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**25TH ANNUAL
CELEBRATION OF
STUDENT RESEARCH,
SCHOLARSHIP,
& CREATIVE WORK**

JANUARY 24, 2025 | WABASH COLLEGE

Celebrating 25 Years!

To commemorate this special 25th Celebration, the event planning committee is excited to welcome back six alumni keynote speakers.

All are invited to attend these reflective seminars during the noon hour, preceding the event's traditional kickoff of student presentations.

The presentations will begin at 12:10 pm in the following locations.

Hays 104

Suniti Karunatillake '01 — A professor at Louisiana State University who investigates the planetary geoscience of Mars with dreams of discovering life beyond Earth.

&

Joe Trebley '01 — CEO of Mono Bioventures LLC and other successful companies. He is a leader in shepherding promising scientific discoveries and innovations into the marketplace.

Korb Classroom

Sterling Carter '07 — A research associate for ISS STOXX in Stockholm, Sweden, providing environmental, social, and governance data and analytics to investors encouraging socially responsible investment decisions.

&

Jacob Stump '11 — A professor at Northeastern University who develops innovative approaches to acquaint students with philosophy as a way of life.

Baxter 101

Ian Finley '19 — A lawyer with Faegre Drinker who specializes in corporate matters, including governance, corporate transactions, and mergers and acquisitions.

&

Jake Schild '13 — A research economist at the Bureau of Labor Statistics where his work centers around poverty, inequality, and consumption.

Congratulations!

The Celebration event 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.

Luis Sanchez - Disability as a Social Construct: A Critique of Capitalism and Utilitarianism through the Privilege Game

Prasun Panthi - Ultralight Dark Matter Halo Model and Properties

Tanner Quackenbush - Blue Ridge Mountains: An Unexpected Hub for Creativity and Professional Growth

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

These \$750 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.

David Leal - Making Home: Charting the Relationship between Wabash's Latino Clubs and Immigration

Don Silas - CSR: Empowering Appalachian Communities through Nursing Education: A Retrospective on SOAR's Impact

Elijah Wetzel - Counterintuitive Justice: How the Supreme Court's Free Exercise Jurisprudence Bucks America's Cultural and Religious Trends

Welcome and Introduction

A silver anniversary. A quarter century. Twenty-five years. At Wabash, we value our traditions, and as we hold the 25th Annual Celebration of Student Research, Scholarship, and Creative Work, it is accurate to observe that this event is a Wabash tradition. I've been at Wabash long enough to remember the first Celebration, and even served for a time as the chair of the organizing committee. As such, this is one of my favorite Wabash events—one of my favorite Wabash traditions—at which the College recognizes, in a proud and public way, the creative accomplishments of its students. We celebrate not only the particular achievements of individual students, but also a deeply embedded ethos of the College committed to teaching and learning. 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. 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: Co-Chairs Lon Porter and Erika Sorensen-Kamakian, Jeff Gower, Michelle Janssen, Matt Meyer, Joe Scanlon, and Nicholas Snow. Hien Anh Hoang Phan and ETS students contributed to poster production, as have other ETS and IT Services staff; Mark Siegel authored the online event presentation application system; Becky Wendt designed the original program book format; Julia Phipps created the campus event poster; Stephanie Crouch and Dawn Hoffman arranged for alumni keynote speaker travel logistics; Linda Weaver, Amber King, Rochella Endicott, Violet Benge, Pam Sacco, Jessica McClamroch, and Rachel Barclay; 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 & Performances

Oral presentations and performances will begin at 1:30 p.m. and continue every 20 minutes. The last session begins at 3:30 p.m. In general, students will present information or perform for 12-15 minutes with a 5-minute pause between presentations for questions, technology reset, and passing time. There will be a 20-minute break at 2:30 p.m. Please see the following pages for a list of oral presentations and performances by room location and time slot. Presenter names, as well as their sponsors and abstracts, are listed beginning on page 11.

Schedule for Poster Presentations & Exhibitions

Students will present and discuss their posters and exhibits in 60-minute increments starting at 1:30 p.m. and 2:45 p.m. in Detchon International Hall. You will find a list of presenters and their time slot beginning on page 7. The names of the presenters, as well as their sponsors and abstracts, are listed beginning on page 22.

Enjoy Delicious Treats on the Detchon Balcony

A wonderful selection of treats will be available on the second-floor balcony, overlooking the poster sessions.

