Creighton University

College of Arts & Sciences

21st Annual Honors Day

Program of Research Presentations

9 April 2025

2:00 – 5:00

(4:30 closing ceremony)

Harper Center 4th Floor

In Celebration of the 20th Anniversary of the Honors Program

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Welcome from the Dean

Welcome to Honors Day 2025!

Today we recognize the innovation, creativity, and dedication of Creighton's College of Arts and Sciences Honors Program students. We celebrate the range of their academic accomplishments. These presentations and posters demonstrate the very best of what exceptional undergraduates can produce when provided with the combination of freedom of inquiry, disciplinary focus, and mentorship from faculty, all of which are key features of Creighton University's Honors Program. What you see displayed here in the Honors students' projects is a culmination of intellectual curiosity, diligent research, and steadfast commitment to creating new knowledge. I hope you will join me in congratulating the students and their mentors. We are proud of your contributions to Creighton and to your fields. We honor you.

Congratulations, Honors Day presenters!

Dr. Bridget Keegan, Ph.D.
Professor of English and Dean
College of Arts and Sciences

Welcome from the Director

Dear Honors Researchers,

We come together today to celebrate the exceptional research and dedication of our Honors students, a fitting tribute to the 20th anniversary of our program. These projects span a wide range of disciplines across our curriculum and exemplify the power of interdisciplinary collaboration, all under the mentorship of our exceptional faculty. Among the fascinating topics you'll encounter are an exploration of the relationship between social work contact and health outcomes in children with cystic fibrosis, the use of AI chatbots in nursing education, the development of noninvasive optical biopsies for skin cancer detection, and an analysis of the parallels between J. Albert Mann's *The Degenerates* and 20th-century psychiatric institutions.

Each of these achievements represents countless hours of effort, critical thinking, creativity, and dedication. We are immensely proud of all you've accomplished!

Congratulations on your well-deserved success.

Dr. Erin Walcek Averett, Ph.D.
Honors Program Acting Director

Schedule of Oral Presentations

Session 1A Harper 4067

2:00	Kacey Yamane	"Molecular Specializations Underlying Phenotypic Differences in Inner Ear Hair Cells of Zebrafish and Mice"
2:20	Nate Schlader	"Fabrication and Optimization of 3D-Printed eEectrodes for Electrochemiluminescent Detection"
2:40	Zach Onyszchuk	"Disinfectant Molecules Decompose with lLght: Organic Chemistry that Might Save your Life"

Session 1B Harper 4068

2:00	Hannah Ladwig	"Structural Analysis of Crassostrea gigas OAZ-PK RNA"
2:20	Megan Ptak	"Defining Infant Mortality in the United States: A Study of Differential Reporting Bias"
2:40	Nina Rehfeldt	"Addressing Hunger: Examining Two Minnesota Food Pantries Using Cluster Analysis and Rhetorical Field Methods"

Session 2A Harper 4067

3:05	Ayden Chavez	“Klotho's Effects on the Stria Vascularis Thickness”
3:25	Hannah Graff	“The Impact of Early Life Adversity on Mental Health Outcomes”
3:45	Ryan Ward	“Predicting Interactions Between Proteins Involved in Gene Silencing Using AlphaFold3”

Session 2B Harper 4068

3:05	Ellysia McElroy	"Laughing in Latin: What Latin Jokes in Modern Media Teach Us About In-Grouping”
3:25	Katherine Dykeman	“Care and Personhood: A Journey Through Communal Oppression”
3:45	Alyssa Gove	“ESG Risk Considerations in Portfolio Construction: Understanding the Tradeoff between Sustainable Investing and Diversifying Returns”

Session 2C Harper 4069

3:05	Allison Benjamin	“In Sickness and In Debt: Medical Debt Lawsuits in Douglas County”
3:25	Jonathan Fales	“Liturgical Mastery of Suffering”
3:45	Brady Culp	“To Whom Shall We Go: Mechanisms of Religious Affiliation”

Schedule of Poster Presentations

Poster Session 1 2:20-3:20 Harper Ballroom

Julia Barbee	“Plasmid Cloning TLCVRed1 and pEGFP-C1 in Preparation for C-BERST Subnuclear Proteomic Mapping”
Dylan Bui	“3D Fluorescence Morphometry Post-Chemoradiotherapy Against Brain Cancers”
Daniel Byrne and Ethan Ernst	“Lipid and RNA Levels in CPT II Knockdown *Spodoptera frugiperda*”
Abigail Engle	“Memorable Messages from Healthcare Professionals: Providing Supportive Communication to Patients through their Reproductive Health Journey”
Isaac Gart	“Synthesis of Fused-ring 1,5-diaryl-1,2,3-Triazoles Containing 5-quinoline and 5-isoquinoline Subunits plus their Dimeric Counterparts”
Erika Germinario	“Antinociceptive Effects of Morphine:Ketamine Mixtures in Female Rats”
Noah Greenwood	“Selective Interactions of Prion Proteins to the Surface of Lipid Membranes: A Molecular Dynamics Study”
Anjali Jayan	“Structural Analysis and Binding Specificity of the Mouse OAZ RNA”
Addison LeGrand	“The Breaking Point: A Correlational Study in Variables of Athlete Burnout”

Katie Logan	"MLH1 and CHEK2: Investigation into Hereditary Mutations and Cancer Development in a High-Risk Family"
Mackenzie Madsen	"Klotho in the Choroid Plexus as a Neuroprotective Factor"
Jack Meeuwsen	"Resin Matrix Selection for Next-Generation Carbon Fiber-Reinforced Orthopedic Implants: A Comprehensive Review"
Kathleen Moran	"Beyond the Wound: An Interdisciplinary Examination of Scarring and Self-Perception in the United States"
Lizzy Nelson	"Evaluating the Personal and Professional Impact of Short-Term Medical Mission Trips: Insights from the ILAC Summer Health Program"
Carly Nowoj	"A Novel Interaction Between Proteins Involved in Nucleosome Assembly"
Greer Porter	"NADH Phasor FLIM Detects Metabolic Changes Associated With HER2 Expression In Breast Cancer In Vitro"
Natasha Ratnapradipa	"Tissue Engineering Using Simulated Microgravity"
Maggie Schaefer	"Amorphous Core-Shell GeO_2-SiO_2 Nanoparticle Growth in the Presence of Polyols"
Zachary Smith	"Investigating a Non-invasive Optical Biopsy to Detect Biochemical Markers and Changes in Metabolism of UV-induced skin Cancer"

Sophia St. Marie	"The Correlation Between Social Work Encounters and Health Outcomes in Children with Cystic Fibrosis"
Emma Strong	"Severed Synapses: Exploring Altered Perceptions of Self-Identity as a Consequence of Neurological and Cortical Dysfunction"
Andrew Wegner	"Optimization of Au-plated Carbon Electrode-based Biosensors"
Clare Williams	"Taking Turns: A Color Analysis"

Poster Session 2 3:30-4:30 Harper Ballroom

Jacqueline Austin	"Computational Modeling of Graphene Quantum Dots Using MATLAB"
Noah Christensen	"Checking in on Checks and Balances: A Justice by Justice Approach"
Aiden Coen	"Economic and Hydraulic Exploratory Modeling of Large-Scale Levee Setbacks"
Andrew Fernandes	"Investigating Polyols for Controlling Sol-gel Germania Nanoparticle Growth for Use in 3D-Printed Glass"
Gigi Fong and Alessandra Kakish	"Analysis of Bacterial Viability in the Presence of glmS Riboswitch Ligand Analogs"
Ephrata Geda	"Optimizing Goal-Directed Physical Therapy: Exploring Self Determination and Functional Outcomes in Youth with Cerebral Palsy"
Katelyn Grzelak	"Photodegradation of Antiseptic Triazolium Salts with Photolabile Subunits"

Ella Hiddleston	"Manding for Missing Items in a Child with ASD: An Experimental Case Study"
Olivia Hoffbeck	"The Pap Smear Diaries: Utilizing Storytelling in Health Education"
Liv Klammer	"Advances in the Synthesis of Mixed-metal Sulfites: Facile Linking of Hard and Soft metals via Sulfite"
Sanford LeGrand	"An Assessment of Factors that Impact the STABLE 2007: Crossover Offenders and Misconduct"
Sahrai Luna	"Layered Hybrid Germania-Silica Nanoparticle Sol-Gel Synthesis for Use in 3D-printing Glass Optics"
Hannah Martin	"Nostrill Mediated Demyelination Following Acute and Chronic Induced Demyelinating Disease"
Gabrielle Pohlad	"Analysis of Fatty Acid Composition in Squash Bug Anasatristis"
Milana Rasin	"Fundamental Investigation of MOF-Polymer Interactions"
Philip Richardsen	"Defining a Novel Biochemical Pathway: Cold Injury Induces Release of Microvesicle Particles with Biochemical Pathway Dependence on Injury Conditions"
Katie Rooney	"Catalytic Performance of Copper Complexes in Atom Transfer Radical Addition (ATRA) Reactions"
Jakob Schmit	"Drug Preference of Remifentanil, Methamphetamine, and Opioid/Stimulant Mixture Using Choice Procedure"

