Creighton University
College of Arts & Sciences

16th Annual Honors Day

Program of Research Presentations

20 April 2020
Virtual Presentations

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Welcome from the Dean

Welcome to Honors Day 2020.

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 2020 presenters!

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

Welcome from the Director

Dear Honors Researchers,

Today, though geographically separated, we gather virtually to celebrate Honors research projects. These projects represent disciplines across our curriculum, treating such diverse topics as aggression in Black Swallowtail butterflies, racism and civic identity, and the prevalence of child marriage. Like all the best research, your work contributes not only to our understanding of the world, but likewise to our admiration and wonder.

The ambitious projects you are presenting today were born not just of your intellectual powers, but of your diligence, patience, courage, and steadfastness. It was hope that inspired you, resolve that carried you through, and conscientiousness that led to completion. Not only your projects, but you yourselves serve as models for the Creighton community to follow. Today, therefore, we celebrate not just Honors research, but Honors researchers.

Congratulations on your hard-won accomplishments.

Dr. Jeffrey Hause, Ph.D.
Honors Program Director

Program Speakers (Pre-recorded)

Welcome and Introduction
Dr. Eric Haas
Interim Associate Director of the Honors Program

Congratulations from the Dean
Dr. Bridget Keegan
Dean of the College of Arts and Sciences

Congratulations from the Provost
Dr. Thomas F. Murray
Provost of Creighton University

Congratulations from the President
Rev. Daniel S. Hendrickson, S.J.
President of Creighton University

Congratulations from Director
Dr. Jeffrey Hause
Director of the Honors Program

Abstracts

alphabetical by last name

Logan Baumberger

Majors: Biochemistry
Faculty Sponsor: Dr. Juliane Strauss-Soukup

"The Role of Spermine in Cell Growth, Cell Maintenance, and Gene Expression"

Riboswitches are segments of messenger RNAs (mRNAs) that bind to specific cellular metabolites and regulate gene expression. Riboswitches are defined based on the following criteria: the RNA binds specifically to one metabolite, the RNA exhibits conformational changes induced by metabolite binding, and the RNA influences gene expression in a metabolite-dependent manner. Although nearly all discovered riboswitches are in bacteria, fungi, and plants, the Soukup lab has identified a putative mammalian riboswitch: an RNA pseudoknot that appears to bind specifically to spermine, exhibits spermine-dependent conformational changes, and affects spermine-dependent expression of Ornithine Decarboxylase Antizyme 1 (OAZ1), an inhibitor of spermine biosynthesis. Investigating the role of the OAZ1 RNA in controlling gene expression will greatly aid in future studies focused on studying how this mammalian riboswitch may be a potential target for drugs to affect a metabolic process key to cancer cell growth and proliferation.

Srilekha Bonala

Majors: Computer Science
Faculty Sponsor: Dr. Brian Kokensparger, Dr. Rosalind Heckman

"Designing a User Interface for Physical Therapy Students to Improve Rehabilitation Research through Clinical Involvement"

The outcomes of rehabilitation following stroke are limited in reducing long-term impairments in movements of the upper extremity. Research

to enhance current practices should include investigations of the physiology underlying the recovery of motor control, but clinicians trained in rehabilitation often lack the computer programming and technical expertise to design and conduct such research. Our objective was to create a framework that integrated multiple hardware components into an interface that was easy to use by physical therapy students to investigate movement impairments in a clinical setting. The resulting framework allowed the physical therapy student to investigate upper extremity movements through the synchronous control of hardware components from an easy-to-use interface. This can further allow clinicians to obtain valid physiological data from individuals during post stroke rehabilitation in a manner that maximizes safety and minimizes the time needed for participants. Applications of computer science are essential for clinicians to improve research without refined technical expertise.

Haley Briggs

Major: Mathematics; Theology and Secondary Education
Faculty Sponsor: Dr. Sherri Brown

"Biblical Foundations of Justice and the call to Food Security"

This research will explore the biblical grounds of treatment of the poor and vulnerable in order to establish that Christians are called to understand the issues of food insecurity in the United States and seek out solutions to these issues. It will outline how justice has a foundation in the Bible, define biblical values, connect biblical justice and values toward food insecurity, analyze the problem of food insecurity within America, and conclude with a call to justice for Christians.

Taylor Burke

Majors: Biochemistry; Spanish
Faculty Sponsor: Dr. Juliane Strauss-Soukup

"Analysis of a putative frameshifting RNA structure from the fungus Agaricus bisporus (mushroom)"

Riboswitches are segments of non-coding RNAs that bind specifically to cellular metabolites and undergo a conformational change that results in a change in gene expression. Riboswitch regulatory behavior in bacteria has been well documented in scientific literature but has remained relatively unexplored in eukaryotes. The crucial role of riboswitches in metabolism allows for the development of potential antibiological and antineoplastic agents. My project focuses on determining whether a predicted frameshifting element in the fungus Agaricus bisporus exhibits characteristics of a riboswitch. The results from the dual luciferase reporter assay (DLRA) indicate that the putative riboswitch exhibits a conformation change upon binding specifically with spermine and a change in gene expression in the presence of this metabolite.

