NORTH CENTRAL COLLEGE

HONORS DAY 2026

THURSDAY, APRIL 16
8:30 a.m. - 7:30 p.m.

ABSTRACTS

- Poster Sessions 1 & 2
- Oral Presentations

NORTH CENTRAL COLLEGE 1861
NAPERVILLE'S UNIVERSITY™

Poster Session I: 8:30am – 9:20 a.m.

Stevenson Hall

Hostility Towards Roman Catholics at North Central College During the 19th Century

Lynsey Glenn '27 History/ Social Studies and Secondary Education
Advisor: Ann Keating

My research focuses on the tensions between Evangelical protestants and Roman Catholics at North Central College. I started my research by looking at the NCC Chronicles, starting in 1873. While doing that, I found a pattern of NCC students expressing deep anger towards Catholics at the school, therefore I began researching the school's affiliation with the Evangelical Association. The school was founded by Evangelical members, who wanted the school to follow strong Evangelical beliefs. We also received a large amount of funding from them. As soon as the school started becoming more religiously welcoming, the church started reducing their funding. The last financial help that North Central received from the Evangelical Association happened between 1965 and 1972. I concluded that the strict enforcement of Evangelical beliefs and the unrest toward Catholics at North Central College were largely motivated by the need to secure continued financial support from the Evangelical Association.

Becoming American: Italian immigrants in the 1920s-1950s

Carolynn Missak '26 History
Advisor: Ann Keating

My research examines Italian immigrants and their descendants in Chicago, and two surrounding suburbs; Highwood and Chicago Heights. I explore the fluid racial identity and status of Italians in America during the 1920s-1950s. This changing perception was determined by aspects such as World War II, community efforts, assimilation, and immigration laws. While there are general patterns that were experienced by Italians all over the nation, there were also unique place-based experiences that immigrants experienced. Original research and analysis of primary and secondary source evidence was used to support my project. Primary sources such as oral histories were especially useful. The historiographical debate was considered as well, which centers on whether or not Italians were seen as white when they arrived in America or if this was a process that occurred over time. My project agrees with the latter view as many factors led to the varied status of Italian Americans.

Filmmaking Under Fascism: How the Nazis Controlled an Entire Industry

Jonathan Tolbert '26 History and Social Science
Advisor: Shereen Ilahi

In post-Weimar Germany, the Nazi Party's propaganda ministry made considerable efforts to control the film industry. They employed a strict policy of censorship and oversight under the Reich Film Law of 1934 and began indoctrinating the next generation of German filmmakers at the German Film Academy. My research analyzes excerpts from Joseph Goebbels' diary, official propaganda ministry communications, and the most infamous propaganda films, such as Triumph of the Will and The Eternal Jew. I argue that the medium of film was the most effective avenue for the Nazi Party to broadcast their messaging and that it was an essential piece of their overall propaganda strategy. I

have been able to identify the thought process behind targeting the film industry for its unique ability to appeal to viewers' emotions and to be shown to massive audiences.

Cleo Tanner and Women's Sports at North Central College

Benjamin DiPasquo '27 Secondary Ed/History Social Science
Advisor: Gregory H. Wolf

The arrival of Cleo Tanner in 1928 marked a turning point in the history of women's athletics at North Central College. My research, conducted in the NCC archives, explores how Tanner collaborated with the Women's Athletic Association to create a vibrant sport community and culture that are still evident a century later. Tanner arrived as the director of physical education for women, focusing on women's exercise and hygiene. In 1931, Tanner became head coach for women's tennis and established the first competitive official women's sports team. Over the next 42 years, until her retirement in 1973, Tanner presided over the expansion of athletics opportunities for women. She established cheer, track, basketball, soccer, and softball teams. With the success of her teams and the tireless advocacy of women's sports, Tanner forged a national reputation before the advent of Title IX, in 1972.

Teaching With Heart: Understanding Teacher Preparedness in Social Emotional Learning (SEL)

Marla Chavez '26 Elementary Education
Advisor: Kathleen King

Social emotional learning provides the foundation for developing the skills a student needs, yet, many educators still struggle with how to teach SEL more effectively. This research focuses on the understanding and comfort level of new and veteran teachers teaching social emotional learning (SEL). We surveyed educators actively working inside of a classroom and teaching in Northern Illinois regarding their SEL curriculum, the level of support they feel, and their awareness of SEL. Results indicated that both novice and veteran teachers are aware of SEL, however, teachers are not comfortable teaching SEL in their classrooms because of a lack of preparedness with the curriculum or comfort-level with the subject. Overall, the lack of confidence and preparedness in educators can lead to inconsistent implementation of SEL practices, impacting students' social and emotional growth.

The Divine Age: A Narrative in Clay and Exhibition

Lucie Jumonville '27 Studio Art
Advisor: Christine Rabenold

This series of artwork acts as an entry point into a mythological world of divine figures and their foes, and the ones passing down the stories of these strange beings. Mythology offers a way to explain the creation of the natural world and its inhabitants. Beyond this, myth provides the world with structure through religious practices and the concept of the 'Divine.' The Divine are creatures that create and steward their surroundings, represented as abstract animal figures covered in an overgrowth of plants. Also examined is the corruption of the Divine and the creation of opposing forces shown as haunting and mythical creatures oozing glaze. The Divine, green and full of growth, and the Corrupted, dark and collapsing, stand in contrast to each other. Each piece is presented with an explanatory journal entry from within this world, so that the artwork is both in-action and a specimen for study.

Invertebrate Host Species Shed Infective Zoospores Into Aquatic Environments at Varying Rates

Hannah Galletti '27 Biology
Advisor: Gregory Ruthig

Multihost pathogens are important in the spread of infectious disease. Using microwell enumeration, we measured the rate at which invertebrate hosts release infective propagules into bodies of water, known as their shedding rate. We found that the mean shedding rate varies between species. Aquatic sowbugs were the most competent hosts in the shed of infective propagules. Frequency distributions showed a right skew, meaning some individual hosts contribute more to transmission than others. By exploring the relationship between shedding rate and invertebrate hosts, we can formulate an epidemiological model to predict the spread of infectious disease involving water-borne pathogens.

Methodological validation of a non-invasive ultrasound technique for in vivo measurement of ankle muscle fiber architecture

Jack Covey '26 Biological Sciences
Advisor: Gregory Ruthig

Muscle imaging is essential in clinical and research settings, providing insight into muscle structure, function, and pathology. While magnetic resonance imaging (MRI) offers images, it is often costly, time-consuming, and less accessible. As a result, ultrasound imaging has emerged as an alternative due to its affordability, portability, and repeatability. Studies have validated ultrasound for quantifying muscle architectural parameters, including muscle thickness (MT), pennation angle (PA), and fascicle length (FL). In this study, we examined whether passive ankle joint movement induces measurable changes in these parameters in the medial gastrocnemius muscle. Two-dimensional ultrasound assessed muscle architecture at posterior calf locations while the foot was relaxed, plantarflexed, or dorsiflexed, with measurements repeated over three weeks. Significant differences in FL and PA were observed across foot positions, while MT showed no significant change. These findings demonstrate the sensitivity and reliability of ultrasound for detecting muscle architecture changes during passive joint motion.

Enhanced or degraded mutualism with arbuscular mycorrhizal fungi and Canada thistle, an invasive plant

Kayla Martinez '26 Biochemistry
Hannah Meyers '28 Biology and Environmental Science
Daniela Acevedo, '29 Secondary Science Education
Eva Chavez Garcia '27 Biology
Carly Grant '26 Biology
Maggie Knopf '27 Biology
Luke Moran '27 Biology
Octavio Ortiz '26 Biology
Nicole Baker '24 Biology

Advisor: Joanna Weremijewicz

Invasive plants are a widespread issue that cause a range of effects, from crop damage to reduced biodiversity. Many factors can contribute to a plant becoming invasive, including climate, natural predators, and native mycorrhizal fungi. Because mycorrhizal fungi associate with 80% of plants worldwide, our research focuses on native arbuscular mycorrhizal fungi (AMF) and how they interact with both native and invasive plants. AMF form underground networks in which the fungi provide nutrients to plants in exchange for carbon. To investigate this, we measured root colonization percentage to determine whether Canada thistle, an invasive species, had a stronger interaction with arbuscular mycorrhizal (AM) fungi compared to pasture thistle, a native species. Our results showed that although Canada thistle did interact with AMF, it had the same level of root colonization as pasture thistle.

Kaempferol Attenuates PFDA-Induced Cytotoxicity and Oxidative Stress in HGrC1 Cells

Kate Taylor '26 Biology
Advisor: Jennifer Sallee

Perfluorodecanoic acid (PFDA) is an environmental pollutant in the PFAS family of “forever chemicals.” PFDA is known to accumulate in the ovary and induce cytotoxicity and oxidative stress. Granulosa cells are a type of ovarian cell which are particularly vulnerable to oxidative damage and play a crucial role in oocyte maturation and hormone production. We investigated the protective potential of kaempferol, a flavonoid known for its antioxidant and anti-inflammatory properties, against PFDA-induced toxicity in the human granulosa cell line HGrC1. We determined cytotoxic concentrations of PFDA and kaempferol in HGrC1 cells using a cell viability assay, then co-treated cells with PFDA and kaempferol. We measured the accumulation of reactive oxygen species (ROS) via a fluorescence-based ROS detection kit and measured the expression of three antioxidant enzyme genes via qRT-PCR. We found that kaempferol alleviates PFDA-induced cytotoxicity, reduces ROS accumulation, and restores the expression of antioxidant enzymes in HGrC1 cells.

Crochet Coral Reef Project

Carly Grant '26 Biology
Advisor: Stuart Patterson

The Crochet Coral Reef project, created by Margaret and Christine Wertheim, is a global, community-based initiative that combines art, mathematics, marine biology, and climate awareness to highlight the beauty and vulnerability of coral reefs. Inspired by the hyperbolic geometry found in coral forms, the project uses crochet to model the structures created by coral polyps. Coral reefs are biodiversity hotspots, supporting approximately 25% of marine life while providing coastal protection, food security, generating economic benefits, and offering potential medical resources. However, reefs have declined by roughly 50% in ecosystem service capacity over the past 50 years due to climate change, ocean warming and acidification, pollution, overfishing, and disease. Rising temperatures cause coral bleaching, leading to widespread death of reefs. Restoration efforts offer hope for rebuilding damaged reefs. By uniting science and creative practice, the Crochet Coral Reef project raises awareness and inspires action to protect these essential ecosystems.

Magnetic Field Profiling an dData Visualization for the MAGIS-100 Atom Interferometer

Patricia Savoia Cooley '27 Physics, Mathematics
Advisor: Mandy Kiburg

Recent work for the MAGIS-100 experiment focused on infrastructure optimization following the discovery of high magnetic field levels in the vacuum tubes, which are currently undergoing reheating to mitigate this interference. To maintain experimental progress, we overhauled the data acquisition system, specifically troubleshooting and fixing a Python-based pipeline that transmits vacuum telemetry through a Raspberry Pi to a secondary analysis computer. Beyond software improvements, we conducted physical tests on vacuum and heater hardware to characterize the system's performance limits. Our findings show that the new code successfully eliminated previous data packet loss, ensuring reliable real-time monitoring of vacuum status. Furthermore, hardware tests revealed that specific vacuum pump combinations achieved pressures closer to the "perfect vacuum" ideal than previous configurations. These results establish a robust, automated framework for environmental monitoring, providing the necessary groundwork for the next phase of high-precision atom interferometric testing.

