could possibly be applied to agriculture/food production in an era of ever-changing climate.

Givers and Receivers of Expressions of Gratitude
Presenter(s): Naomi Langley and Mariana Martinez
Faculty Mentor(s): Randy McCarthy

Independent Study

Previous research suggests that individuals often underestimate the positive feelings that receivers experience after receiving gratitude (Kumar & Epley, 2018). To explore this dynamic, this study investigates experience perceptions of both the giver and receiver of an expression of gratitude. For this on-campus study, dyads are selected to participate. One person is the designated giver, and they are prompted to give an expression of gratitude to the other person and then report on how positive or awkward they think the receiver will feel. The other person is the receiver, and they will report how positive or awkward they actually feel after receiving the expression. It is predicted that the givers will overestimate how awkward and underestimate how positive the receivers feel after the interaction. The results hope to reveal significant discrepancies in perceptions of expressing gratitude, which can show that the experience may be more positive than expected.

Apparent Traditional Garb in Anatomy and Physiology
Presenter(s): Ala'a Lahawani
Faculty Mentor(s): Heather Bergan-Roller
Diversity, Equity and Inclusion
Student Engagement Fund

Anatomy and Physiology (A&P) is an important class for future health care providers and popular among biology majors. However, almost half of students fail on their first try and many leave the sciences altogether. Students who leave are influenced by factors such as lack of sense of belonging in their field or institution. We are investigating how apparent traditional garb is portrayed in A&P textbooks and how it intersects with race and ethnicity. The goal is to promote a sense of belonging among all identities. Traditional garb is a strong indicator of one's ethnicity or social race. Images were coded to consensus with six coders across five A&P textbooks. We found that when the traditional garb is present, it is associated with marginalized races and ethnicities and is portrayed negatively. Instructors and textbook creators need to do more to promote inclusive and representative imaging in A&P textbooks.

The role of mirB gene in *Aspergillus flavus* mycotoxin production
Presenter(s): Cedar Laliberte
Faculty Mentor(s): Ana Calvo
Student Engagement Fund

Aspergillus flavus is a pathogenic fungus that infects crops and poses health risks to humans by producing mycotoxins. Some such as aflatoxin B1 exhibit mutagenic and carcinogenic properties. Resistance to available fungicides poses a problem for management of *A. flavus*. Iron homeostasis is crucial for fungal growth, and iron availability has been linked to regulating mycotoxin biosynthesis. Our study investigates the role of mirB, an iron acquisition gene. Since *A. flavus* relies on siderophores for iron uptake, we hypothesize that deleting mirB will impair iron acquisition and alter mycotoxin biosynthesis. To test this hypothesis, we will generate a deletion mirB strain

of A. flavus via fungal transformation. We will then use the strain set to examine the role of mirB in A. flavus development and mycotoxin production. Based on our findings, we will determine if mirB could be used as a novel target to control for *A. flavus* infection.

Gender and Injustice: How Stigma Consciousness Mediates this Relationship
Presenter(s): Tashique Lawrence, Avionce' Lee and Karina Santos
Faculty Mentor(s): Rachel Saef
Diversity, Equity and Inclusion
Independent Study

This study investigates the role of stigma consciousness as a mediating factor in the relationship between gender and perceived injustice in the workplace. The hypotheses are that stigma consciousness will be positively associated with perceptions of injustice; perceptions of injustice will differ significantly across genders, with women perceiving higher levels of injustice than men; stigma consciousness will differ significantly across genders, with women reporting higher levels than men; and gender will affect perceptions of injustice indirectly through stigma consciousness. To test these hypotheses, participant perceptions using Likert-type scales for perceptions of injustice and stigma consciousness were measured, along with a single-item measure of gender. These findings may help inform workplace policies aimed at reducing gender-based inequities and improving perceptions of fairness.

Breast Cancer: Statistics, Molecular Expression, and Treatment
Presenter(s): Kaia Lechowski
Faculty Mentor(s): Linda Yasui
Class Project BIOS 350

Cancer is one of the leading causes of death in the U.S. Developments in medical interventions have increased the five-year survival rate for many cancers, but the same incidence of cancer remains or has even increased in some instances. Breast cancer is the most prevalent cancer in women, and the number of cases is climbing annually. To know how to successfully treat this disease, the internal mechanisms of the cancer must be understood. The findings of scientists researching in this field has been compiled to present the current major defining aspects of breast cancer and how oncologists are able to fight it. The molecular mechanisms primarily consist of aberrant signaling in cell proliferation pathways. It is important to spread the current knowledge about breast cancer to bring awareness to the detriment it causes, how it operates, and how people can take preventative measures to lessen their risk of pathogenesis.

Episodic Memory links to Abstract Concepts
Presenter(s): Loralei Liggett
Faculty Mentor(s): Katja Wiemer

Independent Study

The meaning of “hope” may seem obvious; it may remind someone of a dream or a wish. When describing abstract concepts like hope, people refer to such inner experiences and complex situations. This relates to episodic memory, which stores personally experienced events that happened at a specific time and place. This project tests the idea that what is recalled about abstract concepts is based on episodic memory. To test this, participants were given 25 abstract terms and instructed to write their characteristics. Additionally, the Autobiographical Recollection Test was administered. The ART uses a Likert scale to measure individual differences on seven aspects of autobiographical memories. Data collection is complete with 62 participants, and the coding process is ongoing. It is hypothesized that if abstract concepts are based on episodic memory, then individuals with higher ART scores would describe concepts with more specific details and experiences**.**

Investigation of Anhedonia
Presenter(s): Austin Littlejohn
Faculty Mentor(s): Michelle Lilly
Honors Capstone and Independent Study

“Investigation of Anhedonia" serves as an independent study where a literature review was conducted to research different aspects and elements of the psychological phenomenon known as anhedonia. With the support of psychology mentors and utilization of the library's resources, the author investigated what anhedonia is and how it is connected to stress and trauma, the trajectory or progression of anhedonia and its symptoms, the connection to more well known psychological disorders like post-traumatic stress disorder (PTSD,) and anhedonia's status of a stress response and whether or not it could be considered a separate disorder. The significance of the literature in this review helps to expand the understanding of anhedonia as more than just another trauma response and helps to make it stand apart from other impactful psychological phenomena like PTSD or major depressive disorder, MDD. Finally, the literature review helps ascertain the potential for improvements in medical intervention.

Flood Buffer Zone Analysis and Design for the Big Thompson River in Big Thompson Canyon
Presenter(s): Xinyi Liu
Faculty Mentor(s): Wei Luo
Class Project EAE 459

The Big Thompson River in Big Thompson Canyon suffered a catastrophic flood in 1976, causing extensive damage to infrastructure, property, and loss of life. Given the region's vulnerability to severe flooding, this project aims to analyze the hydrological characteristics of this river segment using high-resolution elevation data. By leveraging advanced analytical modeling tools such as ArcGIS, a detailed assessment to delineate a flood buffer zone for this area will be conducted. Additionally, the HAND model (Height Above Nearest Drainage) will be used to generate a drainage map, further

analyzing the flood risk and drainage patterns in the area. Furthermore, the study will explore effective flood prevention strategies and mitigation measures to minimize future risks. The findings will provide valuable insights for disaster preparedness, infrastructure planning, and environmental conservation efforts.

Statistical Analysis of Streamflow Changes Before and After Flooding
Presenter(s): Xinyi Liu
Faculty Mentor(s): Xuwei Chen
Class Project EAE 361

This project analyzes streamflow changes before and after a flood in the Big Thompson River. Using historical data, we compare streamflow before and after a selected flood event. Statistical tests like the Wilcoxon Signed-Rank Test and Kolmogorov-Smirnov Test will assess changes in flow rates and distribution. The goal is to determine whether flooding causes temporary or lasting impacts on river discharge, aiding in flood management and mitigation efforts.

Spatiotemporal Disparities in Secondary and Tertiary Industry GDP Across Prefecture-level Cities of the Yangtze River Delta: An ANOVA and Paired Dynamic Analysis (2000–2020)
Presenter(s): Zhengyang Liu
Faculty Mentor(s): Xuwei Chen
Diversity, Equity and Inclusion
Class Project EAE 361

China's rapid economic growth over the past few decades has led to significant shifts in regional industrial structures, particularly in the Yangtze River Delta. This study investigates the disparities and evolutionary trends in industrial structure among prefecture-level cities in Zhejiang, Anhui, and Jiangsu provinces, using aggregate GDP data from the secondary and tertiary sectors for the years 2000, 2010, and 2020. We employ one-way, repeated measures, and multi-factor ANOVA to comprehensively analyze variations across cities and provinces within each time period. Additionally, descriptive statistics, mean calculations, and paired t-tests provide in-depth comparisons of secondary and tertiary industry GDP changes across key provinces over time. The findings reveal significant regional and temporal variations, reflecting the dynamic process of economic transformation and industrial upgrading. Furthermore, the study identifies key factors influencing industrial restructuring, traces the development trajectories of each province, and offers empirical insights to optimize regional economic strategies, promote balanced growth, and support data-driven policymaking.

Community Engagement and Communication Strategies for Downers Grove, IL
Presenter(s): Adilene Lopez and Tori Smith
Faculty Mentor(s): Melissa Burlingame
Community Engaged Research and Class Project ENVS 491

As part of its new sustainability initiatives, Downers Grove has partnered with NIU's Environmental Studies Department to engage with students in the capstone course to develop a community communication plan aligned with the Greenest Region Compact (GRC). Research methods include benchmarking local municipal efforts in communications and analyzing current data about best practices from comparable communities, with a focus on promoting resource conservation and sustainable alternatives. Outcomes include a strategic framework for increasing public education, community participation, and long-term sustainability efforts. This communication plan contributes to the broader goal of integrating sustainable practices into municipal governance, specifically in the sector of materials and resources, while strengthening community involvement in environmental action.