Molly Carrig

Major: Chemistry
Faculty Sponsor: Dr. Lynne Dieckman

"The Thermodynamics of the Interaction between Chromatin Assembly Factor-1 and Proliferating Cell Nuclear Antigen"

Replication-coupled nucleosome assembly is the process by which newly-replicated DNA is packaged around histones. This process conserves the genetic code and preserves levels of gene expression. Two proteins, proliferating cell nuclear antigen (PCNA) and chromatin assembly factor-1 (CAF-1), are key mediators of this process. PCNA is a homotrimeric sliding clamp that regulates DNA replication. It binds and recruits CAF-1, which is required for proper gene silencing. Failed binding results in expression of regions which should be silenced and leads to diseases including cancer. I am investigating the the biochemical and structural means of binding between PCNA and CAF-1. Enzyme-linked immunosorbent assays, x-ray crystallography, and isothermal titration calorimetry are used to determine the kinetics, thermodynamics, and structure of the interaction.

James Connors

Major: Sustainable Energy Science
Faculty Sponsor: Dr. Erica Kirby

"Amazonism: An Ideological Critique of Amazon's Union Busting Training"

With a net worth in excess of 100 billion dollars, Jeff Bezos, founder and CEO of Amazon, may be the richest person in human history. Starting as an online book retailer in the 1990s and moving on to become the largest online retailer and in the business of pretty much everything, there is no question that Amazon as an entity is exceptionally powerful. But is it exceptional? Does it go beyond our traditional understanding of what a company is and how it should be perceived? Amazon's workplaces are "Fulfillment Centers." Amazon's employees are "associates." This paper seeks to root out the underlying ideology of Amazon, whose interests this ideology represents, and what the implications are of this ideology. This will be done via an analysis of a leaked training video shown to Whole Foods management instructing supervisors on how to recognize and report labor organizing.

Mary Cronkleton

Major: History
Faculty Sponsor: Dr. Heather Fryer

"Losing my Homies in a Hurry": Street Reporting through Rap Music"

Rap music emerged in America in the 1970s on the streets of New York. Rap music gives a voice to the underrepresented Black community and allows for Black Americans to express themselves and the struggles of their environment. The most notable subgenre is gangsta rap which reflects the violent lifestyles of inner-city youth. Historically, rap music has been seen as detrimental to the youth of America since its inception in the 1970s and is portrayed by the media in a negative light, however much can be learned from the lyrics within the social and political context of its time.

Joey D'Alesio

Major: Chemistry; Biophysics
Faculty Sponsor: Dr. Janet Seger

"Prototype Readout System Software for The STAR Interlock Safety System at Brookhaven National Laboratory"

The STAR Collaboration uses a detector, the Solenoidal Tracker At RHIC (the Relativistic Heavy Ion Collider), which is located at Brookhaven National Laboratory. RHIC accelerates nuclei to relativistic speeds to artificially create the initial conditions of the universe by colliding nuclei. The project focuses on upgrades to the detector control software for STAR's safety systems. Functionally, the existing and upgraded systems have the same capabilities. However, the new readout system is easier to maintain and more easily updated to include, for example, additional safety signal outputs. In turn, this results in a critical readout system prepared for future operations.

Connor Diaz

Major: Biology
Faculty Sponsor: Dr. Matthew Dilisio

"Novel Hydrogel Template for Guided Tissue Engineering of Shoulder Tendon"

Following rotator cuff repair, rotator cuff tendon shows limited capacity to reattach to the greater tuberosity of the humerus. While rotator cuff repairs have been demonstrated to have strong long-term results, unfortunately a significant proportion of repairs still fail to heal. Impaired repair is due to the unfavorable micro-environment at the tendon-to-bone interface. Consequently, we hypothesize that the development of a tunable engineered hydrogel template designed for the controlled delivery of cells and regenerative signals would activate the healing process. The present study focuses on design, fabrication, and in vitro examinations of a hybrid hydrogel system for shoulder tendon regeneration.

Nicholas Dinaro

Major: Sustainable Energy Science
Faculty Sponsor: Dr. Brian Kokensparger

"Education through Micro:bits"

This research will involve the use of Micro:bits in order to help educate children about Computer Science. Micro:bits are a unique tool that contains a variety of components— twenty-five LED Lights, two buttons, radio and Bluetooth antenna, a USB connector and others— that can be used in a multitude of ways. After an examination of the product, a course will be designed to teach children about how to code. This course will culminate with the students using Micro:bits as a solar sensor to find sufficient locations for a garden at a local company.