Upgrading a Magneto-Optic Microscope for Imaging Artificial Spin Ice

Nazifa Anis '26 Applied Mathematics, Physics Interdisciplinary
Zoya Karim, '26 Chemistry
Annella Bellot '27 Math and Physics
Advisor: Susan Kempinger

Magneto-Optic Kerr Effect (MOKE) microscopy is a key technique for visualizing magnetic states in ferromagnetic systems such as Artificial Spin Ice (ASI). To improve the visualization of fine-scale magnetic features, we upgraded and realigned the optical system. This involved replacing existing polarizers with larger components to expand the field of view and integrating 60X and 100X objectives to enhance resolution. The optical path was realigned using mirrors and irises to ensure even, collimated illumination, and polarization calibration was verified by fitting intensity data to Malus's Law. The upgraded system demonstrates significantly improved contrast, spatial resolution, and field coverage compared to the original setup. These enhancements enable more detailed imaging of magnetic domains and support future studies of switching behavior and dynamic interactions in complex ASI geometries.

Real-Time Enzyme Kinetics by zNMR Monitoring Inveertase-Catalyzed Sucrose Hydrolysis from a Single Progressive Curve

Jean Guillaume Ducreux '28 Bio Chemistry
Advisor: Jeffrey Bjorklund

This study develops a quantitative NMR (qNMR) workflow for real-time enzyme kinetics, using invertase-catalyzed sucrose hydrolysis as a model system. Reactions are monitored by serial ^{1}H NMR spectroscopy with water suppression. Distinct anomeric proton resonances for sucrose and glucose are quantified and normalized to an internal standard. Preliminary results confirm the pseudo-first-order reaction proceeds as expected, with decreasing sucrose and increasing glucose and fructose signals. The integrated Michaelis–Menten equation and Lambert W function were applied to extract Km and Vmax

Optimizing Dye Removal from Water Using Spent Coffee Grounds: Influence of pH and Particle Size

Madeline Hill '26 Environmental Science and Deisy Perez '26 Neuroscience
Advisor: Rebecca Sanders

Textile and dye industries discharge over 700,000 tons of dyes annually, contaminating waterways, blocking sunlight penetration, and disrupting aquatic ecosystems. Conventional treatment methods, like activated carbon adsorption, are effective but economically and environmentally unsustainable for large-scale use. Exhausted coffee grounds (ECGs) are a sustainable, low-cost alternative. This study explored how pH and particle size influence adsorption efficiency of methylene blue, a model dye, onto ECGs. Smaller particle sizes enhance dye adsorption capacity. At pH 6, batch adsorption experiments varied by particle size with the 106–300 μm ECGs having the highest adsorption capacity (95 mg/g) while the 710–1000 μm particles exhibited the lowest (67 mg/g). When examining pH effects independently, both particle sizes performed substantially better under basic conditions, with adsorption capacities reaching 160 mg/g at pH 12. This research highlights the need to optimize pH and particle size to improve ECG use in dye-contaminated water treatment.

Napping and Memory for Emotional Experiences

Stella Bank '26 Behavioral Neuroscience and Psychology
Amelia Deliberto '27 Psychology and Behavioral Neuroscience
Liz Thomas '27 Behavioral Neuroscience and Psychology

Advisor: Alexis Chambers

Emotions and sleep increase memory consolidation separately but can also interact to improve memory for emotional events following sleep. Napping has shown to increase memory retention on negative aspects of emotional scenes, yet those studies test memory for emotional words and pictures. The current study captured more realistic emotional events by using a mood induction procedure(MIP), which asked participants to imagine themselves in sad or neutral scenarios while listening to mood-congruent music. After a 5-hour delay, which either included a nap or not, participants completed a surprise recall task. Valence ratings significantly decreased after the sad MIP compared to neutral, while arousal ratings remained consistent across both groups. Those in the sad condition remembered significantly more of the scenarios compared to the neutral condition. Although there were no significant differences between nap and wake conditions, this data establishes a large role of emotions in memory, emphasizing the effects of sadness.

The Effects of Dialect Cues and Decisions in Healthcare: An Audio-Vignette Study

Genesis Hernandez '26 Psychology
Advisor: Nader Hakim

Effective clinical decision-making requires objective evaluation of patient information. However, social cues, such as dialect, may influence medical judgement. Dialect is a silent auditory cue associated with perceptions of credibility and competence, yet its impact on clinical reasoning remains limited in scope. This study examines whether voice-based dialect cues affect diagnostic accuracy, treatment planning, and response time among healthcare students. Using a within-subjects design, participants will engage in a simulated patient intake delivered through AI-generated voices in Standard American English, African American Vernacular English, Latinx dialect, and a text-only condition. Participants will submit electronic chart notes documenting diagnosis and

treatment recommendations and complete measures of perceived patient credibility. It is expected that non-standard dialect conditions will be associated with lower diagnostic accuracy, less thorough treatment plans, and reduced perceived credibility relative to the Standard American English and text-only conditions. Findings will inform educational strategies aimed to reducing language-based bias in clinical decision-making.

An Analysis of Research Participation Heistancy

Zain Raza '26 Actuarial Science
Advisor: Nader Hakim

This thesis addresses research participation hesitancy, a common theme when it comes to science and innovation. Many people do not feel comfortable with participating in research studies, yet it is exactly their participation that allows science to flourish by knowing more about many phenomena with the help of participants. Therefore this study explores why people do not feel comfortable participating in research through a survey where people choose why they do not feel comfortable with research participation, while also giving an optional survey to those who want to explain more about their reasons. As of February 2026 (N = 40), the most common reasons were unfamiliarity, privacy concerns, schedule inconveniences, and a lack of transparency behind the research, with some differences depending on the type of research conducted. An understanding of differences in research hesitancy can inform how researchers can more effectively recruit participation.

Effects of ketamine on astrocyte activty in the ventral segmental area and nucleus accumbens core

Danni Moser '26 Molecular Neuroscience,Theo VanderHyden '26 Behavioral Neuroscience and Psychology
Miranda Baker '26 Molecular Neuroscience
Ari Watts '26 Molecular Neuroscience
Ceriana Potts '28 Molecular Neuroscience
Yessica Valdez Ponce '27 Molecular Neuroscience
Zoe Vo, '27 Molecular Neuroscience and Psychology

Advisor: Michael Stefanik

Ketamine is an NMDA receptor antagonist used both medicinally and recreationally. Recent work from our lab has shown than low-dose ketamine can reduce oxycodone-seeking behavior in male rats, however, ketamine use has also been associated with long-term cognitive impairment, suggesting that prolonged exposure may be neurotoxic and negatively impact brain structure and function. To determine whether ketamine treatment has neurotoxic effects, male Sprague Dawley rats received either a subanesthetic dose of ketamine (6 mg/kg, IP) or saline for 14 consecutive days. To assess toxicity, glial fibrillary acidic protein (GFAP; a protein that is activated in glial cells in response to injury) was measured in the ventral tegmental area (VTA) and nucleus accumbens core (NAc), key regions in the brain’s reward circuity using immunohistochemistry. We hypothesize that daily ketamine administration will increase GFAP expression in the NAc or VTA compared to saline controls, indicating astrocyte activation and potential neurotoxicity.

Oxycodone incubation changes mTOR or eIF2 expression in the nucleus accumbens shell of male Sprague Dawley rats

Miranda Baker '26 Molecular Neuroscience
Ari Watts '26 Molecular Neuroscience
Theodore VanderHyden '26 Behavioral Neuroscience and Psychology
Ceriana Potts '28 Molecular Neuroscience and Psychology
Zoe Vo '27 Molecular Neuroscience and Psychology
Danielle Moser '26 Molecular Neuroscience
Lukasz Teper '26 Behavioral Neuroscience

Advisor: Michael Stefanik

After years of abstinence, people combatting opioid use disorders relapse. The brain's reward system, including regions like the nucleus accumbens shell, contributes to opioid relapse through changes in glutamatergic AMPA receptors. These receptors, dysregulated after opioid use, result in long-term increases in drug craving. However, the reason behind these changes is unknown. One way the brain makes lasting changes is through regulation of protein translation. mTOR and eIF2, key regulators of translation, are altered following drug use. We hypothesized that phosphorylated mTOR, but not total mTOR, would increase in the NAc shell, because only the activated form drives protein translation. While phosphorylated eIF2 would decrease, because only the inactivated form drives translation. To test this, rats self-administered oxycodone, followed by a drug seeking test. The tissue was fractionated, and immunoblotted to quantify translational proteins. We found a decrease in phosphorylated-eIF2 and an increase in phosphorylated-mTOR of withdrawal day 15 rats.

Daily Self-Administration of oxycodone's impact on eEF2 and eIF2 levels in male Sprague Dawley rats in the nucleus accumbens core

Ari Watts '26 Molecular Neuroscience
Miranda Baker '26 Molecular Neuroscience
Danni Moser '26 Molecular Neuroscience
Ceriana Potts '28 Molecular Neuroscience and Psychology
Zoe Vo '27 Molecular Neuroscience and Psychology
Yessica Valdez Ponce '27 Molecular Neuroscience
Theodore VanderHyden '26 Behavioral Neuroscience and Psychology
Lukasz Teper '26 Behavioral Neuroscience

Advisor: Michael Stefanik

A large issue in treating opioid use disorder (OUD) is the vulnerability to relapse, of which craving is a primary cause. There is a time-dependent intensification in craving (incubation) with opioids like oxycodone. Oxycodone incubation is caused by the strengthening of excitatory synapses in the nucleus accumbens (NAc), sustained by maladaptive protein translation. Protein translation in the NAc is regulated by both eIF2α, an initiation factor, and eEF2, an elongation factor. Phosphorylation of both factors is decreased following the incubation of other drugs, like cocaine, leading to increased translation. However, little is known about the effects of oxycodone incubation on eIF2α and eEF2. Male Sprague-Dawley rats were trained to self-administer oxycodone (0.15mg/kg/infusion/10 days). They were then tested for drug seeking during withdrawal. Brains

were removed, tissue was fractionated to enrich for synapses, and immunoprobed. Preliminary results indicate a decrease in eIF2, but not eEF2 phosphorylation.

The Effect of Protein Consumption Timing on Hypertrophy in Adults Who Resistance Train: A Critically Appraised Topic

Claudia Spalding '27 Master of Athletic Training
Advisor: Kendall Selsky

Resistance training (RT) is a common type of exercise that individuals perform to increase muscle strength, mass, and endurance. Individuals who RT need to consume adequate amounts of macronutrients, specifically protein, to maintain healthy body composition, rebuild muscle, and avoid injury. The timing of protein consumption relative to RT sessions has been a focus of recent research studies, as it may affect the resulting muscle adaptations. Therefore, the focus of this critically appraised topic was to determine whether consuming protein immediately post-RT, compared to delayed consumption of protein, resulted in increased hypertrophy in adults. Two studies were appraised, including a meta-analysis and systematic review, earning a 23/27 and a 27/27 on the PRISMA checklist. Based on this critical appraisal, the clinical bottom line is that consuming adequate protein throughout the day is more important than the actual timing of protein intake for muscle hypertrophy in individuals who RT.