Lights On, Parasites Out: How Light Affects Faucet Snail Parasite Shedding
Presenter(s): Ben Lunaburg
Faculty Mentor(s): Jennifer Koop
Student Engagement Fund

Invasive species can have negative economic, ecological, and human-health-related impacts through their parasites. Faucet snails are invasive freshwater snails that have spread across the Great Lakes region and the Mississippi River. They are host to parasites that, when consumed by waterfowl, can be deadly. To better understand the influence of light on cercarial shedding and how this might affect overall transmission from urban areas, snails were exposed to 12, 24, or 48 hours of continuous light and examined for whether they had shed cercaria. Two repetitions were completed with the second introducing food. There was a non-significant trend that as exposure time increased, so did the number of snails that shed. Additionally, there was no effect from using food. Wild-caught snails were used. The infection status was unknown, suggesting results should be interpreted with caution. Still, it's worth noting that the near-constant light emitted by urban environments may stimulate cercarial shedding and increase transmission.

Flying Safe: Reducing Bird Strikes at Northern Illinois University
Presenter(s): Stacey Marcinkowski
Faculty Mentor(s): Jennifer Koop
Honors Capstone

Bird window collisions result in the deaths of between 365 million to 1 billion birds annually in North America, making it a leading cause of bird mortality. The goal of this study was to determine if placing Fritt Dots on the windows of Montgomery Hall Bridge would reduce the number of bird-window collisions in this area. To conduct the study, Fritt Dots were placed on the windows of the bridge in a grid pattern with roughly four inches between dots, using a white grease marker. Bird monitoring surveys were done by walking a designated path around campus and recording dead or stunned birds. These surveys are part of a long-term monitoring program on campus. Preliminary results suggest the dots were effective in reducing the number of bird-strikes near the

Montgomery Building Bridge. Further research needs to be done to determine if Fritt Dots will help elsewhere on campus.

Public and Private Police and Their Impact on Crime: Evidence from American Universities
Presenter(s): Cruz Marquis
Faculty Mentor(s): Virginia Wilcox
Honors Capstone

This study quantitatively assesses the depressive impact on crime imposed by Stringham's concept of fully deputized private police on American university campuses. Using crime rates of over 800 universities sourced from the Department of Education, and expansive data on campus police departments sourced from the Department of Justice, a unique dataset was made allowing for different security arrangements to be studied. The study controls for variables such as campus size, department budget, and urbanization status. The model reconstructs an average crime rate for campuses which do and do not feature fully deputized private police and compares them using ordinary least squares to determine if there is a statistically significant difference. Research is underway, but it is hypothesized that the presence of fully deputized private police is associated with decreased violent crime on university campuses in the United States.

The Effect of Bison Grazing at Various Intensities on the Carbon and Nitrogen Ratio of Andropogon gerardii and Ratibida pinnata
Presenter(s): Madeline Martinez
Faculty Mentor(s): Samantha Berk and Holly Jones
Student Engagement Fund

Bison are ecosystem engineers in the tallgrass prairie ecosystems because their behaviors such as grazing and defecation heavily impact aspects of their ecosystems, such as nutrient cycling. Herds tend to return to areas that have species they prefer to eat, which leads to changes in the amount of nutrients over time. Plants are primarily made up of carbon, but both the carbon and nitrogen content found in plants can directly impact nutrient cycling and resource availability in the prairies. For analysis, leaf samples from Nachusa Grasslands were collected from areas of various grazing intensities, then tested for differences in the C:N ratios based on the grazing treatment the plant was subject to. The results of this research show a statistically significant difference in the C:N content of samples from different intensities, with plants under high intensity grazing having a lower C:N ratio than plants in low or no grazing treatments.

NIR Fluorescent Sensor for Epidermal Growth Factor Receptor in Cells
Presenter(s): Heather Matenaer
Faculty Mentor(s): Irina Nesterova
Research Rookie

A type of receptor tyrosine kinase, epidermal growth factor receptor (EGFR) plays an important role in cell growth, converting energy, and facilitating cell function. Deregulation or overactivity of the EGFR can lead to numerous diseases, particularly cancer. The focus of the research work is the precise study and monitoring of EGFR by the newly developed NIR small molecule sensor. Lung cancer cells have been introduced with different concentrations and binding response was recorded as a change in fluorescence. Non-cancerous cells being used for the control experiment. Structurally related fluorophores deliberately lacking target binding modality were also used as controls to prove the specificity of our sensor molecule. The results proved the successful specific binding of the sensor to the target in living cells.

The Evaluation of Student Learning, Self-Identity, and Demographics in an Introductory Biology Classroom
Presenter(s): Caniya McCray Brown
Faculty Mentor(s): Bill Martin
Student Engagement Fund

Student identities influence self-efficacy and academic performance in biology. This ongoing research surveys students in an introductory biology course to assess preparedness and diversity, collecting demographic, self-identification, and self-efficacy data. Responses were analyzed across categories including but not limited to final grades, AP course participation, first-generation status, and race/ethnicity. Initial analysis suggested the need for a broader approach, considering additional factors influencing student performance. The survey was expanded to explore first-generation status and its effect on students' educational efforts and financial considerations. This revision aims to examine how finances may affect students' decisions to enroll at NIU and their subsequent academic performance. The revised questions are anticipated to provide new insights, with the hope of gaining better understanding into the factors influencing students' self-perception and course outcomes.

Boozed and Confused: The Effects of Prenatal Alcohol Exposure on Spatial Navigation
Presenter(s): Hannah McQuillan
Faculty Mentor(s): Doug Wallace
Independent Study

According to the CDC, fetal alcohol spectrum disorders may affect 1-5% of school-aged children. This group of disorders, which includes fetal alcohol syndrome, results in a number of physical and developmental disturbances that persist into adulthood with no known cure. To model the effects of prenatal alcohol exposure in humans, rats were exposed postnatally to two doses of alcohol via IP injections at seven days old. The rats were then recorded in the open field at 60 days old to analyze spatial orientation and navigation. Results will be presented at the time of the poster presentation. This study sought to further understand the effects of prenatal alcohol exposure on spatial navigational development in addition to looking at sexual differences in response to

exposure. This work will aid in the development and evaluation of treatments for fetal alcohol spectrum disorders.

Investigating Pseudomonas 20ei1 as a Potential Source of Antimicrobial Compounds Against Bacillus subtilis
Presenter(s): Rosy Mejia
Faculty Mentor(s): Scott Grayburn
Student Engagement Fund

Antimicrobial-resistant infections result in hundreds of thousands of deaths annually. The bacterium Pseudomonas 20ei1, isolated from the NIU lagoon, can inhibit the growth of algae and fungi. Current studies focus on bacterial growth inhibition. A non-pathogenic strain of Bacillus subtilis was used in growth inhibition experiments to assess whether different bacterial extracts and culture conditions can suppress its growth. In plate assays, B. subtilis was spread on growth medium, followed by the addition of live P. 20ei1 or cell-free extracts. Clear zones in a region of B. subtilis growth indicated growth inhibition. A sensitive DNA amplification technique was used to examine P. 20ei1 gene expression under different conditions. Enhanced gene expression was observed in medium supplemented with copper and co-cultures with B. subtilis. This research explores a potential new antibiotic source, with future studies focusing on extract optimization and expression analysis of key genes.

Effect of Climate Change and Gene Insertions on *Arabidopsis thaliana*
Presenter(s): Gia Memenga
Faculty Mentor(s): William (Bill) Martin
Class Project BIOS 305

This study investigated how rising global temperatures affect *Arabidopsis thaliana*, a widely used model organism. Two key questions are explored: the general impact of climate change on plant growth and the effect of gene insertions in different segments of a single gene in the A. thaliana genome. A blind experiment was conducted, growing land and random mutant races at 20°C (current springtime temperature) and 24°C (projected future springtime temperature). Growth was measured as diameter, leaf count when flowering, and seed count at the end of the growth period. The expectation was that higher temperatures will either decrease growth due to nutrient and water limitations or enhance it, leading to larger plants with more seeds. These findings contributed to understanding plant adaptation to climate change and may inform strategies for mitigating its effects in food crops.

Engineering pH Dependent Anti-Caffeine VHH Antibodies by Substituting Acidic and Basic Ionizable Residues into the Homodimer Interface
Presenter(s): Josie Mendell
Faculty Mentor(s): James Horn
Class Project CHEM 498

Antibodies with pH-dependent target binding are valuable for therapeutic applications, due to their ability to reduce dosing frequency or improve targeting. This pH-dependent binding can be achieved by introducing ionizable residues in regions associated with target interaction. Here, an anti-caffeine VHH homodimer had histidine and aspartic acid residues substituted into the VHH:VHH interface to create acidic and neutral pH switches, respectively. Variants with single or paired aspartate (S35D, T52D, and S35D/T52D) and histidine (F49H, Y108H, and F49H/Y108H) substitutions at the homodimer interface led to significant shifts in binding affinity across different pH values. The paired variants exhibited pH-dependent binding weaker than anticipated based on single linked protonation. This suggests that the small interface and close proximity of the introduced ionizable residues limit environmental pKa shifts, thereby reducing the extent of pH-dependent binding.

The Relationship Between the Anti-Shashkvilli Forces in Georgia and the Repeated Militarized Interstate Disputes
Presenter(s): Claire Meyer
Faculty Mentor(s): Ches Thurber
Honors Capstone

This project explores the relationship between the anti-Shashkvilli forces in Georgia and the repeated militarized interstate disputes involving Georgia, particularly with Russia. Specifically, the project tests two hypotheses: (1) popular uprisings in Georgia encouraged Russia to use military force in South Ossetia and Abkhazia; (2) the Georgian government's handling of relations with Russia over South Ossetia and Abkhazia encouraged popular uprisings against Georgian presidents.