Alyssa Ellerbusch

Major: Philosophy
Faculty Sponsor: Dr. Jeffrey Hause

"Stoicism in the Christian Tradition"

This paper follows in the footsteps of Simone Weil, an eclectic philosopher influenced by Stoicism and Christianity. It builds on her works to show that central elements in the Stoic tradition fit well within the Christian tradition. To establish this conclusion, it focuses on modern practices of St. Ignatius's Spiritual Exercises in conjunction with major Stoic philosophers including Marcus Aurelius and Epictetus. This paper, in the spirit of Simone Weil, explores this under-developed area of philosophy to further the thesis that, in addition to Platonism and Aristotelianism, Stoicism can be fruitfully incorporated into Christian traditions.

Olivia Fuson

Major: History, Spanish and Hispanic Studies
Faculty Sponsor: Dr. Heather Fryer

"Red Lines, Class Codes, Highways, and Hipsters: The Origins of Invisibility Politics and "Racial Progressivism" in Portland, Oregon"

This analysis of Portland Housing Authority documents, Portland Development Commission Records, historical newspaper articles, and other archival sources unravels the historical origins of racial invisibility politics in Portland, Oregon. Racial dissonance is not a new phenomenon in Portland. Rather, a history of misdirection in the 1940's and class coding during the 1950's has created and perpetuated a divide between rhetoric and reality which continues to impact Portland politics to this day. This divide has allowed white Portland homeowners and officials to implement racially discriminatory housing/urban land use policies in order to protect the interests of the middle class while simultaneously maintaining white Portlanders' progressive reputations. While the story of the development and perpetuation of racial invisibility politics is by no means unique to Portland, treating Portland as a case study of this larger phenomenon provides a roadmap to revealing the racial realities underlying national housing and land use rhetoric.

Haley Fye

Major: Exercise Science
Faculty Sponsor: Dr. Jake Siedlik

"Effect of Supplementation on Aerobic Ability of Collegiate Endurance Athletes"

PerformElite is an endurance supplement that claims to optimize energy for aerobic performance. In order to test this claim and research the supplement's direct effect on aerobic performance in endurance athletes, we developed a randomized, double-blind, placebo-controlled study investigating whether supplementation increased time to fatigue, heart rate, or lactate threshold in Division I cross country runners.

Coaches as well as recreational, collegiate, and elite runners may implement the results of this study in training in order to increase aerobic capacity via increased repetitions at lactate threshold intensity prior to fatigue onset.

Allyson Greco

Majors: Chemistry
Faculty Sponsor: Dr. James Fletcher

"Phenol-containing tridentate Schiff base chelators with 1,2,3-triazole and imidazole subunits"

Neutral, tridentate Schiff base chelators displaying "turn-on" fluorescence emission signals upon mixing with Zn(II) and Cd(II) salts were identified via high-throughput screening. Competition assays with monovalent and divalent metal cations indicated reversible Zn(II) and Cd(II) coordination. Titration assays showed emission signal intensity was maximized at a 1:1 chelator:metal binding ratio. Selected coordination compound analogs were prepared in mmol quantities and characterized by HRMS, NMR and UV-Vis spectroscopy. XRD analysis of both the Zn(II) and Cd(II) coordination compounds showed a 1:1 binding ratio between the neutral imidazole-containing Schiff base chelator and divalent metal chloride salt. Details of the high-throughput screening, spectroscopic characterization and structural analysis will be presented.

Brieana Gregg

Major: Biology
Faculty Sponsor: Dr. Ann Cavanaugh

"Scaling of Saccharomyces cerevisiae Spindle Pole Body in Haploids and Diploids"

Saccharomyces cerevisiae is a yeast strain that can exist either as a haploid or as a diploid. Initial studies have shown that there are differing levels in the expression of certain spindle pole body proteins

in haploid vs diploid strains, but the ratio is not the expected 1:2. My project involves fluorescently tagging several of these SPB proteins, forcing the strains to become either haploid or diploid, and then imaging the strains in order to quantify the amount of each protein. Examining these ratios could allow us to explore the potential benefits of excess SPB proteins for diploid strains.

Taena Hanson

Majors: Neuroscience, Neuropsychology
Sponsor: Dr. Dustin Stairs

"Effects of extended access cocaine on behavioral inhibition in rats"

We will first train rats under a DRL schedule with food, then with cocaine self-administration, followed by an extended access schedule. One group with one-hour periods of access to cocaine will model the non-drug addiction group, whereas another group with six-hour periods of access to cocaine will model the group that develops cocaine addiction.