Eccentric Loading Therapy in Patients with Patellar Tendinopathy: A Critically Appraised Topic

Camille Ziemba '27 Master of Athletic Training
Advisor: Kendall Selsky

Patellar tendinopathy (PT) is a chronic degenerative tendon condition caused by repetitive loading, commonly affecting athletes in high-impact and plyometric sports.
Tendinopathies are difficult to treat due to the largely avascular nature of this tissue, resulting in treatment-resistant injuries with substantial symptomology. This critically appraised topic evaluates whether eccentric loading accelerates symptom resolution in athletes with PT compared to other treatment approaches. Three systematic reviews were analyzed using the PRISMA checklist assessing methodological quality, risk of bias, and evidentiary strength. All studies were Level 1 on the CEBM scale and scored 23–25 on PRISMA criteria. Based on this critical appraisal, the clinical bottom line is that eccentric loading alone does not outperform alternative rehabilitation strategies in symptom resolution. Therefore, it should not be prioritized as a standalone treatment but may be integrated within a comprehensive program. Further high-quality, long-term studies are needed to clarify its clinical effectiveness.

The Addition of Neuromuscular Electrical Stimulation in Patients with Chronic Spinal Cord Injury Participating in Resistance Training: A Critically Appraised Topic

Tegan Oas '27 Master of Athletic Training
Advisor: Kendall Selsky

Patients with chronic spinal cord injuries (SCI) experience long-term neuromuscular deficits. Therapeutic interventions such as resistance training (RT) and neuromuscular electrical stimulation (NMES) have been shown to support muscle hypertrophy. The potential benefits of combining NMES with RT warrant further investigation. This critically appraised topic seeks to answer whether the combination of NMES and RT increases muscular hypertrophy in patients with chronic SCI. Three studies were appraised, one retrospective cohort study scored using the STROBE checklist (15/22), and two randomized controlled trials scored using the PEDro scale (5/10 and 4/10). All three articles examined the use of NMES and RT and their effects on muscle hypertrophy. Based on this critical appraisal, the clinical bottom line is that combining NMES and RT leads to greater muscular hypertrophy than RT alone. Current evidence supports NMES combined with RT as an effective approach to improving muscle hypertrophy in patients with chronic SCI.

Understanding Physical Activity Behaviors in Young Adults in College

Bella LaRocco '26 Exercise Science and Psychology
Logan Selsky '26 Health Science

Advisor: Rachel Luehrs

This study examines the proportion of college students who meet the physical activity (PA) guidelines and the top barriers to exercise that students experience. The expected result is that less than 50% of students will meet the guidelines. Previous research supports that lack of time, motivation, and energy are the primary barriers that prevent people from meeting the PA guidelines. Data was collected by surveying undergraduate students from ages 18 to 35 years old. Variables analyzed include student demographics, activity levels, and barriers to exercise. Data indicates that 56% of respondents meet the guidelines for both aerobic and muscle strengthening exercise. This left 44% of respondents to not meet the recommended PA guidelines. Lack of energy, motivation, and time were the most common barriers cited by students. This research will contribute to the fields of Exercise Science, Psychology, and Sociology by providing insight into the PA behaviors of students.

What Drives Physically Active College Students to Meet Physical Activity Guidelines

Cristiano Mastropieri '27 Exercise science
Anais Gerard '27 Exercise Science/Kinesiology

Advisor: Rachel Luehrs

Previous research suggests that roughly half of college students achieve recommended physical activity (PA) levels. Most existing work concentrates on barriers to exercise among those who do not meet the guidelines, yet little attention is given to what enables students who do meet PA guidelines to succeed. In this study, 216 students completed a voluntary survey reporting demographic information, PA habits, and advice they would offer to others to help increase PA. Overall, 56% of surveyed students met the PA guidelines. What students commonly attributed to their adherence ranged from reasons like athletic performance, perceived health benefits, and intrinsic enjoyment. The advice that these subjects had to offer to help encourage more PA was to know the benefits of exercise, make it enjoyable and do it for mental health benefits. The study indicates that students who meet physical activity guidelines are largely driven by internal motivations and positive outcome expectations.

Studying How Music Frequencies Psychologically Influence Humans

Eugene Kalin '26 Mechanical Engineering
Advisor: Jonathon Kirk

The goal of the study is to understand if there's a correlation between changing the overall anchor tuning frequencies in songs and emotional reaction. This study will be analyzed from a qualitative perspective. Subjects are shown an affect grid to fill out while listening to 3 different songs, documenting what emotional reaction they feel without being disclosed whether the tuning frequency has been modified, measuring valence/arousal levels. Efforts are made to control expectancy bias as much as possible. After each song, the subject is given 5 minutes to write reflective responses. A thematic analysis is conducted to determine the correlation between the corresponding reactions and other similar reflections. This study aims to understand how music influences people from a more empirical and psychophysical-leaning perspective.

Oral Session: 9:35 a.m. – 10:55 a.m.

Wentz Science Center Classrooms

Historical Perspectives

Moderator: Will Barnett
Location: WSC 256

Crime and Criminal Justice in The Salem Witch Trials

Milam Phills '26 History
Advisor: Bruce Janacek

My capstone paper explores the Salem Witch Trials of 1692-1693 through the lens of Puritan justice, revealing how law, and social norms shaped who was accused, tried, and punished. Using court records, warrants, and examination transcripts, I focus on three cases—Tituba, Bridget Bishop, and Rebecca Nurse—to show how factors like race, gender, and social class affected the court's decisions. The project also looks at the changes in the court system, including the creation of the "Court of Oyer and Terminer" a special tribunal set up by Governor William Phips to handle the surge of witchcraft cases. The project also addresses "spectral evidence". This was testimony based on dreams or visions used to claim the accused harmed others supernaturally and coerced confessions. Ultimately, this study shows how religion, law, and identity worked together—while also integrating irrational approaches to the law—to shape justice in early colonial America.

Scrummaging with Stereotypes: Masculinity, Identity, and LGBTQ+ Inclusion in Sports

Zachary "Caesar" Scalafini '26 Music Composition
Advisor: Will Barnett

One research project can change your life. Last summer, I was allowed to take advantage of living in the gay village of Chicago to study the society and history of gay men. What came out was 50+ pages that synthesized academic literature on the subject, real-life interviews, and personal experiences. My coming-of-age tale involves this project taking me along with my new family, the Chicago Dragons RFC. An inclusive rugby team that attracts lgbtq men, and is a part of a network of national and international teams that have the mission to promote lgbtq awareness, inclusion, and community through performing at a competitive athletic level. This research has taken me across the country to various cities, giving me an insight that few have on the subject. I wish to explain the experience of the gay athlete to those who may not imagine that it can exist in the same person.

A Kingdom of Priests: Women's Authority and Patriarchy in Early Mormonism

Samantha Alis '27 History, Anthropology
Advisor: Will Barnett

This research examines the creation, rise, and suppression of the Nauvoo Relief Society to analyze the paradox of women's authority in early Mormonism. Founded in 1842 under the direction of Joseph Smith, the Society granted women unprecedented administrative and spiritual responsibilities, such as preaching, charitable governance, and ritual healing typically associated with male priesthood holders. In a nineteenth-century Protestant culture that restricted women's public and religious leadership, this development marked a significant anomaly. However, after Smith's death, Brigham Young suspended the organization, sharply curtailing women's independent authority and reaffirming patriarchal control. I argue that women's empowerment in Nauvoo was genuine but provisional: while the Society created a space for collective identity, spiritual agency, and institutional leadership, its authority remained dependent on male sanction. The Relief Society's brief autonomy ultimately exposes the structural limits of female religious power within a patriarchal church framework that continues to shape Mormon gender dynamics.

The Religious and Scientific Views of Isaac Newton

Andres Perez '27 Secondary Education/Social Studies
Advisor: Bruce Janacek

The Scientific Revolution marked a transformative period in early modern European history. Traditional views of the natural world were reshaped by new scientific and intellectual discoveries. At the forefront of this new frontier was Isaac Newton, who argued conclusively that gravity kept the planets including the Earth rotating around the sun. However, Newton was a devoted Christian. He rightly feared that his scientific insights would lead others to doubt the significance or even the existence of God. Therefore, using multiple avenues of study, such as science, theology, and alchemy, he sought to demonstrate God's presence on Earth. This study will cast new light that complicates this towering figure of the Scientific Revolution and grounds his beliefs and life more historically. He was a man who may have been ahead of his time, but he was also very much a man of his time.

Art and Music as Performances

Moderator: Linsay Shannon
Location: WSC 354

Liberté, Antiquity, Publicity: How Jacques-Louis David's Neoclassical Approach to Painting Shaped History

Marina Jòkanović '26 Art History and Acting
Advisor: Lindsay E. Shannon

This thesis investigates how the art of Jacques-Louis David (1748–1825), the leading Neoclassical painter of Revolutionary and Napoleonic France, utilized classical ideals to document history and shape public perception. Building on the scholarship of Dr. Dorothy Johnson, this study explores how David redefined history paintings - a genre of painting depicting scenes from history, mythology, religion, or literature with a moral purpose. By incorporating ancient Greek and Roman art conventions and beauty standards as well as archeologically accurate depictions of architecture and clothing, David cast events of his time in a heroic light while also shaping collective memory of the two ancient civilizations. He managed to elevate contemporary figures and make moral lessons from the past relevant to the French public. Through a detailed visual analysis of his major works, this thesis demonstrates how David's Neoclassical approach helped define the way historical events and figures were remembered in Western art.

From Compton to Puerto Rico: Social Criticism on America's Biggest Stage

Mason Collins '26 English Literature
Advisor: Gregory H. Wolf

Kendrick Lamar's 2025 and Bad Bunny's 2026 NFL Super Bowl halftime performances are amongst the most popular expressions of culture, music, and politics in American history. This project asserts that through national symbols, lyrics, compelling set design, and intricate choreography, both artists confront structural discrimination by illuminating the historical continuity of racial injustices, colonial legacies, cultural resistance, and economic disparity synonymous with "The American Dream." Drawing upon the National Football League's racially controversial foundation and the failed promise of reparations, Kendrick illustrates how racism is collective and not an individualized suffering, depicting what W.E.B. DuBois calls "double consciousness." Visual components–from a Black Uncle Sam to dilapidated urban backdrops–expose the dominant ideology of "White America." Similarly, Bad Bunny reinforces Puerto Rican identity through the Puerto Rican Flag, Afro-Puerto Rican-inspired choreography, and coastal imagery that critiques colonization and U.S. imperialism.

Kinesthetic Contagion: Modeling the Mechanisms of Mass Psychogenic Illness Through Theatre

Aidan McGuire '26 Theatre Design and Technology, Theatre Dramaturgy and Directing
Advisor: John Warrick

In 1518, the people of Strasbourg, France, began dancing uncontrollably in the town square. Many died from exhaustion. Centuries later, in 2011, teenage girls in upstate New York suddenly fell victim to verbal and physical tics. The 1518 dancing plague and the case of Le Roy, New York, are both examples of the widely disputed phenomenon of mass psychogenic Illness, or mass hysteria. Using theatre as a living research space, my analysis uncovers four key mechanisms that are essential to

mass hysteria: desire for recognition, communal contagion, response to authority, and collective stress. My analysis reveals that mass hysteria does not emerge from chaos. Rather, it is a predictable response to societal and institutional instability. Instability such as this is omnipresent in the modern age. By applying theatrical concepts and theories surrounding kinesthetic movement and bodily response, this project explains scientifically improbable instances of mass hysteria.