Kaylee Van Handel	"Navigating Difficult Conversations in Healthcare: The Use of AI Chatbots in Training Undergraduate and Graduate Nursing Students"
Daniel White	"Investigation of the Structure and Dynamics of Alumino-phosphate Glass Melts"
Allie Woog	"Klotho: Adult Neurogenesis and Aging in a Mouse Model"

Closing Ceremony Program
Harper Ballroom

Opening Address	4:35
Dr. Eric Haas	
Interim Associate Director of the Honors Program	
Congratulations from the Dean	4:40
Dr. Bridget Keegan	
Dean of the College of Arts and Sciences	
Congratulations from the Provost	4:45
Dr. Mardell A. Wilson	
Provost	
Closing Remarks & Awards	4:50
Dr. Erin Walcek Averett	
Acting Director of the Honors Program	

Abstracts

alphabetical by last name

Jacqueline Austin

Majors: Physics and Mathematics
Faculty Sponsor: Dr. Andrew Ekpenyong
Poster Session 2

"Computational Modeling of Graphene Quantum Dots Using MATLAB"

Quantum Dots (QDs) have distinct properties and diverse applications due to their size-dependent quantum effects. These nanoparticle structures are an integral part of nanoparticle-mediated radiation therapy (NPRT), where they contribute to improving outcomes of radiotherapy through two approaches: local tumor dose enhancement and radiosensitization. Both the theoretical and experimental characterizations of the QDs themselves are essential. The Translational Biomedical Physics Laboratory at Creighton University aims to characterize carbon and graphene QDs using the Schrödinger Equation in 3D spherical coordinates. This will simulate the energy eigenvalues of the electrons and holes in our QDs. It is expected that the simulations will aid in the refinement of NPRT.

Julia Barbee

Major: Biology
Faculty Sponsor: Dr. Christopher Mesnard
Poster Session 1

"Plasmid Cloning TLCVRed1 and pEGFP-C1 in Preparation for C-BERST Subnuclear Proteomic Mapping"

Pancreatic cancer is the 3rd leading cause of cancer-related deaths, with a 5-year survival rate of 13%. Pancreatic ductal adenocarcinoma (PDAC) disproportionately affects non-Hispanic Black patients, who experience higher incidence and mortality rates. To investigate molecular factors contributing to racial disparities, we performed quantitative mass spectrometry on tumors from 30 Caucasian and 12 African American patients, identifying 183 differentially expressed proteins. The most significant was Ring Finger Protein 2 (RNF2), an epigenetic transcriptional repressor. ChIP-seq analysis in PDAC cells revealed RNF2 binds to GATA6, a key regulator of PDAC subtype, chemosensitivity, and aggressiveness. RNF2 represses GATA6 expression, suggesting a role in tumor progression. To further investigate this repression, we use the dSpyCas9-mCherry-APEX2 system, a CRISPR-based biotinylating tool, to map RNF2 interactions at the GATA6 locus. This study provides insights into epigenetic regulation in PDAC and its potential role in racial health disparities.

Allison Benjamin

Majors: Spanish & Hispanic Studies and Sociology
Faculty Sponsor: Dr. Ryan Wishart
Oral Presentation Session 2C

"In Sickness and In Debt: Medical Debt Lawsuits in Douglas County"

Nebraska has the highest number of medical debt lawsuits per capita in the country. My research examines over 270 medical debt lawsuits filed in Douglas County, uncovering how hospitals and collection agencies sue patients—sometimes for as little as $200—and garnish wages and bank accounts. Often, this pushes low-income individuals, including hospital employees sued by their own workplaces, further into financial hardship. My research inspired a Nebraska legislative bill to cap wage garnishments on medical debt, and this January I led a group of students to testify in its favor. Additionally, I discuss our chapter of Students for a National Health Program's fundraiser with the nonprofit Undue Medical Debt to forgive $1 million in medical debt in Nebraska. This presentation explores the hidden realities of medical debt collection and how research, advocacy, and direct action can drive change.

Dylan Bui

Major: Chemistry
Faculty Sponsor: Dr. Andrew Ekpenyong
Poster Session 1

"3D Fluorescence Morphometry Post-Chemoradiotherapy Against Brain Cancers"

Glioblastoma is a brain cancer characterized by its radioresistance, chemoresistance, and aggressiveness. The current standard of care, which consists of surgical resection followed by radiotherapy and the administration of temozolomide, only marginally increases the survival rate. This motivates research on improvements to chemotherapy.

Lenalidomide, the focus of this research, provides a promising alternative as it has been used to treat other cancers and can pass the blood-brain barrier. Human-derived T98G cells were given a clinically appropriate dosage of lenalidomide and radiation to demonstrate their joint effects. To improve the validity of the experiment, a Rotary Cell Culture System (RCCS) was used to generate 3D clusters of T98G cells. Fluorescence microscopy using Calcein and Hoescht dyes was used to analyze the result of the treatment. A number of parameters in the resulting fluorescence images were used to determine the effectiveness of different chemoradiotherapeutic dosages.

Daniel Byrne (with Ethan Ernst)

Major: Biochemistry
Faculty Sponsor: Dr. Eric Haas
Poster Session 1

"Lipid and RNA Levels in CPT II Knockdown *Spodoptera frugiperda*"

Carnitine Palmitoyl Transferase II (CPT II) shuttles fatty acids across the inner mitochondrial membrane. This is a necessary step in the oxidation of fatty acids to produce ATP. Deficiencies in CPT II cause serious metabolic defects and often lead to the death of affected organism. We used morpholinos to inhibit translation of the CPT II mRNA into the functional transport protein in the fall armyworm, *Spodoptera frugiperda*. Here we report RNA and lipid quantities in the knockdown organism compared to the wild-type in order to determine the effects of inhibiting lipid transport into mitochondria. Understanding the metabolic changes induced by CPT II deficiency will aid development of treatments for patients with this disease.

Ayden Chavez

Major: Neuroscience
Faculty Sponsor: Dr. Gwendalyn King
Oral Presentation Session 2A

"Klotho's Effects on the Stria Vascularis Thickness"

Klotho-deficient mice experience a shorter overall lifespan because of the coalescence of disorders typically unseen outside of advanced human age. Although the mechanisms are unknown, klotho-deficiency induces hearing loss. The presence of klotho plays an important role within the brain's choroid plexus, which produces the cerebrospinal fluid. The cochlea has a similar structure with a similar function in its stria vascularis. The stria vascularis is the tissue that secretes the endolymph necessary for mechanotransduction and hearing. We looked at the stria vascularis to determine whether a common mechanism of klotho action may contribute to dysfunction in both tissues. Stria vascularis functional measurement showed no change between control and klotho-deficient mice; however, histological stain detected increased klotho-deficient stria vascularis thickness. Thickened stria vascularis is sufficient to cause hearing loss. We examined protein expression levels and capillary size for evidence toward a mechanistic understanding of the role of cochlear klotho.

Noah Christensen

Majors: Political Science and Spanish & Hispanic Studies
Faculty Sponsor: Dr. Scott Hendrickson
Poster Session 2

"Checking in on Checks and Balances: A Justice By Justice Approach"

The Supreme Court's role in limiting executive power is a crucial part of the separation of powers. My primary research question is, "What makes a Supreme Court justice more likely to vote to expand executive power?" To answer this, I offer four hypotheses: (1) justices who have spent more time on the bench are more likely to vote to expand executive power, (2) a justice is more likely to vote to expand executive power when the president is a named party in the case, (3) a justice is more likely to vote to expand the power of the president that appointed them, and (4) a justice is more likely to vote to expand executive power when the president in office when the case is heard belongs to the same party as the president that appointed the justice. My analysis shows that the partisanship hypothesis is statistically significant at the 95th percent confidence interval.

Maria Christoffersen

Major: Psychology
Faculty Sponsor: Dr. Matthew Huss
Poster Session 1

"Assessing the Predictive Validity of the CPORT for Sexual Recidivism Among Child Pornography Offenders"

Considering the alarming increase in possession and distribution of child pornography (CP) the U.S. has seen in the past decade, investigating the characteristics, treatment adherence, and especially sexual recidivism rates of child pornography offenders is more critical than ever for maintaining public safety. Predicting recidivism is crucial for the prevention of sexual offenses. The Child Pornography Risk Assessment Tool (CPORT) was designed to assess recidivism risk specifically for adult male child pornography offenders. The present study examined the predictive ability of the CPORT by analyzing the relationship between the CPORT score and sexual recidivism, established risk assessments for sexual offenders, and treatment revocation in a preliminary sample of adult male sexual offenders. The results of the study revealed a significant relationship between CPORT score and sexual recidivism, suggesting its validity as a risk assessment tool.

Aidan Coen

Majors: Environmental Science and Biology
Faculty Sponsor: Dr. Alison Kleffner
Poster Session 2

"Economic and Hydraulic Exploratory Modeling of Large-Scale Levee Setbacks"

This project evaluates the flood risk management (FRM) benefits of implementing large-scale levee setbacks along major rivers within the United States, including the Mississippi and Missouri Rivers. Analysis is conducted by utilizing the USACE Life Safety Risk Indicator tool to quantify how levee setbacks may reduce flood risks, particularly under the potential climate trends of increased frequency of extreme precipitation events. Levee setbacks as a non-structural FRM measure have already been implemented on a smaller scale, and observed benefits may increase when applied across larger systems. This exploratory analysis offers insight for FRM, guiding future decision-making and policy, and contributing to sustainable, scalable FRM along major US rivers.

