



Iowa Regent Universities present

**The 20th
Annual
Research in
the Capitol**

Monday, March 9th, 2026

11:30 am - 1:30 pm

**Iowa State House, Rotunda
Des Moines, Iowa**

Welcome

Welcome to the **twentieth annual** Research in the Capitol. Since its inception, over 1,100 undergraduates from the three Regent's Universities have come to the Iowa Statehouse to present their work to legislators, members of the Board of Regents, and the public. These students have then gone on to contribute to our state as doctors, educators, engineers, lawyers, nurses, and professionals within a wide variety of disciplines. This opportunity for our students to share their knowledge and enthusiasm with legislators, Regents, and guests in the Iowa Capitol is truly an honor that has stayed with them through the years.

Research involvement plays a key role in undergraduate education. Students who participate in research are more successful in their studies, more developed in career and professional preparation, and feel more satisfied with their college experience. Research engagement provides the conditions for collaborative learning and critical thinking that benefits our students as they move into their careers. The presentations before you today required countless hours of effort on the part of the students and their mentors outside of the classroom, and represent the shared commitment our students, staff, and faculty place on the undergraduate experience.

As you speak with these outstanding scholars, you will have a chance to learn firsthand the impact that these involvements have had on Iowa's students, and the impact those students then have on the research being conducted at our outstanding Iowa Public Universities.



Tawny LB Tibbits

Director, Office of Undergraduate Research

Schedule

11:30 am Opening Remarks

Dr. Jessica Moon

University of Northern Iowa, Office of Undergraduate Research

Bella Steffensmeier, Student Speaker

University of Northern Iowa

11:45 am – 1:30 pm Student Poster Presentations

Iowa Regent Universities

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Presenters

1. Alison Meagher (UNI)
2. Lily Ferguson (ISU)
3. Tara Joiner & Julia Correia (UI)
4. Matieis Mayes (UI)
5. Sageena Garg (ISU)
6. ZaKiyah Timmons-Crear (UNI)
7. Grace Nelson & Sonja Cutts (UI)
8. Brendan Millslagle (UNI)
9. Kylie Stambaugh (ISU)
10. Emma Lalor (UI)
11. Suriana Hanson & Adeline Heilman (ISU)
12. William Sprengelmeyer (UI)
13. Andrew Wheaton (ISU)
14. Molly Stamp (UNI)
15. Sam Postma & Hiram Dabbagh (ISU)
16. Eric Spain (UI)
17. Olivia Bujak (ISU)
18. Salimatou Diallo (UNI)
19. DeAndre Steger (UI)
20. Madelyn Wells & Gabriella Haddad (UNI)
21. Marie Ndefua (ISU)
22. Maanya Pandey (UI)
23. William Teggatz (ISU)
24. Emma Larsen (UNI)

25. Shafin Wasimi & Daniel Marren (UI)
26. William Jensen (ISU)
27. Taryn Rice (UNI)
28. Phuong Tran (ISU)
29. Ethan Button & Maren Denison & Hannah DeVore (UI)
30. Katie Lynch (UNI)
31. Zoe Shadravan (UI)
32. Andrew Borlaug (ISU)
33. Cameron Roach (UI)
34. Mary Carolus & Cameron Fraher (UNI)
35. Lizabeth Hamann (ISU)
36. Isabelle Yoder (UI)
37. Jordan Rios (ISU)
38. Jordan Smith (UNI)
39. Lauren Smith & Saina Narsian (UI)
40. Addison Cunningham (UNI)
41. Avery Norman (UI)
42. Vaishnavi Devi Kondabathini (ISU)
43. Jamison Stone (UI)
44. Garey Weaver & Emelia Hauser & Ambrose Neumann (ISU)
45. Bella Steffensmeier (UNI)
46. Sophie Pierce (UI)
47. Nate Keenan (UNI)
48. Vincent Hesselink (UI)
49. Sarah Symonds & Gwendolyn Jacobson (ISU)

50. Jadin Grieser (UNI)
51. Isaac Lewiston (ISU)
52. Emily Newby (UNI)
53. Connor DeGroot & Allison Butz (UI)
54. Jamie Ross (UNI)
55. Caroline Strawhacker (ISU)
56. Minou Emmad (UI)
57. Sarah Broeker (ISU)

Abstracts

1. Alison Meagher, UNI

Hometown(s): West Des Moines, Dallas, IA

Major(s): Political Science/Spanish

Mentor: Evan Renfro

“Police Power” or Puppeteer: US Interventions in Latin America and its Immigration Crisis

This project analyzes the historic pattern of US interventions in Latin American countries, often resulting in destabilization, dependence and chaos. It will focus on specific Latin American countries, including Colombia, Venezuela, the Dominican Republic, Guatemala, and Ecuador, and employ a synthesis-focused research approach. Important methodologies include drawing from historical texts, primary sources and official documents in both English and Spanish, accounts from Latin American writers, politicians and advocates, as well as the core of this research stemming from the implementation and effects of the Monroe Doctrine and Roosevelt Corollary. By synthesizing and analyzing past US foreign policy in Latin America, as well as the immense impact on the government and society in these countries, researchers can better understand the origins of a major contributing factor to the immigration crisis at the United States' southern border. Now, more than ever, this area of research has become a pertinent consideration in international and American diplomacy.

2. Lily Ferguson, ISU

Hometown(s): Boone, Boone, IA

Major(s): Biochemistry

Mentor: William Stodden

A Rural-Urban Comparison of the Non-Profit Ecosystems Providing Services to Combat Human Trafficking in Iowa

In the Midwest, human trafficking is a hidden danger that infects both well populated cities and rural towns. Human trafficking flourishes due to the interconnections provided by I-35 and I-80, however the crime is quite hidden due to discontinuity in data collection and lack of resources provided by the state. Both Ames and Des Moines have their own interconnected ecosystem of Non Profits dedicated to combating human trafficking, however both cities experience constraints specific to population density. By comparing the accessibility and availability of organizations designed to combat human trafficking in Ames and Des Moines through provided

data and interpersonal interviews with workers and directors of these organizations, it will be easier to understand the best strategies for Non Profits to use based on population density of the area surrounding the community members they are serving.

3. Tara Joiner & Julia Correia, UI

Hometown(s): Orange City, Sioux, IA & Iowa City, Johnson, IA

Major(s): BFA in 3D Design & BFA in 3D Design, BA in Violin Performance

Mentor: Monica C D G Correia

Advancing Seamless 3-Dimensional Woven Forms Using Sustainable Materials

The textile industry produces 92 million tons of waste annually with 10-15% from cutting leftovers from the seams. Our project aims to lessen the amount of textile waste by creating a loom that allows us to create a three-dimensional textile, eliminating the seams altogether. To achieve this, we designed a reusable structure that allows the loom to disassemble and be removed after the textile is complete. The collapsable loom structure is being developed with Computer Numerical Control (CNC) and Computer Aided Design (CAD). We are currently exploring how this new loom design works with different curvy/straight forms, as each shape results in different structures. Our design team is researching how to implement traditional techniques in the final textile design. Converging CNC and CAD with historical weaving practice allows for creative design freedom. This project focuses on textiles for upholstered furniture but can also impact other sectors of the textile industry.