After extended access, when the rats are reassessed in a DRL schedule, we predict that the extended access group of rats will show decreased ability to inhibit behavior, showing how prolonged access to cocaine is associated with decreased behavioral inhibition, and providing us with a model of how impulsivity changes over the course of the development of addiction.

Jack Hersh

Major: Health Administration and Policy, Graphic Design
Faculty Sponsor: Dr. Kevin Estep

"Bridging the Digital Divide: Examining the Impact of Broadband Access on Health Outcomes"

The ‘digital divide’ refers to the growing gap between communities that lack Internet access and communities that have access, and this divide is particularly prevalent between marginalized communities and wealthier Americans. Access to the Internet can serve as a major health determinant that influences health literacy and health outcomes. Furthermore, the laws that govern broadband access and telehealth often impact marginalized populations the most. This study aims to examine the relationship between broadband access and health outcomes in different communities with varying degrees of broadband access at the state and county level. This study adds to existing literature on the current state of broadband access in the United States and explores the complex relationship between internet and health, while also providing a potential solution to improve broadband access in urban and rural areas.

Chase Howard

Major: Environmental Science, Biology
Faculty Sponsor: Dr. John Shea

“Use of Snails as Indicators of Ecosystem Health”

Many studies associate healthy freshwater ecosystems with aquatic insect diversity and,more recently, with trematode diversity. However, few studies have asked if the relationship between aquatic freshwater snail diversity correlates with a healthy ecosystem. To address this question, we gathered snails from three freshwater sources inPine Ridge, South Dakota and one reference site at Lacreek National Wildlife Refuge. At each site, three researchers spent 15 minutes inside a 3 x 10 meter transect sampling for snails. The next 15 minutes were dedicated to collecting aquatic insects. Snails were identified before being dissected for trematodes, which were also identified. Our results suggest that insect diversity may be a more reliable measure of ecosystem health than snail or trematode diversity. However, further analysis of the insect data (at the genus level) may change this conclusion.

Sora Hutchison

Major: Psychology
Faculty Sponsor: Dr. Jill Brown

"Complications of Ethnographical Research Amongst Indigenous Communities"

This study investigates the complications of indigenous research in various native communities around the world. The topic was inspired by failed attempts of investigating the urban Aboriginal community and how culture and traditions were implemented in city life after the 'Stolen Generation', which drastically separated many native Australians from their ancestors. To gain a worldwide perspective on the trials of associated with the changing climate of indigenous studies, I took a life history approach and reached out to specialists on indigenous researchers to understand how indigenous communities evolved during their time working with them. Themes associated with communication improvement and cultural differences between indigenous and non-indigenous communities are discussed.

Kelsey Jones

Majors: Exercise Science, Theater
Faculty Sponsor: Dr. Rohan Edmonds

"Examining Cardiac Autonomic Function and its Relationship with Cognitive Function Following Various Interventions"

Heart rate variability, the variability of time between heart beats, has been shown to be a measure of cognitive function. Currently there is little research of its effect on task-switching ability. To discover if there is a correlation between the two a series of test were performed. Four trials were tested: a control, meditation, exercise, and caffeine. Heart rate variability was assessed before testing, between the intervention and cognitive assessment, and after completing the cognitive assessment. Cognitive function was assessed using the Stroop Test.

Ayushi Kaul

Majors: Neuroscience
Faculty Sponsor: Dr. Annamarie Shibata

"CPTII Deficiency Associated with Disruption in Lipid Synthesis in the Development of Zebrafish"

This project is aimed at examining a carnitine palmitoyltransferase II (CPTII) deficiency in a recently identified proband that presented with seizures and hypoglycemia throughout childhood followed by a diagnosis of schizophrenia as a young adult. Using a zebrafish model system, we are investigating the effects of a CPTII deficiency on whole brain development, neuronal differentiation, metabolic activity, and synapse function. There is a critical need to establish a model system that recapitulates human neurodevelopment to dissect the role of specific CPTII mutations in the brain over a developmental trajectory. The long-term goal of our work is to understand how metabolic signaling via long chain fatty acid β-oxidation influences neurodevelopment and neurological disorders of epilepsy and schizophrenia.

John Kral

Major: Biology, Economics
Faculty Sponsor: Dr. Kenneth Kramer

"Investigating prkcda as a Central Regulator in Vertebrate Fear Behaviors"

The amygdala is a region of the brain responsible for fear behaviors and responses. Recent studies have determined that there is significant overlap between the genes expressed in the zebrafish amygdala and mammalian amygdala. One gene that is distinctly expressed within the mammalian amygdala is protein kinase C ∂ (prkcd). Within mammals, prkcd acts a central regulator of fear behaviors. However, the specific role that prkcd has in zebrafish fear responses is still undetermined. Of the two zebrafish prkcd paralogs, we collaborated with Dr Bruce and determined that prkcda is specifically expressed in a region of the forebrain homologous to the mammalian amygdala. Our central hypothesis is that prkcda and prkcda- expressing neurons have evolutionarily-conserved roles in zebrafish.