Brady Culp

Major: Neuroscience
Faculty Sponsor: Dr. TheodoreDedon
Oral Presentation Session 2C

"To Whom Shall We Go: Mechanisms of Religious Affiliation"

Since the 1960s, affiliation within mainline Christianity in the West has faced an unprecedented decline. Sociological analyses of trends pertaining to this phenomenon have largely determined that religious disaffiliation is concentrated in young people, and often the result of gradually losing interest rather than a specific decision to leave the church. There is currently no sociological data to analyze the reasons why people stay within a faith tradition. This project seeks to analyze related sociological trends to provide theories that justify why, in broad trends, people remain affiliated with and participate in their faith tradition. Contextualized within a period of religious disaffiliation, growing social isolation, and the rise of "Christian Nationalism," understanding the rationale of religious participation could help alleviate friction in an increasingly secularized landscape. This preliminary examination explores how family, culture, and personal experience might affect one's religious affiliation, setting the groundwork for future study.

Katherine Dykeman

Major: Psychology
Faculty Sponsor: Dr. Brooke Kowalke
Oral Presentation Session 2B

"Care and Personhood: A Journey Through Communal Oppression"

This project explores the parallels between *The Degenerates* by J. Albert Mann and real-life psychiatric institutions of the 1900s, examining dehumanization and the interpersonal instillation of personhood through acts of care. Brought together as a zine presentation, this talk integrates frameworks of ethics, dehumanization, and personhood, while also drawing on sensitive sources such as poetry, real testimonies, and artistic expressions. Together these illustrate how oppressive environments aim to strip dignity—but within these environments, even small acts of care can foster personhood and community-based care. Thematic sections explore the progression from encompassing dehumanization to the emergence of care, resulting in the creation of an interpersonal community. This project highlights how care is a personal and communal act of defiance, benefitting not only those who receive it, but also those who give it. By acknowledging this interpersonal aspect of personhood, it encourages others to participate in these acts of care and dignity in their own communities.

Abigail Engle

Major: Communication Studies
Faculty Sponsor: Dr. Amanda Holman
Poster Session 1

"Memorable Messages from Healthcare Professionals: Providing Supportive Communication to Patients through their Reproductive Health Journey"

Medical professionals in reproductive healthcare must offer both physical and emotional support to ensure holistic patient well-being. While much research has focused on patient perspectives, the current study involved 20 healthcare workers in reproductive medicine. Using communicative narrative sense-making theory and memorable messages theory, this research project identified three key themes in providing communicative support: keeping patients informed, asking questions, and nonverbal presence. Memorable messages were categorized into four themes: (a) moments of high tension, (b) disagreements with patient choices, (c) language barriers, and (d) heightened emotion. The study also explored self-care strategies, including (a) debriefing with coworkers, (b) setting boundaries, (c) prioritizing well-being, and (d) expressing emotions when appropriate. These findings help enhance patient care by understanding clinicians' communication approaches and perspectives.

Ethan Ernst (with Daniel Byrne)

Major: Biochemistry
Faculty Sponsor: Dr. Eric Haas
Poster Session 1

"Lipid and RNA Levels in CPT II Knockdown *Spodoptera frugiperda*"

Carnitine Palmitoyl Transferase II (CPT II) shuttles fatty acids across the inner mitochondrial membrane. This is a necessary step in the oxidation of fatty acids to produce ATP. Deficiencies in CPT II cause serious metabolic defects and often lead to the death of affected organism. We used morpholinos to inhibit translation of the CPT II mRNA into the functional transport protein in the fall armyworm, *Spodoptera frugiperda*. Here we report RNA and lipid quantities in the knockdown organism compared to the wild-type in order to determine the effects of inhibiting lipid transport into mitochondria. Understanding the metabolic changes induced by CPT II deficiency will aid development of treatments for patients with this disease.

Jonathan Fales

Major: Theology
Faculty Sponsor: Fr. Christopher Krall
Oral Presentation Session 2C

"Liturgical Mastery of Suffering"

Through liturgy, the absurdity of suffering within human experience acquires meaning. The liturgy takes people's suffering and reshapes it into something fruitful, providing healing by uniting them to Christ's suffering in his Passion and Resurrection. In the Eucharist, as the center of Christian worship, the suffering people become the physical embodiment of Christ and as such take on his suffering and death. Dying with Christ is the essence of mastery over suffering. Only in death can we surrender everything, completely relying on Christ for resurrection to new life. This study focuses on the various forms and ways in which suffering is addressed by the liturgies of the Catholic Church and how the liturgy enkindles a zealous practice of enduring suffering not as a burden, but as a blessing. All are called to imitate Christ; however, to imitate *in verbo et factum* is not enough, we must also imitate *quid pertulit*.

Andrew Fernandes

Major: Biochemistry
Faculty Sponsor: Dr. Joel Destino
Poster Session 2

"Investigating Polyols for Controlling Sol-gel Germania Nanoparticle Growth for Use in 3D-Printed Glass"

Germania is a well-known glass former with several desirable properties in glass optics. In comparison to silica, germania has higher refractive capabilities and k-dielectric properties. Additionally, it has a wider optical transparency window and a higher linear coefficient of thermal expansion. Use of germania in 3D printed glass optics has been limited, primarily due to the chemical challenges with synthesizing small (sub-50 nm), stable, amorphous GeO2 nanoparticles. In this study, we investigate using polyol surfactants, xylitol and sorbitol, to tune GeO2 nanoparticle growth. Replicate samples were grown at various concentrations and times of addition. Dynamic light scattering (DLS), atomic force microscopy (AFM), and infrared spectroscopy (IR) measurements were acquired to elucidate the size and structure of the sol-gel nanoparticles. Results show potential for polyol particle capping. Studies continue to explore the effect of the time of addition and other polyols.

Gigi Fong **(with Alessandra Kakish)**

Major: Biochemistry
Faculty Sponsor: Dr. Juliane Strauss-Soukup
Poster Session 2

"Analysis of Bacterial Viability in the Presence of glmS Riboswitch Ligand Analogs"

Researchers have identified riboswitches, non-coding segments of mRNA that affect the expression of downstream genes, as a new target for antibacterial agents, such as the glmS riboswitch. This riboswitch controls the gene expression of fructose-6-phosphate amidotransferase, which synthesizes glucosamine-6-phosphate (GlcN6P) in bacterial cells. GlcN6P is a precursor in bacterial cell wall biosynthesis. The glmS riboswitch is also a catalytic ribozyme, which self-cleaves upon binding to GlcN6P. This cleavage degrades the mRNA, inhibiting glmS gene expression and preventing bacterial cell wall synthesis. This project focuses on identifying analogs with resemblance to GlcN6P that can affect the riboswitch as an agonist or antagonist. To determine whether GlcN6P ligand analogs can inhibit bacterial growth, assays are performed to monitor *Bacillus subtilis* and *Staphylococcus aureus* growth in the presence or absence of potential GlcN6P analogs. Optimization of RT-PCR is also being conducted to verify whether the glmS gene and glmS riboswitch RNAs are downregulated.

Isaac Gart

Major: Biology
Faculty Sponsor: Dr. James Fletcher
Poster Session 1

"Synthesis of Fused-ring 1,5-diaryl-1,2,3-triazoles Containing 5-quinoline and 5-isoquinoline Subunits Plus their Dimeric Counterparts"

Quinoline rings have many valuable properties, including their ability to disrupt bacterial cell machinery, making them potent antimicrobials. Due to the therapeutic relevance of these molecules, we synthesized various quinoline and isoquinoline-containing triazole compounds to explore their differences in chemical properties. Our main focus was on incorporating these quinolines into the 5-position of triazole groups to create a variety of analogs. Furthermore, we examined the synthesis of dimeric versions of these compounds versus their mono counterparts, as well as fused and non-fused analogs.

Ephrata Geda

Major: Biochemistry
Faculty Sponsor: Dr. Kimberley Scott
Poster Session 2

"Optimizing Goal-Directed Physical Therapy: Exploring Self-determination and Functional Outcomes in Youth with Cerebral Palsy"

We explore the impact of goal-directed physical therapy interventions on adolescents and young adults with cerebral palsy (CP) with Gross Motor Function Classification System (GMFCS) levels I-III. Self-determination involves the ability to set and pursue personal goals. Intervention focused on self-selected goals may be a key factor in improving engagement and participation in rehabilitation. Movement-based therapies that integrate tasks aligned with the patient's goals stimulate learning, foster adaptive movement strategies, and enhance functional outcomes. Despite this, the optimal time spent performing goal-related tasks that results in the best functional outcomes is unknown. This study quantifies the time spent on goal related and non-goal-related training tasks during physical therapy to advance our understanding of relationships among self-selected goals, self-determination, training dose (i.e., time performing goal-related tasks), and functional outcomes. This is a pilot study, with the primary clinical trial being the Responder/Nonresponder study.