4. Matieis Mayes, UI

Hometown(s): Cedar Rapids, Linn, IA

Major(s): B.A. Biochemistry and Molecular Biology; B.S. Human Physiology

Mentor: Amy L Ryan

Altered Basal Stem Cell Adhesion Disrupts Airway Epithelial Repair in Chronic Lung Disease

Chronic lung diseases, including COPD, cystic fibrosis, and fibrosis affect millions of Americans each year. Significant structural changes in the lung are associated with impaired airway repair. Basal stem cells play a central role in repairing and maintaining the airway epithelium after injury. Integrin $\alpha 6$ (ITGA6) forms a heterodimer with integrin $\beta 4$ and is an important marker of airway basal cells (BCs) regulating matrix adhesion. The specific impact of ITGA6 expression on BC stemness is currently unknown. We found that knock out of ITGA6 activates a stress-response pathway, p38 MAPK, causing BCs to shift into a squamous state incapable of functional epithelial

regeneration. Pharmacological inhibition of p38-MAPK was able to partially reverse the phenotype, increasing BC proliferation and differentiation. In conclusion, our data highlights how changes in mechanotransduction through integrins can impact BC stemness and disrupt regeneration and identify ITGA6-dependent signaling as a potential therapeutic target in chronic lung diseases.

5. Sageena Garg, ISU

Hometown(s): Ames, Story, IA

Major(s): Computer Science

Mentor: Anuj Sharma

An AI-Powered Traffic Sensor Clearinghouse for Sharing and Querying Sensor Test Results

Traffic signal sensors are safety-critical components that directly influence vehicle, pedestrian, and bicycle detection, signal timing decisions, and real-time traffic operations. As sensor technologies diversify, including video, radar, LiDAR, rigorous testing is required to ensure reliable performance across traffic and environmental conditions; however, testing is currently decentralized, leading to duplicated effort and increased public costs. This research presents an AI-enabled clearinghouse that centralizes standardized traffic sensor test results to support cross-state data sharing and more efficient sensor deployment decisions.

6. ZaKiyah Timmons-Crear, UNI

Hometown(s): Burlington, Des Moines, IA

Major(s): Family Services/Gerontology: Social Sciences

Mentor: Melinda Heinz

Bridging Connection & Care: AI-Modified Activities for Residents

The study examined AI's effectiveness in modifying care facility activities for individuals with vision, hearing, mobility impairments, or dementia. Using ChatGPT and Co-Pilot, researchers analyzed activity calendars from independent living, assisted living, nursing homes, and memory care facilities. In the first iteration, prompts asked how activities could be modified for specific impairments. ChatGPT provided detailed suggestions, such as using bright colors and textures to enhance sensory stimulation for dementia residents. In the second iteration, AI was tasked with modifying activities under short-staffed conditions. It recommended allowing residents greater independence, though this approach was less feasible in memory care due to cognitive limitations. The study highlights AI's potential to adapt care activities, addressing diverse needs while considering facility constraints. This exploration underscores how AI can

support care facilities in tailoring activities to improve residents' experiences, though challenges remain in implementing these solutions effectively, particularly in memory care settings.

7. Grace Nelson & Sonja Cutts, UI

Hometown(s): Sioux City, Woodbury, IA & Portland, Multnomah, OR

Major(s): Political Science & Ethics and Public Policy

Mentor: Nicholas F Martini

Analyzing Iowa's Unique Approach to Cannabis Policy from a Criminal Justice, Public Health, and Economic Standpoint

The research project is a policy report that examines how Iowa's current cannabis laws affect everyday people and communities, and how alternative policies could better serve the state. We analyze Iowa's approach through three lenses: criminal justice, public health, and the economy. Drawing on data from Iowa and comparisons with other states, the report shows that strict cannabis enforcement is costly, contributes to racial disparities in arrests and incarceration, and does little to reduce use or improve health outcomes. At the same time, Iowa's restrictive policies limit consumer safety and push economic activity to neighboring states. The report proposes a practical, politically viable path forward: replacing criminal penalties for small amounts of cannabis with civil fines, automatically clearing past low-level cannabis convictions, restoring reasonable THC limits, and using THC-based taxes to support healthcare and harm-reduction programs. Together, these reforms aim to reduce unnecessary incarceration, improve public health, and strengthen Iowa's economy without requiring full legalization.

8. Brendan Millslagle, UNI

Hometown(s): Creston, Union, IA

Major(s): Biology - 3+1/Pre-Prof: Nursing

Mentor: Michael Walter

Characterization Of B. cereus and B. anthracis Bacteriophages Selected for Stability and Durability

Bacteriophages (phages) are viruses that infect bacterial hosts, take control of their biological functions and produce progeny phages. Our model hosts are *Bacillus cereus*, a foodborne pathogen and *Bacillus anthracis* the causal agent of anthrax disease. Both can be treated primarily using antibiotics, but antibiotic resistance is a growing threat to health. Phage treatments continue to be developed to control infection, being naturally occurring antibacterial agents. For each bacterial infection, phages require

selection based on anticipated therapy application conditions (bacterial host, therapy route). Our selected phages previously survived conditions modeled after a topical treatment following an epidermal anthrax spore exposure (heat, pH, perspiration, UV, sunlight, etc). Our non-selected phages were propagated without any treatment conditions. Through Genomic analysis, we are able to see key differences in amino acid composition of major structural proteins between the two groups. This demonstrates durability in soil phage populations, even following stringent selection steps.

9. Kylie Stambaugh, ISU

Hometown(s): Hiawatha, Linn, IA

Major(s): Dietetics

Mentor: Sarah Francis

Cyclone Kitchen Program Evaluation: A Pilot Study of Hands-On Nutrition Education

Many lowans struggle with everyday nutrition practices. Statewide data indicate that many adults report “poor to moderate” diet quality, and most adults report their health as “poor or fair.” Teaching kitchens offer a straightforward, innovative approach to help improve their health in the kitchen. Cyclone Kitchen is being developed at Iowa State University to address a clear gap in accessible food and nutrition education across Iowa, particularly in rural areas where teaching kitchens are limited. Cyclone Kitchen is a statewide initiative that combines hands-on cooking with practical nutrition guidance, encouraging lowans to gain confidence in the kitchen and establish healthy eating habits that support long-term health. This pilot project included 14 participants and was led by nutrition faculty and Extension Educators. Participants completed a five-question evaluation to assess effectiveness. Results are being processed for descriptive data analysis.

10. Emma Lalor, UI

Hometown(s): Eagle Grove, Wright, IA

Major(s): Ethics and Public Policy

Mentor: Nicholas F Martini

An Analysis of Iowa's Beginning Teacher Mentoring and Induction Program

This policy report conducted a comprehensive analysis of Iowa's Mentoring and Induction Program (M&I) and the additional programming option included in the 2017 revision, Teacher Leadership and Compensation Program (TLC). This report employs a research-based analysis of the goals of the M&I program option and the TLC program option. Each goal, outlined by the program, is used as our basis for re-

search: first-year teacher retention and attraction, student achievement scores, and educator well-being. This report achieves reviews prior TLC program reports and external datasets to identify trends in education and assess the program's goal achievement. Additionally, we review a prior analysis of the TLC program conducted by the American Institute of Research. A comprehensive analysis of both program options is imperative for continuing Iowa's efforts in enhanced educational programming throughout the state and informing policy decisions.

11. Suriana Hanson & Adeline Heilman, ISU

Hometown(s): Ames, Story, IA & Correctionville, Woodbury, IA

Major(s): Marketing and Finance & Apparel, Merchandising, and Design

Mentor: Kate Greder

Beyond the Fashion Plates: Documenting Everyday Dress in 20th Century Iowa

A Comparative Analysis

This research project examines the relationship between canonical fashion history narratives and the lived sartorial experiences of Iowans throughout the 20th century (1900-present). By analyzing photographic evidence, material culture, and regional publications from university archives and museum collections, we seek to document how geography, economics, climate, and midwestern cultural values shaped dress practices that may have diverged from—or selectively adopted—the fashion trends typically presented in fashion history pedagogy. Using Iowa as a litmus test, we plan to assess the gap between prescriptive fashion media and descriptive evidence of actual dress. We plan to look at regional adaptation and timing of trend adoption, the role of practicality, climate, and occupational needs in shaping dress choices, class, and the plurality of fashion styles existing simultaneously within a single geographic region. Iowa, with its agricultural economy, continental climate, land-grant university culture, and geographic distance from fashion capitals, provides an ideal case study for examining these factors. This research contributes to a more complex and accurate fashion history that acknowledges regional variation and the experiences of the everyday, beyond the traditional canons of fashion history.