Neha Lamsal

Major: Biology, Psychology
Faculty Sponsor: Dr. Mackenzie Taylor

"Characterization of the progamic phase in the aquatic monocot Stuckenia pectinata"

pollen is transported to stigmas via the water surface or underwater currents. Little is known about the consequences of the transition to hydrophily for postpollination pollen development. The goal of this study was to characterize the progamic phase, the life history stage between pollination and fertilization, in the water pollinated monocot, Stuckenia pectinata. Flowers were hand pollinated and collected at 5-15 minute intervals for two hours after pollination. In order to document the timing of pollen germination, stigmas were removed, stained with aniline blue, and imaged with light microscopy. The germination status of each pollen grain was documented. Pollen germination occurred as soon as 5 minutes after pollination. In order to characterize pollen tube growth, carpels were cleared in NaOH, stained with aniline blue, and the length of the longest pollen tube was measured. Results in Stuckenia will be compared to related hydrophilous species to better characterize this life history stage in water pollinated plants.

Alexander Larsen

Major: Biology, Environmental Science
Faculty Sponsor: Dr. Mary Ann Vinton

"Using Drone and Satellite Imagery to Evaluate Sustainability in the Nebraska Sandhills"

The Nebraska Sandhills encompass one of the largest stabilized sand dune formations in the world. Studying grass cover is vital to sustainability in the region because grass stabilizes the sand dunes by protecting them from wind erosion and is a source of forage for cattle-grazing, the dominant land use. Although water is often the limiting factor to vegetation on the semi-arid dunes, high amounts of water flood the wet meadows and prevent ranchers from harvesting hay. To

understand the complex relationship between moisture and grass cover as well as its necessity to both people and the environment we used satellite and drone imagery as well as drought indices in our analysis. Findings suggest grasses in the uplands are sensitive to short term fluctuations in moisture and in the wet meadows grasses reflect more substantial changes in the water balance. This complex relationship between spatial and temporal factors presents a challenge for land managers to work with.

Jackie Laughlin

Major: English
Faculty Sponsor: Dr. Michael Miller

"Comparison of E. coli Bacteria Levels in Source Water versus Filtered Water in Dominican Republic"

Drinking water in some regions of the Dominican Republic contains non-potable levels of E. coli bacteria. In response, the Institute for Latin American Concern water quality program has created and distributed filters to homes that do not have easy access to clean water. This research compares the E. coli levels in the faucet water to the levels in water that has passed through the filters in order to determine effectiveness of the filters based on cleaning techniques and water source. By collecting this data, the water quality program will be able to best adapt the filters recommended to persons in the villages as well as properly advise the members of these communities as to which sources are best suited for use in filters, how to clean the filters, and other factors that are found to be relevant, including future testing of metal-ion levels in the water.

Kimberly Levine

Major: Neuroscience, Spanish and Hispanic Studies
Faculty Sponsor: Dr. Maya Khanna

"Spelling Megastudy"

In English, there are many words in which the phonological code corresponds to several spelling patterns. For example, the sound /brAk/ may be spelled break or brake. Several factors can influence the spelling pattern one assigns such a word, such as context, frequency of meaning, etc. In this project, we examine spelling patterns participants assign to auditorily presented words by conducting a megastudy where participants spell 2,000 monosyllabic words. By collecting spelling patterns, we can evaluate which lexical variables are influential. This presentation focuses on the preliminary findings of how word regularity and ambiguity influence participant response.

Kaitlyn McFarland

Major: Neuroscience
Faculty Sponsor: Dr. David Vanderboegh

"The Impact of Vichy France and the Resistance on Modern France"

On September 3, 1939, France declared war on Germany after the German invasion of Poland. Unfortunately, Germany's Blitzkrieg lit fire to France and within weeks Germany shoved themselves deep into France, forcing the French to sign an armistice. There are two passionate sides of this story; the conservative French who collaborated with Vichy France, and those who believed France should resist, viewing the armistice as a collaboration with Nazism. My project will explore this topic in depth, researching the history of the Vichy take over, and discussing the viewpoints of both sides of the political tensions in this region at the time, and how this impacted the future of France as a whole, both in the war and after.

