W. CELEBRATION OF STUDENT RESEARCH, SCHOLARSHIP, & CREATIVE WORK

JANUARY 27, 2023 | WABASH COLLEGE

Congratulations!

The Celebration Planning Committee is excited to announce the winners of two prestigious awards associated with today's event.

Celebration Research, Scholarship, and Creativity Awards

These \$150 prizes are awarded to the students who most effectively articulated gains in professional development and personal growth as a result of their research, scholarship, or creative work.

This year's winners are listed below, in alphabetical order.

Nhan Huynh '24: Functional Study of the SASH1 Gene in Developing Skin Pigmentation Disorder

Auggie Isaac '25: Bacdegron-LOCKR: When You Want to Break Up with Your Proteins

Tom Oppman '25: Developing a Model for C. elegans 26S Proteasome Function in vitro

Robert Wedgeworth '59 Library Research, Scholarship, and Creativity Awards

These \$500 prizes are awarded to recognize effective use of library resources in the preparation of Celebration work. This year's winners are listed below, in alphabetical order.

Nathen Burnside '23: Life, and Philosophy, in Moderation: Hume's Practical Argument for Moderate Skepticism

Eric Green '24: Rainbow Numbers of Z_p for $x - y = z^k$

Khoi Truong '23: Impacts on Income Inequality from the Aftereffects of Financial Crisis with Market Expectations and Macroeconomic Factors

Welcome and Introduction

Welcome to the 23rd Annual Celebration of Student Research, Scholarship, and Creative Work at Wabash College. For the past 22 years, the College has recognized in a proud and public way the creative accomplishments of Wabash students. We celebrate not only the particular achievements of individual students, but also a deeply embedded ethos of the College. The impressive breadth and quality of student creative work is evidence of the challenge and change that marks the Wabash experience.

This program is dedicated to the memory of Paul Caylor McKinney '52, who passed away in 2003 after a courageous battle with cancer. Dr. McKinney proudly served the College for more than half a century as chemistry teacher, department chair, division chair, and Dean of the College. He was an exemplar of the liberally educated person whose interests ranged from quantum mechanics to Plato, from playing the piano to pondering Nietzsche. He acted in Wabash College Theater productions and was often found backstage working on difficult equations in his notebook. He was a master teacher who helped countless Wabash students develop their creativity and love of the liberal arts. Likewise, he encouraged new faculty to embrace the culture of the College. I fondly remember the encouragement he gave me to teach in the Wabash first-year program and his mentorship on a teaching and learning project on which we collaborated. Among Wabash men, he would well understand and appreciate everything presented today; he would be the first to celebrate the successes of Wabash students and faculty members.

Close collaboration between Wabash students and faculty across the College is a hallmark of our culture, a labor of pedagogy and love that makes a difference for our students. It is a special pleasure to introduce some of the results of that collaboration in these presentations. Our thanks go to the students who are prepared to teach the Wabash community about their good work and to the faculty and staff members who have devoted considerable time helping students in their research and creative productions.

A conference of this size and scope would not be possible without the dedicated work of many people. I want personally to express my thanks to the planning committee: Chair Lon Porter, Michelle Janssen, Beth Daniel Lindsay, Jeffrey Reed Jay, Robert Royalty, Nicholas Snow, Erika Sorensen-Kamakian, and Sarin Williams. Andrew Taylor and ETS students contributed to the poster production, as have other ETS and IT Services staff; Becky Wendt formatted and prepared the program for printing; Mark Siegel authored the online event presentation application system; Campus Services, and Mary Jo Johnston and her Bon Appetit staff make the logistical support appear effortless. Finally, we are grateful to all of you whose attendance supports this community Celebration.

—Todd McDorman, Dean of the College

Schedule for Oral Presentations

Oral presentations will begin at 1:15 p.m. and continue every 25 minutes with a 10-minute break. The last sessions begin at 3:20 p.m. In general, students will present information for 12–15 minutes with a few minutes for questions and passing time. Please see the following pages for a list of oral presentations by room location and time slot. Names of the presenters, as well as their sponsors and abstracts, are listed in alphabetical order beginning on page seven.

Schedule for Poster Presentations

Students will present and discuss their posters and exhibits in 60-minute increments beginning at 1:15 p.m. and 2:30 p.m. in Detchon International Hall. You will find a list of presenters and their time slotbeginning on page five. Names of the poster presenters and co-presenters, as well as their sponsors and abstracts, are listed by alphabetically beginning on page 10.