Erika Germinario

Majors: Psychology and Computer Science
Faculty Sponsor: Dr. Vanessa Minervini
Poster Session 1

"Antinociceptive Effects of Morphine:Ketamine Mixtures in Female Rats"

Prescription opioids are the gold standard for treating moderate to severe pain despite their adverse effects. Combining opioids with non-opioid drugs can decrease the opioid dose needed for pain-relieving effects while reducing adverse effects that can occur with large doses of opioids. Our laboratory has previously shown that the opioid morphine in mixtures with the non-opioid ketamine has additive pain-relieving effects in male rats. The goal of the present study was to test the pain-relieving effects of morphine, ketamine, and morphine:ketamine mixtures in female rats using a warm water tail withdrawal procedure. Our results show that given alone, both morphine and ketamine increase latency for female rats to withdraw their tails from 50°C water, with morphine being more potent and more effective as compared to ketamine. Our results also show that the 1:3 morphine:ketamine mixture was the most effective at decreasing the amount of morphine needed to relieve pain.

Alyssa Gove

Majors: Economics and Finance
Faculty Sponsor: Dr. Keith Olson
Oral Presentation Session 2B

"ESG Risk Considerations in Portfolio Construction: Understanding the Tradeoff between Sustainable Investing and Diversifying Returns"

As sustainable investing gains traction, investors face a critical tradeoff between Environmental, Social, and Governance (ESG) considerations and portfolio diversification. This paper examines the impact of ESG risk factors on portfolio construction following Blackrock's controversial decision to centralize ESG in its investment strategies in 2020. While ESG integration can enhance long-term resilience by mitigating regulatory, reputational, and climate risks, it may also limit diversification by excluding high-performing but non-compliant companies. By ranking S&P 500 constituents according to their Sustainalytics ESG Risk Scores, this study compares stock performance of the top 50 and bottom 50 scorers for 2017-2020 leading up to Blackrock's controversial statement and 2021-2024 to gauge markets' response to it. We analyze whether ESG-aligned portfolios achieve competitive risk-adjusted returns compared to conventional investment strategies and provide insight into balancing sustainability objectives with financial performance.

Hannah Graff

Majors: Data Science, Mathematics, and Musical Theatre
Faculty Sponsor: Dr. Nathan Pennington
Oral Presentation Session 2A

"The Impact of Early Life Adversity on Mental Health Outcomes"

Early Life Adversity (ELA) negatively impacts mental health, although the relationship between specific ELA categories and mental health outcomes is not well understood. Using a longitudinal analysis of the Adolescent Brain Cognitive Development (ABCD) study, we analyzed the relationship between ELA and mental health outcomes. The ABCD study is an ongoing comprehensive evaluation that follows over 11,000 adolescents across the United States, gathering data on brain development and health. Beginning with the data from baseline and year two of the study, we looked at seven key categories, adapted from previous definitions of ELA: Physical and sexual violence, parental instability (encapsulating parental substance use, mental health, and other unstable behaviors), neighborhood threat, prenatal substance exposure, discrimination, scarcity, household dysfunction, and potentially traumatic events. Additionally, we examined four mental health outcomes: internalizing behaviors, externalizing behaviors, anxiety, and depression. Using linear mixed models, our research found strong associations between ELA and these mental health outcomes. Furthermore, there was an overall shift in the effects of ELA on mental health as adolescents grew up. It is important to monitor adolescents' mental health in future years to further understand the impact of ELA.

Noah Greenwood

Major: Biomedical Physics
Faculty Sponsor: Dr. Patricia Soto
Poster Session 1

"Selective Interactions of Prion Proteins to the Surface of Lipid Membranes: A Molecular Dynamics Study"

The Prion protein is central to prion diseases, which affect mammals, including humans, with examples like Creutzfeldt-Jakob Disease in humans and Chronic Wasting Disease in cervids. The protein-only hypothesis posits that Prion protein misfolding and accumulation drive disease toxicity. Unlike Doppel and other similar mammalian prion proteins, PrPC misfolds, causing disease. To model Prion protein conversion, we examine biophysical forces in Prion protein-lipid interactions under physiological conditions. Using coarse-grained molecular dynamics simulations, we analyze how PrPC and the toxic fibril interact with membranes, highlighting PrPC's preferential binding near α-helix 2 due to GPI anchoring. Polar side chains within PrPC loops engage with the membrane, potentially triggering misfolding and aggregation. Experimental studies, such as atomic force microscopy and spectroscopy, could further clarify Prion-induced membrane changes and protective mechanisms.

Katelyn Grzelak

Majors: Chemistry and Justice & Society
Faculty Sponsor: Dr. James Fletcher
Poster Session 2

"Photodegradation of Antiseptic Triazolium Salts with Photolabile Subunits"

Quaternary ammonium compounds (QACs) are commonly used antiseptics effective against both Gram-positive and Gram-negative bacteria. QACs such as benzalkonium chloride are stable and can accumulate in the environment, promoting bacterial resistance. Degrading antiseptic QAC analogs in a controllable manner after their point-of-use could address this issue. Previously, the Fletcher lab illustrated triazolium salt QACs can be as potent as commercial compounds, depending on the substituents used. This project began by developing triazolium salts containing photolabile substituents that display antiseptic properties but can be deactivated by light-driven photodeprotection reactions. Bromoacetophenone photolabile groups were introduced to triazoles using click chemistry synthesis to create trisubstituted-1,2,3-triazolium bromide salts. Based on these results, the project began to focus on verifying the potency due to the quinoline and isoquinoline components. Compounds were characterized by HNMR spectroscopy and antiseptic properties were measured using microdilution minimum inhibitory concentration assays against Gram-positive and Gram-negative bacteria and yeast.

Ella Hiddleston

Majors: Spanish & Hispanic Studies and English
Faculty Sponsor: Dr. Jill Brown
Poster Session 2

"Manding for Missing Items in a Child with ASD: An Experimental Case Study"

One of the biggest questions within Applied Behavior Analysis (ABA) therapy for children with ASD is how to teach them to communicate what they need and want. My research at the UNMC Munroe Meyer Institute attempted to replicate previous studies involving interrupted chains, or interrupted patterns of behavior, while changing the experimental model to fit more closely with our client's interests. We modified the procedure to include appropriate behaviors beyond manding (asking for an item), such as grabbing when the item is within reach and allowing for varying mand frames. This made the behavior more applicable to daily life and results suggest that it enhanced the client's ability to generalize these skills across activities. This case study, along with previous research, have important applications within ABA research and how we go about teaching these skills in a way that ensures their relevance to daily life.

Olivia Hoffbeck

Majors: Health Administration & Policy and Spanish & Hispanic Studies
Faculty Sponsor: Dr. Cristina Pop
Poster Session 2

"The Pap Smear Diaries: Utilizing Storytelling in Health Education"

Informal education can be equally important as knowledge learned in schools because it includes emotions and puts listeners in the place of the informer. Personal experience and storytelling are a common method of this type of education and connection. The formal counterpart of storytelling can justly be understood as ethnography, which includes "thick description." After creating my own piece of ethnographic fiction about a girl's first pap smear, the question arose, "how can this story increase education and awareness about the importance and experiences of young women before their first pap exam?" The goal of this research project is to examine the benefits of storytelling in health education among young women in an informal sense and to propose how storytelling could be incorporated in a formal process for medical students to understand the experiences of their patients.

Anjali Jayan

Majors: Psychology and Spanish & Hispanic Studies
Faculty Sponsor: Dr. Juliane Strauss-Soukup
Poster Session 1

"Structural Analysis and Binding Specificity of the Mouse OAZ RNA"

Riboswitches are noncoding regions of messenger RNA that have various cellular functions. In order to be classified as a riboswitch, the RNA molecule must contain a binding site for a specific ligand, undergo a structural change from the binding interaction, and induce a change in gene expression. Riboswitches have only been verified in bacteria so far; however, Dr. Soukup's laboratory has been focused on investigating a potential mammalian riboswitch RNA in the Ornithine Decarboxylase Antizyme Pseudoknot (OAZ-PK) RNA. My research investigates the binding specificity of the mouse OAZ-PK RNA. To analyze the interactions between the mouse OAZ-PK RNA and various polyamines, I utilize a technique called Selective 2′-Hydroxyl Acylation and Primer Extension (SHAPE). By studying the structure and function of non-coding RNAs and how they interact with metabolites, my investigation will hopefully help lead to future design of potential anticancer and antibiological agents that can target riboswitches.

Alessandra Kakish (with Gigi Fong)

Major: Biochemistry
Faculty Sponsor: Dr. Juliane Strauss-Soukup
Poster Session 2

"Analysis of Bacterial Viability in the Presence of glmS Riboswitch Ligand Analogs"

Researchers have identified riboswitches, non-coding segments of mRNA that affect the expression of downstream genes, as a new target for antibacterial agents, such as the glmS riboswitch. This riboswitch controls the gene expression of fructose-6-phosphate amidotransferase, which synthesizes glucosamine-6-phosphate (GlcN6P) in bacterial cells. GlcN6P is a precursor in bacterial cell wall biosynthesis. The glmS riboswitch is also a catalytic ribozyme, which self-cleaves upon binding to GlcN6P. This cleavage degrades the mRNA, inhibiting glmS gene expression and preventing bacterial cell wall synthesis. This project focuses on identifying analogs with resemblance to GlcN6P that can affect the riboswitch as an agonist or antagonist. To determine whether GlcN6P ligand analogs can inhibit bacterial growth, assays are performed to monitor *Bacillus subtilis* and *Staphylococcus aureus* growth in the presence or absence of potential GlcN6P analogs. Optimization of RT-PCR is also being conducted to verify whether the glmS gene and glmS riboswitch RNAs are downregulated.