Renae Melone

Major: Neuroscience, Biology
Faculty Sponsor: Dr. Laura Bruce

"Role of Gastrin-Releasing Peptide (GRP) Gene on Fear Behavior in Zebrafish (Danio rerio)"

Studying the genes that are involved in the fear response pathway is important in the understanding of emotional responses of anxiety-associated behavior and diseases. Previous research on fear behavior has focused on the gastrin-releasing peptide (GRP) gene, which is highly expressed in the basolateral amygdala (BLA), a brain region that is vital for the expression of fear responses, activates inhibitory interneurons within the BLA and CeA, and regulates memory expression and extinction. In this project, I will use a Zebrafish, or Danio rerio model, to study the effects of grp mutation on fear expression and to localize the GRP+ neurons, their targets, and Nitric Oxide Synthase (NOS) to support the idea of a conserved fear pathway between zebrafish and mammals.

Marah Miller

Majors: Neuroscience
Faculty Sponsor: Dr. Maya Khanna

"Incidental Memory for Color Word Associates Processed in Color Naming and Reading Aloud Tasks: Is a Blue Ocean More Memorable than a Yellow One?"

The aim of this project is to investigate the effects and importance of the inner ear proteins in otolith attachment and function in zebrafish. Microphonic recording assays will be used to record action potential responses from the vestibular nerve in zebrafish. Zebrafish mutants for inner ear proteins have been generated via CRISPR/Cas9 genome editing and will be compared and contrasted with wild-type zebrafish. This investigation will help us to better understand the linking proteins in the inner ear in zebrafish, and will help us better understand the homologous structures that are present in human inner ears.

Peyton Miller

Majors: Economics
Faculty Sponsor: Dr. Ernie Goss

"Iowa Sports Gaming: Its Impact on Casino Revenue, State and Local Tax Revenue, and the National Implications"

In 2018, the Supreme Court overturned The Professional and Amateur Sports Protection Act, enabling state governments to pass regulation to implement legal sports gambling. The recency of this ruling leaves the economic impact of sports gambling legalization unknown. This study uses Iowa as a case study to explore the national implications of sports gambling legalization by evaluating how Iowa's adoption of legal sports gambling impacts casino attendance and revenue distribution between different forms of gambling. Through a literature review, data collection, and empirical analysis, this study finds that cannibalization is observed in the Iowa gambling market and that it negatively impacts both AGR and tax revenues beyond specific levels of sports gambling revenues. Therefore, both casinos and states that consider implementing sports gambling should evaluate how cannibalization will impact their ability to maximize tax revenues or gambling profit respectively if they choose to implement sports betting.

Chisom Nwakama

Major: Chemistry
Faculty Sponsor: Dr. Andrew Ekpenyong

"Microfluidics for the Physics of Cancer"

Over 90% of cancer-related deaths are caused by metastasis, the process by which cancer cells spread to other parts of the body to cause new tumors. Metastasis requires specific physical properties of cells. A new research frontier called physics of cancer seeks to unravel the role of mechanical properties, forces and interactions on cancer metastasis with the aim of enabling new anti-metastasis therapies. This project will use a microfluidic device that mimics the circulatory phase of cancer metastasis to explore the physics of cancer in the cases of acute myeloid leukemia (using HL60 cells) and chronic myeloid leukemia (using K562 cells).

Hannah Okelberry

Major: Psychology, English
Faculty Sponsor: Dr. Matthew Reznicek

""I Stand in Awe of My Body": The Embodied Self and the Question of Self-Liberation in a Dualistic World"

While the notion of the dualistic self—that our minds are fundamental while our bodies are ornamental—pervades across our culture, I argue that dualism is not only incomplete in its assessment of the self but also implicated in our intolerance of aberrant bodies. Moreover, in manufacturing the notion of an "ideal" body associated with certain signifiers and selling those signifiers for profit, I suggest that dualism is impressed upon us by capitalist forces which also compel us to continually monitor ourselves and others, giving rise to a toxic environment in which we discipline the bodies around us. I also propose an alternate, "embodied" understanding of the self, challenging the basis on which such intolerance disseminates.

Hannah Okelberry

Major: Psychology, English
Faculty Sponsor: Dr. Dustin Stairs

"Effects of Environmental Enrichment and Adolescent Nicotine Exposure on Novelty Seeking in Rats"

The sensation seeking personality trait is associated with increased likelihood of adolescent cigarette or e-cigarette smoking. A rodent environmental enrichment paradigm has also been shown to induce a similar drug vulnerability behavioral phenotype in rats. In order to further validate the rodent environmental enrichment model we tested enriched and impoverished rats treated with nicotine or saline in adolescence in two different novelty-seeking tasks: novel place preference and novel object preference. This study allows us to look at whether exposure to nicotine in adolescence alters novelty-seeking later in life and if there is an interaction with an environmentally-induced behavioral phenotype similar to the sensation-seeking personality trait.