Learning to Listen: Understanding Farmers' Perspectives on Weather Forecasting
Presenter(s): David Meyer
Faculty Mentor(s): Emily McKee
Student Engagement Fund

Extreme weather and shifting climate patterns are creating new challenges for American farmers, especially when it comes to decision-making during daily and seasonal practices. This study explores how farmers in the Midwest use weather forecasts and what improvements they believe would make these tools more reliable and useful. Through qualitative interviews, our research team is gathering insights into how farmers access weather data, evaluate its trustworthiness, and apply it to their daily work. My role has focused on reviewing interview transcripts in preparation for thematic coding and analysis. While the coding is still in progress, early impressions suggest that many farmers may want more localized forecasts, access to historical weather trends, and trusted relationships with human advisors. Next steps include completing the coding process, expanding the participant pool, and refining our understanding of how weather communication can better support farmers in an increasingly uncertain climate.

Temperature-Dependent Growth Patterns in *Arabidopsis thaliana*: Implications for Crop Adaptation to Climate Change
Presenter(s): David Meyer, Michelle Pastor and Alyssa Tuzzolino
Faculty Mentor(s): William (Bill) Martin
Class Project BIOS 305

Arabidopsis thaliana, although a weed, is a model organism that plays a crucial role in agricultural research due to its rapid lifecycle and genetic similarity to many human-consumed crops. As climate change increases global temperatures, understanding the effects of temperature on plant growth and productivity becomes increasingly important. In a 10-week experimental study that has observed phenotypes and environmental interactions, a strong argument emerges that warmer temperatures allow the organism to survive a longer lifecycle than it would in a colder environment. By studying *Arabidopsis thaliana* traits, we can relate these genetic modifications to our current crops developing optimal genetics to sustain continuous temperature changes in our climate.

Supporting Mathematical Instruction Around Definitions Through Values-Centered Collaboration
Presenter(s): Mik Mieczkowski
Faculty Mentor(s): Rachel Rupnow

This project integrates focus groups, class observations, surveys, and interviews with instructors and students to develop a toolkit of instructional innovations for effectively communicating mathematical norms and values around definitions. This poster presents preliminary observations in the first round of focus groups and surveys with 10 mathematics faculty from two universities. Instructors reported challenges with limited time for activities in lecture, highly coordinated courses limiting freedom of instruction, as well as more content-specific challenges. For example, instructors reported difficulty in communicating precision without becoming over-encumbered in fine details. Other instructors expressed difficulty in growing students' intuition about certain definitions or translating between students' informal and technical understandings.

Pancreatic Cancer
Presenter(s): Izaiah Morris
Faculty Mentor(s): Linda Yasui
Research Rookie

Pancreatic cancer is the third leading cause of cancer death, despite not being among the top five most diagnosed cancers. Its incidence rate has been increasing in recent years and remains one of the most painful and aggressive forms of cancer. Understanding this cancer is crucial for advancing cancer research and promoting public awareness. This project examines the nature of pancreatic cancer through a literature review. This review studies some of pancreatic cancer's molecular defects, such as the mutation and inactivation of the genes for KRAS and SMAD4. Additionally,

it explores the demographics, symptoms, prognosis, and treatments for pancreatic cancer.

No Hat Upon His Head; A Forgotten American Obsession
Presenter(s): David Mortenson
Faculty Mentor(s): Taylor Atkins
Senior Thesis

No Hat Upon his Head is a historical research project that starts at the event of the New York Straw Hat Riots of 1922. From there it expands into an exploration of hat culture in America to understand why it was so important. Male customs and mores around wearing hats in public were an ever-present part of presenting yourself in public. Etiquette books assumed a hat was worn outdoors and had elaborate rules on to whom you tipped your hat. The word hatless was synonymous with wretched or desperate and was used as shorthand by writers and journalists to signify a terrible situation. Simply put, a hat was required when interacting with the public in any manner and the absence of one was significant enough to be newsworthy.

Identification of the G-protein coupled receptors involved in tissue organization
Presenter(s): Margaret Myer and Paige Minogue
Faculty Mentor(s): Olivier Devergne
Senior Thesis and Student Engagement Fund

Epithelial cells are the most abundant cell type in the body and are required to form organs like the lungs, liver, and skin. They follow a specific architecture required for proper cell functions including the deposition of the basement membrane (BM) which lines the basal side of epithelial cells. BM mislocalization leads to developmental defects and cancer metastasis. Our lab studies genes important for proper BM deposition using the follicular epithelium of Drosophila ovaries as our model system. Previously, we identified the gene Rcp as critical for BM protein deposition. Rcp is a known component of G-protein coupled receptor (GPCR) signaling, leading us to investigate the roles of GPCRs in BM deposition. To do so, we are performing a genetic screen which targets each of the 116 classical GPCRs in Drosophila. From this screen, we already identified 3 GPCR important for epithelial organization and/or BM deposition.

Synthesis of a Cobalt Phthalocyanine Electrocatalyst Film
Presenter(s): Eric Riley
Faculty Mentor(s): Evgueni Nesterov
CHEM 499 Research

Phthalocyanines (abbreviated Pc) are relatively large, very stable, heterocyclic molecules composed of four isoindole units first synthesized intentionally in 1927 for use as a pigment. These molecules have attracted research interest in recent years in applications ranging from catalysis to photovoltaics to medicine, primarily because it is easy to tune the electronic and physical properties by adding subsituents or inserting a metal atom. In this research, a substituted cobalt phthalocyanine (CoPc) was

synthesized and solubilized to create a cheap, effective, easily manufactured electrocatalyst that can be deposited as a thin film.

Cockroaches of the Parasite World: Parasite Survival Even After Host Death
Presenter(s): Josh Nelson
Faculty Mentor(s): Jennifer Koop
Research Rookies

Since 2002, several parasitic trematode species have been responsible for thousands of waterfowl deaths within the Upper Mississippi River. These trematodes spend part of their life cycle in ducks and the remainder within faucet snails, an invasive aquatic species. Relatively little is known about the effects of abiotic conditions on snail hosts and their trematode parasites. The goal of this study was to understand how snail and trematode survival is affected by prolonged periods of desiccation. Sixty adult faucet snails were removed from water and dried for periods of one, two, or three weeks. Afterward, the survival of snails and their trematode parasites were assessed. This study found that trematodes were able to survive three weeks of desiccation conditions, even after host snail death had occurred. These findings demonstrate the ability of these parasites to endure strenuous environmental conditions, further increasing their likelihood of completing transmission and infecting waterfowl hosts.

Monitoring Real-time Data Collection
Presenter(s): Samantha Nickle
Faculty Mentor(s): David Koop
Student Engagement Fund

Real-time data helps people track changing systems, spot trends, and improve decision-making. While data is often freely available online, it is usually transient; current data is available but past data cannot be retrieved. By collecting this data over time, we can use it to calculate statistical summaries, locate patterns, and visualize trends and outliers. However, we need to monitor the real-time data collection to ensure that our data is being collected at the correct intervals and matches the expected schema. This research looks at how to collect, process, and summarize real-time data streams using Python. Using libraries like polars and pandas, we create scripts to efficiently read, clean, analyze, and store the data. Some of the statistics like file size consistency can be tracked for all data, but others are specific to individual datasets. The tools developed have been applied to monitor data collected from bike-sharing services, fuel stations, and public transportation systems.

Self-Affirmation and Apologies
Presenter(s): Caroline Norton and Reem Shihab
Faculty Mentor(s): Randy McCarthy

Independent Study

Facing conflict is an everyday occurrence, and apologies are essential for resolving transgressions. Unfortunately, transgressors may be reluctant to apologize due to anticipating an uncomfortable experience. To alleviate feelings of discomfort, individuals have to reinstate their positive self-concept, which can increase their likelihood of apologizing. This experimental study tests a value-based self-affirmation intervention to help individuals overcome the averseness associated with apologizing. Replicating the manipulated transgression from Leunissen (2014), participants are told to apologize for committing a transgression against a fictitious participant, and their anticipated discomfort is measured. Afterwards, participants either reflect on personally relevant values (self-affirmation) or randomized values (control), and their likelihood of sending an apology is measured. We predict that self-affirmation acts as a buffer against anticipated discomfort, such that those in the self-affirmation condition are likely to apologize regardless of anticipated discomfort. This study hopes to discover a way to motivate transgressors to apologize.

The Influence of Social Relationships on Cognition: Research with an Animal Model
Presenter(s): Elitzia Ocasio
Faculty Mentor(s): Angela Grippo
Independent Study

Social isolation disrupts the brain's response to stress, negatively affecting psychological and physiological well-being. While research has explored the link between emotionality and cardiac function, its impact on memory and cognition remains unclear. This study examines cognitive performance in socially isolated vs. paired prairie voles, a valuable model due to their social nature and long-term pair bonding. Adult prairie voles (n=24) were either paired with a sibling or isolated for four weeks. They were then exposed to a two-day Novel Object Recognition (NOR) task, an index of declarative memory. On day one, voles familiarized themselves with two novel objects, while day two measured recall when one object was replaced. Results showed that paired voles spent more time investigating the novel object, indicating better recognition memory than isolated voles. These findings suggest that social isolation impairs memory, emphasizing the importance of social relationships in maintaining healthy cognitive function.

Evaluating and Improving Transit Predictions
Presenter(s): Shaivil Patel
Faculty Mentor(s): David Koop

Research Rookie

People who utilize public transportation systems rely on accurate timing information, and many systems now help by offering real-time tracking and stop arrival predictions. This information is often made available on websites or apps, leveraging computational models to make reasonable predictions even when vehicles are not on schedule. However, it can be frustrating when this technology is not as accurate as desired. This research examined the DeKalb Public Transit's bus route data to identify anomalies and improve prediction accuracy. The analysis involved cleaning raw transit data, detecting irregularities, and developing an approach to identify when buses reach a stop. The results showed some inaccuracies in existing prediction models for certain conditions, leading to the development of a new machine learning model with the goal of improving arrival time forecasts. These findings help establish approaches to improve the reliability of public transit predictions, helping passengers confidently plan their trips.