12. William Sprenghelmeyer, UI

Hometown(s): Iowa City, Johnson, IA

Major(s): Earth and Environmental Science (Bioscience) BS

Mentor: Tiffany S Adrain

Digitizing Paleontological Collections: Specimens, Documents, and Ongoing Preservation.

With the 5th largest university-held fossil collection in North America, the University of Iowa Paleontology Repository is working to digitize our collection to make its diverse range of specimens more accessible to the general public. This includes digitizing documents, 3D scanning specimens, and recording ongoing preservation work in a variety of digital forms. Digitization efforts have become more and more important as technology improves. Now more than ever repositories are working to provide access to their collections for as many people as possible.

13. Andrew Wheaton, ISU

Hometown(s): Minneapolis, Hennepin, MN

Major(s): Industrial Design

Mentor: Rob Pfaff

Economic Impact Analysis for the Iowa River's Edge Trail extension from Marshalltown to Albion

This project analyzes the economic impacts of existing and proposed trail infrastructure in Marshalltown, Iowa, as a part of CRP 5360, Community Economic Development. This study especially focuses on a seven-mile extension as part of the River's Edge Trail to Albion. Trail infrastructure has historically supported economic development, tourism, and quality of life improvements for communities that significantly invest in it. This study aims to evaluate the local and regional economic opportunities for Marshalltown and surrounding smaller communities. The assessment integrates economic impact modeling, resident surveys, field research, spatial analysis, and community engagement conducted in partnership with Marshalltown Parks and Recreation. Key findings indicate that expanded trail connectivity will stimulate new and existing businesses, increase recreation engagement, and enrich the community. The findings will enable government officials to continue project development, recommending improvement priorities, strategies to integrate businesses into the system, and arguments to justify trail investment to community members.

14. Molly Stamp, UNI

Hometown(s): Springville, Linn, IA

Major(s): Kinesiology: Pre-Health/Pre-Prof: Physical Therapy

Mentor: Terence Moriarty

Effect of Nutritionally Enriched and Decaffeinated Coffee Consumption on Aerobic Exercise & Cognitive Performance

Caffeine and hydration strategies are widely used for optimizing performance and cognitive function, yet the combined effects on coffee with added electrolytes during exercise are not yet well understood. This study examined the acute effects of Long Run Coffee (LRC), a caffeinated coffee with electrolytes, compared to decaffeinated coffee on exercise performance, cognition and hydration in trained runners. Ten participants completed a 10k treadmill time trial following ingestion of either beverage, with cognitive performance and hydration assessed before and after exercise. Cognitive response time improved following exercise, with greater post exercise improvements seen with LRC. Cognitive accuracy remained high, trending in favor of LRC. Physiological markers confirmed normal exercise progression, and hydration status changed over time but did not differ between conditions. These findings suggest that caffeinated electrolyte coffee may enhance post exercise cognition and support endurance performance without negatively affecting hydration, warranting further investigation in larger cohorts.

15. Sam Postma & Hiram Dabbagh, ISU

Hometown(s): Johnston, Polk, IA & Ames, Story, IA

Major(s): Community and Regional Planning & Community and Regional Planning, Environmental Science

Mentor: Carlton Basmajian

Designing an Idyllic Suburb: The Grimes Corridor Beautification Guide

In spring 2025, the City of Grimes collaborated with Iowa State University's CRP 4160 Urban Design Studio to develop the Grimes Corridor Beautification Design Guide, the city's first comprehensive framework for improving the aesthetic, functionality, and identity of its major transportation corridors. The studio identified key corridors in need of beautification and produced practical, context-sensitive guidance to support future investment. The planning process combined existing conditions analysis, site visits, and public engagement to ground recommendations in community priorities. Students evaluated roadway design, land use, multimodal transportation, and landscaping treatments, while community input helped identify desired corridor and community character. The final plan documents existing conditions, public feedback, and establishes corridor typologies, design principles, and streetscape guide-

lines. Photo-realistic renderings demonstrate how existing and future corridors could be transformed over time. The guide provides the City of Grimes with an implementation-oriented resource to inform capital projects, development review, and long-term corridor planning.

16. Eric Spain, UI

Hometown(s): West Des Moines, Dallas, IA

Major(s): Biochemistry and Molecular Biology

Mentor: Sean B Fain

Evaluation of Cardiovascular Effects of Vaping in Young Adults Using Advanced MRI Techniques

Electronic Nicotine Delivery Systems (ENDS), more commonly called vapes, are becoming frequently used in Iowa's young adult population (18-24 year olds). According to the 2024 Iowa BRFSS Survey, 23.7% of young adults in Iowa currently use ENDS despite the law restricting sales to those 21+. Even with the increased use among young adults in Iowa and nationwide, the effects of ENDS use on the heart and lungs are not well understood in otherwise healthy young adults. Using advanced MRI techniques, this study explores these early effects. Participants underwent standard lung function tests and an MRI to measure heart strain and blood flow in the large vessels flowing to the lungs. The results suggest that vaping leads to early-stage disease affecting the right side of the heart and reduced blood flow in the pulmonary circulatory system. Continued research into these effects can provide insight into the public health impacts of vaping.

17. Olivia Bujak, ISU

Hometown(s): Algonquin, McHenry, IL

Major(s): Industrial Engineering

Mentor: Esther Jose

Equity-Aware Resilience Hub Siting for Cold-Weather Power Outages in Iowa with Industrial Demand Prioritization

During extreme winter conditions in Iowa, electricity demand risks outpacing supply, threatening prolonged outages that affect residents and critical industries. Existing framework fails to protect vulnerable populations, especially older adults, who face greater risks due to medical device dependencies and reduced tolerance to cold. This work introduces an equity-aware planning framework that links industrial demand prioritization with the siting/use of Power Outage Resilience Community Hubs (PORCHes). PORCHes are pre-existing facilities that can be equipped to provide

backup services. We propose a two-stage optimization model: first, we decide which facilities should be upgraded to PORCHES; second, we determine outage decisions while minimizing both risk to critical industries and affected residents (particularly older adults) without access to a PORCH. We developed and tested the Stage 2 model in case studies across selected regions of Iowa. Early results demonstrate that such modeling can highlight tradeoffs between risk reduction and equity-aware resilience.

18. Salimatou Diallo, UNI

Hometown(s): North Liberty, Johnson, IA

Major(s): Computer Science/Biochemistry/Physics: Custom

Mentor: Paul Shand

Electronic and Magnetic Properties of NiFeMnAl and NiFe_{1.25}Mn_{0.75}Al

Heusler alloys have attracted significant interest for spintronics applications due to their tunable magnetic and electronic properties. We present a combined theoretical and experimental study of the Heusler compound NiFe_{1+x}Mn_{1-x}Al, focusing on compositions with $x = 0$ and $x = 0.25$. For $x = 0$, we observe a sharp increase in longitudinal resistance near 350 K, a feature absent in the $x = 0.25$ sample. At low temperatures, the $x = 0$ composition exhibits negative magnetoresistance, which gradually becomes positive as the temperature approaches the resistance upturn. In contrast, the $x = 0.25$ sample shows negative magnetoresistance over the entire temperature range. Hall measurements reveal a change in the dominant charge carrier sign near the resistance upturn for $x = 0$, coinciding with the magnetoresistance sign reversal. These results suggest a redistribution of electron and hole contributions driven by band structure effects, clarifying the transport behavior of NiFe_{1+x}Mn_{1-x}Al and its relevance for spintronics.