Sonification of Biological Molecules

Claudia Andrews '26 Biology and Music Performance
Advisor: Jonathon Kirk

Sonification, the process of translating data into music, has potential as a complement or alternative to data visualization. It may be used to reveal complex patterns invisible to the eye, and for communicating complex ideas to non-scientists in an accessible way. My thesis builds on this expanding field by providing a simple, repeatable methodology for the sonification of some of the biological sciences' most ubiquitous building blocks: proteins. Selected parameters for sound-mapping include the primary amino acid sequence, as well as three-dimensional structural information where available, to demonstrate important structural features to the listener. By balancing scientific rigor and communicative accuracy with artistic and aesthetic concerns, I have developed a simple platform to translate readily accessible datasets into musical works, enabling audiences to explore any protein of interest.

Philosophy, AI, and Society

Moderator: Shaheen Moosa
Location: WSC 042

The Role of Balance in Novel Videogame Monetization

Samuel Salvador '26 Philosophy
Advisor: Shaheen Moosa

Take Tic-Tac-Toe and contrast it to 1972's Pong. One game is perfectly fair, but the other provides a massive advantage to the first player and is arguably more math equation than game. However, mindful of exponential growth in videogame complexity, I propose several alternative goals to fairness in game balancing, or varying ways to interpret fairness in an inherently competitive system. How these emerging philosophies are impacting the artistic vision and financialization of videogames is examined. Engagement-based, skill-based, and randomized matchmaking are explained. The implications contained in pay-to-win, 'hat-to-win', and grind-to-win digital economies are contextualized. In the end, balance is just a mirage–or a societal mirror.

The Ethics of Suicide

Justin Schroeder '26 Philosophy, Religious Studies
Advisor: Perry Hamalis

One underexamined aspect of Friedrich Nietzsche's work is his treatment of suicide. While scholars in recent years have attempted to understand Nietzsche's position, this paper seeks to synthesize

these explanations to extract a fuller understanding, especially in the light of modern debates over physician-assisted suicide. Secular and religious critics alike condemn suicide on three assumptions: that individuals do not possess fully themselves, that suicide is a betrayal of one's social duties, and that one cannot judge the value of their life. Conversely, I claim that suicide is not a morally reprehensible action if certain preconditions are met. Further, with these conditions met, suicide can serve as a final declaration of one's strength and will. Much of the opposition toward suicide stems from the metaphysical and moral assumptions carried on past what Nietzsche called "the death of God." Through a revaluation of all values, suicide can appear unfettered as "free death."

Modular Multi-state AI Teaching Protocol

Ian Gorrell '26 Computer science and computer engineering; and Ethan Jordan
Advisor: Nnamdi Nwanze

Large language models are increasingly deployed in interactive systems, yet controlling their behavior over extended multi-turn interactions remains challenging. Most existing approaches rely on prompt-based steering, leaving behavior sensitive to context and probabilistic drift. This paper presents the Modular Multi-State AI Teaching Protocol (MMA-TP), a protocol-level framework for constraining model behavior through structured interaction design rather than model modification. MMA-TP pairs an engineered system prompt that establishes a persistent runtime persona with a structured specification encoding interaction states, transitions, and response constraints. Operating entirely at the interaction level, the framework leverages contextual conditioning to stabilize behavior across extended sessions without altering model parameters or decoding. A mechanistic analysis grounded in transformer attention dynamics explains how persistent structured inputs bias generation toward protocol-consistent behavior. Behavioral evaluation across multiple domains shows MMA-TP enforces constraints, preserves phase ordering, and resists structural degradation relative to prompt-only instruction.

Lebensborn: Brothel or Baby Sanctuary?

Peyton Farrow '26 Human Resource Management
Advisor: Shereen Ilahi

Lebensborn, or "fount of life" in German, was a program in which Aryan women gave birth to "racially pure" babies for SS families to adopt. The program was founded by Heinrich Himmler, the leader of the SS, to increase the birth rate and reduce the number of abortions in Germany. Later on, the program aimed to replenish the stock of soldiers, as the war was taking its toll on the German population. Some scholars and popular media have depicted the program as a state-sanctioned brothel where young women were treated as brood mares for SS men. To evaluate the validity of this claim, I employ the historical method by analyzing primary sources from the Bad Arolsen archives, such as Nazi propaganda and translated speeches by Himmler. I argue that Lebensborn was simply a selective reproduction welfare network grounded in eugenics, using maternity homes to create a "racially pure" population.

Mental Health, Memory, and Psychology

Moderator: Alexis Chambers
Location: WSC 254

Gender differences in police officer mental health seeking attitudes

Emily Mostaccio '26 Psychology
Advisor: Liana Peter-Hagene

The current study examined gender differences in attitudes toward seeking mental health among police officers. Participants were 44 police officers from local and state departments (xx women) who completed an online study. The study included a vignette about an officer experiencing mental health struggles after a traumatic work experience. Participants completed the same measure of attitudes toward seeking mental health twice: once about seeking mental health support for themselves, and once as a recommendation for the officer in the vignette. Group comparisons revealed no gender differences in officers' attitudes. Yet, within-subject comparisons revealed that officers were significantly more supportive of seeking mental health help for the vignette officer compared to themselves. Knowing that officers are more willing to support their peers in seeking help can be useful for departments by increasing support groups.

Discrete Emotion Effects on Memory Recall

Stella Bank '26 Behavioral Neuroscience and Psychology
Advisor: Alexis Chambers

Features of emotional experiences, including valence (positive versus negative) and arousal (intensity), have been shown to influence memory for such experiences, such that negative, high arousal content is remembered best. Previous literature examined emotional memory by testing memory for emotional words or pictures, but these methods may not fully reflect realistic experiences of emotions. To capture this, the current study used a mood induction procedure which had participants imagine themselves in emotional scenarios (happy, sad, fearful, or neutral) while mood-congruent music played in the background. Five hours later participants were presented with a surprise recall task for the scenarios presented previously. In line with previous literature, results revealed that fear and sad conditions were remembered significantly better than neutral and happy. Results trended towards fear performing better than sadness and happy performing better than neutral. These results highlight the specific effects of discrete emotions on memory, emphasizing strong negative emotions.

N-Ovation: A Restaurant Manager's Guide to Leading Employees Towards Better Well-Being

Nora Klepczarek '26 Shimer Humanities
Advisor: Karl Kelley

America often relies on small restaurant businesses, and they're a common first workplace. Small restaurant owners balance operational efficiency and costs with the ethical treatment of employees to sustain long-term profitability, leaving employee care as the lowest priority. This behavior, affecting the broader community, turnover rates, employee satisfaction, and business income remains overlooked.
This white paper–style literature review answers: "How can restaurant owners enhance employee well-being using a holistic approach to individuals, workplace culture, and leadership practices?" Drawing from leadership studies, psychology research, and databases, this guide for restaurant leaders provides strategies for improving employees' mental, social, and emotional health, like

assessments and tools related to employee wellness (such as the PERMA-H and VIA frameworks), and adaptive leadership, wellness programs, and emotional intelligence.
Findings show inexpensive improvements lead to improved employee well-being, productivity, and retention. Workplaces invested in employe growth and happiness experience higher applicant interest and workplace satisfaction.

Exercise and Self-Esteem: Running toward Better Mental Health

Macy Fleury '26 Exercise Science and Allison Peloso, '27 Exercise Science
Advisor: Rachel Luehrs

The correlation between aerobic exercise and the self-esteem of children is studied frequently, with most research addressing elementary school children and adolescents. This excludes the middle school age group (11-14). Therefore, this study investigated the correlation between self-esteem of middle school-aged children by asking 12 participants to take part in the Run with your Heart Youth Running Camp (combination of aerobic, strength, and flexibility training). Then, the Harter Self-Perception Profile was given 48 hours pre- and post-camp to assess changes in participant self-esteem. An identical questionnaire was given to local middle school students that did not participate in the camp as a control group. There were statistically significant increases in behavioral conduct and physical appearance self-esteem ($t = -4.491$ $p = 0.011$ and $t = -5.048$ $p = 0.007$ respectively). These findings suggest that the running camp improved behavioral and physical appearance self-esteem of the middle-school children involved.

Space, Narratives, and Portrayals

Moderator: Jennifer Smith
Location: WSC 356

Who is our Purpose?

Olivia Durbin '27 Health Sciences
Advisor: Nicole Rivera

The NetVUE grant, "Who is Our Purpose"_, depicts the landscape mapping of vocational exploration happening across North Central College's campus and documenting physical spaces given to students to articulate their meaning and purpose. Driven by curiosity, we aim to widen collective understanding and awareness of the diverse spaces and processes NCC students are engaging in their vocational exploration across campus, enabling students to dream and explore the vast career options. Our work takes on a compassionate view as we centered the diverse student voices to in identifying conversation locations to ensure inclusion and giving each student space to dream. This piece also demonstrates courage, courage to fail, discover, and try again in the pursuit of professional fulfillment of passion. These images are not just walls of a classroom or confinements to learning, they are the incubators for student discovery and vision to pursue their individualized impactful and fulfilling civic life.

Caring through Stories: A Narrative Medicine Intervention to Enhance Empathy in Physician Assistant Students

Nmesoma Onyejekwe '26 Biochemistry
Advisor: Jennifer Smith & Mary Groll

Narrative medicine aims to strengthen the humanistic dimensions of healthcare through cultivating clinicians' abilities to listen, interpret, and respond to patient stories. This mixed methods study examined the impact of a narrative medicine intervention on empathy. Delivered across six weeks, participants, composed of first year physician assistant students, engaged in guided discussions of Paul Kalanithi's When Breath Becomes Air and a digital narrative of illness. Empathy was measured before and after the intervention using the Jefferson Scale of Empathy. There was a statistically significant increase in empathy scores for all participants, with the group mean rising from 116.0 to 123.3, indicating a stronger empathic orientation toward patient care. Qualitative analysis revealed themes of reflective awareness, emotional attunement, and deeper appreciation of patient experience. Overall, these findings suggest that narrative medicine can support empathy, with future work testing how these results translate into clinical practice among PAs and other clinicians.

The Depiction of Antisocial Personality Disorder in Crime Media

Brianna Gounelis '26 Criminology
Advisor: Jesse Self

The aim of this study was to examine the depiction of antisocial personality disorder in popular crime media to align it with the criteria for the disorder in the Diagnostic and Statistical Manual of Mental Disorders. This study holds significance because crime media influences the public's perception of mental disorders. A literature review was done to establish credibility on this research before data analysis. Ten episodes of the television show, Criminal Minds, were used to analyze ASPD depictions in violent offenders. The proper information about antisocial personality disorder was studied and analyzed to determine common patterns and associations of the disorder. With that information in mind, a coding sheet with common factors and themes of ASPD was created to conduct the content analysis. Following the content analysis and reviewing the existing literature, I found some common themes in the crime media that align with ASPD in the DSM. I also came across some limitations to the study and demonstrated how crime media can be helpful or harmful to the public's perception of ASPD.

Lack of Access to Athletic Trainers in SES; A Critically Appraised Topic

Lunden Alexander, '27 MA Athletic Training
Advisor: Taylor Arman

Socioeconomic status (SES) is a determinant of access to health care in the U.S. In the secondary school setting, athletic trainers (ATs) often function as the primary health care providers for student athletes, delivering immediate evaluation, treatment, and continuity of care. Secondary schools in low SES communities frequently lack the funding to hire and retain ATs. Therefore, this critically appraised topic addresses the question: In U.S. secondary schools, how does being in a low SES community, compared with a high SES community, affect the ability to hire and retain athletic trainers? Four cross sectional studies were appraised, and all earned an A under the Strength of Recommendation Taxonomy (SORT) and a 19/20 on the AXIS score. Based on this critical appraisal, the evidence suggests that disparities in athletic health care access may place student athletes in lower SES secondary schools at increased risk for injury and delayed medical care.