Oral Presentation Schedule

	Detchon 109				
1:15	Jonathan Silva-Melendez	Return Migration in a Transnational Mexican Community Ruth Hernandez (Hispanic Studies)			
1:40	Nikolai Jones	Comparing Classical and Quantum Decay Rates of an Unstable Particle in a Barely-Bound State of a Finite Square Well Dennis Krause (Physics)			
2:05	Cooper Smith	Correcting (Un)usual Residence: Prison-Based Gerrymandering, Rural Counties, and State Expenditures Dylan Irons (Political Science)			
2:30	Alexander Litts	Computational Study of CuSeO ₃ as Catalyst for Sonogashira Reactions Joe Scanlon (Chemistry)			
2:55	Joseph Miller, Thomas Oppman, & William Neubauer	Vaping on Wabash's Campus Jill Rogers & Eric Wetzel (Global Health)			

Detchon 209				
1:15	Luis Rivera	Prostitution Houses and Storyville in New Orleans Sarin Williams (Music)		
1:40	Gage Businger	Jazz on the River: A History of Riverboat Jazz Sarin Williams (Music)		
2:05	Patrick Beam	Musical Ensembles on TikTok Mollie Ables (Music)		
2:30	Richard Ricketts	Calvinist Horror and the Summary, Analysis, Continuity, and Discontinuity of Two Contemporary Retellings of <i>Doctor Faustus</i> Jeffrey Reed Jay (Religion)		
2:55	Preston Reynolds	A Relationship of Trust: Defining Fiat Currency in the 12th Century Song Dynasty Stephen Morillo (History)		
3:20	Nathen Burnside	Life, and Philosophy, in Moderation: Hume's Practical Argument for Moderate Skepticism Matthew Carlson (Philisophy)		

Poster Presentation Schedule

		Detchon International Hall
	Brian Dobbels & Brigham Anderson	Drivers of Variation in Innate Immune Assays in Box Turtles Bradley Carlson (Biology)
	Quinton Wood & Ethan Johns	Investigating the Role of Calcium in Endoplasmic Reticulum Stress Heidi Walsh (Biology)
	Jovan Simakoski & Nathan Pairitz	Uvulifer ambloplitis (Platyhelminthes: Trematoda) Larval Infection in its Local Fish Host (Notropis sp.) Eric Wetzel (Biology)
	Owen Hauber	Aelosoma Regeneration in Different Solutions Patrick Burton (Biology)
	Eric Green & Cody LeNeave	Computational Investigation of CuPdO_2 Catalyzed Sonogashira Reaction Joe Scanlon (Chemistry)
1:15–2:15	Austin Johnson & Mitchell Keeling	When Worms Get on Your Nerves: Destroying Neuronal Proteins using LOCKR Erika Sorensen-Kamakian (Biology) & Walter Novak (Chemistry)
	Mawuli Nevis & Henry Giesel	A "Key" Template for Unlocking Protein Degradation in <i>C. elegans</i> Erika Sorensen-Kamakian (Biology) & Walter Novak (Chemistry)
	Michael Bertram & Connor Wakefield	Crushing it with LOCKR: an Eggceptional Way to Destroy Proteins Erika Sorensen-Kamakian (Biology) & Walter Novak (Chemistry)
	Augustus Isaac & Nhan Huynh	Bacdegron-LOCKR: When You Want to Break Up with Your Proteins Walter Novak (Chemistry) & Erika Sorensen-Kamakian (Biology)
	Nhan Huynh	Functional Study of the SASH1 Gene in Developing Skin Pigmentation Disorder Walter Novak (Chemistry) & Erika Sorensen-Kamakian (Biology)
	Thomas Oppman & Grant Johnson	Developing a Model for <i>C. elegans</i> 26S Proteasome Function <i>in vitro</i> Walter Novak (Chemistry) & Erika Sorensen-Kamakian (Biology)
2:15	Break	

Poster Presentation Schedule

		Detchon International Hall
2:30-3:30	Eric Green	Rainbow Numbers of Z_p for $x - y = z^k$ Katie Ansaldi (Mathematics & Computer Science)
	Ethan Hurt	The Consequences of Recessionary Variables on Beverage Expenditures in The United States from 1999–2019 Sujata Saha (Economics)
	Khoi Truong	Impacts on Income Inequality from the Aftereffects of Financial Crisis with Market Expectations and Macroeconomic Factors Sujata Saha (Economics)
	Simon Terpstra	Rich vs. Poor: A Comparative Analysis Between Western and Eastern Europe, Including Other Regions, and the Factors that Affect Gross Domestic Product Sujata Saha (Econimics)
	Nikolai Jones & Bryan Cherry	The Frequencies that Comprise the Wabash "W" Nathan Tompkins (Physics)
	Bernardo Morales	Aerodynamics: Measuring the Downforce of a Costume Rear Wing in a Wind Tunnel Nathan Tompkins (Physics)
	Michael Hoppel	Camphor Boats Nathan Tompkins (Physics)
	Luis Rivera	The Impact of Avoidance Coping and Fear on Conspiracy Theory Beliefs Neil Schmitzer-Torbert (Psychology)
	Jonathan Silva-Melendez, Seth Kirkpatrick, Richard Ballentine, & Parker Gamble	The Interception of Hispanic Identity and Democracy Chris Anderson (Rhetoric)