Oral Presentations & Performances Schedule

Detchon 109

1:30	Evan Baldwin	Waves in the Dark – Introducing the Dark Matter Wake Force and Why It’s Important Dennis Krause (Physics)
1:50	Prasun Panthi	Ultralight Dark Matter Halo Model and Properties Dennis Krause (Physics)
2:10	Augustin Sanchez	Precision Measurements of Atomic Matrix Elements Gaylon Ross (Physics)
2:30	Break	
2:50	Patrick Countryman & Ayden Lutes	Effects of Substituents on Halogen Bond Tethered Electron Donor-Acceptor Complexes Joe Scanlon (Chemistry)
3:10	Henry Giesel	Establishing a Model for Tick-Borne Bunyavirus Reassortment Anne Bost (Biology)
3:30	Don Silas	Empowering Appalachian Communities through Nursing Education: A Retrospective on SOAR's Impact Jill Rogers (Global Health Initiative)

Detchon 111

1:30	Kayden Beatty	Bridging Methodologies: A Comparative Analysis of Writing Center Practices in Greece Zachery Koppelman (Writing Center)
1:50	Lance Williams	How the American College of Greece Navigates the Rise of AI Zachery Koppelman (Writing Center)
2:10	Ashton Moore & Austin Pickett	Academics and Student Culture in Greece: Insights from Interviews and Analytics with the Student Academic Support Services of the American College of Greece Zachery Koppelman (Writing Center)
2:30	Break	
2:50	Gavin Tindall & Ethan Kimmerle	Utilizing AI to Enhance Golfing Performance Michele Pittard (Education Studies)
3:10	Ryan Frazier	Bridging the Literacy Gap: A Community Conversation for Change Michele Pittard (Education Studies)
3:30	Christopher Board	Fixing the IPS Attendance Rate Michele Pittard (Education Studies)

Oral Presentations & Performances Schedule

Detchon 112		
1:30	Elijah Wetzel	Counterintuitive Justice: How the Supreme Court's Free Exercise Jurisprudence Bucks America's Cultural and Religious Trends Jonathan Baer (Religion)
1:50	Nicholas Green	Race and Rust: How the American Social Gospel Reacted to Reconstruction Jonathan Baer (Religion)
2:10	Noah McRoberts	Cracking the Mind of Paul: An Example of Study in Religion Warren Campbell (Religion)
2:30	Break	
2:50	Gavinn Alstott	Candidate Religiosity and Voter Choice in America Lorraine McCrary & Hwei-Jyun Ye (Political Science)
3:10	Quinn Manford	Democracy Promotion with ASEAN and the EU: A Comparative Study Hwei-Jyun Ye (Political Science)
3:30	Brennan Beausir	Pitcher's Peril How MLB's Offensive Awakening Jeopardizes its Moundsmen Nick Snow (Economics)

Detchon 209		
1:30	Tanner Quackenbush	Blue Ridge Mountains: An Unexpected Hub for Creativity and Professional Growth Annie Strader (Art)
1:50	Logan Weilbaker	Max Reinhardt at Wabash: The Lasting Innovations of a 20 th Century Director James Cherry (Theater)
2:10	Preston Parker	Let Nothing Stand in Your Way: Getting <i>Angels in America</i> to Wabash College James Cherry (Theater)
2:30	Break	
2:50	Carson Wirtz	<i>It Can't Happen Here</i> : A Dramatic History in the Federal Theater Project James Cherry (Theater)
3:10	Alexander Schmidt	How the Federal Theatre Project Transformed Chicagoland James Cherry & Michael Abbott (Theater)
3:30	Ashton Moore	Relatively Banal but Ultimately Irreconcilable Differences: Judgement and Punishment in Albert Camus' <i>The Fall</i> Crystal Benedicks (English)

Oral Presentations & Performances Schedule

Detchon 211		
1:30	John Schnerre	A Latin Inscription from Puteoli in Late Antiquity: Geological, Historical, and Economic Considerations of a Roman Port Jeremy Hartnett (Classics)
1:50	Andrew Dever	The Damnation of Democracy: The Partition of Babylon and Athens Noe Pliego Campos (History)
2:10	Preston Reynolds	Anxiety, Fear, and Understanding: Late-18th Century Republican Discourse Noe Pliego Campos (History)
2:30	Break	
2:50	Luis Sanchez	Disability as a Social Construct: A Critique of Capitalism and Utilitarianism through the Privilege Game Jeff Gower (Philosophy)
3:10	William Chapman	Designing Effective Carbon Pricing: Balancing Environmental Goals and Social Equity Jeff Gower (Philosophy)