Shambhabi Paudyal

Major: International Relations
Faculty Sponsor: Dr. Terry Clark

"Prevalence of Child Marriage: Variation in National Marriage Laws"

The literature emphasizes poverty, sociocultural norms, and the marriage market in explaining the variation in child marriage. I argue that the variation can be explained by the national minimum-age-of-marriage laws and the inconsistency between them. I use the OLS regression model to test the question, "what explains the variation in the prevalence of child marriage across the international system?" I also test for a relationship between general marriage age, parental consent age, and sexual consent age using the interactive effect on regression model. Findings suggest that national marriage laws interact with one another and their significance may lie in their collective workings, rather than individual.

John Rafferty

Majors: Biology
Faculty Sponsor: Dr. Travis Bourret

"Functional Characterization of Thioredoxin in Borrelia turicatae"

Tick-borne relapsing fever (TBRF) is an emerging infectious disease in the United States. One strain of bacteria causing TBRF, Borrelia turicatae, has been found to cause infection in the United States and is spread by Ornithodoros turicata, a soft bodied tick. O. turicata produce both reactive oxygen species (ROS) and reactive nitrogen species (RNS). Thioredoxin A (TrxA) is likely responsible for maintaining homeostasis in these environments by reducing thiol groups on cysteines. It is our goal to determine if TrxA is involved in B. turicatae's oxidative and nitrosative defenses. We tested the expression of the trxA gene by growing cultures with the spirochete and exposing them to ROS. Reverse Transcriptase quantitative PCR (RT-qPCR) was

used to determine the expression of trxA transcripts. We have also developed a plasmid to knockout the trxA gene with a streptomycin resistance gene to compare the survival rates of wild-type and ΔtrxA B. turicatae.

Pablo Read

Majors: Biology, Spanish
Faculty Sponsor: Dr. Andrew Kraemer

"Impact of Interview Skin Tone on Respondent Truthfulness"

Originally, the research project consisted of three parts: inducement of the deactivation of HIV in infected cells using CRISPR technology, exposure of HIV latent cells hit with the CRISPR library to latent reactivating agent (LRA), and an attempt to find the cellular targets that CRISPR interacts with to either silence HIV active cells or suppress the activation of HIV latent cells. So far, we have completed parts one and two; however, we have attained unexpected results, with CRISPR appearing to increase HIV activation in cells. With these results, we may have to change the direction of our research and look for cellular targets CRISPR interacts with to activate HIV latent cells.

Mason Rhodes

Majors: Physics, Mathematics
Faculty Sponsor: Dr. Tom Wong

"Quantum Walk Search on the Complete Bipartite Graph"

The coined quantum walk is a discretization of the Dirac equation of relativistic quantum mechanics, and it is the basis of many quantum algorithms. We investigate how it searches the complete bipartite graph of N vertices for one of k marked vertices with different initial states. We prove intriguing dependence on the number of marked and unmarked vertices in each partite set. For example, when the graph is

irregular and the initial state is the typical uniform superposition over the vertices, then the success probability can vary greatly from one timestep to the next, so the precise time at which measurement occurs is crucial. When the initial state is a uniform superposition over the edges, however, the success probability evolves smoothly. This reveals a contrast to the continuous-time quantum walk, whose evolution is governed by Schrödinger's equation.

Lorenzo Riva

Major: Mathematics, Physics
Faculty Sponsor: Dr. Nathan Pennington

"Low Regularity Local Solutions to the Generalized MHD Equations"

The Magneto-Hydrodynamic (MHD) system of equations governs viscous fluids subject to a magnetic field and is derived via a coupling of the Navier-Stokes equations and Maxwell's equations. It has recently become common to study generalizations of fluids-based differential equations. Here we consider the generalized Magneto-Hydrodynamic alpha system, which differs from the original MHD system by the presence of additional non-linear terms and replacing the Laplace operators in the equations by more general Fourier multipliers with almost-polynomial symbols. Pennington considered the problem with initial data in Sobolev spaces of the form (s,2,n) with $n > 2$. Here we consider the problem with initial data in (s,p,n) with $n,p > 2$, with the goal of minimizing the regularity required to obtain unique existence results.

Abby Robinson

Major: Biology, Environmental Science
Faculty Sponsor: Dr. Ted Burk

"Effect of Ambient Temperature on Black Swallowtail Territoriality"

Black Swallowtails (Papilio polyxenes) are a prairie habitat specialist common in Nebraska. They are well known for exhibiting "hill-

topping" territoriality, in which males compete to hold territories in high elevation locations within prairies, to which females move when seeking mates. I observed the hill-topping behavior of male Black Swallowtails at several locations at Glacier Creek Preserve, a restored prairie in Bennington, Nebraska, owned and managed by the University of Nebraska at Omaha. I recorded the number of interactions as well as the durations of male-male interactions and of male perching behavior on the hilltops. Using weather records from weather stations at G. C. P., I looked for effects of temperature humidity on the territorial behavior. I found significant effects of temperature on number of interactions overall. With ongoing anthropogenic climate and environmental variability, such temperature-dependent effects on behavior may have consequences for habitat specialists.