Oral Presentations (Alphabetical by Presenter)

Presenter: Alexander Litts **Sponsor:** Scanlon, Joe

Title: Computational Study of CuSeO₃ as Catalyst for Sonogashira Reaction

The Sonogashira reaction is a useful cross-coupling reaction employed in the creation of new carbon-carbon bonds between two terminal alkynes, aryl, or vinyl halides. These carbon-carbon forming reactions are useful for the synthesis of more desirable and complex organic compounds. CuSeO₃ nanoparticles were experimentally found to be an effective catalyst producing high yields of the desirable product for this reaction whereas, the monometallic CuCl₂ and SeO₃ were found to be ineffective. Computational chemistry was employed to investigate the catalytic mechanism of the CuSeO₃ complex by comparing the catalytic activity of CuCl₂ and SeO₂. Several reaction pathways were determined along with important intermediates and transition states. Experimentally, it was found that the solvent DMF (dimethylformamide) is crucial for a high yield and the possible role of DMF participating in the reaction was investigated as well. The barrier height for the CuSeO₃ was determined to be 22.1 kcal/mol, while the barrier heights for SeO₂ and CuCl₂ were determined to be 49.0 kcal/mol and 35.9 kcal/mol.

Presenter: Cooper Smith Sponsor: Irons, Dylan

Title: Correcting (Un)usual Residence: Prison-based Gerrymandering, Rural Counties, and State Expenditures

Prison-based gerrymandering refers to the act of counting people in prison as residents of their prisons—not their pre-incarceration homes—for representation. As prisons are disproportionately located in rural, whiter areas, and the nonvoting people inside them are disproportionately urban people of color, prison-based gerrymandering bolsters political power in prison communities while siphoning would-be voters from urban areas. Recent studies suggest that prison communities wield their political power at the state level, receiving more in state expenditures than the community pays in tax revenue. In other words, rural communities with prisons receive more "bonus dollars" than rural communities without prisons. Is this trend reversible?

As more states abolish prison-based gerrymandering, this project analyzed two cases to determine if the abolition of prison gerrymandering changed the amount of "bonus dollars" to prison communities. Both New York and Indiana engaged in prison gerrymandering in 2010. But by the end of 2010, New York abolished prison-based gerrymandering. This study relies on 2020 Census data—the first redistricting cycle since New York's abolition—and finds that New York saw a five-fold decline in the correlation between percentage of people in prison and "bonus dollars" at the county level. Just 10 years after abolition, New York's bonus spending for prison counties dissipated. Indiana, which did not abolish prison-based gerrymandering, did not see the same decrease. Abolition worked—and it only took one redistricting cycle to see the effects.

Presenter: Gage Businger **Sponsor:** Williams, Sarin

Title: Jazz on the River: A History of Riverboat Jazz

The presentation will inform the audience about riverboat Jazz on and around the Mississippi River and other rivers in the continental United States. The presentation will prove the significance that riverboat jazz had in the integration of black culture in the form of jazz music in northern industrialized cities during the Great Migration. This presentation will be performed orally with the help of visual aid (Power Point) for the audience.

Oral Presentations

Presenter: Jonathan Silva-Melendez

Sponsor: Hernandez, Ruth

Title: Return Migration in a Transnational Mexican Community

This project draws on qualitative interviews with return migrants (10 men). The data is part of a study that analyzes transnational Mexican migration between Connecticut, U.S.A., and Tlaxcala, Mexico. The research questions that guide our analysis are 1) what factors drive migrants to return to Mexico? 2) How does gender factor into those decisions? Return migrants cite physical exhaustion, emotional well-being, and labor abuses as the main reasons to return to their home country. Moreover, our findings illustrate how migrants conceptualize their migration through a rigid dichotomy tied to economic prosperity.

Presenter: Joseph Miller, Thomas Oppman, & William Neubauer

Sponsor: Rogers, Jill & Wetzel, Eric J. **Title:** Vaping on Wabash's Campus

Nicotine vape use is a growing epidemic among young adults aged 18–26. The student-lead Public Health Organization (PHO) at Wabash College is interested in launching an informational cessation-based campaign to supply students with resources they need to quit their use of nicotine vapes. The PHO surveyed the Wabash student body in order to gather baseline data about Wabash students' vaping habits. Survey results will inform next steps in developing campus-wide strategies to encourage and support cessation. Several significant statistics were obtained through this survey. Approximately 17.6% of students reported current nicotine vape use. Of those who reported current use, 78.3% reported daily use, and 32.4% reported using hourly or multiple times an hour. Notably, 73% of users reported the desire to quit. Based on these results, the PHO plans to develop programming on vaping topics that are important and relevant to Wabash students.