Detchon 212		
1:30	Jacob Weber	Layers of The Onion: Generic Deviation and the Burlesque Frame in the U.S. Supreme Court Sara Drury (Rhetoric)
1:50	Jacob Sitzman	The Freedom in Remembering Jesus: Examining the Themes of Tolerance of He Gets Us Ads through a Lens of Critical Rhetoric Jeff Drury (Rhetoric)
2:10	Kobe Perez	Gender and Job Advertising Jennifer Abbott (Rhetoric), Agata Szczeszak-Brewer (English), & Joyce Burnett (Economics)
2:30	Break	
2:50	Aidan Geleott	Despair and Defiance: Exploring Queer Identity and Political Resistance in the Works of Reinaldo Arenas María Cristina Monsalve (Spanish)
3:10	Neal Laymon	The Pertinence of Michel De Montaigne's Skepticism in Modern Society Karen Quandt (French)

Poster Presentations & Exhibitions Session #1 Schedule

Detchon International Hall		
1:30–2:30	Owen Volk	Analysis of Changes in Personal Consumption Across US Regions Sujata Saha (Economics)
	Cooper Jarvis	The Impact of Macroeconomic Indicators on Sectoral Employment: Evidence from the 2008 Crisis Sujata Saha (Economics)
	Elijah Arnold	Snapshots Examination of Vicarious-Trial-and-Error Through Gaze Behavior and Deliberation in a Translational Virtual Navigation Task Neil Schmitzer-Torbert (Psychology)
	Garrett Dalton	Cav 2.2 and Dibutyryl-cAMP Delay Aeolosoma (Annelida) Anterior and Neural Regeneration Pat Burton (Biology)
	Rhys Cadigan	SKL2001 and CHIR-98014 Inhibition of Aeolosoma Annelid Regeneration Pat Burton (Biology)
	Jacob Ramirez, Caden Short, & Matthew McIlvenna	Investigating the Role of Estrogen in Neuronal Lipotoxicity and Endoplasmic Reticulum Stress Heidi Walsh (Biology)
	Henry Giesel & Ike O'Neill	Switch-ing Things Up: A Novel Method of Post-Translational Control in <i>C. elegans</i> Erika Sorensen-Kamakian (Biology) & Walter Novak (Chemistry)
	Cole Shifferly & Bawithathawng Thang	Peptide Tools for Big Changes: Exploring Proteostasis in Worms Erika Sorensen-Kamakian (Biology) & Walter Novak (Chemistry)
	Precious Ainabor, William Boswell, & Augustus Isaac	Small Cells, Big Potential: Bringing New Protein Tools to Bacteria Walter Novak (Chemistry) & Erika Sorensen-Kamakian (Biology)
	Jonathan Parackattu & Lucas Cunningham	Measuring PFAS in Sugar Creek using MIP Sensors Lynn Krushinski (Chemistry)
Don Silas	Improving Aptamer-Based Sensor Stability with Optimization of Applied Potential Lynn Krushinski (Chemistry)	
<i>Posters and exhibitions presented in this session continue onto the following page.</i>		

Poster Presentations & Exhibitions Session #1 Schedule

Detchon International Hall		
1:30–2:30	Ethan Johns & Benedict Grill	Synthesis of Known and Novel Fluorescent Dyes Laura Wysocki (Chemistry)
	Owen Hauber & John Nabors	Electron Donor-Acceptor Complexes as Molecular Switches? Joe Scanlon (Chemistry)
	Nathaniel Litts	Effects of a Tether on Electron Donor-Acceptor (EDA) Complexes and their Use as a Molecular Switch Joe Scanlon (Chemistry)
	Evan Dickey	Strengthening Botanical Research with Scientific Illustration Amanda Ingram (Biology) & Damon Mohl (Art)
	Evan Baker & Braeden Cooper	Global Health Initiative in Perú Eric Wetzel (Global Health Initiative)
<i>Posters and exhibitions presented in this session continue onto the following page.</i>		