19. DeAndre Steger, UI

Hometown(s): Cedar Rapids, Linn, IA

Major(s): Psychology

Mentor: Michelle W Voss

Evaluating the Convergent Validity of Digital Processing-Speed Assessments: An Analysis of DSST, Letter Comparison, and Pattern Comparison Tasks

This study evaluates the convergent validity of three digital neuropsychological processing-speed tasks: Digit Symbol Substitution Test (DSST), Letter Comparison (LC), and Pattern Comparison (PC) administered to middle-aged adults (ages 40 to 65). Raw test files were cleaned and merged using consistent identifiers, retaining only core performance variables (accuracy and reaction time) to ensure construct

alignment across tasks. Participant-level summary scores were computed for each test to produce a unified dataset for correlation-based validity testing. This dataset will support both digital-to-digital convergent validity analyses and subsequent digital-versus-paper comparisons using matched paper-based scores. Findings will clarify the degree to which digital processing-speed tasks measure shared cognitive constructs and correspond to traditional paper formats.

20. Madelyn Wells & Gabriella Haddad, UNI

Hometown(s): Marion, Linn, IA & Rogers, Hennepin, MN

Major(s): Psychology/Criminology & Criminal Justice/Pre-Prof: Law & Psychology/Sociology

Mentor: Helen Harton

Effects of Race and Tattoo Status on Criminality Judgements

This study examines how people perceive others with tattoos and the extent to which that differs depending on the target's apparent ethnicity/race in the context of being suspects of a crime. 250 study participants viewed eight AI-generated images of men who appear to be Asian, Black, Hispanic, or White who are "suspects in an ongoing investigation." There were two targets from each ethnic group; some participants viewed a particular target with an arm tattoo, whereas others viewed the same target without a tattoo. Participants also viewed four distractor images. Participants rated each target on characteristics such as intelligence, competency, and trustworthiness, and rated how likely they think it is that the target is the perpetrator. The results will have potential implications for discrimination in criminal justice settings rooted in racial or tattoo prejudice.

21. Marie Ndefua, ISU

Hometown(s): Cameroon

Major(s): Genetics

Mentor: Ping Kang

Finding how changing temperatures from 25 degree Celsius to 18 degree Celsius during specific developmental times of drosophila flies influences adult fly longevity

Drosophila melanogaster has an optimal developmental temperature of 25 °C but can develop across a wider range of 13 °C to 31 °C, with lower temperatures slowing development and higher temperatures causing physiological stress. Previous studies have shown that rearing flies at cooler developmental temperatures can increase adult longevity, which formed the basis of this experiment. In this study, equal num-

bers of pure-bred w^{118} and YWR flies were divided into treatment groups and exposed to 18 °C for 24 hours during specific developmental stages before being returned to 25 °C. Following treatment, flies were maintained for 40 days, and mortality was recorded every two days. The goal was to assess whether temporary temperature shifts during development affect metabolism, body size, and other physiological processes, and whether these changes influence adult lifespan in a genotype-specific manner. The results partially supported our hypothesis: flies treated during the P1 and L3–96 stages showed significantly increased lifespans, while other stages showed reduced or no significant effects.

22. Maanya Pandey, UI

Hometown(s): West Des Moines, Polk, IA

Major(s): Public Health

Mentor: Donna A Santillan

Examining themes contributing to aspirin non-compliance in pregnancy

This study investigates factors contributing to low-dose aspirin noncompliance as a preventive measure against preeclampsia, a significant risk during pregnancy. Patient perspectives from an EndPreeclampsia Facebook support group relating to aspirin use during pregnancy were qualitatively analyzed. Findings reveal that only 63.55% of posts indicated compliance, with 36.45% indicating noncompliance/undetermined compliance. Prevalent themes influencing compliance included Knowledge Gaps (65.89%), Seeking Reassurance (56.19%), Doubting Provider Recommendations (27.76%), Concern/Experience of Adverse Effect (21.07%), and Doubting Treatment Effectiveness (16.72%), whereas factors such as Treatment not Prioritized (2.34%) and Forgetfulness (1.34%) were not significant factors. The study underscores the complexity of factors contributing to aspirin noncompliance and highlights gaps in patient education and provider-patient communication. These insights emphasize needs for tailored interventions to remove barriers, improve user knowledge, adherence to therapy, and mitigate preeclampsia-related complications to improve maternal and fetal health outcomes.

23. William Teggatz, ISU

Hometown(s): Carroll, Carroll, IA

Major(s): Chemical Engineering

Mentor: Dhananjay Dileep

Engineering High-performance Coatings from Sugars

Polymeric materials are invaluable in coating applications across the automotive, aerospace, and industrial manufacturing sectors due to their easy processability and applicability, allowing for facile delivery as suspensions onto various surfaces. Most prevalent polymeric coatings possess a relatively low glass transition temperature (T_g) $< 100^\circ\text{C}$, consequently leading to a loss in mechanical integrity and dimensional stability, rendering them unsuitable for high-temperature applications. Furthermore, most materials that surpass the 100°C mark are petro-derived, resulting in a carbon-intensive economy. Herein, we address this challenge by exploring readily available sugars for the synthesis of stiff polymer networks demonstrating substantially higher T_g than are currently obtainable and aiming to offer a monomer platform for developing more effective high-performance polymer coatings. This work enables the integration of stiff, bio-derived components into polymer networks representative of a paradigm shift towards cost-effective, environmentally friendly, and high-performance coatings.

24. Emma Larsen, UNI

Hometown(s): Manson, Calhoun, IA

Major(s): Biology: Ecol, Evoltn, Organismal

Mentor: Chad Heinzel

Growth and Sustainability of Ash Tree Replacements in Twin Lakes, Iowa

The Emerald Ash Borer is an invasive beetle known for feeding under the bark of ash trees leading to death of the tree in only a few years. Twin Lakes Bible Camp (TLBC) has removed approximately 75 ash trees in recent years with more still needing to come down around their property. Recognizing the need for healthy green spaces, the staff at TLBC planted 32 trees of eight different recommended species in summer 2024 to replace the ash. Using growth measurements, health assessments, and evaluation of soil compatibility, the results of this study provide data on replanting efforts and recommendations for future planting.

25. Shafin Wasimi & Daniel Marren, UI

Hometown(s): Cedar Rapids, Linn, IA & Johnston, Polk, IA

Major(s): Biomedical Sciences & Biochemistry

Mentor: Douglas Spitz

Inhibition of Glutathione and Thioredoxin Metabolism Synergistically Sensitizes KEAP1 Mutant and WT Non-Small Cell Lung Cancer Cells (NSCLCs) to Therapeutic Interventions by an H₂O₂ Dependent Mechanism

Lung cancer accounts for 20-21% of cancer deaths yearly and 11-27% of the non-small cell lung cancers (NSCLC) harbor KEAP1 (Kelch-like ECH-associated protein 1) mutations. KEAP1 mutants demonstrate constitutive activation of the nuclear factor-erythroid factor 2 (NRF2) transcription factor, which leads to upregulation of many cellular antioxidants involved in H₂O₂ metabolism, including glutathione and thioredoxin reductase. Patients with NSCLCs harboring KEAP1 mutations show resistance to most existing therapeutic strategies, such as radiation and chemotherapies [PMID: 39817679, 34500370, 28899199, 31548347, 27663899, 34440648]. There is an urgent need for effective therapeutic strategies for sensitizing Keap1/Nrf2 mutant NSCLCs to therapy. This project will determine if pharmacological agents that deplete glutathione (buthionine sulfoximine) and inhibit thioredoxin reductase activity (auranofin) can sensitize KEAP1 mutant and WT NSCLCs to therapeutic interventions by compromising H₂O₂ metabolism. Inducible over expression of catalase will be utilized to determine the role of H₂O₂ in any observed effects on radio-chemo-sensitization.