Liv Klammer

Majors: Neuroscience and Business Certificate
Faculty Sponsor: Dr. Eric Villa
Poster Session 2

"Advances in the Synthesis of Mix-metal Sulfites: Facile Linking of Hard and Soft Metals via Sulfite"

The lanthanides are a part of the rare earth elements and are located near the bottom of the periodic table. These elements have many proven societal benefits in advanced fields of technology and medicine; however, to further these advances, insights into the fundamental processes forming these complexes are essential. Further investigations into the coordination and complexing chemistry of lanthanides with secondary metals and organic ligands has profitable implications within luminescence, catalysis, and magnetism. An effective complexing agent, sulfite could be used to bridge softer transition metals and harder lanthanides. Previously, our research group synthesized several neodymium sulfite complexes and then expanded this into novel mixed lanthanide-rhodium complexes. The current project illustrates how this chemistry can be expanded to other soft metals, opening the applications using this facile technique, and discusses the syntheses and structural characterizations of four new mixed metal lanthanide-copper sulfite compounds.

Hannah Ladwig

Major: Biology
Faculty Sponsor: Dr. Juliane Strauss-Soukup
Oral Presentation Session 1B

"Structural Analysis of *Crassostrea gigas* OAZ-PK RNA"

Riboswitches are a type of non-coding RNA that regulate downstream gene expression upon metabolite binding. When a riboswitch interacts with its ligand it undergoes a conformational change resulting in a change in gene expression. This change operates as a feedback mechanism, affecting the same metabolic pathway in which the ligand functions. The Soukup Lab researches potential eukaryotic riboswitches within the Ornithine Decarboxylase Antizyme pseudoknot (OAZ-PK) RNA. One such potential riboswitch is found in a species of oyster, *Crassostrea gigas*, and is believed to interact with various natural and non-natural polyamines. In-Line Probing (ILP) experiments can be used to analyze the structural changes of this RNA segment upon binding to differing concentrations of polyamines. Preliminary data from ILP experiments indicate that the binding of spermine results in a structural change to the *Crassostrea gigas* OAZ-PK RNA segment. Current experiments aim to examine the presence of a structural change upon binding of closely related polyamines. Riboswitches have demonstrated significant impacts on the regulation of metabolic pathways in bacteria. Identification of similar riboswitches in eukaryotic species will provide an opportunity for the development of novel antibiological agents.

Addison LeGrand

Major: Psychology
Faculty Sponsor: Dr. Joshua Fairchild
Poster Session 1

"The Breaking Point: A Correlational Study in Variables of Athlete Burnout"

This study investigates the relationship between practice start times, coaching styles, and athlete burnout among collegiate athletes in Midwest universities. Given the increasing concerns about athlete burnout, characterized by emotional and physical exhaustion and reduced performance, this research explores additional contributing factors such as coaching climate and athletes' self-perception in sports. Utilizing surveys distributed across various universities across the United States, we examine how variables such as start times of practices, coaching styles, and the athletes' sports-related identities influence burnout levels. Through the Athlete Burnout Questionnaire (ABQ), Empowering and Disempowering Motivational Climate Questionnaire-Coach (EDMCQ-C), and the Athletic Identity Measurement Scale (AIMS), we aim to understand better the interplay between these factors. This study's outcomes could provide insights into modifying coaching practices and adjusting athletic schedules to enhance collegiate athletes' well-being and performance, potentially decreasing the incidence of burnout.

Sanford LeGrand

Majors: Psychology and Economics
Faculty Sponsor: Dr. Matthew Huss
Poster Session 2

"An Assessment of Factors that Impact the STABLE 2007: Crossover Offenders and Misconduct"

To determine the effectiveness of oHelp treatment on sex offenders in the Omaha region, this study will utilize the STABLE 2007 to analyze different factors that can impact its score. This is a test utilized to assess the risk potential in adult male sex offenders, with the contrast between Pre and Post stable scores indicating progress in these areas as a result of intervention. Various studies employing the STABLE 2007 have demonstrated its significant association with sexual recidivism. Additionally, research has revealed a notable prevalence of cross-over offenders among sex offenders, characterized by their involvement across different age ranges, genders, or relationship types. There has also been research that demonstrates that misconduct while undergoing treatment has a significant impact on the recidivism rate for inmates. This study focus on two factors and their impact on the STABLE 2007 status as a cross-over offender and misconduct in treatment.

Katie Logan

Major: Exercise Science
Faculty Sponsor: Dr. Holly Stessman
Poster Session 1

"MLH1 and CHEK2: Investigation into Hereditary Mutations and Cancer Development in a High-Risk Family"

This study investigates the relationship between two heritable pathogenic mutations: one in the MLH1 gene and another in the CHEK2 gene. Mutations in these genes have been linked to cancer development. A large pedigree of a single large family will be examined. This study aims to explore the severity of the types of cancers and their ages of onset in individuals carrying one or both of these genetic mutations. The detection of these genetic mutations is important because of their heritable nature. If these mutations are screened for in people who have been diagnosed with the cancers the genes are associated with, then preventative, potentially life-saving, medical intervention could be provided to family members of the affected individuals.

Sahrai Luna

Major: Spanish & Hispanic Studies
Faculty Sponsor: Dr. Joel Destino
Poster Session 2

"Layered Hybrid Germania-Silica Nanoparticle Sol-Gel Synthesis for use in 3D-printing Glass Optics"

Glass products play an essential role in everyday life and are essential to advancing common technologies. The development of new chemical approaches to fabricate glass materials is vital to enabling innovative, additive manufacturing of 3D-printed glass technologies. This project examines the fundamental sol-gel chemistry needed to synthesize various nanoparticle structures composed of germania and silica. This presentation summarizes our exploration of various hybrid silica-germania nanoparticles designed in layer-by-layer compositions through multiple methods of analysis. Particle size and morphology data and analysis were done using atomic force microscopy (AFM), with further data collected using back-scatter detection (BSD) on a scanning electron microscope (SEM), and from dynamic light scattering (DLS). The chemical composition of these particles was determined by using energy-dispersive X-ray spectroscopy (EDS) and Fourier transform infrared radiation spectroscopy (FTIR). The findings from this project could help reimagine the fabrication of glass materials and could ultimately enable the design of freeform optics and innovate optical system design.

Mackenzie Madsen

Major: Neuroscience
Faculty Sponsor: Dr. Gwendalyn King
Poster Session 1

"Klotho in the Choroid Plexus as a Neuroprotective Factor"

Klotho is a neuroprotective protein that has created a new frontier for studies in neurodegeneration. Klotho-deficient model mice have short lifespans accompanied by symptoms typically observed with advanced aging. Klotho exists in three protein forms: shed, transmembrane, and secreted with its function remaining unknown. My lab in particular looks at the cochlea, olfactory bulb, and choroid plexus in a Klotho KO mouse model. The choroid plexus is responsible for the blood brain barrier. Although Klotho is often studied in the hippocampus, the choroid plexus exhibits a much higher concentration. The quantification of the relative fluorescence of proteins in the choroid plexus between the KO and WT mouse brains including VEGF, TGFB, and WNT-5A will indicate signaling molecules. The imaging and measurement of cell size variations of ependymal cells by between the control and experimental group can offer insight to Klotho's role in the cell.

Hannah Martin

Major: Biology
Faculty Sponsor: Dr. Annemarie Shibata
Poster Session 2

"Nostrill Mediated Demyelination Following Acute and Chronic Induced Demyelinating Disease"

The development of neurodegenerative pathologies is often seen following systemic inflammation as a result of viral infection. In these neurodegenerative disease states, lncRNA up-regulation has been observed. We hypothesize that lncRNA Nostrill is involved in regulation of microglial antiviral immunity, and expression varies in mouse strains with and without the ability to clear viral infection. In FVB/nJ but not C57Bl6 mice, Theiler's murine encephalomyelitis virus (TMEV) induces demyelinating pathology that is similar to multiple sclerosis. We have intercranially injected C57Bl6 and FVB/nJ mice with TMEV to compare disease pathology and evaluate Nostrill lncRNA expression. At 7, 35, and 90 days, behavioral tests were performed. Mice were euthanized and spinal cord, brain, and spleen tissues were collected for analysis. Tissues were prepared for histological evaluation and Luxol Fast Blue staining was used to evaluate myelination in spinal cord samples at each time point. These data will be used to visualize virus-induced demyelination. Histological data will be combined with behavioral analyses and evaluation of gene expression to determine whether Nostrill and other lncRNA expression is correlated with antiviral neuroinflammation and neurodegenerative disease states.