Developmental Differences in Digital Technology and AI Use in Middle and High School Students
Presenter(s): Arathi Patri
Faculty Mentor(s): Julia Ogg

Artificial intelligence and digital technology have been on the rise, impacting most aspects of people's daily lives, including education. Studies have found that middle and high school students generally know how AI works and enjoy using digital technology for their schoolwork. Research also suggests that certain types of artificial intelligence may be especially useful in helping students learn class materials and studying, such as ChatGPT. This study aims to examine the developmental differences in use of digital technology and AI in middle and high schools, as well as whether students find AI helpful in school, and which tools specifically. These questions will be examined among a national sample of 111 students in grades 6-12. Participants completed a survey on how they use digital technology, and results will be analyzed to answer the research questions.

Acculturation Stress and Internalizing Disorders in Adolescents
Presenter(s): Hser Paw
Faculty Mentor(s): Elizabeth Shelleby
Independent Study

Acculturation stressors such as parent-child conflict are linked to higher levels of internalizing symptoms in adolescence (Smokowski & Bacallao, 2007). Protective factors such as social competence have buffered the effects of risk (Loukas et al., 2007). This study explores the relationship between caregiver psychological aggression at child ages 9 and 15 and age 15 anxiety levels, exploring whether school connectedness moderates this relation. In a sample of 447 adolescents, linear regression demonstrated that higher psychological aggression ($\beta = 0.96$, $p < .05$) and lower levels of school connectedness ($\beta = -0.28$, $p < .001$) at age 15 significantly predicted higher levels of age 15 anxiety. School connectedness did not emerge as a

moderator (p = .52). Longitudinal relations were not supported. These findings suggest that family and school experiences during adolescence may be more impactful for adolescent anxiety than childhood factors. Future research should explore additional moderators and intervention strategies.

Evaluating the Extent and Consequences of Polarization and Partisanship in the Supreme Court
Presenter(s): Brianna Pechman
Faculty Mentor(s): April Clark
Honors Capstone

This research joins a limited number of existing studies investigating polarization on the Supreme Court by focusing on a specific policy area, reproductive rights, through an analysis of Martin-Quinn scores, a traditional measurement of judicial ideology. Following previous studies investigating polarization in the judicial system, polarization on the Supreme Court is identified through partisan sorting, the alignment of party affiliation and issue position, and traditional polarization, increasing support for extreme positions relative to more positions. Overall, the Court shows no signs of traditional polarization as moderate justices are still present on the Supreme Court and liberal and conservative justices are no more extreme in their ideologies today than justices were in previous terms, as demonstrated by their Martin-Quinn scores. However, justices have formed clear ideological blocs on the Supreme Court, in which justices of opposing ideologies, as determined by their Martin-Quinn scores, no longer vote together on reproductive rights cases.

Detecting Storm Mode with Machine Learning
Presenter(s): Sean Phipps and Brandon Weart
Faculty Mentor(s): Alex Haberlie
Student Engagement Fund

Machine learning and AI is becoming increasingly relevant to the field of atmospheric science. From utilizing it for numerical weather prediction to statistical analysis of certain features of the creation of new models, it has emerged as an essential component to the future of the science. In this project, we seek to utilize a convolutional neural network (CNN) along with the SVRIMG radar image archive to classify distinct storm modes on archived radar images. After compiling nearly 10,000 radar images over four distinct categories, a CNN was trained on these images and produced a success rate surpassing 70%. More work is needed on this model and there are some caveats that need to be worked out regarding the data, but overall, the CNN showcases adequate skill at classifying radar images and distinguishing between the four categories.

The Effect of Prescribed Fire on *Zapus Hudsonius* Population Activity
Presenter(s): Amber Platt
Faculty Mentor(s): Holly Jones

Student Engagement Fund

Prescribed fire is an important tool in the restoration of prairie ecosystems. This practice was utilized by indigenous populations long before colonization as a management strategy for the vegetation as well as the wildlife, from the largest bison to the smallest mice. The meadow jumping mouse (*Zapus hudsonius*) is one such species affected by these prescribed fires. Using live-trapping data gathered between 2013-2024, this analysis explores the connection between prescribed fire prairie management and population activity levels of *Z. hudsonius* at Nachusa Grasslands. Population activity level is measured through capture rates and average body weight of specimens captured in burned vs not burned trapping sites, while the burn status of a site was noted at the time of trapping. The results of this analysis show that *Z. hudsonius* exhibits greater activity in burned sites than non-burned sites with both higher capture rates but an increased average body weight measurement.

Temperature-Dependent Structuring of Ionic Liquids
Presenter(s): Magy Ponce
Faculty Mentor(s): Ralph Wheeler
Research Rookies

Ionic liquids are salts that exist in a liquid state at or near room temperature, composed of cations and anions. They have applications in catalysis, drug delivery, and electrochemistry, particularly as battery electrolytes. Compared to traditional carbonate-based electrolytes, ionic liquids offer increased stability and reduced volatility, leading to enhanced safety. Understanding ion-ion correlations is crucial as it relates to properties like viscosity and ionic conductivity. Molecular dynamics simulations conducted by Emily Dalbey have shown increased structuring with higher temperatures, which is counterintuitive. We hypothesize that this effect arises from adjacent peaks in the structure factor merging at elevated temperatures, resulting in higher peak intensities and an apparent increase in structuring. To investigate this, we will perform statistical analysis and functional fitting to examine peak behavior and gain insights into temperature-dependent structuring in ionic liquids.

The Protective Influence of Music in Socially Isolated Prairie Voles
Presenter(s): Kiana Pope
Faculty Mentor(s): Angela Grippo

Social stressors influence physical and psychological health. Music exposure may protect against some aspects of stress, such as agitation, emotion-related behaviors, and cardiovascular functions. This study explored the influence of classical music on hormonal, cardiac, and behavioral biomarkers in socially isolated prairie voles. These rodents display social bonding and respond negatively to social isolation. Adult prairie voles were socially isolated for eight weeks. During the final four weeks, the experimental group was exposed to 30 minutes of classical music twice per week, while the control group was exposed to ambient noise, followed by investigation of: corticosterone levels to assess endocrine changes; heart rate to measure cardiac stress

reactivity; and an open field task to measure anxiety-related behaviors. Analyses of variance and t-tests indicated statistically significant beneficial effects of classical music on all outcome measures. These findings have important implications for future research in stress management in humans.

Not all Representation is Good Representation: Body Sizes in Anatomy and Physiology Textbooks
Presenter(s): Chaol Priest
Faculty Mentor(s): Amanda Littauer
Diversity, Equity and Inclusion and Student Engagement Fund

A&P textbooks lack unbiased diversity and inclusivity, specifically when it comes to body sizes. The vast majority of A&P textbooks showcase mainly smaller body types, and when bigger/fat bodies are shown it has a negative connotation. It is important that bigger/fat bodies are included without negative connotations. This starts by erasing the stigma of fatness and being aware that the medical field is built on fatphobia.

High Population Densities and Limited Food Slow Invasive Snail Growth
Presenter(s): Gabriel Reynolds
Faculty Mentor(s): Jennifer Koop

Faucet snails are an invasive aquatic snail species from Europe, known to carry parasitic trematodes. They have invaded the Great Lakes and upper Mississippi river region, causing harm to local species. These snails are often found living in very high densities within the invaded range, begging the question of how density might affect their growth rates and whether that is mediated by food availability. Adult snails were collected from the field and randomly housed in groups of 5, 10, and 20 snails/cup Each group was then further divided into one of two food treatments: one was given food at all times while the other was only given enough for 5 of every 7 days of the week. T Snail shell lengths were measured after 1, 8, 16, and 32 weeks to calculate growth. While snails in all treatments grew over the course of the experiment, those in the high-density treatment and with limited food grew the least. Therefore, food availability likely plays a role in limiting growth, at least at high population densities.

Feeding Families: Building Collaborations between the Communiversity Gardens and DeKalb Food Pantries
Presenter(s): Kaitlyn Rhoads
Faculty Mentor(s): Kris Borre
Community Engaged Research and Research, Engagement and Academic Diversity Grant

Many DeKalb families experience food insecurity due to lack of affordable, available, and accessible nutrient-dense foods. DeKalb food pantries report a lack of fresh vegetables each week. A partnership developed between St. Paul's Communiversity Garden and the New Hope Food Pantry for garden produce to be provided at the pantry and for St. Paul's to assist New Hope to develop their own garden to address the issue.

Developing relationships among the churches, the gardens, and the pantry were observed and documented over a six-month period using participant observation while volunteering. The significance of fresh produce and shared work among partners was documented. Both the quality and quantity of fresh produce varied seasonally and was sought out by shoppers. Garden produce became a vehicle for building community capacity to provide nutrient dense foods in season to the food insecure.

Parental Involvement and Children's Social Skills
Presenter(s): Vanessa Rios
Faculty Mentor(s): Elizabeth Shelleby
Independent Study

Research shows that parents' involvement in their children's lives impacts children's development of social skills. Fathers participating in outdoor activities with their children is associated with children's stronger interpersonal skills. Additionally, if parents and children have close relationships, parental involvement at home positively impacts children's development of social skills. The present study aimed to investigate how parental involvement in infancy is associated with children's social skills in early childhood. Two simple regression analyses were conducted. Mothers' involvement in infancy positively predicted children's social skills in early childhood. However, there was not a significant association between fathers' involvement in infancy and children's social skills in early childhood. These results may be due to differences in mothers' and fathers' involvement in their children's lives, as the measure may not have captured important ways that fathers are involved in their children's lives.