26. William Jensen, ISU

Hometown(s): Barrington, Cook, IL

Major(s): Microbiology

Mentor: Larry Halverson

How diverse are naturally abundant plant growth promoting Oxalobacteraceae bacteria in Iowa soils?

Nitrogen (N) availability is a major limiting factor in maize production. Using bacteria to improve maize N nutrition may represent a more sustainable alternative to excessive synthetic N fertilizer use. This research focuses on isolating, characterizing, and sequencing plant growth-promoting Massilia species within the Bacterial family Oxalobacteraceae. We sought to assess Massilia diversity across four key Iowa landforms historically used in maize production and test Massilia species' ability to promote maize growth under low N fertilizer conditions. We have collected more than one hundred isolates from four field sites by growing maize seeds in rhizotrons, isolating root-associated bacteria, and identifying Oxalobacteraceae isolates using PCR-screens

followed by 16S rRNA sequencing to verify taxonomy. Early results of plant growth promotion testing show some *Massilia* strains promote corn growth while others inhibit it, demonstrating clear potential for *Massilia* as biological seed treatments.

27. Taryn Rice, UNI

Hometown(s): Northville, Wayne, MI

Major(s): Biochemistry/Pre-Prof: Physician Assistant

Mentor: Daniel Lee

Photochemical Activation of Macrocyclic Alkynes

This project investigates the light-controlled activation of chemical reactions in large ring-shaped molecules containing a carbon-carbon triple bond, known as an alkyne. Alkynes are typically linear and relatively unreactive; however, when incorporated into a macrocyclic ring, their geometry becomes distorted, introducing strain that can increase reactivity. This work aims to design and characterize a photoswitchable macrocyclic alkyne that undergoes a light-induced change in shape, twisting the ring and increasing alkyne strain. The resulting strain is expected to activate the alkyne toward strain-promoted azide-alkyne cycloaddition (SPAAC), a widely used reaction in biochemistry research.

28. Phuong Tran, ISU

Hometown(s): Vietnam

Major(s): Software Engineering

Mentor: Sarah Bentil

Investigating the Biomechanics of Flatfoot Reconstruction Using Computational Simulations

Flatfoot deformity alters foot biomechanics and often requires surgical correction to restore alignment and function. Lateral-column-lengthening procedures, including the Evans and cuboid osteotomies, are commonly used as treatments; however, the biomechanical effects of different osteotomy techniques and graft designs are not well-understood. This study applies finite element analysis (FEA) to investigate stress distribution and load transfer in the foot following the procedures. Three-dimensional models of the calcaneus, cuboid, talus, and navicular bones were constructed from medical imaging data and processed using segmentation and mesh refinement. Computational simulations using FEA replicated the osteotomies using a trapezoidal graft. Physiological boundary conditions were applied during FEA to approximate stance loading. Preliminary results demonstrate that osteotomy location and graft geometry significantly influence stress, strain, and deformity patterns. This work high-

lights computational modeling as a complementary approach to experimental and clinical studies and provides biomechanical insight for surgical planning and graft design for flatfoot reconstruction.

29. Ethan Button & Maren Denison & Hannah DeVore, UI

Hometown(s): Des Moines, Polk, IA & Cedar Rapids, Linn, IA

Major(s): Political Science, International Relations & Public Health

Mentor: Nicholas F Martini

Insecurity in the Hawkeye State: A State-Wide Policy Analysis of Food Insecurity

We have analyzed food insecurity in Iowa through the lens of the State's current and prior public policies, with the intent to inform legislators on Iowa's best steps going forward. After carefully researching various data sets to understand the state of food insecurity in Iowa, we researched policies from other midwestern states and local municipalities to understand which approaches best serve those without steady food access.

Applying four of these promising policies to a statewide analysis, we discuss how well each policy can curb Iowa's food insecurity through four criteria: providing food generally, providing healthy food, cost-effectiveness, and each policy's ability to bridge the state's urban-rural divide and target the areas in Iowa with the highest food insecurity.

30. Katie Lynch, UNI

Hometown(s): Arlington Heights, Cook, IL

Major(s): Communication Disorders

Mentor: Kenneth Bleile

The Role of Parent Involvement in Enhancing Pediatric Speech and Language Therapy

As speech-language pathologists we provide articulation therapy for children in a variety of settings. It is crucial to include the client's family in therapy because family involvement has been shown to promote generalization of skills learned in therapy to a child's typical environment. Despite this, there are a variety of barriers that exist for families as they try to support their child's speech and language goals. A literature review will be conducted in an effort to understand how speech-language pathologists can gain an understanding of these barriers and work to understand how vital family involvement is in pediatric articulation therapy.

31. Zoe Shadravan, UI

Hometown(s): Ankeny, Polk, IA

Major(s): Sustainability

Mentor: Joseph P Honings

Evaluation of Legacy Petrophysical Data from the Vincent Dome for Geologic Hydrogen in the Midcontinent Rift System

My research project explores where geological hydrogen may have accumulated above the Midcontinent Rift system, a 1.1-billion-year-old major geological feature located in the central United States. Through digitizing and analyzing historical geophysical data, I examine subsurface stratigraphy and structures that allow hydrogen to accumulate. While geological hydrogen is produced through reactions between rock and water, this project focuses on the conditions that enable its accumulation rather than its formation. This work assesses the presence of geologic hydrogen in legacy data that could serve as a basis for future exploration, extraction, and storage infrastructure.

32. Andrew Borlaug, ISU

Hometown(s): Des Moines, Polk, IA

Major(s): Environmental Science

Mentor: Wenjuan Huang

Not All Soil Organic Matter Is the Same Across Cropping Systems and Seasons

Enhancing soil organic matter (SOM) is a key objective of sustainable agriculture, yet how conservation practices (e.g., cover crops and perennial vegetation) improve SOM remain uncertain. Here we leveraged a long-term Comparison of Biofuel Systems experiment to examine seasonal dynamics of SOM and its fractions (particulate organic matter, POM; mineral-associated organic matter, MAOM) at 0–15 cm depth, during the 2024 growing season (April–October). COBS includes continuous corn systems with and without cover crops, a corn-soybean rotation, and prairies with and without fertilizer. We found the fertilized prairies tended to have the highest POM, MAOM, and overall SOM among cropping systems. However, differences in SOM and its fractions were not consistently detectable across months. Seasonal SOM dynamics were mainly driven by POM rather than MAOM. Our findings indicate that internal POM cycling may provide an important nutrient source for crop growth during the growing season.

33. Cameron Roach, UI

Hometown(s): Waukee, Dallas, IA

Major(s): Earth & Environmental Sci (Planetary Science) BS

Mentor: Hang Chen

Integrated Gravity and Magnetic Imaging of Iowa Basement Geology for Natural Hydrogen Prospectivity

Natural hydrogen has emerged as a potential low-carbon energy resource, yet favorable generation and migration settings remain poorly constrained in sediment-covered regions such as Iowa. This project will leverage existing regional gravity and aeromagnetic datasets to image basement lithology and structure in northeastern Iowa and to delineate geophysical indicators relevant to hydrogen prospectivity. We will compile and quality-control public survey data, apply advanced potential-field processing, and perform 3D modeling/inversion to estimate subsurface density and magnetic susceptibility contrasts. The resulting basement framework will be interpreted to identify dense and/or strongly magnetic units (potentially iron-rich lithologies) and major structural features (faults, fracture zones, basement highs) that may promote water-rock interaction and fluid pathways. Deliverables include an uncertainty-aware 3D basement model and target maps to guide future field validation and follow-up surveys.