Compelling Approaches in Art and Design

Moderator: David Cordero
Location: WSC 015

From Fields Afar: Facing the Unknown

William Wrage '26 Graphic Design
Advisor: David Cordero

My fall exhibition, From Fields Afar, grew out of an interest in building immersive worlds and narrative systems as a way to reflect on our collective reactions to the unknown and the uncertainties of the future. The project invited viewers into the universe of the Novel Structure Research Commission (NSRC), a fictional pseudo-governmental organization investigating the sudden appearance of abnormal objects around the world. Through this speculative structure, I explored how institutions, bureaucratic language, and material artifacts can echo real systems of power, control, and fear. The exhibition combined 3D rendering, rapid prototyping, wax sealing, typewritten documentation, and cohesive organizational branding. Drawing on influences such as Biblical apocrypha, the postwar Atomic Energy Commission, and contemporary science fiction, the work formed a realized alternate reality, one more fantastical and dangerous than our own, yet intentionally reflective of it.

Pandora and Her Creators: A Reinterpretation of Myth and Art through Clay

Lucie Jumonville '27 Studio Art
Advisor: Michael de Brauw

My ceramic sculpture subverts typical post-classical interpretations of the Pandora myth by reintroducing overlooked elements from the poet Hesiod, the oldest source for the myth. Post-classical interpretations of Pandora such as John William Waterhouse's painting Pandora (c. 1896), flatten and show her as an object of female sin; conflated with Eve. They neglect that Pandora was a vessel for Zeus's anger at deceitful humans, a gift and curse. In my interpretation Pandora is tightly interwoven with the vessel and craft; two ideas lost in later interpretations. In Hesiod, Pandora had a pithos, a large earthenware jar. In the Renaissance, pithos was misunderstood as pyxis (box), helping distort the myth. Pandora herself was made from clay, a material thematically connected, but completely absent in depictions. My piece reconnects artistic depictions of Pandora with the material, the vessel concept, and ambiguity of the original myth, while adding depth back into them.

RESPLENDENT: Self-Portraiture as Process, Product, and Research in Exploration of the Female Identity

Jessica Zambo '26 Design
Advisor: David Cordero

By considering how women have historically used self-portraiture to shape and express themselves, psychoanalytic readings of female artwork reveal both intentionally portrayed and hidden aspects of their identity. This thesis treats art-making as a form of research, using the creative process to explore identity through RESPLENDENT, a solo exhibition created during Jessica's transition into adulthood. RESPLENDENT exhibited a salon-style arrangement of 17 mixed-media paintings in 2026

at Oesterle Library, along with 2 pedestal arrangements of staged workspaces giving insight into the creative process and her own formation of identity.

The Impact of Educational Animation's Design on Contemporary Undergraduates' Engagement in the Digital Age

Aria Suh '25 Design
Advisor: Kevin Valentine

This literature review examines the influence educational animation's design has on undergraduates' engagement in higher education primarily for Generation Z students. Researchers found significant trends in younger generations that are a growing concern such as easy distractibility caused by mobile devices. However, the growing dominance of these screens is not entirely negative. Screens such as smartphones and tablets provide a strong connection between users and knowledge. After analyzing the studies at universities across the world and cognitive theories cited, researchers found simple designed animations are great for sustained attention and comprehension aid. Sources provided guidelines for how an educational animation should be designed and where they can be found in the different studies conducted. The animations that incorporated the use of clever design for education were concluded to be helpful to undergraduates who grew up in a digital age.

Biology and Society

Moderator: Gregory Ruthig
Location: WSC 013

Water Molds as Model Multi-host Pathogens: Determining Disease Risk in Midwestern Pond Communities

Evelyn Kandler '26 Biochemistry
Advisor: Gregory Ruthig

Understanding whether host biodiversity increases (amplification effect) or decreases (dilution effect) disease risk has great potential to inform conservation biology and public health policy; however, evidence for these competing hypotheses remain uncertain. We tested the effect of biodiversity on disease risk using pathogenic water molds and their hosts. Water molds are infectious pathogenic microorganisms common to river and lake ecosystems and infect amphibians as well as many species of aquatic invertebrates. We hypothesized an increase in host species diversity would increase disease risk, supporting the amplification effect. We tested for the effects of host abundance and species diversity as indicators of biodiversity and measured the concentration of infectious water mold zoospores in local ponds to estimate disease risk.
Our data showed that species richness did not significantly drive water mold populations. Cumulatively, these results indicate biodiversity does not determine disease risk and individual host-pathogen relationships may be more valuable.

Carbon Sequestration on Coffee Plots in Highland Guatemala

Tejaswini Baskar Joshi '26 Accounting
Advisor: David Gray

Coffee farmers in the Highlands of Guatemala grow Arabica coffee under shade trees, creating high quality and flavor while also helping the environment. Due to fluctuating market prices, coffee farmers' livelihoods are financially unpredictable. In 2023, we measured shade trees on 8 coffee plots in Guatemala and found there are significant amounts of carbon sequestered in them. Additionally, there is evidence that carbon-neutral coffee has a higher market value. Since coffee roasters produce carbon emissions, they can be potential customers to purchase carbon offsets from the sequestered carbon from the shade trees. From the shade trees on the plots, we found that there is around 28,000 kg of carbon sequestered. Coffee roasters can purchase these offsets to increase the value of their own coffee by labelling it as carbon neutral. Using this income, it is possible to compensate farmers for their work in helping the environment.

Exhausted Coffee Grounds: Reusability for the Adsorption of Contaminants from Water

Madeline Hill '26 Environmental Science
Advisor: Rebecca Sanders

Water contamination from synthetic dyes is an accelerating global issue. Industrial effluents from dye manufacturers and textile mills, release synthetic dyes into the environment. These chemically stable molecules persist in aquatic environments, harming ecosystems and human health. Conventional treatment methods are expensive, energy-intensive, and generate additional waste. Previous studies have demonstrated that exhausted coffee grounds (ECGs) are a sustainable, low-cost biosorbent for removing methylene blue, a model cationic dye, from water. This study evaluates the reusability of ECGs through adsorption-desorption cycles to assess performance over repeated use. It was hypothesized higher pH levels and smaller particle sizes would enhance the performance of ECGs over multiple cycles. Sixty-minute trials showed smaller ECGs retained more methylene blue than larger ECGs after three cycles with 113 mg/g and 42 mg/g, respectively. This study highlights the need to optimize pH and particle size to improve ECG reuse for the purification of dye-contaminated water.

COX10 activity in Leigh Syndrome: The effect of overexpressing a partially functioning allele in Saccharomyces cerevisiae

Bruce Juarez '26 Biochemistry
Advisor: Steve D. Johnston

Leigh Syndrome, a rare genetic disorder characterized by a wide range of neurodegenerative symptoms, results from dysfunction in the oxidative phosphorylation pathway leading to reduced ATP production. We focused on Cytochrome C oxidase 10 (COX10), a gene encoding a protein that is crucial to the assembly and function of cytochrome C oxidase. COX10 variants have shown significantly reduced activity of cytochrome C oxidase, with a select few alleles producing varying partial functionality. Deletion of XRN1, an exoribonuclease involved in RNA metabolism, was

reported to increase the quantity of mRNA transcripts of numerous genes including COX10. A partially functioning allele of COX10 was expressed in Saccharomyces cerevisiae with deletion of XRN1 and COX10 to investigate possible recuperation of phenotypes associated with reduced cytochrome c oxidase activity. The strain exhibited continued loss of aerobic metabolism suggesting that increased expression the partially-functional allele cannot compensate for the reduced activity that is otherwise observed.

Language and Storytelling

Moderator: Quanisha Charles
Location: WSC 040

Marvel-Less Genre and the Narrative Consequences of Franchise Fatigue

Camden Welander '26 Computer Science
Advisor: Saul Kutnicki

The Marvel Cinematic Universe has devolved from an experiment in long-form blockbuster storytelling into a dominant yet diminishing franchise within contemporary cinema. This paper argues that the franchise's diminishing cultural momentum results from a gradual flattening of genre complexity, as films that once layered recognizable genre conventions beneath superhero conventions shifts toward a repetitive formula. Drawing on Rick Altman's syntactic and semantic genre theories, I analyze case study examples from the Captain America and Ant-Man trilogies to demonstrate how early installments showcase varied structural genres beneath a consistent surface aesthetic, and how later entries in the franchise weakened that structural diversity, particularly as comic-book serialization translated into an ongoing cinematic model. By reframing franchise fatigue as a problem of genre erosion rather than audience burnout, this study offers a new lens for evaluating blockbuster storytelling and invites scholars to reconsider how large-scale franchises can sustain artistic vitality within industrial constraints.

Dialogic Healing and Shared Authorship: A Multilingual Student's Duoethnographic Journey Through the e-LOVE Framework

Manar Abdullah '28 Mechanical Engineering
Advisor: Quanisha Charles

This presentation shares the perspective of an Iraqi American multilingual student participating in a duoethnographic, dialogic study with a teacher-mentor. Through sustained dialogue, I explored how elevated-L.O.V.E. (Liberation, Openness, Vulnerability, Equity) shaped my language learning, cultural identity, and confidence as a co-author. Through examining our dialogue and the transformative nature of the student-mentor relationship, we identified how e-L.O.V.E. promotes healing within multilingual educational environments by creating safe, caring, and open spaces. Hence, as my mentoring relationship developed it prospered as a space where my experiences were centered, allowing me to challenge classroom hierarchies while developing my academic voice. Co-publishing with my mentor affirmed the value of my multilingual story and demonstrated how e-L.O.V.E. fosters culturally responsive, healing-centered learning. This work highlights the transformative impact of elevating marginalized student perspectives through dialogue and shared authorship.

The Strategies for L1 and L2 Acquisition

Ruth Nicolalde '26 Psychology
Advisor: Quanisha Charles

This presentation examines how the brain responds to language learning and compares instructional approaches used in first-language (L1) and second-language (L2) acquisition of education. Key topics include the critical periods for language learning, pedagogical techniques, and sociolinguistic factors that shape linguistic development. The goal of this presentation is to demonstrate why early L2 acquisition offers significant cognitive and educational advantages and to highlight the teaching methods that effectively support this process. Because the intended audience includes emerging educators, the presentation also encourages participants to advocate for early and sustained L2 learning. The significance of this research underscores the growing societal need for multilingual competence across sectors such as education, healthcare, business, and other domains of human communication.

The Gateway to the Soul: Adolescent Black Reason in The Bluest Eye

Mia Cassin '27 Secondary Education & English Education
Advisor: Megan Cole Paustian

Recognized as a literary masterpiece, Toni Morrison's The Bluest Eye showcases the internal conflict of a young Black girl's perception of racial beauty. These types of themes connecting race and self-image have previously been explored through critical theories of race. However, specific attention to adolescent characters' experiences with racial awareness is seldom addressed. This critical essay examines how Pecola's story in The Bluest Eye develops the scholarly work of Achille Mbembe, Franz Fanon, and W.E.B. Du Bois. Featuring a close reading of Toni Morrison's work, this essay connects literary theories of structuralism and psychoanalysis with concepts of double consciousness and Black reason. As a result of this analysis, readers can see how Pecola engages in complex instances of emotional regulation and justification to understand her Blackness in relation to the Whiteness around her, representing the mental processes Black adolescents may experience in the real world.