Social Media and Protection of the Youth: Assessing Policy Safeguards and Political Implications
Presenter(s): Genesis Rivera
Faculty Mentor(s): Kikue Hamayotsu

The term "child influencers" is central to this research, serving as the primary focus of this study. An influencer is defined as "…a subset of digital content creators defined by their significant online following, distinctive brand persona, and patterned relationships with commercial sponsors" (Duffy, 2020, p. 1). The research question it addresses is: How can policies be strengthened to protect underage influencers from exploitation? Additionally, how can these policies balance the rights, opportunities, and interests of stakeholders? The study utilizes both primary and secondary sources, such as personal testimonies and case studies, to provide insights into the situation. The study aims to use a comparative analysis of selected states and countries to identify and address gaps in the effectiveness of existing policies. This study will propose specific reforms and provide guidance for stakeholders to develop new policies that enhance policy effectiveness.

Lifting the Fog: Understanding the Occurrence of Cognitive Deficits after Radiotherapy Treatment for Brain Cancer
Presenter(s): Cate Robson

Faculty Mentor(s): Douglas Wallace
Independent Study

Cognitive deficits due to radiation exposure for the treatment of brain cancer are becoming more prevalent as the number of survivors increases. While radiotherapy has significant benefits in halting the progression of brain tumors, neuroinflammation and the disturbance of neuronal functions affect memory and learning and create overall brain fog. In this study, A control group of mice (n=5) and mice with brain exposure to radiation (n=6) were tested. Six months after exposure the mice were video recorded in a round open field arena, under dark then light conditions. The movement of each mouse was tracked with Noldus software over a period of 20 minutes to establish x- and y- coordinates for measuring home base stability, progression complexity and change in heading. Results will be presented at the time of the poster presentation. The alleviation of the severity or progression of cognitive deficits after exposure to radiotherapy treatment allows for a better quality of life for survivors of brain cancer.

Morphological and Physiological Effects of Nutrient Manipulation on a Colonial Marine Hydroid
Presenter(s): Jenna Roers
Faculty Mentor(s): Neil Blackstone
Independent Study

Environmental nutrients are an existential constraint for heterotrophic organisms and are thus expected to impact numerous biochemical and physiological features. The continuously proliferative polyp stage of colonial hydroids provides a useful model to study these features, allowing genetically identical replicates to be compared. Two groups of colonies of *Podocoryna carnea*, defined by different feeding treatments, were grown by explanting the same founder colony onto cover glass. No clear differences in growth form were found, although some of the nutrient-scarce colonies grew slowly. The probe 2',7'-dichlorodihydrofluorescein diacetate and fluorescent microscopy allowed visualization of the mitochondrion-rich cells at the base of the polyps and showed that the nutrient-abundant colonies exhibited greater amounts of reactive oxygen species (ROS) than the nutrient-scarce colonies. Parallels to the Warburg effect—aerobic glycolysis, diminished oxygen uptake, and lactate secretion—were found in another colonial hydroid, arguably because aerobic metabolism resulted in high levels of ROS.

Swift Studies: Taylor Swift, Poetry, and Academia
Presenter(s): Madison Ruhl
Faculty Mentor(s): Ryan Hibbet
Student Engagement Fund

Taylor Swift, undoubtedly, is a giant in the entertainment industry. Swift continues to break records and pushes the limits of success, yet doubt surrounds her talent. Judgment of Swift's songwriting capabilities and questions about whether she deserves her success surface in almost every discussion about her. So, that begs the question, how and why is she so successful? How could she have classes at Harvard surrounding

her lyrics? Do her lyrics classify her as a poet? Does gender and identity play a role in who we see as legitimate poets in pop music? Through research, readings, and interviews with experts on Swift, a judgment will be made on whether or not Swift's lyrics are poetry and if she herself is a poet to add to the ever-constant debate surrounding her and her success.

Characterization of the sit1 Gene in the Development and Mycotoxin Production of the Agriculturally Relevant Fungus *Aspergillus flavus*
Presenter(s): Christopher Salgado
Faculty Mentor(s): Ana Calvo

Aspergillus flavus is an opportunistic fungal pathogen known for producing mycotoxins, particularly aflatoxin B1, the most potent natural carcinogen. This fungus contaminates economically important crops like corn, peanuts, and cotton, resulting in economic losses approximately one billion dollars annually in the U.S. Resistance to antifungal chemicals is emerging which require new targets to control its effects. One promising target is iron homeostasis. The *A. fumigatus* sit1 gene encodes a siderophore transporter involved in iron uptake and fungal development. The Sit1 homolog was identified in *Aspergillus flavus*, and it is hypothesized that this gene plays a critical role in iron acquisition, normal growth, mycotoxin production, and plant infection by the fungus. To address this hypothesis, this study aims to characterize sit1 in *A. flavus*, particularly conidiation, sclerotia and mycotoxins production. Understanding sit1 in *A. flavus* may provide new insights into fungal iron homeostasis and contribute to mitigating its global impact.

Let the Algae In — and the Undergrads Too: Making Research More Accessible (With a Little Help from Algae)
Presenter(s): Christopher Salgado
Faculty Mentor(s): William (Bill) Martin and Scott Grayburn
Diversity, Equity and Inclusion and Independent Study

Undergraduate Research Experiences (UREs) foster scientific inquiry, strengthen technical skills, and help prepare students for careers in research and industry. This project completed protocol verification of published, open-source URE modules in anticipation of deployment for future UREs at Northern Illinois University. The purpose of refining selected modules is to help lower barriers to participation and increase accessibility to hands-on research experiences. The modules covered a range of techniques, including field collection, freshwater algal isolation and culture, and molecular cost and quality comparisons. Through time and effort invested to trial and adapt these protocols, this research verifies ways to reduce costs and improve feasibility for planned URE implementation.

Impact of "Sanctuary State" Laws on Labor Productivity
Presenter(s): Ryan Sarau-Young
Faculty Mentor(s): Virginia Wilcox
Diversity, Equity and Inclusion and Civic Engagement

Honors Capstone

Using state-level data from the American Community Survey, the Bureau of Economic Analysis, the Bureau of Labor Statistics, and the U.S. Patent and Trademark Office from 2007-2023, a linear regression and a difference-in-difference analysis was used to see the benefit of sanctuary state policies. Sanctuary state policies are pro-immigration laws that in general protect immigrants, specifically illegal immigrants, from Immigration and Customs Enforcement. The question explored in this research study is whether these policies positively influence their work productivity by creating inclusive institutions, as previous research into sanctuaries shows that these policies improve economic conditions. Results and analysis, using both the linear regression model and the difference-in-difference model will be shared and show whether sanctuary policies have an influence on labor productivity.

Research Biography of Professor Raluca Radulescu
Presenter(s): Brenda Schurrer
Faculty Mentor(s): Nicole Clifton
Honors Capstone and Independent Study

Professor Raluca L. Radulescu is a distinguished literary historian whose work has significantly shaped contemporary Arthurian studies. This research biography examines her academic contributions, exploring how her scholarship bridges traditional medieval literary analysis with modern perspectives, particularly in gender and cultural studies. The project employs a literary-historical methodology, incorporating biographical research, textual analysis of her key works, and contextual evaluation within the broader field of medieval studies. By analyzing her scholarship, this study highlights her influence on the interpretation of Arthurian literature and the evolving discourse surrounding medieval texts. The findings underscore the importance of her contributions in expanding the understanding of medieval narratives and their relevance in contemporary scholarship. This research aims to illuminate Radulescu's role in shaping the field and to contribute to a broader appreciation of female scholars in medieval literary studies.

The Effect of Denatonium Benzoate on the Feeding Behavior of Muscidifurax raptorellus, a Parasitic Wasp of House Flies
Presenter(s): Anahita Senobari
Faculty Mentor(s): Bethia King
Honors Capstone

Muscidifurax raptorellus is a parasitic wasp used in biological control to manage house flies (Musca domestica). However, toxic fly baits may harm these beneficial insects. Some baits contain denatonium benzoate (DB), a bittering agent that prevents accidental ingestion by children and pets. This study examines how M. raptorellus responds to different DB concentrations in a 10% sucrose solution to determine deterrence thresholds. Two assays were conducted: a 10-minute feeding assay, measuring feeding duration on 1 µL sucrose drops with 0, 10, 100, and 200 ppm DB, and a 6-hour assay, assessing gut contents after exposure through dissections.

Identifying DB concentrations that deter feeding provides insight into its compatibility with integrated pest management. Findings will help refine fly control methods to reduce unintended harm to parasitoids, supporting sustainable pest management strategies and ensuring biological control agents remain effective in reducing house fly populations.

Deep Learning Based Gait Video Data Validation

Presenter(s): Michael Sensenbrenner
Faculty Mentor(s): Ziteng Wang
Student Engagement Fund

This research enhances the iGAIT web app which is developed to screen autism-spectrum disorder (ASD) in children based on their walking gait. The web app relies on user-submitted walking video data for screening autism and training an underlying machine learning model. It is important to implement a pre-check step that filters out wrong and inappropriate video submissions. By leveraging a Deep Learning based model (YOLO5 + Slow Fast) to validate video data being submitted to iGAIT, this research ensures only videos of people walking are accepted and processed, which enables iGAIT to provide increasingly accurate autism likelihood scores for families across the world.