34. Mary Carolus & Cameron Fraher, UNI

Hometown(s): Waverly, Bremer, IA & Urbandale, Polk, IA

Major(s): Psychology/Social Work & Psychology

Mentor: Helen Harton

Marked for Bias: Tattoo and Race Effects on Promotion Decisions

Tattoos have become more common in society, yet negative stereotypes about tattooed individuals persist, especially in professional settings. Most previous research on tattoo stigma has focused on White individuals, leaving open questions about how tattoos interact with race and ethnicity in workplace judgments. This study examines how visible tattoos and race influence perceptions of job candidates' suitability for promotion. Participants will evaluate photographs of male candidates from four racial and ethnic groups (White, Black, Asian, and Hispanic), with and without visible tattoos, and rate them on traits such as competence, trustworthiness, and overall suitability for promotion. We expect candidates with tattoos to be evaluated less favorably than those without tattoos, and racial differences in evaluations to emerge. Findings will highlight how appearance-based bias and racial bias can combine to affect important workplace decisions, with implications for promoting fairness and inclusion in organizational practices.

35. Lizabeth Hamann, ISU

Hometown(s): Correctionville, Woodbury, IA

Major(s): Business Analytics, Agricultural Studies

Mentor: Kurt Rosentrater

Precision Livestock Farming: “Potential to Increase Beef Sustainability for Cattle Feeding Operations.”

Global population growth and increasing demand for meat requires improvements in the sustainability and efficiency of beef production systems. Precision Livestock Farming (PLF) technologies offer data-driven approaches to enhance productivity while addressing environmental, economic, and social concerns associated with cattle feeding operations. This study evaluated selected PLF technologies applicable to feedlots, including Precision Livestock Technologies, C-Lock, and Performance Livestock Analytics. Information was collected through structured interviews with company representatives and supplemented with economic breakeven analyses to assess feasibility for commercial producers. Technologies examined targeted feed efficiency, rate of gain, emissions monitoring, herd health, labor reduction, and data management. Results indicate that while PLF systems vary widely in cost, scale, and intended impact, many have potential to improve operational efficiency and contribute to sustainability if implemented appropriately. Further on-farm performance and return-on-investment studies are recommended to quantify benefits and guide informed adoption decisions by beef producers.

36. Isabelle Yoder, UI

Hometown(s): Maquoketa, Jackson, IA

Major(s): Neuroscience

Mentor: Natalie L Denburg

Quantifying the Relationship Between Sleep Quality and Cognitive Function in Older Adults.

The objective of this study is to quantify the relationship between sleep quality and cognitive functioning in older adults. Over this 8-week study, we aim to identify specific sleep disturbances from actigraphy watch data in relation to cognitive performance data obtained from a standardized neuropsychological battery. Study participants, between the ages of 56-85 enrolled in the randomized, double-blind, placebo-controlled clinical trial, Evaluating the Disease-Modifying Potential of a Sleep Intervention for Alzheimer's Disease, were included in this study. This study utilized neuropsychological testing to evaluate attention, memory, executive functioning, language, visuospatial skills, and speed of processing. Comprehensive analysis from actigraphy

and neuropsychological performance has helped us quantify this relationship between sleep quality and cognitive function in older adults.

37. Jordan Rios, ISU

Hometown(s): Makakilo, Honolulu, HI

Major(s): Computer Science

Mentor: Myra Cohen

Safety-Aware Drone Ecosystem: Towards a Safer Iowa Airspace

Increasing recreational and commercial use of small Unmanned Aerial Systems (sUAS) in shared and sometimes controlled airspaces such as near the Des Moines Airport, active rescue mission sites, and even around the Des Moines Capitol raises concerns for public safety. Drone collisions in these airspaces can be disruptive, hazardous, or destructive. On-going research seeks to create safety-aware drone ecosystem zones to facilitate safe flight paths in shared airspace. Our research at Iowa State is investigating the construction of safety-assurance cases to take into account individual environmental, equipment, and operator factors through our prototype web-based application, known as SafeCert. My current research involves the merging of individual assurance cases into a collection that is tailored to the characteristics of a specific airspace. Also, I aim to integrate two-way communication with airspace managers to provide drone pilots with the information needed to identify, evaluate, and mitigate potential risks prior to their flight.

38. Jordan Smith, UNI

Hometown(s): Burlington, Des Moines, IA

Major(s): Psychology

Mentor: Helen Harton

Predictors of prejudice towards people with Tattoos

Thirty-two percent of Americans have at least one tattoo, up from 16% about twenty years earlier. Despite this growing popularity, tattooed individuals are still viewed more negatively than those without tattoos. Tattoos have had a history of negative associations due to being associated with criminal activities (e.g. cartels and biker gangs) and continue to hold negative connotations. Little research has addressed potential associates of these negative attitudes to try to understand the sources of this bias. I will examine several potential sources of negative attitudes toward people with tattoos using a survey that is administered online. The survey will examine the participants' potential bias, personality characteristics, and overall demographics.

39. Lauren Smith & Saina Narsian, UI

Hometown(s): Ames, Story, IA & Waukee, Dallas, IA

Major(s): Neuroscience, Anthropology & Neuroscience

Mentor: Gordon F Buchanan

Lack of Central Serotonin Alters Arousal and Respiratory Responses to CO in a Mouse Model of Epilepsy

Epilepsy affects one in 26 people, and approximately 30% of these individuals experience seizures that are resistant to medication, placing them at increased risk for sudden unexpected death in epilepsy (SUDEP). During tonic-clonic seizures, CO₂ rises to dangerous levels (hypercapnia). Although hypercapnia normally triggers respiratory and arousal responses, these protective mechanisms are impaired post-seizure, increasing the risk of SUDEP. Serotonin (5-HT) is modulated by hypercapnia, and in turn modulates seizures, breathing, and arousal, suggesting that loss of central 5-HT neurons may further hinder recovery.

To investigate this, we used mice lacking central 5-HT neurons and a pilocarpine-induced epilepsy model. EEG, EMG, plethysmography, and CO₂ levels were recorded to assess hypercapnic responses. Epileptic mice of both genotypes showed prolonged arousal latency, while respiratory responses were reduced in epileptic wild-type mice and non-epileptic mice lacking 5-HT. These findings suggest that both 5-HT deficiency and recent seizures impair compensation for elevated CO₂.

40. Addison Cunningham, UNI

Hometown(s): Okoboji, Dickinson, IA

Major(s): Physics: Data Science

Mentor: Ali Tabei

Stochastic Modeling of Nucleoprotein Oligomerization and Parameter Estimation from Mass Photometry Data

RAD51 proteins bind to single-stranded DNA and are assembled into cooperative nucleoprotein filaments that are essential in DNA repair. To capture the stochastic nature of this process, we developed a Dynamic Monte Carlo simulation that models nucleoprotein polymerization on a DNA lattice. To connect the simulation with mass photometry data, we applied Expectation-Maximization (EM) and Nonlinear least squares (NLS) fitting to fit Gaussian mixture models to model polymer size distributions. Our results demonstrate that stochastic modeling, combined with EM and NLS fitting, provides a framework for analyzing RAD51 dynamics and validating theoretical predictions against experimental data. Our future work will extend the model to larger

polymer sizes, refine parameters using experimental data, and apply the framework to other systems.

41. Avery Norman, UI

Hometown(s): Panora, Guthrie, IA

Major(s): Geoscience

Mentor: Joseph P Honings

Geologic Hydrogen Potential of the Midcontinent Rift System in Iowa, USA: Background and Preliminary Research Efforts Using Legacy Data

Hydrogen is gaining interest as a low-carbon energy resource, and some naturally occurring hydrogen forms underground when water reacts with certain rock types. Ancient rift systems, where the Earth's crust once pulled apart, may provide favorable conditions for these processes. One such feature is the 1.1-billion-year-old Midcontinent Rift System, which lies buried beneath Iowa and is poorly understood due to limited subsurface data.