7 Moons and the Post-Mortem Point of View: Music, Literature, Photography, and the Sri Lankan Civil War

Moderator: Casey Gough
Location: WSC 034

Humans & the Connection of Dark Humor in Literature

Cameron Andrea '26 English Literature
Advisor: Casey Gough

Dead Moms Make Great Jokes. But why do we laugh at them? Using two novels, Martyr! by Kaveh Akbar and The Seven Moons of Maali Almeida by Shehan Karuntilaka, I aim to capture how both of these novels tell their respective cultural stories through humor. Whether identity (queer theory and cultural theory) or "laughter through tears", as Chekhov proposes, I aim to write a funny but serious

metanarrative style essay. My goal is to capture how dark humor works fundamentally (narratively and metaphorically) in these novels, and how this humor allows the stories of Iranian and Sri-Lankan conflicts to reach audiences. I'll merge the historical facts and research done by these novelists into my own paper, as well as using their "fictional versions" of the events that occur in the novels. I'll poke and prode at the questions unasked. Why do we have to put a comedic letter on tragedy? How do you write a book about something so gruesome and make it so funny? I'll use my saucy writing style and humor to create a oral presentation as well as writing a humorous essay about a not-so-humor filled concept. Overall, I hope to show how comedic and fiction characters are vessels for the real conflicts and humanity around the world, and raise awareness about the true horrific events that these novels capture. Events that history pretends aren't real.

The Seven Moons of Maali Almeida: A Bohemian Rhapsody

Jillian Calcagno '27 English and Secondary Education
Advisor: Casey Gough

In his Booker Prize-winning novel The Seven Moons of Maali Almeida (2022), Shehan Karunatilaka depicts the brutality of the Sri Lankan Civil War through the ghost of Maali Almeida, a gay war photographer trying to solve his own murder. A clue to the mystery lies hidden in an album by the British rock band Queen, and references to Freddy Mercury appear throughout the novel. However, the references to Queen's music serve a deeper purpose; their iconic song "Bohemian Rhapsody" parallels Maali's fragmented narrative, shifting between contrasting tones and moods, from confessional ballad to operatic crescendo. Drawing from Queen's composition, I argue that Karunatilaka's novel employs cross-genre functions to process queer trauma within postcolonial violence. Thus, performance in both stage and narration creates a space for concealment and revelation, showing how experimental forms help marginalized subjects express the guilt and shame tied to collective political violence.

Photojournalism & the Morals in Between

Seanah Battung-Wenz '27 English and Education
Advisor: Casey Gough

In this paper, I examine photojournalism that critiques tyrannical regimes and exposes genocide, questioning whether spreading awareness through images constitutes meaningful activism. Focusing on the Sri Lankan War and its complex political history, I analyze how photography operates within morally ambiguous spaces of violence and power. The Seven Moons of Civil Maali Almeida by Sri Lankan novelist Shehan Karunatilaka humanizes these tensions through its protagonist, war photographer Maali Almeida, who documents atrocities committed by multiple factions. While his photographs aim to expose injustice, his detachment raises questions about bystander morality and the limits of observational activism. By situating Maali’s choices alongside broader conversations about historical intervention and modern political engagement, this paper argues that photography exists in a moral in-between: capable of revealing truth, yet not inherently equivalent to action.

Center for Social Impact: Community First Fellows Roundtable

Moderator: Suzanne Chod
Location: WSC 104

BOLD Choice: Promoting activist theatre in suburban spaces and the hiatus of Paramount Aurora's BOLD series

Jake Keller '26 Musical Theatre and Theatre: Directing & Dramaturgy
Advisor: Stuart Patterson

As part of the CSI Community First Fellowship panel: The role activist theatre plays in suburban spaces is substantial. My research argues that this type of theatre, which navigates complex societal issues and celebrates marginalized identities, is essential to communities of all kinds--especially those outside of arts-dense spaces. When we place an emphasis on allowing activist theatre to prosper in these communities, we spark education, advocacy, and change amongst them. I am diving into the hiatus of the Paramount Theatre in Aurora, IL's BOLD series, which went into effect in August of last year. Using web research, investigative journalism, and empathizing with various affected constituents, my project will put on display the importance of this service to the Aurora community; too, I have created a piece of theatrical work to supplement my aims. My project is both solution-oriented in its white paper and artfully digestible in its verbatim play.

Pathways to Civic Participation: Increasing Internal Civic Efficacy Among Low-Income

Roselynne Orrala '28 Economics
Advisor: Suzanne Chod

CSI Fellowship Panel Applicant. In 2014, West Aurora High School (WAHS) adopted the Illinois Democracy School (IDS) student engagement framework, a K-12 systemic approach to civic learning. However, with a low-income student population of 49.8%, the need for additional forms of intervention is beyond the adoption of the IDS framework. Research shows that low-income students tend to have persistently low levels of civic efficacy due to fewer in-person civic experiences. It is also known that engaging youth in discussion, debate, or simulation increases their civic knowledge, improving their overall civic efficacy. To test this, I have designed a 1-hour pilot workshop "Pathways to Civic Participation" that includes an in-person simulation, hosted in partnership with the WAHS Upward Bound (UB) program. UB supports college readiness for low-income potential first-generation college students in grades 9-12. The pilot aims to exemplify a replicable intervention that increases low-income youths' short-term internal civic efficacy.

CFF - How Churches can be used for Educational Purposes

Jayden Lawrence '27 Journalism and Media Communications
Advisor: Steve Macek and Suzanne Chod

In the American debates over immigration, communities have long believed that immigrants pose a national threat, as if they contribute nothing to general society. But recently, we've all been forced to face a new truth. The conversation of immigration has always been a local issue. The reason the debates have become so contentious is because we haven't made our systems of democracy inclusive for all individuals. One way to begin evolving our democracy is to look at a community's

church. My project for the Community First Fellowship will produce a workshop centered at Community United Methodist Church, and in this, I argue that motivating civic engagement for immigrant communities isn't separate from our daily lives, instead the Church needs to be involved in this contentious issue. This project begins to look at the roles of local churches in American cities while applying Critical Race Theory frameworks.

The Healthcare Desert: Implementation of Mobile Integrated Healthcare and Community Paramedicine in Rural Areas

Aaliyah McCormick '26 Political Science
Advisor: Nader Hakim

Rural communities in the United States face many barriers to healthcare access, including distance from hospitals, smaller medical workforces, and economic hurdles. Nearly four in five rural counties in the U.S. are considered healthcare deserts. These areas may lack access to a number of vital health institutions, including hospitals, primary care providers, and pharmacies. The COVID-19 pandemic further exposed gaps in medical coverage, particularly for populations at high risk due to age and economic circumstance. In 2025, economic conditions worsened, as federal budget cuts are expected to cost rural healthcare over $100 billion of previously provided funding. In response to these circumstances, I propose the implementation of mobile integrated healthcare and community paramedicine programs through local fire departments in order to fill vital gaps between hospital care and primary care. Ultimately, these programs should seek to improve accessibility, affordability, and efficiency for community members, healthcare institutions, and emergency services.

This submission is for the CSI Community First Fellowship panel.

CSI Fellowship - Data Center Education

Simisola Smith-Pariola '27 Environmental Business
Advisor: Ann Dolinko

I'm applying to the Rall Symposium as part of the CSI Community First Fellowship panel. I have been researching data centers and their environmental impacts. In examining the opinions on data centers, there are two main schools of thought. One group believes that data centers are overall beneficial for cities and towns because of the sizable economic boost that they provide. Another contends that there is no benefit to data centers, they are entirely harmful for the environment with no exceptions, and moratoriums must be set in place. I argue that neither school of thought is correct, as the economic advantage is marred by environmental concerns and there are steps to make data centers less harmful to the environment. By comparing the various stances on data centers in the area, I have realized that education on these topics is key to understanding the complexities behind this crucial and timely environmental concern.

Building Leadership Pipelines: Advancing Women in Collegiate Athletic Administration

Skyy Hills '26 Political Science and Sport Management
Advisor: Suzanne Chod

Despite significant progress in women's participation in collegiate athletics, women remain underrepresented in athletic administrative leadership, particularly within male-dominated sport environments. While existing research documents gender disparities in sport organizations, less attention has been given to the structural systems that shape advancement into decision-making

roles. This project examines the organizational barriers that limit women's progression and explores how intentional leadership pipelines may address these gaps.

Drawing on peer-reviewed literature and semi-structured interviews with women working in collegiate athletic departments, this study analyzes how informal hiring networks, limited mentorship and sponsorship access, and opaque promotion pathways contribute to persistent inequities. The findings suggest that underrepresentation reflects structural shortcomings rather than a lack of qualified women. By synthesizing scholarship and practitioner perspectives, this project proposes evidence-based recommendations for developing transparent, equitable leadership pipelines that strengthen organizational culture and long-term effectiveness in collegiate athletics.

The Stories We Inherit: Student Immigration Storytelling Roundtable

Moderator: Jelena Sánchez
Location: WSC 256

The Stories We Inherit: Student Immigration Storytelling Roundtable

Amanda Azpeitia '28 Biology: Health Professions
Luisa López López, '28 Biology: Biological Science, Entrepreneurship, Finance
Kamryn Neer, '27 Biology: Health Professions & Political Science
Shea Smith,'26 Computer Science
Kelly Tapia, '26 Human Resource Management & Finance
Gabrielle Gangloff, '27 Psychology
Holly Salazar-Ramírez, '29 Communication Studies & Journalism and Media Communications
Advisor: Jelena Sánchez

Across immigrant families in the United States, migration narratives remain an underexamined site of epistemological knowledge. This student roundtable moves beyond descriptive narrations to analyze collected accounts of immigration journeys as primary qualitative texts through the dual frameworks of Narrative Inquiry and Oral History Theory. By focusing on these frameworks, students identified recurring patterns across stories including shared cultural values, collectivism, inherited memory, intergenerational trauma, restorative processes, perseverance, and hope. Situating personal narratives within broader scholarship on storytelling and migration demonstrates that immigrant storytelling functions not merely as personal testimony and reflection, but as vital acts of historical and scholarly significance that illuminate underrepresented communities' experiences of belonging and identity. Furthermore, when told collectively, these stories reveal how the intergenerational transmission of immigration journeys profoundly shape student's sense of self, educational motivation, and their place within the larger story of U.S. history.

Poster Session II: 11:10am – 12:00 p.m.

Stevenson Hall

The Persecution of the Sinti-Romani during the Third Reich

Esteban Nunez '26 English
Advisor: Gregory H. Wolf

Two years after the National Socialists came into power in Germany, in 1933, they enacted the Nürnberg Laws, which legally defined who could be German. While these laws affected primarily Jews, one often overlooked group is the Sinti and Romani, an historically nomadic ethnic group primarily found in central and southeastern Europe. My research explored how the National Socialists systematically persecuted Sinti and Romani. Many were confined to municipal detention camps, where they were subject to violence from the SS and forced labor. After the beginning of World War II, in 1939, the Nazis expanded their genocide of the Sinti and Roma in neighboring countries, enforcing their racial ideology that Sinti and Romani "contaminated" Aryan blood, therefore they, like Jews, needed to be eradicated from society. By the conclusion of the war, more an estimated 250,000 to 500,000 Sinti and Romani were killed in concentration camps.