Challenges Navigating Healthcare for Latino Patients

Presenter(s): Berania Serna
Faculty Mentor(s): Ibette Valle
Diversity, Equity and Inclusion and Research Rookie

The United States healthcare system has historically faced challenges in providing equitable care to minority ethnic-racial groups. Latino patients, particularly, encounter several barriers that affect their healthcare experiences. This review of literature sought to understand possible factors influencing challenges experienced by Latino patients navigating the healthcare system. Though this review is still in progress, three major themes are emerging. A prominent theme is the consequences of a language barrier between limited English proficiency Latino patients and providers. Limited English proficiency significantly impacts patient-provider communication, resulting in poor health outcomes and decreased patient satisfaction. Other emerging themes include cultural disconnect between Latino patients and providers, and inaccessibility of health services. Ongoing challenges in achieving solutions will be discussed. By addressing these barriers, healthcare systems can foster trust and ensure equitable, quality care for Latino patients, ultimately benefiting both the patients and the healthcare providers involved in their care.

Advancing Ecological Sustainability in Downers Grove

Presenter(s): Kayla Short, Ella Siblik and Emily Radzinski
Faculty Mentor(s): Melissa Burlingame
Community Engaged Research and Capstone Project

The Village of Downers Grove is developing a sustainability plan in compliance with the Greenest Region Compact (GRC), an agreement between 162 communities in the Chicago area to take environmental action. To create this plan, Downers Grove worked with the Environmental Studies capstone course students to assist in the research process. The ecology team specifically researched conservation and climate resilience efforts. Students were trained and tasked with the responsibility to 1) collect sustainability benchmarking data across five other GRC municipalities, 2) draft a performance management plan for the village to effectively measure the success of specific sustainability targets, and 3) design an outreach plan to educate the public and increase environmental awareness. The group found most municipalities had detailed ecological sustainability plans and community engagement initiatives. Therefore, the team suggested Downers Grove takes further action to develop an effective sustainability plan and achieve the Greenest Region Compact goals.

Consistency in Self-Concept Clarity Across Gender and Major
Presenter(s): Ava Simons
Faculty Mentor(s): David Valentiner
Diversity, Equity and Inclusion

Self-concept clarity (SCC) examines how clear, consistent, and confident one feels with who they are as a person (Campbell et al., 1998). Research has shown that women in STEM (science technology, engineering, and math) often have a lower SCC when compared to their male peers (Kramer & Soberaj, 2019). The current study seeks to examine the gap in research that overlooks the comparison of gender differences in SCC of students of humanities subjects compared to those of STEM. 494 college students in a psychology class completed a survey on their SCC, gender identity, and major. An ANOVA found no significant differences in SCC were found between gender ($p = 0.122$), area of study ($p = 0.077$), or an interaction between the two ($F(4, 464) =(0.486, p= .746)$. These findings could indicate a reduction of gender differences in SCC across all fields of study for college students.

Financial-Aid Challenges for Undocumented Students: Psychological Impacts and Potential Solutions
Presenter(s): Marco Sotelo Avila
Faculty Mentor(s): Ibette Valle
Diversity, Equity and Inclusion and Independent Study

Financial aid plays a crucial role in the attainment of higher education degrees for students from low-income backgrounds. Yet, low-income students who must also navigate immigration status (e.g., being undocumented, living in a mixed-status home) often face significant barriers when applying for and receiving financial assistance. In this literature review, we explore the psychological impacts of financial aid barriers for students with immigration backgrounds and how various university systems have sought to minimize the barriers students face. To date we have identified three themes related to psychological impacts on students. These include impacts on mental health

and impacts on persistence. We also identified systemic solutions for addressing financial-aid barriers. We discuss the benefits and challenges of the current solutions as they relate to the psychological well-being of students from undocumented and mixed-status immigrant backgrounds.

Suzuki Coupling of Chlorinated Quinolines to Synthesize Biaryl Quinolines
Presenter(s): Allison Stewart
Faculty Mentor(s): Timothy Hagen

This research focuses on the synthesis and importance of biaryl quinoline derivatives using microwave-assisted Suzuki cross-coupling reactions. These reactions were carried out between 4-chlorquinolines and aryl pinacol boronic esters. The 4-chloroquinolines yielded the biaryl products in low to moderate yields. This research highlights the importance of Suzuki methodology for synthesizing substituted quinoline compounds and contributes to the advancement of cross coupling reactions.

The Effects of Known Traumatic Event Outcomes on Mental Health
Presenter(s): Francesca Strangis
Faculty Mentor(s): Allie Jessen

Research suggests that the ability to tolerate uncertainty is associated with mental health conditions (Carleton et al., 2016), however, there is limited information about uncertainty regarding the outcome of traumatic events. The current study examines how knowing the outcome of an event influences mental health outcomes related to the event. Not knowing the outcome may hinder trauma recovery. Researching trauma outcomes can clarify their impact on mental health. This study investigates the relationship between outcome uncertainty and intrusive memories. Participants will watch a film clip depicting physical assault and keep an intrusion diary for seven days. People with high intolerance of uncertainty (reacting negatively in uncertain situations) may be particularly affected by not knowing the outcome of a traumatic event (Carleton et al., 2007). Inferential statistics will compare intrusions between participants who knew the film outcome and those who did not. These findings will be explored, and observations will be shared.

Moderating Effect of Coworkers Humorous Reputation on the Relationship Between Perceived Time Pressure and Burnout
Presenter(s): Brian Sullivan
Faculty Mentor(s): Lisa Finkelstein
Independent Study

This study investigates the moderating effect of coworkers' humorous reputation on the relationship between perceived time pressure and burnout. Time pressure is a well-known stressor leading to symptoms of burnout (e.g., feelings of fatigue, exhaustion, and lack of control). Humor can provide a temporary escape by reducing tension and anxiety, promoting positive emotions, and fostering social connections. We hypothesize that a higher perceived humorous reputation will weaken the positive association

between time pressure and burnout. Using Likert scale surveys, we are collecting data on perceived time pressure, burnout, and perceived coworker humor, along with demographic information. Through moderation analysis, we anticipate that the buffering effect of humor will weaken the positive relationship between time pressure and burnout.

Positive Experiences as Protective Factors in Child Mental Health Amid Societal Disruption
Presenter(s): Brooke Swanson
Faculty Mentor(s): Elizabeth Shelleby
Research Rookies

Understanding what influences children's mental health during major disruptions—like the COVID-19 pandemic—is important for creating effective support strategies. This study explored whether positive experiences during the pandemic helped protect children from developing mental health symptoms. Using survey data, a statistical test was run (linear regression) to examine the relationship between the number of parent-reported positive experiences and children's psychological well-being. The analysis showed no significant connection, meaning that having more positive experiences did not relate to fewer mental health issues. These results suggest that parents' reports of positive experiences alone may not be enough to reduce the psychological impact of stressful events like a pandemic. Future research should explore children's reports about their own positive experiences and other possible influences, such as family stress, financial stability, and access to resources. It may also be helpful to examine whether certain types of positive experiences are more effective in supporting children's mental health.

Inhibitors of SARS-CoV-2
Presenter(s): Natalia Teran
Faculty Mentor(s): Timothy Hagen
Research Rookie

Five years ago, when the COVID-19 pandemic emerged, scientists worldwide began developing treatments. A crucial enzyme in SARS-CoV-2, the virus causing COVID-19, is the Main Protease (Mpro). Inhibiting Mpro prevents the virus from replicating, as inhibitors bind to the enzyme's active site, rendering it non-functional. This project focuses on Paxlovid, a prescription drug composed of Nirmatrelvir and Ritonavir. Nirmatrelvir specifically targets the SARS-CoV-2 Mpro enzyme, effectively inhibiting its activity and thus treating COVID-19 infections. The docking of Nirmatrelvir with Mpro illustrates the key interactions that make this inhibition possible. Understanding these binding interactions is essential for designing new drugs to treat COVID-19, including potential new variants of the virus.

Perception of Criminal Cases: The Role of Race and Afrocentricity
Presenter(s): Nya Thomas
Faculty Mentor(s): Katja Wiemer

Diversity, Equity and Inclusion and Independent Study

Although African Americans make up only 12% of the U.S. population, 44% of the incarcerated population is Black. Previous work by Wilson & Rule has shown that the harshness of prison sentencing is correlated to Afrocentricity. This experiment tests the hypothesis that Afrocentricity (wide nose, fuller lips, coarse hair, and a darker skin-tone) as well as race affect the evaluation of criminal case information. Participants were given a fictive parole application case of an individual. For each case, the storyline stayed consistent, with only the photo of the inmate changing per participant (black vs. white, high vs. low in Afrocentricity, varied between subjects). Afterwards, participants rated a set of items including the likelihood of future violations, the severity of the original offense and conduct in prison. Data collection is ongoing (currently N=29). An ANOVA will test the effects of race and Afrocentricity on these ratings.

Collegiate Support STEM-ing from Human Peer-to-Peer Networks
Presenter(s): Drew Unrath
Faculty Mentor(s): William (Bill) Martin
Diversity, Equity and Inclusion and Student Engagement Fund

Student course attrition rates, especially among underrepresented groups, are persistently high in STEM (science, technology, engineering, and math) courses. Introductory collegiate courses are populated by students early in their academic journey who may have undeveloped or underdeveloped academic peer support networks. The present study aims to quantify the impact to academic network size by purposefully altering laboratory classroom structure. Iteratively reassigning working groups within introductory biology laboratory courses aims to expand networks, increase student connectedness, improve sense of belonging, and support academic success. Student perceptions of GRIT and growth mindset were also assessed to determine if these impacted student networks, connectedness, sense of belonging, or success. Data were collected through self-report surveys at the start and end of each semester using published research instruments.