This project evaluates whether older seismic and well-log datasets can still provide useful information about the buried rift in north-central Iowa. Reinterpreted seismic data reveal a fault-bounded rift basin divided into structural blocks with varying rock thicknesses. Well-log analysis identifies laterally consistent rock layers and repeated subsurface zones with distinct physical properties. While these features do not confirm the presence of hydrogen, they highlight areas that may be important for fluid movement or future investigation.

Overall, the study shows that legacy data can improve understanding of Iowa's buried rift and help guide future hydrogen-focused research.

42. Vaishnavi Devi Kondabathini, ISU

Hometown(s): Warangal, Telangana, India

Major(s): Data Science

Mentor: Biswa Das

Tax Increment Financing and Local Development in Iowa

Tax increment financing (TIF) is a common tool used by local governments to support economic development, but it is often difficult to understand how it works in practice. This poster explores how TIF has been used in Iowa, a state with a long history of TIF use and strong public reporting data. Using statewide data from 2000 to 2021, the study examines trends in the number of urban renewal districts, growth in property

values captured by TIF, and differences between urban and rural use. The findings show that TIF has expanded steadily over time and now captures a significant share of property value growth. Most TIF activity occurs in cities, but rural counties also rely on TIF, especially for large industrial or infrastructure projects. Overall, the results suggest that TIF is not automatically good or bad. Its impact depends on how it is designed, monitored, and managed by local governments.

43. Jamison Stone, UI

Hometown(s): Des Moines, Polk, IA

Major(s): History

Mentor: Robert M Roupail

Resilient Lawmaking: The Palm Sunday Tornado Outbreak of 1965 and the Critical Turning Point in Disaster Legislation

This thesis argues that the Palm Sunday Tornado Outbreak in 1965 was a major turning point in how the government reacts to disasters. These tornadoes killed 271 people as they rampaged through the Midwest, as Indiana was the worst hit. They pushed President Lyndon B. Johnson to travel to the disaster-stricken area with representatives from Congress who worked for the areas affected. The trip was monumental: not only was it the first recorded time a president visited a larger disaster site, but it was the catalyst for Indiana senator Birch Bayh to introduce legislation to change disaster aid. Previously, disaster aid was given after every disaster, only at the behest of Congress. Congress would eventually pass the Stafford Act in 1988, which is in effect today. Prior to this from 1965 to 1970, Senator Bayh initiated and helped pass legislation that streamline the process of aid distribution and gave the executive branch authority to speed up relief. This legislation would be the groundwork for the later Stafford Act. The tornado watches and warning system and invention of a continuous weather broadcasting system were also outcomes of this act. The thesis makes use of contemporary newspapers, journal articles, and various primary sources from the Bayh collection.

44. **Garey Weaver & Emelia Hauser & Ambrose Neumann, ISU**

Hometown(s): Deerfield, Cook, IL & State Center, Marshall, IA & Minnetrista, Hennepin, MN

Major(s): Biology & Kinesiology & Mechanical Engineering

Mentor: Karri Haen

Motion-Controlled Rocket Repair for Space Exploration: Bionics Lab

As space missions grow longer and more complex, efficient and safe in-space maintenance is increasingly critical. Funded by NASA's Iowa Space Grant Consortium (ISGC), this research addresses these challenges through an interdisciplinary approach integrating human-centered design and advanced robotic systems. Our work explores the development of a modular, motion-controlled robotic arm system for spacecraft maintenance, inspired by biomedical engineering and human biomechanics. The system is being developed around a glove-based controller intended for use inside a spacecraft, designed to capture precise hand and arm movements through motion tracking and sensors. These inputs are translated in real time to control a servo-driven, multi-joint robotic arm, enabling remote maintenance tasks such as repairs and component manipulation without requiring extravehicular activity. Developed in Iowa State's Bionics Lab, the project brings together undergraduate researchers across disciplines in an environment fostering innovation and interdisciplinary collaboration, while inspiring communities and supporting NASA's mission.

45. **Bella Steffensmeier, UNI**

Hometown(s): Farmington, Van Buren, IA

Major(s): Biology: Biomedical/Pre-Prof. Medicine

Mentor: Martin Chin

Synthesis and Reactivity of Diruthenium-Based Complexes with Polyhydride Ligands

The development of more sensitive, efficient, and reactive hydrogenation catalysts in metal complexes is important for various applications. Hydrogenation converts liquid unsaturated oils into semi-solid fats, like the conversion of vegetable oil to margarine. This project investigates diruthenium hydride complexes, focusing on how the number and type of hydrides influence reactivity, stability, and hydrogenation potential. Ruthenium's flexible hydrogenation states and robust organometallic frameworks make it well suited for probing fundamental metal-hydride behavior. The research will synthesize and characterize a series of diruthenium complexes containing bridging and terminal polyhydrides, using hydrogenation reactions, spectroscopy, and small-molecule reactivity studies to clarify structure-reactivity relationships. These insights

will advance understanding of diruthenium hydrogenation catalysis and metal-hydride chemistry.

46. Sophie Pierce, UI

Hometown(s): West Des Moines, Polk, IA

Major(s): Geoscience

Mentor: Tiffany S Adrain

Shining a Light on Lantern Slides

My research focuses on transcribing and cataloguing the geologic lantern slides collection at the University of Iowa to record and preserve these slides and their significance. Lantern slides are images that were projected during lectures at the University up until the late 20th century and many are snapshots taken by past professors. Now that lantern slides are no longer in use, we have these collections left behind and the goal of the research I'm helping with is to sort through them and catalogue their inscriptions, where they were photographed, the geologic features they present, and think through the significance of why they were taken. In this project I will go over the process of documenting lantern slides, more about what they are and how they were created, and prominent places and features shown in the slides that tell us more about the history of geology in different regions.

47. Nate Keenan, UNI

Hometown(s): Waukon, Allamakee, IA

Major(s): Kinesiology and Exercise Science/Pre-Prof: Physical Therapy

Mentor: Terence Moriarty

The effects of creatine and acute caffeine on exercise performance and cognitive measures in healthy young adults

Creatine and caffeine are independently associated with improvements in strength, endurance, and cognitive performance, but limited research has examined their combined influence. This study investigated the effects of varying acute caffeine doses on resistance exercise performance and psychological outcomes following 18 days of creatine supplementation. On Day 18, subjects ingested coffee containing 0, 100, 200, or 300 mg caffeine 1 hour prior to post-testing. Pre- and post-measures included mood (mood, stress, energy, focus), cognition (attention, processing speed, memory), and resistance performance (estimated 1RM squat/bench, repetitions at 50% 1RM). The results showed that acute caffeine ingestion yielded domain-specific effects, with decaf improving muscular endurance and 200 mg caffeine having significant gains in processing speed and memory. No clear dose-response effects

emerged across groups. These findings suggest potential benefits of moderate caffeine dosing for cognition, while creatine alone supports muscular endurance. Larger trials are needed to confirm these preliminary results.

48. Vincent Hesselink, UI

Hometown(s): Cedar Falls, Black Hawk, IA

Major(s): Environmental Engineering

Mentor: David M Cwiertny

Environmental Fate of Fungicides Used in Crop Production

Fungicides like pyraclostrobin and trifloxystrobin are widely used in agriculture. Due to their widespread use via aerial applications and as seed treatments, they are commonly detected in soil, sediment, and surface waters. However, their behavior, persistence, and fate in the environment is understudied. In this work, we explored how commonly utilized fungicides break down through reaction with sunlight. We find that a popular class of fungicide known as quinone outside inhibitors reacts with sunlight, sometimes forming degradation products that may still exhibit fungicidal activity. Ongoing work focuses on evaluating the ecosystem impacts of the degradation products we have observed and isolated, and on developing a better understanding of how different environmental variables alter this light-driven degradation pathway.