James Sickler

Major: Chemistry, Biochemistry
Faculty Sponsors: Dr. Martin Hulce

"Synthesis of Haloketoses for Preparation of Perdurable Mosquito Repellents"

To prevent mosquito-borne diseases, it is imperative to engineer a long-lasting mosquito repellent. This can be accomplished through the synthesis of a tetramethylethylenediamine (TMEDA) cross-linked adduct of a hydrolyzable pro-picaridin unit with the skin-binding sugar 1-bromo-3-hydroxyacetone. This sugar is formed using recrystallized N-bromosuccinimide (NBS) and 2-chloroallyl alcohol. Nuclear magnetic resonance (NMR), gas chromatography-mass spectrometry (GC-MS), and thin-layer chromatography (TLC) are used to analyze the molecules and assess purity. Having verified the formation of 1-bromo-3-hydroxyacetone and the successful linkage of an analogue with TMEDA, the focus of this work is purifying the sugar, binding it to TMEDA, and linking the picaridin. However, 1-bromo-3-hydroxyacetone exhibited rapid decomposition from polymerization. Accordingly, an acetonide of L-erythrulose was synthesized to create a sugar protected from polymerization. Having successfully purified this acetonide via medium pressure liquid chromatography, the next step is to brominate this erythrulose derivative and analyze its stability before linking it to TMEDA.

Shelby Smith

Majors: Medical Mathematics
Faculty Sponsor: Dr. Nathan Pennington

"Molecular Analysis of Endotracheal Tube Biofilms and Tracheal Aspirates in the Pediatric Intensive Care Unit"

Ventilator-associated pneumonia (VAP) is a known complication of mechanically ventilated children in the pediatric intensive care unit (PICU). Endotracheal tube (ETT) biofilms are often implicated in the development of VAP by providing a conduit for pathogens to the lower respiratory tract.

Mary Townley

Majors: Spanish
Faculty Sponsor: Dr. Ryan Spangler

"The Life and Poetry of José Martí: the political impacts of his works on Cuba and the effects words have in creating a revolution"

Jose Martí is a revolutionary Cuban writer who inspired independence and became a face of change in Cuba. This paper will provide a background on Martí's life and the political climate of Cuba during his lifetime. It explores how he and his works were perceived by the Cubans who adored him back then and today. Through analyzing his life and poetry, I will demonstrate the power his writings had in inspiring a movement of independence. I believe his writings and the works of other political figures who had the ability to start a revolution can inspire people generations later.

George Varghese

Major: Biology
Faculty Sponsor: Dr. Michael Nichols

“The Application of FLIM to diagnose squamous-cell carcinoma”

The current method of diagnosing squamous cell carcinoma requires a gross alteration to be detected and analyzed histologically. This method necessitates an invasive biopsy and imposes unnecessary risk and discomfort. Fluorescence Lifetime Image Microscopy (FLIM) offers a novel method for skin cancer diagnosis that does not rely on visible morphological changes. Our lab has developed a microscope that uses this technique to assess metabolic shifts in cancer using both in-vitro and in-vivo models. By demonstrating the effectiveness of this technique at assessing cancerous cells, our research offers a less invasive, more easily accessible mode of diagnosis for skin cancer.

Jacquelyn Wright

Majors: Biochemistry, Spanish and Hispanic Studies
Faculty Sponsor: Dr. Lynne Dieckman

“Investigation of Gene Silencing Proteins through Single Molecule Assay”

Following replication, DNA winds around histones and condenses into chromatin during replication-coupled nucleosome assembly. This essential DNA packaging is mediated by two key proteins: proliferating cell nuclear antigen (PCNA), a DNA sliding clamp protein that acts as a scaffold during protein recruitment, and chromatin assembly factor-1 (CAF-1), which recruits histones to the replication fork. Their interaction is essential for gene silencing, but the process by which the proteins mediate gene expression is unclear. We will examine the kinetics of the CAF-1-PCNA interaction using total internal reflection fluorescence (TIRF) microscopy. Preliminary efforts have developed and established a TIRF imaging protocol.

About the Honors Program

Honors Program Mission Statement

Rooted in the 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.

The program is designed for talented, imaginative students desirous of participation in small, discussion-oriented classes and in courses on interdisciplinary and topical issues. It provides students with special opportunities and challenges to enhance their undergraduate experience and to contribute to the intellectual and cultural life of the University. The program also offers students the opportunity to pursue a course of study that complements their majors. Criteria for admission to the Honors Program include academic achievement and demonstrable interest in the program's aims and aspirations. Required application materials include an activity resume and two essays.

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Program by Jolene Buckingham and Eric Haas