Presenter: Luis Rivera
Sponsor: Williams, Sarin

Title: Prostitution Houses and Storyville in New Orleans

Unbeknownst to many, the prostitution houses in Storyville played an integral part in the growth of Jazz as a genre. In fact, many famous Jazz artists such as Jelly Roll Morton, Tony Jackson, and Rosalind Johnson got their start playing in the prostitution houses of Storyville. In this presentation, I take a deep dive into the rich history of Storyville, and specifically, the unique intersection of Jazz and prostitution houses.

Presenters: Nathen Burnside **Sponsors:** Carlson, Matthew

Title: Life, and Philosophy, in Moderation: Hume's Practical Argument for Moderate Skepticism

In discussing what constitutes human knowledge, David Hume argues we have no good reasons to believe anything we have come to know or could ever possibly know, and if we are to follow skeptical arguments to their logical end, it can only result in a rejection of all possible beliefs. The strictest adherence to philosophical practices and ideas, as Hume points out, can only ever lead to skepticism and, in certain cases, insanity. However, Hume believes the answer to this philosophical crisis is to simply enjoy quality time with others and soon thereafter, your worries about the rationality behind your own beliefs will disappear. For centuries, philosophers have debated the efficacy of Hume's response to this issue, with some claiming the response is really no response at all. I argue that Hume's response to this philosophical crisis shows a preference for 'life' over 'philosophy' when ultimately faced with the decision, and that although his answer does not have logical support, the response is completely warranted given its practicality for human life.

Oral Presentations

Title: Nikolai Jones **Sponsor:** Dennis Krause

Title: Comparing Classical and Quantum Decay Rates of an Unstable Particle in a Barely-Bound State

of a Finite Square Well

The classical and quantum versions of a system exhibit markedly different results. While Bohr's correspondence principle tells us that the behavior of quantum systems at high energy levels resembles classical systems, conversely there exist some very low energy states maximizing the difference in character. We observe one such case, the barely bound state, in which the difference between the classical and quantum versions of the system is maximized. Then, we determine how we can probe this with a real experiment using an unstable particle. This enables us to use the average kinetic energy of the particle K in a formalism that gives a relationship describing the relative decay rate due to time dilation between a free particle at rest and a bound one using its average kinetic energy.

Presenter: Preston Reynolds **Sponsor:** Morillo, Stephen R.

Title: A Relationship of Trust: Defining Fiat Currency in the 12th Century Song Dynasty

Fiat currency, a national currency deriving value from a promise of backing, is generally considered to be modern innovation. However, the origins of unbacked currency go as far back as the 9th century AC. Under the Chinese Song Dynasty (960–1279), innovation, trade, and bureaucracy all reached new heights for the region, if not the world. The Song pioneered movable-type printing and the world's first government-issued paper-printed money. Song currency eventually culminated in the Huizi, completely reliant on government trust. In a larger sense, the Song dynasty redefined a "relationship of trust" between the emperor and citizenry, ensuing a coequal societal awareness. The result is an efficient network-hierarchy relationship. In a world where the gold standard has been left in the dust, we must consider how a relationship of trust informs our current bond between government and citizens.

Presenter: Richard Ricketts **Sponsor:** Reed Jay, Jeffrey

Title: Calvinist Horror and the Summary, Analysis, Continuity, and Discontinuity of Two Contemporary

Retellings of Doctor Faustus

Doctor Faustus and its Contemporary Retellings, ore Calvinist Horror and the Summary, Analysis, Continuity, and Discontinuity of Two Contemporary Retellings of Doctor Faustus, will be a short presentation examining what makes Calvinist horror truly terrifying. The use of multi-media examples will be used to show how two contemporary retellings of Goethe's Faust explore and play with the concept.

Poster Presentations (Alphabetical by Presenter)

Presenters: Augustus Isaac & Nhan Huynh

Sponsors: Novak, Walter & Sorensen-Kamakian, Erika

Title: Bacdegron-LOCKR: When You Want to Break Up With Your Proteins

Protein degradation removes old or unnecessary proteins from the cell and is crucial to maintaining cellular activities and responding to external stimuli. Degrons are short protein sequences that flag proteins for degradation. The degron-LOCKR (Latching Orthogonal Cage/Key pRoteins) system is a designed bioactive protein switch that elicits protein degradation of LOCKR and any protein it is attached to in the presence of an inducible key. LOCKR, while utilized in eukaryotic cell models, has not yet been utilized in prokaryotes. Therefore, this research aims to develop degron-LOCKR to control protein degradation in bacteria. First, we redesigned LOCKR to contain the bacterial ssrA degron sequence (bacdegron). Next, we fused bacdegron-LOCKR to a green fluorescent protein using PCR and Gibson Assembly techniques. To examine the effectiveness of our bacdegron-LOCKR design, we expressed it in E. coli. Following key induction, we found a reduction in fluorescence, verifying bacdegron-LOCKR's ability to degrade proteins in prokaryotes. While our current work seeks to optimize the LOCKR system for protein degradation in bacteria, we hope that the adaptation of different bioactive motifs, such as ones that trigger a change protein localization or initiate a new protein-protein interaction, will allow the bacdegron-LOCKR system to manipulate bacterial proteins in novel ways and provide a new technique for cellular engineering in prokaryotes.