Ellysia McElroy

Majors: English, Classical and Near Eastern Civilizations and Classical Languages
Faculty Sponsor: Dr. Martha Habash
Oral Presentation Session 2B

"Laughing in Latin: What Latin Jokes in Modern Media Teach Us About In-Grouping"

Although allegedly a dead language, Latin permeates our culture from its presence in the Catholic church, its use in scientific terminology, its development into the romance languages, and even its use in modern English fiction. By analyzing the comedic uses of Latin (and dog Latin) present in novels and films from the last fifty years, this research uncovers how jokes can both reinforce in-grouping and poke fun at elitism. Media analyzed for the project includes the film *Top Secret!* (1999), Margaret Atwood's *The Handmaid's Tale*, and Monty Python's film *Life of Brian* (1979). Although the importance of Latin and classical studies as a whole are often questioned in our current society, here, we see how our current culture still employs its language to bolster modern thought.

Jack Meeuwsen

Major: Biology
Faculty Sponsor: Dr. Eric Haas
Poster Session 1

"Resin Matrix Selection for Next-Generation Carbon Fiber-Reinforced Orthopedic Implants: A Comprehensive Review"

This study reviews research on resin matrices for carbon fiber-reinforced orthopedic implants, focusing on materials such as PEEK, PEKK, PCU, PPS, PPSU, and epoxy resins. CFRPs are promising for their high strength-to-weight ratio, radiolucency, and fatigue resistance, yet the resin choice is crucial for ensuring mechanical integrity and biocompatibility. Findings highlight that PEEK and PEKK, with strong clinical validation and established use in spinal and orthopedic devices, are the leading candidates. PCU shows potential for shock absorption due to its flexibility, while PPS and PPSU offer toughness and chemical stability. Epoxy resins, despite high strength, require modifications to address brittleness and biocompatibility issues. This study suggests that incorporating bioactive or antimicrobial coatings could further enhance implant longevity, and emphasizes the need for long-term in vivo testing and improved fiber-resin bonding.

Kathleen Moran

Majors: Medical Anthropology and Spanish & Hispanic Studies
Faculty Sponsor: Dr. Laura Heinemann
Poster Session 1

"Beyond the Wound: An Interdisciplinary Examination of Scarring and Self-Perception in the United States"

Current research on scarring in the U.S. often focuses on the biological and clinical aspects of scar formation and management, with limited attention to the intersubjective and socio-cultural dimensions of scars and scar treatment. Although studies acknowledge the emotional effects of scarring, they rarely address the experiences and contexts of those affected. This research seeks to fill that gap by exploring scar narratives to understand how societal and cultural perceptions of scars engage personal identity and well-being. The project aims to bridge the gap between biomedical research and anthropological perspectives by analyzing scar stories, media representations, and medical discourse.

Lizzy Nelson

Majors: Medical Anthropology and Public Health
Faculty Sponsor: Dr. Alexander Roedlach
Poster Session 1

"Evaluating the Personal and Professional Impact of Short-Term Medical Mission Trips: Insights from the ILAC Summer Health Program"

Short-term medical mission trips (STMMs) provide healthcare students with immersive global health experiences, but their long-term impact remains underexplored. This study examines the personal and professional effects of participation in the ILAC Summer Health Program using GroupThink software for group concept mapping. Participants, including former ILAC volunteers, engaged in structured brainstorming and sorting exercises to identify key themes in their experiences. Preliminary results indicate that STMMs foster cultural humility, reinforce vocational commitment, and enhance clinical and teamwork skills. Additionally, participants report increased motivation to serve underserved communities and a broader understanding of healthcare disparities. These findings suggest that STMMs contribute meaningfully to professional development and ethical awareness in future healthcare providers. Understanding these impacts can help optimize program design and ensure meaningful engagement for both participants and the communities they serve. Further research is needed to assess long-term career influences.

Carly Nowoj

Major: Biochemistry
Faculty Sponsor: Dr. Lynne Dieckman
Poster Session 1

"A Novel Interaction Between Proteins Involved in Nucleosome Assembly"

Within the nucleus, DNA wraps around histones to form nucleosomes. Replication-coupled nucleosome assembly is the process where newly-synthesized DNA is packaged into nucleosomes. This process requires two proteins: proliferating cell nuclear antigen (PCNA) and chromatin assembly factor 1 (CAF-1). The direct interaction between PCNA and CAF-1 is crucial for nucleosome assembly; however, the mechanism of this interaction remains unclear. We previously characterized a known site of interaction between PCNA and CAF-1 at the structural, kinetic, and thermodynamic levels. Recently, we identified a secondary binding site between these two proteins and my goal is to characterize the thermodynamics of this interaction. My data show this secondary interaction has a much lower affinity than the known interaction, suggesting multivalent binding sites may be necessary for high affinity binding. Understanding the thermodynamics of the interaction between PCNA and CAF-1 will provide insight into how PCNA and CAF-1 mediate nucleosome assembly.

Zach Onyszchuk

Majors: Biology and Certificate in Business Administration
Faculty Sponsor: Dr. James Fletcher
Oral Presentation Session 1A

"Disinfectant Molecules Decompose with Light: Organic Chemistry That Might Save Your Life"

Antimicrobial resistant pathogens have cemented themselves as a crucial threat to human health. Quaternary ammonium compounds (QACs) have been used for a multitude of antimicrobial products, such as sanitizers, herbicides, soaps, shampoos, cosmetics, and more. The degradation of commonly used QACs is slow and gradual due to its stability, which leads to unwanted environmental accumulation and potential induction of antibiotic resistance. Developing new antiseptics that share comparable potency of commercial QACs, but can be controllably photo-decomposed, could address this issue. The goal of this project was to study 1,3,4-trisubstituted-1,2,3- triazolium salts containing photolabile groups in order to define their antiseptic and photoreactive properties. Target molecules were synthesized via click chemistry and characterized by HNMR. Antiseptic properties were studied by minimum inhibitory concentration assays against different strains of bacteria and yeast. The relative rates of photodeprotection using a photoreactor with 365 nm light were studied by HNMR.

Gabrielle Pohlad

Major: Biochemistry
Faculty Sponsor: Dr. Eric Haas
Poster Session 2

"Analysis of Fatty Acid Composition in Squash Bug Anasatristis"

Squash bug Anasatristis is a pest insect found throughout the Midwest. On average, it causes millions of dollars worth of damage to crops annually. We are interested in analyzing the lipid composition of different organs and comparing between sexes. In particular, we are interested in arachidonic acid because of its role in insect immunity. By understanding the role of lipids, specifically arachidonic acid, we can control squash bug Anasatristis populations and reduce pesticide use on crops. We saponified and esterified insect samples for analysis of FAMES by GC-MS and summarized the results.

Greer Porter

Major: Biochemistry
Faculty Sponsor: Dr. Michael Nichols
Poster Session 1

"NADH Phasor FLIM Detects Metabolic Changes Associated With HER2 Expression In Breast Cancer In Vitro"

Current cancer diagnosis fails to identify alterations to cellular metabolism before structural changes. Metabolic changes result from numerous factors and lead to dysfunction of the electron transport chain (ETC). Of notable interest is human epidermal growth factor receptor 2 (HER2), a receptor tyrosine kinase responsible for survival in the tumor environment. If the metabolic effect of HER2 expression could be detected before physical changes, then prognoses could be improved. We investigated NADH-phasor fluorescence lifetime imaging microscopy (FLIM) as an optical method for assessing ETC activity associated with HER2 expression in breast cancer. SKBR3, MCF-7, and MDA-MB-231 cell lines were imaged via NADH-phasor FLIM with or without HER2 inhibition. NADH phasor FLIM was sensitive to HER2 expression in all cell lines. The project described was supported by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under Grant #5P20GM103427.

Megan Ptak

Majors: Public Health and Health Administration & Policy
Faculty Sponsor: Dr. Cristina Pop
Oral Presentation Session 1B

"Defining Infant Mortality in the United States: A Study of Differential Reporting Bias"

Infant mortality rate (IMR) represents the number of children per one thousand live births that die before reaching the age of one year. The social science research on the ways race and socio-economic status impact IMR in the United States is very robust. Less attention has been given, however, to how infant mortality is defined, controlled, and reported across administrative and medical organizations. A review of the social science literature on IMR management shows significant differences between states, counties, and even hospitals in defining and reporting infant mortality. Our research project addresses local policies and practices of IMR management with a focus on differential reporting for racial/ethnic minorities. We have begun interviewing OB-GYN, neonatal, pediatric, and family medicine practitioners to document: 1. differences in defining and reporting infant mortality; 2. correlation between state public health funding and IMR; and 3. reporting bias related to racial and ethnic minority groups.

Milana Rasin

Major: Health Administration & Policy
Faculty Sponsor: Dr. Angela Devlin
Poster Session 2

"Fundamental Investigation of MOF-Polymer Interactions"

Metal-organic frameworks (MOFs) are a class of crystalline materials known for its porous structure. The discrete pore sizes of MOFs make them great candidates for size-selective separations. MOFs have been combined with polymer membranes in order to enhance the mechanical strength of the material to form mixed matrix membranes (MMMs), which can be advantageous in industries such as water treatment. However, direct interrogation of the MOF-polymer interface has not been widely studied despite the fact that the MOF-polymer interface is critical for membrane performance. It is unknown to what extent polymers may infiltrate MOF pores, which is not desirable from an application standpoint. In this work, we investigate the interface of membrane-relevant polymers and the prototypical copper MOF HKUST-1, assessed via various analytical techniques. We aim to understand if the polymer follows a surface coating model or a pore infiltration model; this insight will help us further understand the dynamics of HKUST-1 and various polymers, which will inform the membrane design community.