49. Sarah Symonds & Gwendolyn Jacobson, ISU

Hometown(s): Des Moines, Polk, IA & Battle Creek, Ida, IA

Major(s): Kinesiology and Health & Kinesiology and Health

Mentor: Gregory Welk

The Role of Companionship Social Support in Physical Activity Intervention for Older Adults

The aging population poses challenges for the healthcare system. Preventative care programs, including falls prevention programs, often incorporate physical activity (PA) to reduce injury and maintain independence. Walk With Ease (WWE) is a walking program developed to promote PA and improve health outcomes among older adults. To maximize the efficiency of such programs, it is critical to understand the underlying factors, like social support, that encourage adherence despite barriers. This study analyzed adherence variables and psychosocial factors related to PA engagement among WWE participants with and without companions to better understand the role of social support in participant success. Participants enrolled in the study with a companion had no significant difference in adherence and psychosocial changes versus those who enrolled without a companion. These findings suggest

that participants across groups received similar social support, although further research with a larger, random sample size is necessary to fully address this topic.

50. Jadin Grieser, UNI

Hometown(s): Lone Tree, Johnson, IA

Major(s): Political Science/Public Administration

Mentor: Ana Kogl

Power, Perceptions, and the Working-Class

The working class is the foundation for any society, as it represents the majority of the population and, in a democracy like the United States, should have a strong influence on politics. The working-class, however, often is the most overlooked section of the American polity and may not see their interests represented by those they elect for office. To understand why people may be supportive of policies or politicians that go against their own economic self-interest, this project looks into the underlying power dynamics influencing the working class. Through interviewing multiple working-class Iowans, this project first gathered data on their perceptions and beliefs, then sorted the responses into themes. These themes were then examined within the current context of American politics along with political theories on subconscious power dynamics to understand why people act contrary to their interests.

51. Isaac Lewiston, ISU

Hometown(s): Ogden, Boone, IA

Major(s): Psychology, Math

Mentor: Kevin Blankenship

Understanding Attitudes and Persuasion: A Study on Inter-attitude Consistency

Attitudes can be changed both directly and laterally. Lateral attitude change occurs when a person changes their attitude towards a topic due to an experience indirectly related to the topic in question. A key component of lateral attitude change is the degree to which certain opinions are related to other opinions. In this study, we examined how writing about the relation between opinions affects the strength of that relation. ISU undergraduates (N=111) were asked to write about their opinions on two political issues: same-sex marriage and civil rights policies. We found that when students wrote about how these two issues relate to morality and core values, the strength of the relation between these opinions increased. The results of this study will hopefully inspire future studies on the topic of lateral attitude change and therefore increase our understanding of exactly how attitude change occurs.

52. Emily Newby, UNI

Hometown(s): Crescent, Pottawattamie, IA

Major(s): Communication

Mentor: Chris Martin

The Times They Are A-Changin': How Bob Dylan's Music Helped to Change an Era

Influential singer-songwriter Bob Dylan left his mark on the musical, social, and political world in the 1960s. By using his songs as a powerful form of communication, his work brought about needed awareness and change in an evolving world where social and political norms were being challenged by a new generation of activists against the backdrop of conflict and civil rights. The final project will be presented as a research paper that uses rhetorical analysis to examine three of Dylan's songs, 'Blowin' in the Wind' (1963), 'Masters of War' (1963), and 'The Times They Are A-Changin'' (1964), and how the lyrics reflected America's social and political climate in the early 1960s.

53. Connor DeGroot & Allison Butz, UI

Hometown(s): Cedar Falls, Black Hawk, IA & Hopkins, Hennepin, MN

Major(s): Political Science, Philosophy & International Relations

Mentor: Nicholas F Martini

Thirsty Servers: Evaluating the Impact of Data Center Water Use in Iowa

Iowa has become a hotspot for data center development amidst growing demand for AI and cloud computing. Large data centers can consume hundreds of thousands or even millions of gallons of water per day during summer months. We investigate the impact of this increased demand on local supply of water.

Our research draws from news articles, as well as reports by the State of Iowa, municipalities, and major data center businesses. We evaluate whether data center water consumption by several existing or proposed hyperscale data centers constitutes a serious policy problem. We then use evaluative criteria including political feasibility, data center water demand relative to supply, economic impact, and fiscal impact in considering possible state policy responses. We find that data center water use poses a slight risk to Iowa communities in the immediate term, and that key information on groundwater drawdown and data center water use is incomplete.

54. Jamie Ross, UNI

Hometown(s): Cedar Falls, Black Hawk, IA

Major(s): Family Services

Mentor: Anne Plagge

Trauma and Attachment Outcomes Among Foster Youth

Children in foster care have histories of trauma, such as abuse, neglect, and instability, which affect their development and sense of security. Understanding how placement experiences impact trauma and attachment is essential to understanding long term outcomes. Using semi-structured interviews with staff at Cedar Valley Angels, this study examines staff perspectives of how stable placements and supportive caregiving affect attachment and emotional well-being, how trauma and frequent moves influence social, academic, and health outcomes, and which practices and strategies help foster resilience in youth. Thematic analysis is used to identify common experiences, challenges, and effective practices, all of which will be discussed.

55. Caroline Strawhacker, ISU

Hometown(s): Burlington, Des Moines, IA

Major(s): Agricultural Business, Agronomy

Mentor: Rabail Chandio

Understanding Stakeholder Perspectives on Iowa Farmland Markets

Farmland has been viewed as a productive agricultural resource and an asset. Recently, new economic, environmental, and technological dynamics have been reshaping how stakeholders perceive the US land market. This study aims to examine different perceptions, experiences, and predictions for Iowa's farmland by analyzing interviews from farm managers, rural appraisers, landowners/farmers, lenders, auctioneers, and real estate agents from varying regions in Iowa. The objective of this study is to understand how the new dynamics are changing farmland values and to identify where there are potential future issues in Iowa's farmland market. Analysis of each of these interviews reveal reoccurring themes: technology, auctions, conservation, green energy, policy, etc. and their effect on the value of farmland in Iowa.

56. Minou Emmad, UI

Hometown(s): Iowa City, Johnson, IA

Major(s): Physics, Computer Science, Math

Mentor: Michael J Schnieders

Understanding How Zinc Finger Proteins Bind DNA

Zinc finger proteins are key regulators of gene activity, turning genes on or off depending on how they bind to DNA. These proteins contain a zinc finger, which has a small structure stabilized by a zinc ion attached to four cysteine amino acids. Subtle changes in the chemical state of the cysteines can modulate zinc binding and, in turn, modulate the protein's DNA binding affinity. In this study, we use advanced computer simulations to observe these changes happening in real time. By simultaneously modeling the fluctuations of the protein conformation and the chemical states, we can understand how these fluctuations influence DNA binding. Our simulation strategy captures, for the first time, the effects of the charged, polar environment surrounding the zinc ions within several key transcription factors. Our results provide insight into how zinc finger proteins achieve their control over gene activity.

57. Sarah Broeker, ISU

Hometown(s): Pekin, Peoria, IL

Major(s): Civil Engineering

Mentor: Roy Sturgill

Utilization of Bentonite for Reduced Grout Loss in Soil Nail Walls

Soil nails are commonly used in geotechnical engineering to stabilize slopes, retaining walls, and excavations, relying on cementitious grout to bond steel reinforcement to surrounding soil. A persistent challenge in soil nail construction is grout loss into voids or permeable soils, which can reduce bond efficiency and increase project costs. This study investigates the effects of bentonite as an admixture in Type IL concrete grout, a material increasingly used in field applications. Laboratory testing was conducted on grout mixtures containing varying bentonite contents to evaluate viscosity, density, and compressive strength. Results demonstrate that bentonite increases grout viscosity, improving resistance to grout loss, while maintaining compressive strength suitable for soil nail applications. These findings provide insight into the influence of bentonite on Type IL concrete grout performance and support its potential use in improving constructability and reliability of soil nail systems.



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