Presenters: Austin Johnson & Mitchell Keeling

Sponsors: Sorensen-Kamakian, Erika

Title: When Worms Get on Your Nerves: Destroying Neuronal Proteins Using LOCKR

The ability to inactivate gene function in living organisms is essential for understanding how those genes participate in normal and disease traits. Our work involves optimizing the de novo designed 'Latching Orthogonal Cage—Key pRoteins' (LOCKR) system for use in *C. elegans*, a nematode worm. This system can inactivate multiple genes (at the protein level) simultaneously. There are two main components of LOCKR used for protein inactivation or degradation: 1) the degronSwitch and 2) the inducible key. The degronSwitch cages a degron, a short sequence that signals for protein degradation. When caged, the degron is in the off or "locked" state. Upon key addition, the degron becomes exposed, causing the degronSwitch and any protein fused to it to undergo degradation. Keys can be tailored for tissue-specific expression in worms using promoters. Here, we discuss constructing KeyC constructs with tissue-specific promoters to restrict key expression to all neurons or dopaminergic neurons. Given that worms have only eight dopaminergic neurons and neuronal architecture is more complex than other cell types, we are optimizing an imaging technique called expansion microscopy. Expansion microscopy allows detailed imaging by making biological specimens physically bigger through a chemical expansion process that preserves detail. In the future, we will generate worms with neuron-specific keys using MosSCI, a powerful gene editing technique, and examine key expression in the worm using the expansion microscopy technique.

Presenters: Bernardo Morales Sponsors: Tompkins, Nathan

Title: Aerodynamics: Measuring the Downforce of a Costume Rear Wing in a Wind Tunnel

Aerodynamics has been an essential tool to design efficient means of transportation, which increases downforce and fuel efficiency. The force that slows down any object moving through a fluid is drag. In motor vehicles, rear wings are meant to make a car move through air faster, thus reducing drag. Through geometry, 3D modeling, and data gathering, a wing that can improve downforce and reduce drag can be designed. A wind tunnel will be the ideal setting to test the wing and look at the comparison between drag and downforce. The significance of designing a rear wing is that a car can go faster, which will reduce the fuel consumption of the car. The results of the wing determined that the wing creates great amounts of downforce for its size.

Presenters: Brian Dobbels & Brigham Anderson

Sponsors: Carlson, Bradley

Title: Drivers of Variation in Innate Immune Assays in Box Turtles

Immune function is critical for survival of animals, and innate immunity is believed to be the most important component of immunity in reptiles. We have been studying the box turtle (Terrapene carolina) population at Allee Woods, a Wabash College nature preserve. This species is declining in many regions, in part due to diseases. This study aimed at evaluating innate immune function of individual box turtles, and determining how immune function was affected by sex, size, behavior, and individual differences. Hemagglutination assays as well as bacterial killing assays (BKA) were run twice for each individual turtle. BKA was also found to be lower in males when compared to females, however the opposite was true for the hemagglutination. Both BKA and hemagglutination were repeatable across individuals, indicating individuals are distinctly different in immune performance, and the two assays were correlated with each other. All other variables had no effects on the innate immune function of individual turtles.

Presenters: Eric Green **Sponsors:** Ansaldi, Katie

Title: Rainbow Numbers of Z_p for $x - y = z^k$

An exact r-coloring of a set S is a surjective function $c: S \longrightarrow \{1, 2, \ldots, r\}$. A rainbow solution to an equation over S is a solution such that all components are a different color. The rainbow number for an equation in the set S is the smallest integer r such that every exact r-coloring has a rainbow solution. We compute the rainbow numbers of Z_p for the equation $x - y = z^k$, where p is prime and k > = 2.

Presenters: Eric Green & Cody LeNeave

Sponsors: Scanlon, Joe

Title: Computational Investigation of CuPdO₂ Catalyzed Sonogashira Reaction

The Sonogashira coupling is a carbon-carbon bond-forming reaction between a terminal alkyne and an aryl halide. This type of reaction is useful as it can lead to desirable complex molecules. Experimentally, CuPdO₂ nanoparticles were found to be efficient catalysts for this reaction, whereas the monometallic CuCl₂ and PdCl₂ were not. Mechanisms for this reaction using CuPdO₂ and the monometallic analogs were investigated computationally using the B₃LYP density functional and def2-SVP basis set. Multiple reaction pathways were modeled, including important intermediates and transition states. Also, the possible role of the solvent, dimethylformamide (DMF), in the reaction was investigated. Without DMF, the barrier height for CuPdO₂ was found to be 50.5 kcal/mol. The barrier height for PdCl₂ and CuCl₂ reaction were 40.9 and 35.9 kcal/mol.