Changing Ocean Currents: A Biogenic Silica Record of the Interaction between Arctic and North Atlantic Ocean Currents over the Past 30 million Years
Presenter(s): Katelynn Valdez
Faculty Mentor(s): Justin Dodd
Senior Thesis

Ocean currents carry warm, salty water northward where it mixes with cold water masses, and today this mixing is a primary component of ocean circulation and global climate. The International Ocean Discovery Program recovered sediment cores from the ocean floor east of Greenland to understand changes in ocean circulation over millions of years of Earth history. I present the biogenic silica concentration in marine sediments as records of changing ocean circulation and climate conditions in the North Atlantic. Diatoms are algae that produce biogenic silica during photosynthesis at the ocean surface. The silica and organic carbon are transported to the bottom of the ocean where

they are buried and preserved. I interpret variations in the biogenic silica as a record of changes in ocean circulation cold-water conditions, with the highest and most variable biogenic silica content after the onset of glaciation in Greenland ~3.6 million years ago.

Detection of Antibiotic-Resistant Genes Present in the Water Environment Across Dekalb, McLean, and Cook County
Presenter(s): Whitney Vanman
Faculty Mentor(s): Pallavi Singh and Barsha Bhattarai
Student Engagement Fund

Antibiotic resistance threatens public health, creating economic and social burdens. Overuse and misuse of antibiotics drive selective pressure on bacteria in humans, animals, and the environment. Freshwater systems, particularly rivers, transmit antibiotic-resistant bacteria (ARB) and resistance genes (ARGs). This study examines ARB and ARGs in water from Dekalb, McLean, and Cook County, focusing on cephalosporin-resistant bacteria. Cephalosporins (C3GR) are broad-spectrum antibiotics used in medical and agricultural settings, and resistance limits treatment options. Water samples were collected in July, September, November, and January to assess seasonal ARB variations. Bacteria were cultured using enrichment broth (TSB) and C3GR CHROMagar plates, revealing an abundance of cephalosporin-resistant bacteria (~$7.9x10^{-4}$CFU/ml). DNA extraction and Polymerase Chain Reaction (PCR) detected bla-TEM gene in 26/35 (74%) of the samples. Future work will test for additional ARGs. This study highlights the persistence of resistant strains in freshwater and emphasizes the need for further research within the One Health framework.

A New Approach to Related-Rates
Presenter(s): Charlie Vazquez Acosta
Faculty Mentor(s): Sien Deng
Research Rookie

Related-Rates problems in calculus have flaws. In my previous research, under the guidance of Dr. S. Kifowit at Waubonsee Community College, we proposed models aong with solution techniques to address the flaws of the standard Related-Rates framework. However, there are a number of questions that cannot be answered by these models. In this ongoing research project, we plan to propose new models and refine the models in the previous research. A key feature of the current research is to layout a theoretical foundation to justify the models we proposed. We expect that this work will reveal how even first-year calculus problems can evolve into complex, beautiful systems when viewed through the lens of physics and mathematics.

'Atig No More: The Case of Hemdane 'Atig Dali and the Legacy of the Trans-Saharan Slave Trade in Tunisia
Presenter(s): Andrea Velez
Faculty Mentor(s): Ismael Montana
Diversity, Equity and Inclusion and Student Engagement Fund

In 2020, a court in Tunisia made a historic ruling in favor of Hemdane 'Atig Dali permitting him to remove the word 'Atig from his name. 'Atig, meaning "liberated by," is one of several labels proclaiming the bearer has enslaved African ancestors who were brought to Tunisia through the Trans-Saharan slave trade. This project ties the labeling practice of 'Atig to its roots in the Trans-Saharan slave trade and highlights the contemporary implications of Trans-Saharan slavery. Because of the negative connotations associated with having enslaved ancestors, Black Tunisians bearing slavery-related labels as surnames continue to face negative stereotypes, insults, and other racist acts, thus revealing the slave trade's continuing legacy. This project, which draws on the Tunisian Majba population census to shed light on the labeling practice of 'Atig, is part of a larger database project under construction by Professor Ismael Montana to facilitate academic and public access to digital source materials on the Trans-Saharan slave trade.

An Analysis on the Most Effective Parental Involvement Behavior(s)

Presenter(s): Katrina Viloria
Faculty Mentor(s): Julia Ogg
Honors Capstone

Parental involvement is the parent participation in the learning and educational process of their children (Myers-Young, 2018). Within parental involvement, there are home-based, school-based, and home-school communication forms of involvement. Previous research indicated that even after accounting for diverse background characteristics and risk factors, parent involvement in school was consistent in positive association with academic achievement, lower rates of high school dropout, increased on-time high school completion, and highest grade completed (Desforges & Abouchaar, 2003). The current study investigates which of the various parental involvement behaviors are the most strongly associated with children’s academic achievement as well as how these behaviors may predict early literacy and motivation in a sample of 104 preschool and kindergarten students. Regression analyses will be run to see which aspect of parent involvement is the strongest predictor of early literacy and numeracy skills.

The Effects of Migration Behavior and Building Luminosity on Bird Window Strikes

Presenter(s): Jemma Waldrop
Faculty Mentor(s): Jennifer Koop
Independent Study

Bird window collisions kill an estimated one billion birds per year in the United States. This study investigated how the luminosity of windows impacts bird window collision rates and tested whether birds that migrate primarily during the day versus night were more likely to collide with windows around the NIU campus. To answer these questions, a long-term data set on bird window collisions on the NIU campus, collected over the past decade was used. Luminosity (pixel brightness) of buildings at night was quantified in Adobe Photoshop and compared against the number of bird strikes. All

birds found dead were identified to species and their migratory behavior categorized as (day or night). There was no significant relationship between a building's average luminosity and the number of bird strikes. Eighty percent of all species found were night migrators.

A Context-Intelligent and Verifiable Smart Assistant for An Autism Screening Web Tool
Presenter(s): John White
Faculty Mentor(s): Ziteng Wang
Diversity, Equity and Inclusion and Student Engagement Fund

The objective of this research project is to create a useful artificial intelligence capable of assisting users of the iGait screening tool to locate and interpret results. This tool will bridge the gap of understanding for users of our system, allowing them to ask questions about what their result means, options for next steps, and even the technical details of the system. Users will be able to quickly and accurately get their questions about iGait, ASD, and their results answered in the context of the system. Our assistant is a tailored OpenAI Assistant V2 capable of retrieving and searching for results within our systems, and accuracy is ensured by requiring sourced responses based on internal documentation and hand-picked information from a vector store to ensure minimal hallucination. This assistant is directly available on the iGait website and highly secured via Firebase JWT-based authentication, WSS, and HTTPS - all integrated directly into our pre-existing Rust backend on AWS.

Not Just Deer in the Corn(Maize): Isotopic Analysis of Ancient Deer Bones to Examine Garden Hunting Strategies Among the Oneota
Presenter(s): Nessa Randall, Leo Rodriguez and Bee Williams
Faculty Mentor(s): Bill Balco
Student Engagement Fund

Koshkonong Creek Village is an archaeological site in southeast Wisconsin occupied between approximately AD 1100-1500. The Oneota people who lived at the site consumed a maize-rich diet supplemented by protein from deer, fish, and freshwater mussels. Parsing which strategies were employed to hunt deer at and around the site is key to understanding community organization and territory. Analysis of light stable isotopes (δ13C, δ15N, and δ18O) from bone collagen helps address whether butchered deer consumed maize. Had the deer consumed maize, they were likely targeted by Oneota hunters employing garden hunting strategies rather than forest hunting strategies. Likewise, carbon dating (via Accelerator Mass Spectrometry) of the deer bones couches the hunting strategies temporally. Results contribute to contextualizing Oneota hunting strategies as well as refining the dating of the Koshkonong Creek Village site.

Strategic Sustainability Communication: How Local Governments Can Use Social Media to Inspire Action
Presenter(s): Hallela Wagner

Faculty Mentor(s): Colin Kuehl

Local governments are key actors in advancing sustainability initiatives, yet their communication strategies often fall short of inspiring lasting and impactful community action. This research explores how social media can be used strategically to engage community values, foster place-based identity, and encourage pro-environmental behavior. Drawing on environmental psychology, cultural ecosystem services, and behavioral science, the project examines how visually rich, emotionally resonant content—grounded in local values—can build trust and participation. Using insights from sentiment-filtered social media analysis, it proposes a strategic framework for inclusive messaging that makes sustainability visible, relevant, and actionable. The findings suggest that when communication is relational and responsive, social media becomes a powerful tool for mobilizing public engagement and turning sustainability goals into everyday collective action.

Identification of New Genes Involved in Epithelial Basement Membrane Protein Deposition

Presenter(s): Anna Wigington
Faculty Mentor(s): Olivier Devergne
Research Rookies

All animals are made up of cells, which make up tissues and organs, crucial for their existence. Epithelial cells are a common type of cells, which are uniquely organized to form epithelial tissues that are found in skin, lining organs and cavities, etc. These cells display apical-basal polarity (ABP), which is critical to their structures and functions. ABP is partially established and maintained by a structure called the basement membrane (BM), which is found underlying all epithelia. Epithelial cells can lose ABP and cause developmental defects and pathologies, such as cancer metastasis, when the BM is mislocalized. Crag is a key regulator of BM deposition. The main goal of this project is to identify new genes involved in the proper placement of BM by isolating Crag's partners. Using Drosophila ovaries coupled with immunoprecipitation and mass spectrometry, we aim to understand better the pathway involved in BM deposition.

Double Crossed by Parasite

Presenter(s): Katelin Wolken-Wright
Faculty Mentor(s): Jennifer Koop
Independent Study

An outcome of environmentally driven natural selection can be local adaptation where populations of the same species, from different locations, adapt different traits in response to their local environment. In host-parasite systems, both host and parasite adapt to their local environment and one another, creating unique patterns of local adaptation. This study originally aimed to test whether an invasive aquatic snail across North America was more susceptible to infection by sympatric parasitic trematodes than allopatric trematodes, which is evidence of local adaptation. A cross infection experimental design where naive snails from two different locations were infected with sympatric or allopatric trematodes was created. Then, a post-mortem analysis was conducted that determined infection prevalence and abundance. However, in examining these snails, the presence of cryptic trematode species was discovered. Morphological investigation suggests the unknown species could be Leyogonimus polyoon. Future work is aimed at identifying this trematode species using genetic tools.