The Effects of LSD and Marijuana on Counterculture Ideologies

Sophia Fischer '28 History and Secondary Education
Advisor: William Barnett

My research examines how the use of psychedelics and marijuana shaped counterculture ideologies in the United States. During the 1960s, cultural movements that opposed mainstream culture bloomed and social activists focused on bringing people together through peace and love. Anti-war activists Jerry Rubin and Abbie Hoffman wanted young Americans to smoke marijuana together to bring their ideas of unity closer to reality. Psychologist Timothy Leary experimented with LSD to show its therapeutic use and how it can transform the brain. These counterculture activists believed that hallucinogenic drugs could re-wire your brain and create new and transformative ideas. While some argued drug usage was dangerous, many argued that using psychedelic drugs brought positive changes such as musical expression and mindfulness. Experimentation with drugs played a significant role in young people's counterculture efforts to explore the meaning of life and rebel against societal norms in the 1960s.

The Neoliberal Shift in Body Positivity: Commodifying Empowerment and Individualizing Resistance

Megan Sinnaeve '26 Sociology
Advisor: Steve Macek

This research examines how contemporary media narratives surrounding wellness and body positivity movements reinforce neoliberal ideologies through the commodification of empowerment and self-love. Tracing anti-fat bias to its colonial roots, the paper explores how fatness became racialized and moralized, transforming a symbol of abundance into one of inferiority and indiscipline.

While body positivity movements initially sought to dismantle systemic fatphobia, their mainstream adaptation often centers on whiteness, individual acceptance, and consumerism. Through analyses of corporate campaigns like Dove's "Real Beauty" and the rise of wellness industries, the study looks into how media shifts the focus from collective action to one of individualized self-optimization. Drawing on intersectional theory and critiques of neoliberalism, it argues that contemporary representations of empowerment are shaped by capitalist ideology that reward conformity and exclusion. Looking into the limitations of visibility without structural change, this paper calls for a more politicized, inclusive approach to body liberation.

The Effects of Japan's Aging Population on Japanese Business

Patrick Duffy '27 Japanese
Advisor: Reiko Speich

This independent study was conducted solely in Japanese and examines how Japan's rising age and declining birthrates have negatively affected Japanese business. Since the postwar era, fertility rates have consistently fallen. As a result, the working population has shrunk, leading to a decreasing GDP, labor shortages and lowered productivity. Additionally, increasing social insurance costs driven by a mass retirement has put pressure on paychecks and business profits. To keep up with international markets, companies began implementing flexible working, increased part-time gigs, and promoted work-life balance to attract workers. These changes have shifted alongside a change in employee career values from lifetime employment towards flexibility. Overall, the aging population have significantly transformed the Japanese labor markets, company profitability and macro-level economics.

The Boogeyman Is Not Real: Disgust, Anger, and Anti-Transgender Tactics in Contemporary American Conservatism

Aaliyah McCormick '26 Political Science
Advisor: Suzanne Chod

In the years since the landmark Supreme Court case, Obergefell v. Hodges (2015), transgender people, along with the LGBTQ+ community as a whole, have gained considerably higher visibility. Many conservative elites have operationalized backlash to this visibility in the form of disgust directed at the transgender community. Past research on the impact of emotions in political behavior has emphasized anxiety as the primary response to perceived threats. Further analysis, though, reveals that disgust can replace anxiety as the initial reaction to a perceived threat. Affected individuals are more vulnerable to manipulation by political elites, who activate disgust to create an environment of fear and anger. Using historical analysis, I argue that the current backlash against the transgender community is another example in a decades-long political strategy that mobilizes the conservative voter base by invoking disgust towards the LGBTQ+ community.

Essential Oil Thymoquinone Suppress Water Mold Germination in a Dose Dependent Manner.

Connor Stafiej '26 Biology and Cristian Sandoval, '26 Biomedical Science
Advisor: Gregory Ruthig

Water molds are microbes that infect invertebrates and their eggs, causing high egg mortality and economic losses in hatcheries. Management strategies aim to limit water mold infections without eliminating water molds entirely, as they play a key role in organic matter turnover. Recent studies suggest that thymoquinone, an essential oil component, inhibits water mold Growth while remaining nontoxic to aquatic organisms. In this study, water molds were cultured on cornmeal agar containing varying concentrations of thymoquinone dissolved in Tween 80. Control plates containing Tween 80 and untreated agar confirmed that observed effects were due to thymoquinone alone. Partial growth suppression occurred at 37.5 µg/mL, while substantial inhibition was observed at 75 µg/mL after two days. These findings support thymoquinone as a potentially effective and environmentally sustainable strategy for water mold management, warranting further investigation into long-term and ecosystem-level effects.

Thermal Influence on Zoospore Release and Hyphae Growth of Saprolegnia Ferax

Jason Smith '26 Biomedical Sciences
Advisor: Gregory Ruthig

Multihost pathogens, such as Saprolegnia ferax, influence aquatic ecosystems by infecting vertebrate and invertebrate hosts. Temperature can influence both hyphal growth and zoospore release however, there have been past conflicting patterns with how temperature influences water molds. I studied how zoospore release and hyphal growth of S. ferax are influenced across four temperatures (15 °C,20 °C, 25 °C, 30 °C). In the zoospore release experiment, I took measurements using 96-well plates. In the hyphal growth experiment, I measured the diameter and radius of the cornmeal agar plates. Zoospore release was optimum at 25 °C, while hyphal growth increased as the temperature increased and was optimum at 30 °C. This study shows that S. ferax is optimum under higher temperatures. However, higher temperatures, whether it's the zoospore release stage or the hyphal growth stage of S. ferax, can cause different effects that can affect the transmission, infectivity, and susceptibility of Saprolegnia. This study suggests that temperature changes in the field could affect how S. ferax transmits the pathogen and how well it grows within the host.

Survey of pathogen diversity in Midwestern pond communities

Daniella Ballestas '28 Biology
Dallas Gillson '25
Evelyn Kandler '26
Hannah Galletti '27

Advisor: Gregory Ruthig

Pathogen-host interactions create linkages in ecological communities. We assessed the presence of pathogenic organisms infecting invertebrates and living in the water column of pond communities in Northern Illinois. We identified microorganisms living on the hosts by putting the hosts into water baths and sampling the organisms that were shed into the water. We surveyed the water baths as well as water collected directly in the field by adding the water to wells of a 96 well plate that favored the growth of water molds and true fungi. To identify the microorganisms, we sequenced the Intertranscribed Spacer Region (ITS) of the organisms and matched the sequences to previously published sequences on Genbank. We identified a wide diversity of microorganisms living on the

hosts and in the water, including water molds and true fungi. Our findings are important to identifying the common microbes that are associated with invertebrate hosts in aquatic communities.

TCG Verify

Ian Gorrell '26 Computer Science and Computer Engineering
Dastan Kasymbekov '28 Computer Science
Matija Vuckovic '26 Computer Science

Advisor: Sun-il Kim

TCGVerify is a proof-of-concept computer vision system designed to authenticate trading card game (TCG) cards through image-based analysis. While intended for deployment as a mobile application, the current prototype operates on a PC environment. Users upload a local image of a card, which is processed using OpenCV to detect, crop, and warp the card into a canonical form. The system extracts multiple high-resolution regions of interest (ROIs) alongside a resized full-card image. These inputs are jointly evaluated by a convolutional neural network trained on a growing dataset of over 2,500 counterfeit and 6,000 authentic cards. The model produces a binary authenticity classification with an associated confidence score returned through the application interface. Preliminary validation metrics demonstrate promising performance; however, dataset expansion is ongoing to improve robustness and establish statistically reliable evaluation benchmarks.

Predictive Model for Magnetic Field Required to Switch Islands of Magnetic Material

Annella Bellot '27 Professional Physics, Mathematics
Advisor: Susan Kempinger

Artificial magnetic systems are systems of interacting nanomagnets that have interesting technical applications. This project focused on the switching behavior of individual magnets in an artificial magnetic system. We investigated the effect of the orientation of the applied magnetic field on the island coercive field of artificial magnetic systems using micromagnetic simulations. Specifically, we varied the azimuthal angle and original island magnetic state to look at the impact of the polar angle on the effective magnetic field. From this we found the magnetic field required to switch an island. We then created a model that predicts the magnetic field required to switch an island based on the initial conditions.

Simulating Hard Axis Field Contribution on Artificial Magnetic Systems via Mumax3

Zoya Karim '26 Chemistry
Nazifa Anis '26 Applied Mathematics and Physics Interdisciplinary
Annella Bellot '27 Physics

Advisor: Susan Kempinger

Artificial Magnetic Systems (AMS) consist of interacting nanomagnets arranged in defined geometries to impersonate naturally occurring magnetic behavior under controlled conditions. In this study, we examine how hard-axis field contributions affect magnetization dynamics using MuMax3 GPU-accelerated micromagnetic simulations complemented by Python-based data analysis. By systematically varying the in-plane tilt component of the applied magnetic field, changes in in-plane magnetization and switching fields were evaluated. The results indicate that increasing the in-plane tilt strengthens in-plane magnetization and reduces the external magnetic field required for efficient switching. Additionally, the symmetry of the tilt direction influences coupled island behavior, promoting simultaneous switching in specific magnetic pairs. These findings demonstrate that magnetic anisotropy orientation and geometric configuration play critical roles in governing collective magnetic responses and switching dynamics. These fundamental insights can help in the design and optimization of low-power spintronic technologies, including magnetic memory devices (MRAM) and neuromorphic computing systems.

Crystal Structures of Large-Volume Commercial Pharmaceuticals

Jacob Salazar '26 ACS-Certified Chemistry
Advisor: James A. Kaduk

As part of a continuing project, the room-temperature crystal structures of 4 commercial Active Pharmaceutical Ingredients have been solved and refined using synchrotron X-ray powder diffraction data (beamline 11-BM at the Advanced Photon Source at Argonne National Laboratory and the Wiggler Low Energy Beamline at the Canadian Light Source) and optimized using density functional techniques. These include: sunvozertinib $C_{29}H_{35}ClFN_7O_3$ (Zegfrovy®; non-small-cell lung cancer), carfilzomib $C_{40}H_{57}N_5O_7$ (Kyprolis®; multiple myeloma), cefepime dihydrochloride monohydrate $C_{19}H_{26}N_6O_5S_2Cl_2(H_2O)$ (4th-generation cephalosporin antibiotic), and bromfenac sodium sesquihydrate Form I $C_{15}H_{11}BrNO_3(H_2O)_{1.5}$ (Prolensa, Bromday, and Yellox; management of ocular pain).

Evidence of Victim's Depression Influence on Juror Verdicts

Elizabeth Thomas '27 Cognitive/Behavioral Neuroscience and Psychology
Cordelia Skuldt '27 Psychology
Tia Atkins '25 Psychology

Advisor: Claudia Peter-Hagene

Misconceptions about mental health can bias jury decisions. Although a small % of individuals with depression commit suicide, jurors might over-estimate the likelihood of suicide when the victim had symptoms of depression (i.e., high depression incidence among those who commit suicide is incorrectly interpreted as high suicide rates among those with depression). Across three mock-juror studies involving a murder trial in which the forensic evidence was incriminating, but defense argued the victim committed suicide, we examined whether testimony about the victim's depression predicted verdicts. In two non-experimental studies, we found that 22-35% of participants referenced the victim's depression as a key factor in their decision to acquit the defendant. An additional experiment demonstrated that testimony about the victim's depression (vs. no-depression-evidence control) significantly increased acquittal rates, but only for jurors who held negative attitudes toward depression. The studies illustrate the importance of educating jurors about mental health and reasoning biases.