Presenters: Ethan Hurt Sponsors: Saha, Sujata

Title: The Consequences of Recessionary Variables on Beverage Expenditures in The United States

from 1999-2019

This paper examines changes in expenditures on consumable beverages (coffee, alcohol, and non-alcoholic drinks) in the United States of America in terms of how they behaved after the 2007–09 financial recession. Quarterly data from the St. Louis Federal Reserve Economic Data (FRED) for the years 1999–2019 and regression analysis were used to determine how the financial impacts of the recession affected the demand for coffee, alcohol, and non-alcoholic drinks and therefore affected expenditures on beverages. The results suggest a positive relationship between the different Consumer Price Indices (CPI) and personal income, unemployment rate, and delinquency rate. Additionally, there is a secondary model that used stock price data of large companies within the coffee, alcohol, and non-alcoholic drinks industry from Yahoo Finance. The goal of these models is to evaluate the impacts at an industry level. Overall, the findings suggest an increase in expenditures on beverages as either net worth or economic uncertainty increased.

Presenters: Jonathan Silva-Melendez, Seth Kirkpatrick, Richard Ballentine, & Parker Gamble

Sponsors: Anderson, Chris

Title: The Interception of Hispanic Identity and Democracy

Demographic changes within the United States necessitate a new understanding of the meaning of democracy for its fastest-growing ethnic population (Vespa, Medina, & Armstrong, 2020). Marginalized communities often view democracy with an alternative understanding, given its historical and modern applications to their community. Hispanic/Latinx communities are becoming powerful in terms of their voting potential and impact on U.S. politics. However, their unique understanding of democracy leads to different applications and standards for democracy and those trying to engage those populations in political organization. Thirteen semi-structured interview transcripts focusing on the understanding of democracy with Hispanic/Latinx individuals throughout the U.S. are examined using thematic analysis. Themes are linked with the individual understanding of Hispanic/Latinx identity, suggesting more nuance than monolithic identity labels apply. The accessibility and application of democracy as a construct to these identities often suggests a need for alternative framings to help engage these communities in the political process. The problematic application of single race/ethnicity labels changed the understanding of political issues commonly linked with the Hispanic/Latinx community.

Presenters: Jovan Simakoski & Nathan Pairitz

Sponsors: Wetzel, Eric J.

Title: Uvulifer ambloplitis (Platyhelminthes: Trematoda) Larval Infection in its Local Fish Host (Notropis sp.)

Uvulifer ambloplitis (Trematoda: Digenea), one of several parasites found commonly in local aquatic ecosystems, is easily identified by observing this larval parasite ("blackspot" metacercariae) in the skin, fins, and musculature of fish intermediate hosts. However, few reports of this infection exist for this region of Indiana. In this study, the prevalence, abundance, and dispersion of blackspot infection were examined in minnows (Notropis sp.) from three sites in Sugar Creek to determine if intraspecific variation in fish size significantly affected the number and prevalence of blackspot metacercariae. Large fish appeared to have the highest prevalence (56%), followed by small (39%) and then medium-sized fish (34%). The parasite displayed an aggregated dispersion pattern in the fish population from all months, sites, and size classes that were examined. Additional findings showed support for treating the three sampling sites as individual (sub-) populations despite them being in relatively close proximity to one another. Finally, we suggest that our research supports the conclusion of Lemly & Esch (1984), that larger fish with higher densities of blackspot infection may have an increased mortality rate compared to smaller fish with fewer parasites.

Presenters: Khoi Truong Sponsors: Saha, Sujata

Title: Impacts on Income Inequality from the Aftereffects of Financial Crisis with Market Expectations and

Macroeconomic Factors

Recent decades have seen the distribution of income affected by multiple factors, especially with the recent financial crisis. This paper analyzes the aftereffects of the 2007–09 Great Recession on income inequality, in combination with market expectations and macroeconomic factors, across 15 countries. Annual data is collected for the period between 2004 and 2018, from upper-high-, lower-high-, and middle-income economies. Key results provide more evidence to the expected rise in income inequality across all-country income groups. Additionally, rising per-capita income in all panels is expected to translate to the narrowing income gap post-crisis. This paper also notes that expansionary monetary policies can have stabilizing effects on the income gap in all-country income groups involved.

Presenters: Luis Rivera

Sponsors: Schmitzer-Torbert, Neil

Title: The Impact of Avoidance Coping and Fear on Conspiracy Theory Beliefs

This study attempts to replicate the findings of Marchlewska and colleagues (2021), who found that priming participants to think about avoidant coping strategies significantly increased ratings of belief in conspiracy theories. We had previously attempted to replicate their findings earlier in the Spring of 2022, but were unsuccessful. In another attempt to replicate Marchlewska and colleagues' findings, we crafted a new coping strategy prime. We also added a list of stressful situations to the survey to increase the effectiveness of the subsequent coping prime. We ran this study both online using Prolific and in-person (n = 80) on the campus of Wabash College. Despite our efforts to increase the effectiveness of our coping primes, we were unsuccessful in replicating the findings of Marchlewska and colleagues, and we found no impact of priming avoidant coping strategies on conspiracy theory belief. While there are few discrepancies between our study and their study, it still stands to reason that we should have been able to replicate their findings at least once in two targeted attempts. This result, combined with the similar result from earlier this year, suggests that the integrity of the result achieved by Marchlewska and colleagues in their study may be brought into question.