Natasha Ratnapradipa

Major: Biochemistry
Faculty Sponsor: Dr. Andrew Ekpenyong
Poster Session 1

"Tissue Engineering Using Simulated Microgravity"

Microgravity is a condition of apparent weightlessness which can be simulated in a laboratory setting. Astronauts returning from space missions suffer bone, muscular, and immune system dysfunctions partly due to microgravity. Interestingly, efforts to find solutions for these adverse effects of microgravity led to the discovery of beneficial effects, such as the transformation of single cells in culture to 3D tissue. In this project we use simulated microgravity to develop 3D tissue models useful for biomedical science and engineering applications. We grew brain cancer cells lines (T98G and U87) in microgravity simulated using a NASA-developed Rotary Cell Culture System (RCCS), which transforms the cells into tissue-like spheroids. The 3D tissues we have engineered using microgravity are used for further biomedical research including the physics of cancer, and an attempt to use cell mechanical properties to develop anti-metastasis strategies against cancer.

Nina Rehfeldt

Major: Biology
Faculty Sponsor: Dr. Erika Kirby
Oral Presentation Session 1B

"Addressing Hunger: Examining Two Minnesota Food Pantries Using Cluster Analysis and Rhetorical Field Methods"

Public organizations and governmental assistance programs have long sought to eradicate hunger in the United States. This project examines the rhetorical strategies used by micro-scale nonprofit organizations to engage key audiences: food-insecure clients, volunteers, and donors who provide support. Focusing on the Community Food Response (CFR) and Channel One Regional Food Bank in Rochester, Minnesota, this study applies cluster analysis to examine official organizational rhetoric and rhetorical field methods to assess its impact on stakeholders. CFR's website and Facebook page were analyzed for their effectiveness in persuading donors and volunteers while also encouraging vulnerable individuals to seek assistance. Additionally, Channel One's website was examined for similarities and differences in its messaging approach. Primary data from interviews, field notes, and photographs at CFR will be used to further assess the alignment between official rhetoric and real-world experiences. Our findings will contribute to a strategic communication template for food pantries, presented through conference papers and posters.

Philip Richardsen

Majors: Biochemistry and Biomedical Physics
Faculty Sponsor: Dr. Eric Haas
Poster Session 2

"Defining a Novel Biochemical Pathway: Cold Injury Induces Release of Microvesicle Particles with Biochemical Pathway Dependence on Injury Conditions"

The Department of the Air Force has the greatest United States Military presence in Arctic and subarctic regions with personnel at high risk for cold injury, including frostbite and hypothermia. Sequelae associated with frostbite include inflammation, ischemia, necrosis, and self-amputation. Previously, the Travers group has shown that the lipid mediator Platelet-activating factor (PAF) was biosynthesized and released by cells undergoing cold injury. Moreover, many environmental stressors that produce PAF also generate subcellular microvesicle particles (MVP). The goal for these studies was to define whether cold injury results in MVP generation and release and cold injury MVP PAF-Receptor (PAFR)-dependency and acid sphingomyelinase (aSMase) dependency. Using the human keratinocyte-derived cell lines HaCaT, KBM (PAFR-), and KBP (PAFR+) as well as human, mouse, and pig ex vivo models, we find that cells undergoing Air Force relevant cold injury released MVPs consistent with the release of PAF in a PAFR-independent manner but with dependence on aSMase depending on injury condition, providing pharmacological targets to regulate the post-cold injury small particle cell-signaling response.

Katie Rooney

Major: Medical Anthropology
Faculty Sponsor: Dr. Kayode Oshin
Poster Session 2

"Catalytic Performance of Copper Complexes in Atom Transfer Radical Addition (ATRA) Reactions"

This research explores the efficacy of various copper and iron catalysts in atom transfer radical addition (ATRA) reactions, with a focus on comparing their performance to established ligands, TPMA and Me6TREN. The catalysts were synthesized and structurally characterized using NMR spectroscopy, IR spectroscopy, and mass spectrometry. Their catalytic efficiency was evaluated under different catalyst-to-reactant ratios, and the resulting product yields were quantified via NMR spectroscopy. Comparative analysis revealed that the L1OH copper complex exhibited the highest catalytic efficiency, highlighting its potential as a superior catalyst for ATRA reactions.

Maggie Schaefer

Major: Chemistry
Faculty Sponsor: Dr. Joel Destino
Poster Session 1

"Amorphous Core-Shell GeO_2-SiO_2 Nanoparticle Growth in the Presence of Polyols"

Understanding the underlying chemistry is imperative for controlling the growth of amorphous mixed composition colloids, or nanoparticles (NP), for additive manufacturing (AM) glass materials and ultimately enabling the fabrication of innovative designer optics. Here, the growth of amorphous germania (GeO2) NP growth and the addition of a silica (SiO2) shell to determine the range of sizes and compositions of hybrid GeO_2-SiO_2 NP that can be synthesized. The novelty of this project lies in the application of polyols to stabilize amorphous GeO2 NP growth and the study of subsequent silica growth in a one-pot type reaction. We present preliminary results characterizing the resulting NPs with dynamic light scattering spectroscopy (DLS) to measure particle size in solution and attenuated total reflectance (ATR) Fourier-transform infrared spectroscopy (FTIR) to determine NP network structure. Ongoing efforts seek to characterize NP particle morphology and elemental composition by scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDX), and towards utilizing the NPs as glass AM feedstocks.

Nate Schlader

Majors: Biochemistry and Mathematics
Faculty Sponsor: Dr. Erin Gross
Oral Presentation Session 1A

"Fabrication and Optimization of 3D-printed Electrodes for Electrochemiluminescent Detection"

Fully 3D-printed electrodes (3DPEs) offer a solution to the need for portable, inexpensive, fast, and accurate sensors. Current 3DPE models have been optimized by using a conductive carbon filament on an extrusion printer and treated by an alternative chemical process. Each electrode is characterized through a cyclic voltammetry scan rate study and various electrochemiluminescent (ECL) studies using tris(bipyridine)ruthenium(II) (Ru(bpy)2+3). On average, 3DPEs exhibit a greater resistance compared to stencil-printed carbon electrodes (SPCEs), but ECL can be generated with application of the appropriate potential. ECL detection of DBAE was optimized using an iPhone 14 Pro Max camera, which has shown to be an effective method of quantification. Future application for fully 3DPEs include portable ion detectors and rapid blood glucose sensors.

Jakob Schmit

Majors: Neuroscience and Psychology
Faculty Sponsor: Dr. Vanessa Minervini
Poster Session 2

"Drug Preference of Remifentanil, Methamphetamine, and Opioid/Stimulant Mixture Using Choice Procedure"

Abuse of multiple drugs is more common than any singular drug, but there is no FDA-approved treatment. The goal of this experiment is to test novel treatments for polysubstance abuse, particularly opioid/stimulant drug mixtures. In this study, an intravenous catheter was surgically implanted into a rat's femoral/jugular vein. Rats then completed daily sessions in which they chose between a pellet alone or an intravenous injection with a pellet. Results showed that when given alone, both the opioid remifentanil and the stimulant methamphetamine are reinforcers in this procedure. Remifentanil was significantly effective at lower doses (i.e., more potent), whereas methamphetamine was significantly effective only at the highest dose tested. Data analysis is in progress to analyze the results of remifentanil/methamphetamine mixtures, and data collection is in progress to test the effects of GLP-1 agonists as a novel treatment for reducing reinforcing effects of opioid/stimulant mixtures.

Zachary Smith

Major: Biochemistry
Faculty Sponsor: Dr. Michael Nichols
Poster Session 1

"Investigating a Non-invasive Optical Biopsy to Detect Biochemical Markers and Changes in Metabolism of UV-induced Skin Cancer"

A cutaneous squamous cell carcinoma (SCC) is a type of tumor that forms in the outer layer of the skin. These tumors are often a result of too much exposure to ultraviolet light. We aim to develop a noninvasive optical biopsy for cancer that does not involve removal of the tissue. We created and tested an imaging study using multiphoton fluorescence lifetime imaging microscopy (FLIM) to observe the protein bound fraction of NAD(P)H in epidermal skin cells. We assessed the impact of oxygenation and human epidermal growth factor receptor 2 (HER2) expression on the optical metabolic signals. Considering the Warburg hypothesis, we had expected that cancerous cells would not use the electron transport chain (ETC), instead favoring glycolysis. However, our results showed evidence of ETC utilization that was affected by HER2 and the availability of oxygen, suggesting that these cells will still use the ETC if oxygen is available.