Investigating oxytocin-mGluR2/3 interactions on oxytocin's attenuation of cocaine-seeking in differentially reared rats

Trinity Murray '26 Molecular Neuroscience
Lukasz Teper '26 Behavioral Neuroscience and Psychology
Ryan Breese '28 Psychology and Economics
Olivia Roth '29 Molecular Neuroscience

Advisor: Margaret Gill

Various environmental and genetic factors during childhood can impact susceptibility to drug dependence later in life. Altering environmental rearing conditions early on in rodents alters future susceptibility, as rearing rats in enriched conditions attenuates drug-seeking behavior compared to impoverished rearing. The current study investigated whether the enrichment-induced protective effect is modulated by oxytocin and metabotropic glutamate receptors 2 & 3 (mGluR2/3). Male Sprague-Dawley rats arrived at 21 days of age and were placed into enriched (EC) or impoverished (IC) conditions, for 30 days. Rodents underwent the cocaine-self administration paradigm, which was split into three phases: cocaine self-administration, extinction, and reinstatement. Reinstatement was pretreated with two injections pairing saline/LY341495 (mGluR2/3 antagonist) and saline/oxytocin. Oxytocin only attenuated cocaine-seeking in EC rats, but not in IC rats. mGluR2/3 antagonism did not alter cocaine-seeking or oxytocin attenuation in EC rats, which suggests that oxytocin contributes to enrichment-induced neuroprotection against cocaine-seeking.

The Framing of News Articles

Ruth Nicolalde '26 Psychology
Advisor: Mary Jean Lynch

This study examined the effects of emotionally framed news articles on two different variables: anxiety levels and opinion change. First, undergraduate students (N = 61) had to complete a demographics questionnaire that measured their knowledge about climate change and how important it is to them. Next, they were given the task of either reading a negatively or positively framed article. Last, they had to complete an opinion-change questionnaire that measured their knowledge about climate change and the State-Trait Anxiety Inventory questionnaire to measure their anxiety score after reading the article. I predicted that participants who read the negatively framed article would most likely have a higher anxiety score and greater opinion change than participants who read the positively framed article. The negatively framed article had a marginally significant effect on anxiety scores and opinion-change, suggesting that word-framing has an impact on emotional responses.

Exploring Personality Effects in Text-Based Communication Through Emoji Usage

Taylor Graveman '27 Psychology & Sports Management,
Alayna Lazicki '27 Psychology & Health Science
Katie Weisheit (Non-NCC Student)
Jesus Herrera '26 Psychology

Naomi Virgil '27 Psychology

Advisor: Mary Jean Lynch

This study investigated emoji patterns in everyday text-based communication. Prior research has shown that personality predicts emoji behavior on social media platforms such as Twitter, but less is known about whether these associations extend to text messages. We examined the structure of recent text messages and whether personality traits correlate with individuals' most frequently used emojis. Participants were recruited from NCC's Psychology and Neuroscience subject pool. They completed a Big Five personality questionnaire and shared limited, non-identifiable information from their iMessage history. Emoji data included the four most-used emojis in the "Recently Used" section and the composition of the five most recently sent messages (emoji-only, text-only, mixed), along with the participant's relationship to each message recipient. Preliminary results suggest that emoji use is highly idiosyncratic; college students are most likely to use text-only in their messages and to text their friends more than their parents and siblings combined.

Can white noise with the placebo effect increase memory recall performance?

Colette Tozier '26 Psychology
Advisor: Marissa Bamberger

Previous studies have only separately observed the effect of white noise and the placebo effect on memory– this study combines them in search of an improved joint effect. Introductory psychology students participated in a between-subjects experiment where they completed short-term memory (20-word recall list) and working memory (backwards digit span) tasks with either (1) no white noise and no placebo (control), (2) white noise without placebo, or (3) white noise with placebo. The placebo effect was implemented by falsely claiming white noise improved short-term memory capacity by 5+/- bits of information. I hypothesize the placebo group will perform the best of the two experimental groups with the control group performing the worst. Data collection is ongoing but will be completed in the following weeks. With these findings, teachers may use the expectancy induction of the placebo effect with white noise for teaching to improve students' memory capacities.

Mathematics of Nurikabe

Corey Budd '26 Applied Mathematics
Advisor: Matthew Pons and David Schmitz

Nurikabe is a logic-based pen-and-paper puzzle game. While multiple studies exist for more popular games such as sudoku, research on nurikabe is comparatively scarce. This paper serves as a preliminary investigation into nurikabe by researching questions that have been explored in sudoku, such as counting the number of possible solutions and finding how much information is necessary to guarantee a solution. The project also includes a computer program that can both count solutions and can solve a given nurikabe grid. The results illustrate how differences in the structures of puzzles can make similar questions significantly more simple or complex, and it shows how much more is still unexplored with nurikabe and other games.

Conservative vs Surgical Treatment of FAI

Mia Giurini '27 MA Athletic Training
Advisor: Taylor Arman

Femoroacetabular impingement (FAI) is the number one cause of non-arthritic hip pain in the adolescent and early adult populations. Conservative treatment of FAI includes physical therapy, activity modification, and injections. While hip arthroscopy is the typical surgical technique performed and considered the gold standard. This critically appraised topic (CAT) sought to compare conservative vs. surgical treatment for improving function and reducing pain in patients diagnosed with FAI. Three high-level studies were analyzed using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist and found that, despite being a first-line approach for FAI, conservative treatment alone did not significantly improve patient's quality of life. Conversely, hip arthroscopy led to greater short-term improvements in function and decreased pain in younger adults. However, evidence for long-term surgical outcomes is limited. Therefore, clinicians should consider a multi-layered approach and tailor treatment to patient age, functional limitations, and goals.

Is Open Kinetic Chain Exercise necessary in an ACLR rehabilitation program? A Critically Appraised Topic

Jack Stam '27 MA Athletic Training
Advisor: Taylor Arman

Following an anterior cruciate ligament reconstruction (ACLR), a well-constructed rehabilitation program is crucial to restore knee function to pre-injury levels. Debate persists on whether open kinetic chain (OKC) exercise is necessary in the program. Therefore, the focus of this critically appraised topic was to evaluate whether OKC exercise should be included in an ACLR rehabilitation program to improve knee function and strength. Three articles were selected that fit the inclusion criteria. There were two systematic reviews and a cohort study, making the level of evidence 1a and 2b according to the OCEBM Level of Evidence scale (OCEBM LOE). These articles compared programs that included both OKC and CKC (closed kinetic chain) exercises vs programs with only CKC exercises. Results suggest OKC exercise improved knee function, and should be included alongside CKC exercise in ACLR rehabilitation to optimize knee strength and function, provided proper precautions are taken to avoid adverse effects.

Effect of Mentorship on New Athletic Training Professionals on Job Satisfaction and Clinical Decision Making: A Critically Appraised Topic

Lily Stacey '27 MA Athletic Training
Advisor: Taylor Arman

Athletic trainers (ATs) are allied health care professionals who provide comprehensive care to physically active individuals. Although accredited graduate programs prepare students with foundational skills, newly certified ATs often face challenges as they transition into independent practice. Mentorship can play an important role in supporting this transition. This CAT aims to answer the question: In new athletic training professionals, does a formal mentorship program during the first year of practice improve job satisfaction and clinical decision-making? Three articles

were appraised to examine the relationship between mentoring and the transition to practice among new athletic training professionals. These articles received CASP scores of 9/10, 10/11, and 9/10. Based on this critical appraisal, the clinical bottom line is that evidence supports implementing a formal mentorship program for new athletic training professionals to improve job satisfaction and clinical decision-making. Having a mentor during the transition to practice is beneficial for professional development.

Early Functional Exercise vs Traditional Exercise Post ACL Reconstruction A Critically Appraised Topic

Trevor Scott '27 MA Athletic Training
Advisor: Taylor Arman

Anterior cruciate ligament (ACL) injuries are the most common knee injury that requires surgical intervention and lengthy rehabilitation protocols to regain prior function. Many tests are performed to assess functional performance in the lower leg, but the single-leg hop test is a popular technique. Thus, this critically appraised topic explores the effects of an accelerated rehabilitation protocol with a focus on the hop test outcome measure. Three level 1 randomized controlled trials were included. Each article was assessed using the PEDro scale and received scores of 10, 10, and 8. The analysis of the literature suggests that an accelerated rehabilitation protocol provides a path to regaining strength and stability in a shorter timeframe. Particularly, the studies encompassed a wide age range, revealing that younger individuals yielded better positive hop test results across the board. Therefore, healthcare professionals should consider implementing an accelerated program to shorten recovery timelines.

Virtual on Augmented Reality in CPR Training

Michelle Watson '27 MA Athletic Training
Advisor: Taylor Arman

Cardiopulmonary resuscitation (CPR) is a vital emergency procedure that preserves brain function and restores circulation and breathing during cardiac arrest. Early administration improves survival. CPR training is essential for laypeople and professionals, providing hands-on practice for these life-saving skills. While traditional methods are common, virtual and augmented reality (VR/AR) technologies deliver realistic scenarios that improve skill retention and decision-making. This critically appraised topic seeks to answer: Does participation in CPR training lead to improved performance in CPR skills when assessed [TA1.1]through VR/AR simulation or traditional training methods? Four studies involving both populations were appraised. Collectively, the evidence aligns with Level 1 on the CEBM scale. On the PEDro scale, two articles scored 9/10, and the other two scored 10/10. Based on this critical appraisal, while VR/AR simulation offers additional advantages, participation in CPR training, whether traditional or VR/AR-based, leads to improved CPR performance across all populations.

In Football Athletes Without Previous Knee Injury, How Does Bracing, Compared to No Knee Bracing, Affect the Risk of Knee Injury: A Critically Appraised Topic

Joana Persiani '27 MA Athletic Training
Advisor: Taylor Arman

Major knee injuries are common among American football linemen, leading many athletes to use bilateral knee braces as a preventive measure. Despite this practice, concerns about cost and player reluctance have raised questions about the true effectiveness of bracing. Therefore, the focus of this critically appraised topic was to answer the clinical question: In football athletes without previous knee injury, how does bracing affect the risk of knee injury? Three studies were appraised: a systematic review, a cohort study, and a controlled laboratory study. The studies received the following critical appraisal scores: PRISMA 23/27, STROBE 24/25, and MINORS 15/16. Based on this critical appraisal, the clinical bottom line is that current evidence is inconclusive, and further research is needed before strong clinical recommendations can be made.

Whole Body Vibration and Increasing Hitting Performance for Baseball and Softball Players: A Critically Appraised Topic

Benjamin Dakis '27 MA Athletic Training
Advisor: Kendall Selsky

Whole-body vibration (WBV) platforms are a widely used tool in the sports, health, and fitness world within recent years because they have been shown to improve muscle function in users. Hitting sports such as baseball and softball require the athlete to have very quick muscle activation in the upper and lower extremity, indicating that WBV therapy may be useful in increasing an athlete's hitting performance. Therefore, the focus of this critically appraised topic was to answer the clinical question: does WBV training increase hitting power/performance in baseball and softball players? Four randomized controlled trials were appraised for this topic. Three of these articles were rated 8/10, and one was rated 6/10 using the Physiotherapy Evidence Database (PEDro). Based on this critical appraisal, the clinical bottom line is that WBV training was effective in increasing hitting performance, but only when combined with other exercises.