Presenters: Mawuli Nevis & Henry Giesel

Sponsors: Sorensen-Kamakian, Erika & Novak, Walter

Title: A "Key" Template for Unlocking Protein Degradation in *C. elegans*

The ability to control proteins in an organism allows scientists to understand how proteins function in development and disease. The Latching Orthogonal Cage-Key pRoteins (LOCKR) system is a de-novo protein-control tool consisting of a key and switch. The switch masks a bioactive sequence, such as a degron, for protein destruction. When the key is added, the degron is unmasked, causing the switch and any attached protein to be degraded. In our work, we designed templates for two keys (A and C) for expression in *C. elegans*, a small worm, using PCR and Gibson cloning. Our templates have the key, a small epitope tag used for detection in the worm, a tubulin 3' UTR for sequence stability, and most importantly, a docking site for promoters. This docking site allows us to insert different promoters, which will specify which tissues have key expression and therefore, which tissues will have degronSwitch degradation. So far, we have added two promoters, one for key expression throughout the animals and one for germline-specific expression, the tissue that generates eggs and sperm. Next, we will generate key-containing worms using MosSCI, a powerful gene editing technique, and test key and degronSwitch interactions in the worm.

Presenters: Michael Bertram & Connor Wakefield Sponsors: Sorensen-Kamakian, Erika & Novak, Walter

Title: Crushing it with LOCKR: an Eggceptional Way to Destroy Proteins

Our lab is developing an in vivo method to inactivate gene function to better understand normal and disease development in animals. Our method is the 'Latching Orthogonal Cage/Key pRoteins' (LOCKR) technique, which uses de novo designed protein switches and keys to inactivate genes at the protein level. The switch cages a protein sequence, in this case, a degron for protein destruction, in the off or "locked" state (degronSwitch). Upon addition of the key, the degronSwitch is "unlocked," exposing the degron. Degron exposure causes the destruction of the degronSwitch along with any protein we fuse to it. Our work seeks to develop LOCKR in *C. elegans*, a small nematode worm. To do this, we designed and optimized the key for worms (ceKey) using molecular cloning. The ceKey construct includes the ceKey, two tags for key identification in worms (GFP and an epitope tag), a tubulin 3'UTR for stability, and a site for a promoter. The promoter site allows tissue-specific ceKey expression, which allows LOCKR to promote degronSwitch degradation in only specific worm tissues instead of throughout the animal. Here, we discuss our recent work cloning and troubleshooting our design for key expression in the pharynx and the egg-laying apparatus. Our future work includes generating transgenic key-containing nematodes for these two tissues using MosSCI, a powerful gene editing technique.

Presenters: Michael Hoppel
Sponsors: Tompkins, Nathan
Camphor Boats

In this presentation, I will describe results found while designing and testing 3D printed camphor-propelled boats around a circular track. Using a circular track, distilled water, camphor wax, and a camera, I was able to find the velocity of one of the 3D printed boats to be 14.07 mm/s. After finding this velocity, I used Stokes' Law to find the linear drag experienced by the boat to be $5.197 \mu N$. It was also found that boats with a small or pointed bow do not work in this experiment. Lastly, using Newtonian Mechanics, I was able to find the force of propulsion for one of the boats.

Presenters: Nhan Huynh

Sponsors: Novak, Walter & Sorensen-Kamakian, Erika

Title: Functional study of the SASH1 Gene in Developing Skin Pigmentation Disorder

Multipotent stem cells are a class of stem cells that can self-renew and develop into various functional cell types such as embryonic organs, fat cells, or skin cells. In the skin, the pigmented melanocytes (melanin-forming cells) develop from the adult melanocyte stem cells. Patients who display an extensive increase of pigmented melanocytes and an increase of melanin pigments in their skin can carry a mutation in the SASH1 gene, which decreases SASH1 expression. This inherited disorder is called SASH1 associated inherited hyperpigmentation disorder. Our lab found that while skin pigmentation increases, melanocytes stem cell pools are decreased. Therefore, we hypothesized that SASH1 normally prevents development of pigmented melanocytes from the melanocyte stem cells. To determine the effects of decreased SASH1, we studied the synthesis of important protein differentiation markers between the control and SASH1 mutant cells. We predicted that SASH1 mutant cells would have more differentiation markers than control cells. Experiments suggest that the mutant SASH1 gene enhances the expression of differentiation markers in pigmented melanocytes when in the presence of a differentiation-inducing drug. Additionally, the study of the stem cells and particular hallmarks of differentiation in the melanocyte lineage will broaden our understanding of other stem cells and their proliferation of the differentiated population.