Sophia St. Marie

Major: Medical Anthropology
Faculty Sponsor: Dr. Laura Heinemann
Poster Session 1

"The Correlation Between Social Work Encounters and Health Outcomes in Children with Cystic Fibrosis"

This study evaluates the impact social work encounters have on the health of children with cystic fibrosis. Electronic medical records at a pediatric hospital in a mid-sized city in the U.S. Midwest were used to compile a database on demographic information, physical health markers, and social determinants of health. Statistical analysis revealed that among patients with the most social work encounters, exacerbation trends remained consistent, but FEV1 and BMI trends appeared in the inverse. The findings highlight the potential for social worker care to improve multiple aspects of patient health by providing social support and resources.

Emma Strong

Majors: Neuroscience and Medical Anthropology
Faculty Sponsor: Dr. Brooke Kowalke
Poster Session 1

"Severed Synapses: Exploring Altered Perceptions of Self-Identity as a Consequence of Neurological and Cortical Dysfunction"

Severed Synapses is an art portfolio inspired by conducted medical and clinical literature on cortical structures and the neural basis of selfhood. Through artistic interpretation, it explores how self-identity, consciousness, perception, and homeostatic biology are altered by neurological damage affecting the brain's ability to construct a cohesive sense of self. Synthesizing clinical research and personal narratives from individuals experiencing such deficits, each piece highlights a relevant and the underlying neuroanatomical structure and is complemented by partner pieces depicting the disruption of self-identity and biological function caused by cortical dysfunction.

Kaylee Van Handel

Major: Data Science
Faculty Sponsor: Dr. Steven Fernandes
Poster Session 2

"Navigating Difficult Conversations in Healthcare: The Use of AI Chatbots in Training Undergraduate and Graduate Nursing Students"

This project enhances nursing education by integrating an AI-based communication practice tool utilizing Large Language Models (LLMs). Designed to help students develop critical communication skills, the tool allows for asynchronous practice of challenging patient and family conversations within the Blueline platform before engaging in simulated or real clinical encounters. Through a tiered experiential learning approach, the tool was piloted with approximately 80 graduate and undergraduate nursing students. The study employs both quantitative and qualitative participant feedback to assess the tool's usability and effectiveness in improving clinical communication. Specifically, we evaluate its impact on students' preparedness and confidence in navigating sensitive discussions. Findings will guide future refinements and inform its integration into nursing curricula to enhance clinical communication training.

Ryan Ward

Major: Chemistry
Faculty Sponsor: Dr. Lynne Dieckman
Oral Presentation Session 2A

"Predicting Interactions Between Proteins Involved in Gene Silencing Using AlphaFold3"

Genetic material in the cell is stored in the form of chromatin, which is composed of units called nucleosomes. These consist of DNA wrapped around proteins called histones, which are deposited on to DNA immediately after replication. The process of histone deposition after replication is accomplished by two proteins: proliferating cellular nuclear antigen (PCNA) and chromatin assembly factor 1 (CAF-1). PCNA recruits CAF-1 to the replication fork to deposit modified histones responsible for maintaining proper gene silencing in eukaryotes. The direct interaction between PCNA and CAF-1 is essential for proper gene silencing, and improper gene silencing in cells is linked to several serious genetic diseases. However, the structural mechanism of binding between

PCNA and CAF-1 is unknown. We have identified three PCNA binding sites on CAF-1. Characterizing the structure of the interactions between these two proteins in the lab has been quite difficult, as two of the PCNA-binding sites in CAF-1 are within an intrinsically disordered region of the protein, making it difficult to determine structural mechanisms by traditional methods. Therefore, I use the computational program AlphaFold3 to predict structures of possible interactions between PCNA and CAF-1. We have generated predicted structures of PCNA and CAF-1 complexes that show only two of the three previously identified interactions can occur simultaneously. This suggests that there may be a conformational change that occurs in the PCNA-CAF-1 complex that is necessary for CAF-1 to deposit histones onto DNA during replication-coupled nucleosome assembly.

Andrew Wegner

Majors: Chemistry and Biomedical Physics
Faculty Sponsor: Dr. Erin Gross
Poster Session 1

"Optimization of Au-plated Carbon Electrode-based Biosensors."

Folding-based nucleic acid electrochemical biosensors offer an inexpensive and fast method for clinical measurements and disease diagnostics. Previous research in our lab fabricated electro-chemiluminescent (ECL) nucleic acid biosensors using commercial gold electrodes. This method allows for fast detection, but the gold surfaces require extensive cleaning before modification. To solve this, in situ chip based ECL biosensors can be fabricated with a fresh, easily modifiable gold layer deposited over carbon. The surface can be modified with an alkane thiol and a fluorescently tagged aptamer, allowing for biosensor specificity. A chronoamperometry method has been developed for gold plating and fluid submersion technique has been developed for alkane-thiol modification.

Daniel White

Majors: Physics and Economics
Faculty Sponsor: Dr. David Sidebottom
Poster Session 2

"Investigation of the Structure and Dynamics of Alumino-phosphate Glass Melts"

We report on a study of glass dynamics across a series of $(Al_2O_3)x(NaPO_3)100\text{-}x$ glass-forming liquid samples. The study employs photon correlation spectroscopy (PCS), which examines time-dependent intensity fluctuations of scattered laser light to interpret molecular-level rearrangements occurring in the glass melt. These fluctuations are autocorrelated, resulting in a direct measurement of the samples' dynamic structure factor. The study reveals how the systematic crosslinking of phosphate polymer chains ($NaPO_3$) by aluminum oxide affects both the glass transition temperature and the fragility (a measure of how rapidly viscosity rises near the transition).

Clare Williams

Majors: Criminal Justice and Public Health
Faculty Sponsor: Dr. Brooke Kowalke
Poster Session 1

"*Taking Turns*: A Color Analysis"

MK Czerwiec's graphic novel *Taking Turns: Stories from HIV/AIDS Care Unit 371* is a heart-wrenching, yet informative glimpse into HIV/AIDS care. Czerwiec uses the background color of the graphic illustrations to establish settings and tone throughout the novel. Color, viewed through the lens of graphic novels, often has a level of iconography associated with it. According to Scott McCloud, author of *Understanding Comics: The Invisible Art*, colors in comics can be used to evoke mood, depth, or sensations within their readers. The primary research question for this project is: how do the colors in *Taking Turns* influence how the story is told and how the novel's settings are expressed? This research is important because graphic novels are intrinsically artistic and color plays a large part in the visual arts, so understanding how Czerwiec uses color can help us better understand this novel's overall implications.

Allie Woog

Majors: Neuroscience and Philosophy
Faculty Sponsor: Dr. Gwendalyn King
Poster Session 2

"Klotho: Adult Neurogenesis and Aging in a Mouse Model"

The Klotho protein is important for healthy brain aging and its deficiency induces premature memory impairment. Klotho is produced in brain ventricles by choroid plexus, which produces the cerebrospinal fluid required for brain homeostasis and health. Klotho-deficiency causes a dramatic decreased expression of transporter proteins required to produce cerebrospinal fluid, but analysis of cerebrospinal fluid is complex due to a small volume in mice. However, the subventricular neurogenic niche hosts stem cells that are sensitive to CSF cues and composition change. If Klotho-deficiency alters the quality and production of cerebrospinal fluid sufficient to impact the neural stem cells, changes may be detected in the niche cells or their downstream products. I hypothesize that decreased proliferation will alter maturation and morphology of neuroblasts as they migrate and differentiate, resulting in changes to the downstream neurons of the olfactory bulb.

Kacey Yamane

Major: Neuroscience
Faculty Sponsor: Dr. David He
Oral Presentation Session 1A

"Molecular Specializations Underlying Phenotypic Differences in Inner Ear Hair Cells of Zebrafish and Mice"

Hair cells (HCs) are the sensory receptors of the auditory and vestibular systems in the inner ears of vertebrates that selectively transduce mechanical stimuli into electrical activity. Although all HCs have the hallmark stereocilia bundle for mechanotransduction, HCs in non-mammals and mammals differ in their molecular specialization in the apical, basolateral, and synaptic membranes. To understand the genetic mechanisms underlying differences between adult zebrafish and mammalian HCs, we compared their RNA-seq-characterized transcriptomes, focusing on protein-coding orthologous genes related to HC specialization. There was considerable shared expression of gene orthologs among the HCs, including those genes associated with mechanotransduction, ion transport/channels, and synaptic signaling.

However, there were some notable differences in expression among zebrafish HCs and mouse HC subtypes, which likely underlie the distinctive physiological properties of each cell type. Our analyses unveil substantial differences in gene expression patterns that may explain phenotypic specialization of zebrafish and mouse HCs.

About the Honors Program

Honors Program Mission Statement

Rooted in the Creighton University's Christian, Catholic, and Jesuit traditions, the Honors Program relies on the belief, articulated by Pope John Paul II, that "the united endeavor of intelligence and faith will enable people to come to the full measure of their humanity." Its goal is to foster a community committed to the ongoing education of students and faculty members as fellow seekers for truth. The program seeks individuals of all faiths and backgrounds who are intelligent, well prepared academically, highly motivated, and academically adventurous. The curriculum then immerses these students in an academically rigorous but flexible program of study guided by a faculty mentor who is charged with paying special attention to the personal dimension of learning. The program ultimately understands itself as a fellowship of inquiry whose individual members have dedicated themselves without reserve to love of learning.

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Community Resident Advisors

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Program by Philip Richardsen and Dr. Eric Haas