Editor-in-Chief Meets History Major: Newspapers as Primary Sources in Historical Research
Presenter(s): Olivia Zapf
Faculty Mentor(s): Anne Hanley
Student Engagement Fund

Newspapers have been a staple of communication and information sharing throughout the world for centuries. These publications have changed over time, from political and commercial reporting to cultural and society pieces and increasingly included globalized reporting and editorialized content. Because of this, newspapers are commonly used by scholars as historical sources. During the Fall 2024 semester, I worked with the South Carolina Gazette (1732-1775) to gather data on rice exports and ship movement for research on the 18th century transatlantic rice trade. At the same time, I worked as the Editor-in-Chief of the Northern Star, NIU's student news publication. As a history major doing research and Editor-in-Chief, I was able to learn about newspapers as historical sources while actively leading and making publication decisions for a news publication. The considerations that make up published articles, the information that is added, and the biases present make for interesting areas of study.

What Socioeconomic Factors Affect Crime Occurrence in Chicago from 2014 to 2024
Presenter(s): Wendy Zhang
Faculty Mentor(s): Xuwei Chen
Class Project EAE 361

Chicago faces persistent issues with violent crime, which poses significant challenges to public safety and social stability. This study aims to examine the changes of violent crime rates in the city of Chicago from 2019 to 2024 and explore its relationships with selected socioeconomic factors, including the unemployment rate, education level, race, and economic factors. By integrating violent crime data with socioeconomic variables at the census tract level, this study analyzes the spatial patterns of violent crime and constructs an ordinary least squares (OLS) regression model to investigate the associations between violent crime and underlying contributing factors. This study

expects to identify which socioeconomic factors are closely linked to violent crime and how these associations may have evolved over time in Chicago. The findings could provide valuable insights into the dynamics of violent crime in the city, helping inform policies to address the issues related to violent crime.

Where and Why? Multidimensional GIS Analysis of Chicago Traffic Crashes

Presenter(s): Wendy Zhang
Faculty Mentor(s): Wei Lou
Class Project EAE 459

Chicago's persistent traffic crash issues pose risks to public safety and urban efficiency, requiring spatial solutions. This project focuses on the distribution pattern of Chicago traffic crashes and analyzes relationships between traffic accidents and key social factors, including population density, transportation conditions, crime rates, and different land uses. The study uses professional software ArcGIS Pro and relevant data collected in 2017 to generate heat maps and hotspot maps to visualize crash concentrations and identify underlying trends. Preliminary results show that high-crime areas, congested traffic zones, and bustling urban districts overlap to some extent with high-traffic accident areas. These insights suggest that mitigating traffic accidents requires a multifaceted approach, including improvements in urban road infrastructure, enhanced traffic management, and strengthened public safety measures. The data-driven approach of this project offers valuable evidence to support more effective traffic management and urban planning efforts in Chicago.

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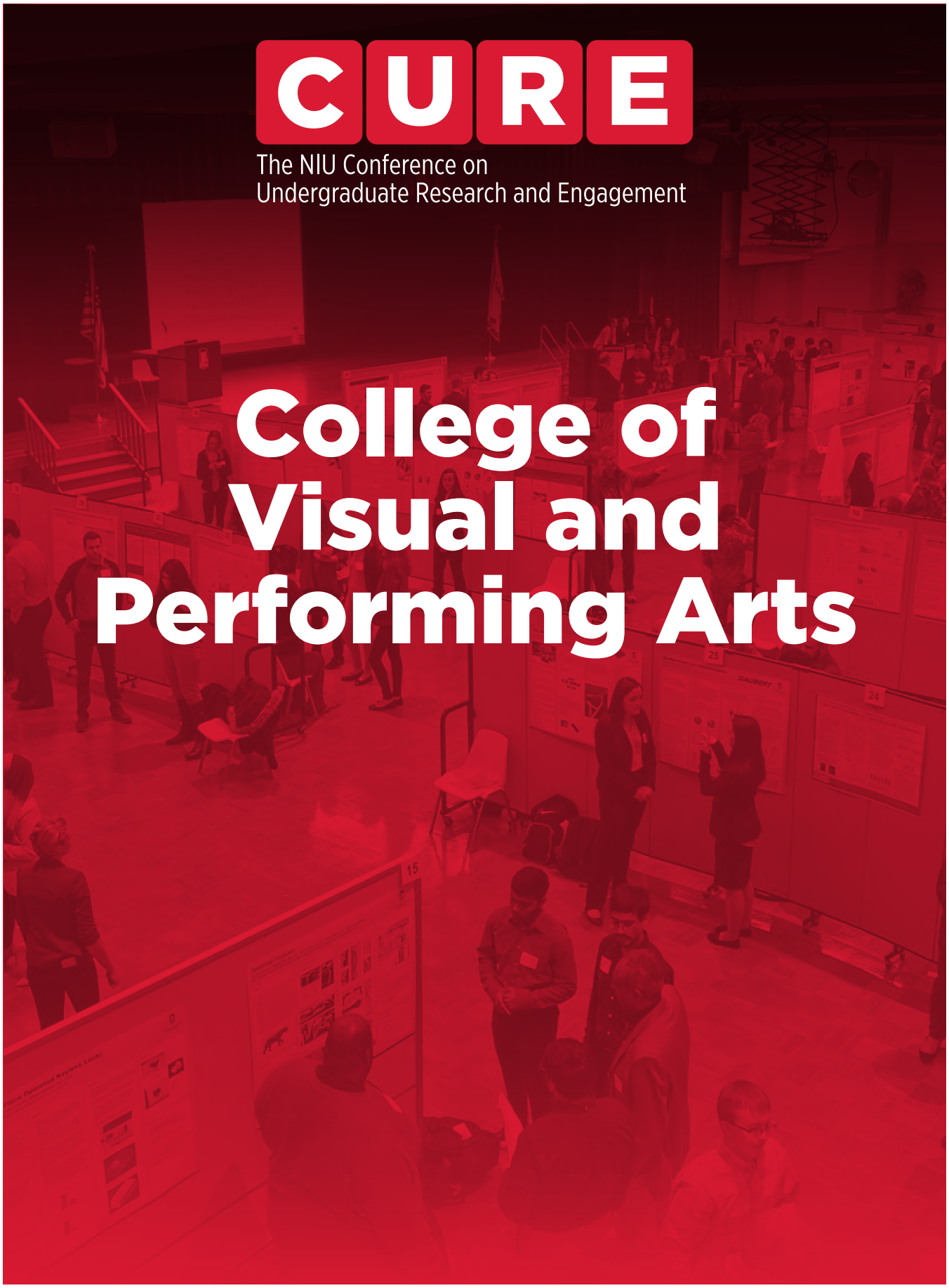

A Changing Morphology: Arabidopsis thaliana
Presenter(s): Sophie Bergagna
Faculty Mentor(s): William (Bill) Martin
Class Project BIOS 305

This study visually evaluated the physical development of Arabidopsis thaliana. These specimens have potential gene knockouts, which were investigated for possible changes in morphology or growth speed. The plant specimens included were selected from two random, complete experiments carried out at two different temperatures. The specimens were evaluated for height and rosette diameter changes every week for four consecutive weeks. Each week, specimens were photographed and measured. The photographs and measurements were then illustrated true-to-life for comparison. At the time of writing, the results are not yet known whether the specimens had gene knockouts. This project aims to more effectively communicate the changes in a model organism’s growth.

The Oral History of Mariachi NIU and its Impact on NIU's Latino community
Presenter(s): Matthew Diaz
Faculty Mentor(s): Sandy Lopez
Independent Study

The impact of Mariachi NIU upon Northern Illinois University Latino community is quite extensive. This oral history aims to catalog their beginnings and its impact upon the Latino community. This has been done by interviewing founding and current members, staff at the Latino Recourse Center and Latino Studies, and faculty involved with Mariachi NIU. Discussion focused on what they've done with Mariachi NIU for the Latino community and their hope for how it will continue its positive impact upon the Latino community. Formulating their personal accounts into one display of the impact with secondary research on how mariachi's impact on local school's Latino population. All this information and testimonial accounts will be put together to show the full scope of Mariachi NIU's impact on the Latino population at NIU and its surrounding community.

Stronger Storytelling with Museums and Theatre
Presenter(s): Elizabeth Nowak
Faculty Mentor(s): Gibson and Jessica Cima
McKearn Fellow and Student Engagement Fund

Museums and theatres both tell stories, but through different means. Museums use objects, while actors perform in plays. Combining museum and theatre concepts is an innovative storytelling approach. There are comparatively few examples of museum exhibits pairing with theatrical performances. When they do appear, they are not curated by museum professionals. This drove me to ask the question, “How can a temporary exhibit impact the audience’s understanding of the play?” To answer this question, I curated the exhibit "The Journey," for NIU’s production of *Anon(ymous)* by Naomi Iizuka, a play following a young immigrant’s heroic journey. After viewing the exhibit, audience members were encouraged to complete a survey evaluating their

experience and understanding of the play and its context. Data from my previous research indicates viewing a temporary exhibit does impact the audience's experience. The next step is to continue this research for different productions and audiences.

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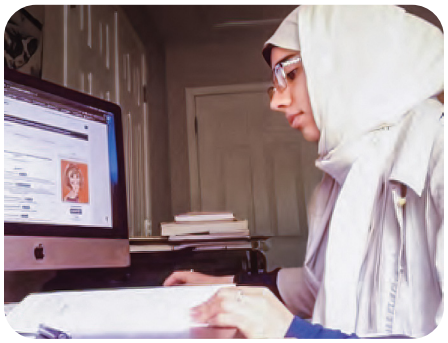

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