Presenters: Nikolai Jones & Bryan Cherry

Sponsors: Tompkins, Nathan

Title: The Frequencies that Comprise the Wabash "W."

Fourier Microscopy creates a frequency plane in which image processing can be done. We determine the relative frequencies that comprise the Wabash "W." symbol. We obtain this by performing selective spatial filtering and determining what range of frequencies are responsible for both the majority of the shape and also the edge discrimination of the shape. We use lowpass and band-pass filters, and determined that high frequencies are required to create distinct edges, while low frequencies comprise the vast majority of the saturation and area of the figure.

Presenters: Owen Hauber **Sponsors:** Burton, Patrick

Title: Aelosoma Regeneration in Different Solutions

In this research, we first studied how Aelosoma regenerates over time and with Serotonin, Tubulin, and DAPI stains. We then studied how their regeneration differs when they are in solutions of Wnt Agonist and Cyclopamine, which interfered with the Hedgehog signaling pathway. We found that these solutions did have effects on the regeneration of Aelosoma, but did not have enough time to investigate further what precisely was happening.

Presenters: Quinton Wood & Ethan Johns

Sponsors: Walsh, Heidi

Title: Investigating the Role of Calcium in Endoplasmic Reticulum Stress

The endoplasmic reticulum (ER) is a major calcium store in cells, and is responsible for the synthesis of secreted and membrane proteins. When the ER's capacity to fold proteins is exceeded, ER stress occurs. ER stress activates an adaptive signaling pathway called the unfolded protein response (UPR) to help resolve protein misfolding, but prolonged or severe stress can lead to disruption of ER calcium homeostasis and apoptosis. In obesity, excess saturated fatty acids can cause ER stress, but the role of calcium in this process is unclear. We used inhibitors of ER calcium release and fluorescent calcium indicators to explore saturated fatty acid and calcium signaling. 2-APB blocks calcium release in the ER via IP3 receptors and prevented UPR activation in a neural cell line. We observed changes in cytosolic and ER calcium due to ER stress in HEK293 cells using Genetically Encoded Calcium indicators for Optical imaging (GECOs). There was a positive correlation between chemically-induced ER stress and cytosolic calcium levels and a negative correlation between chemically-induced ER stress and ER calcium. Future research could expand upon the findings of this study by improving the methodology. Viral transduction, rather than transfection, could improve the expression of GECOs in cells.

Presenters: Simon Terpstra Sponsors: Saha, Sujata

Title: Rich vs. Poor: A Comparative Analysis Between Western and Eastern Europe, Including Other Regions,

and the Factors that Affect Gross Domestic Product

This paper examines key indicators that affected real Gross Domestic Product (GDP) during the 2008 financial crisis, and outside of it, considering data from Eastern and Western European countries. Using quarterly data from 2000 to 2014, this study aims to offer a greater understanding of how output is related to other areas of the economy and how it may vary between Eastern and Western Europe, given their economies are not the same. To offer a broader perspective, I also considered countries from North America, South America, and Asia. Through a multivariate regressive analysis and modeling, it is found that most of the variables used in this study had quite different effects on real GDP between Eastern and Western Europe. In fact, many variables saw a positive effect for one region, and a negative for the other. One important finding is that increasing private credit in Western Europe had a positive effect on GDP, whereas it had a negative effect in Eastern Europe. It was also found that rising prices had a negative effect in Western Europe, but a positive effect in Eastern Europe. For policy recommendation purposes, the European Union needs to strengthen its cohesion policy to better facilitate economic integration between Eastern and Western Europe.

Presenters: Thomas Oppman & Grant Johnson

Sponsors: Novak, Walter & Sorensen-Kamakian, Erika

Title: Developing a Model for *C. elegans* 26S Proteasome Function *in vitro*

Proteins are constantly generated by cells to regulate processes required for cellular life; however, old or damaged proteins need to be degraded and broken down. The 26S proteasome is a multi-subunit protein complex responsible for breaking down proteins in cells. Our research team is developing a protein control system in *C. elegans* that relies on the 26S proteasome to degrade the proteins we want to study. Our initial experiments showed unexpected variations in proteasome assays. To better understand how 26S proteasome-mediated degradation happens *in vitro*, we used different strains of *C. elegans*, which differed in proteasome concentrations, and biochemically purified proteasome for *in vitro* assays. This data allowed us to develop a model for how the 26S proteasome interacts with proteins. Based on our data, we propose that the 26S proteasome has two forms: 1) a latent form, which binds proteins but does not degrade them, and 2) an active form, which degrades proteins immediately, as it normally does in living cells. Additionally, we propose that the 26S proteasome changes between these forms *in vitro*, depending on total lysate concentration. Here, we present the details of our model, as well as the data to support it.