Poster Presentations & Exhibitions Session #2 Schedule

Detchon International Hall		
2:45–3:45	Raymond Arebalo	Fabrication of Microfluidic Devices with Laser Cutting Nate Tompkins (Physics)
	Evan Baldwin	Savings Ships – Detecting Steel Corrosion on Naval Ships using Acoustic Impulses Nate Tompkins (Physics)
	Arlie Benson & Timothy Smith	MoNA Collaboration: Next Generation Neutron Detector Jim Brown (Physics)
	Atticus Blank	What Effect does a Stemming Defense have on a Offense in the NFL? Brent Harris (Athletic Communication Director)
	David Leal, John Huisden, & Robert Greene	Making Home: Charting the Relationship Between Wabash’s Latino Clubs and Immigration Aiala Levy (History)
	Andrew Dever	Snapshots of Democracy: The Athens Democracy Forum and Global Democracy Jane Hardy (Spanish)
	Enrique Ruiz, Mitchell Bock, Johnathan Otte, Matthew Hendrick, Alexander Straw, & Keane Albright	A Web Tool to Aid Multi-Orbit Interference Analysis Chad Westphal (Mathematics and Computer Science)
	Matthew Hendrick, Samuel Decker, & Luka Difilippo	Bet Big or SML Qixin Deng (Mathematics and Computer Science)
	Mitchell Bock, Johnathan Otte, & Enrique Ruiz	Humanity Indiana Qixin Deng (Mathematics and Computer Science)
	Jackson Leeper, Julius Hearn, & Keane Albright	Snapshots Computer Science Senior Capstone: Game Development/Parallel Qixin Deng (Mathematics and Computer Science)
Gregory Powers & Abdul Basit Tonmoy	Enhanced Facial Emotion Classification Method with 135 Classes Qixin Deng (Mathematics and Computer Science)	

Posters and exhibitions presented in this session continue onto the following page.

Poster Presentations & Exhibitions Session #2 Schedule

Detchon International Hall		
2:45–3:45	Matthew Lepper	Effects of Rhizobial Diversity on Soybean Health Under Environmental Stress Brad Carlson (Biology)
	Quinn Fitzgerald, Cole Shifferly, & Omar Garcia	Analyzing Scute Annuli of Eastern Box Turtles Brad Carlson (Biology)
	Cole Shifferly, Quinn Fitzgerald, & Omar Garcia	Scute & Seek: The Role of Microhabitat in Locating Wabash’s Favorite Reptile Brad Carlson (Biology)
	Logan Weilbaker	Inside the Making of <i>12 Angry Men</i> at Wabash College Michael Abbott (Theater)
	Tanner Quackenbush	Blue Ridge Mountains: An Unexpected Hub for Creativity and Professional Growth Annie Strader (Art)
	Drake Green, Adonis House, Devonta Bailey, Caleb Drousias, John Miller, Masun Moore, Carter Ripke, Ethan Sparks, Timothy Stohl, Andrew Williams, Kannon Chase, Grayson Dunn, Kamden Earley, Curtis Faughnan, Caden Friedt, Devin Jimenez, Clayton McPeek, Thang Sathing, Kai Warren, & Alex Worley	Wabash Animation Video Art Damon Mohl (Art)

Oral Presentations & Performances (Alphabetical by Presenter)

Presenter: Aidan Geleott
Sponsor: María Cristina Monsalve (Spanish)
Title: Despair and Defiance: Exploring Queer Identity and Political Resistance in the Works of Reinaldo Arenas

In a world that has begun to better appreciate the voices of minority populations and, in general, those facing unique struggles, the works of Reinaldo Arenas are illuminating and help us to develop more comprehensive and nuanced perspectives of the past and present. For this reason, I have chosen to focus my essay on the Cuban author Reinaldo Arenas (1943–1990). I will analyze various texts from his extensive poetic work, *Inferno: Complete Poetry* (2001), which includes both poetry and prose. I am particularly drawn to this author because his works, acclaimed by numerous critics, deeply explore queer identity and political oppression—topics I am interested in. My primary goal is to highlight a prominent queer voice that sheds light on the emotions and lives of many people within the queer community in Cuba and around the world during the 20th century. Most queer individuals did not have a platform to share their stories of love and struggle, so I assume that Arenas’ works will provide me with deeper insight into the queer community. Queer literature likely always existed, but I believe it has become more dominant in recent years. For this reason and many others, I want to answer the following questions:

What role does existential despair play in the representation of Arenas’ queer identity, and how does it reflect broader themes of oppression and resistance?

How does Arenas’ use of language and imagery reflect the duality of beauty and pain in the queer experience?

How does Arenas’ poetry challenge traditional narratives of love and identity, particularly within the context of heteronormative social expectations?

What impact does Arenas’ poetry have on contemporary works?

Presenter: Alexander Schmidt
Sponsors: James Cherry & Michael Abbott (Theater)
Title: How the Federal Theatre Project Transformed Chicagoland

This presentation will detail the Federal Theatre Project's impact on the Chicagoland area. Specifically, it would focus on Gary, Indiana, and its lasting effect on American Theatre. Some examples of this would include talking about a children’s theater troupe and even Gary being the influence on Walt Disney’s Mickey Mouse Club. Gary’s children’s theater troupes, the FTP created opportunities for Black artists, highlighted political and economic injustices through works like *Triple-A Plowed Under* and *Big White Fog*, and introduced theater to new audiences, including minority and working-class communities. Despite political backlash and funding challenges that led to its demise in 1939, the FTP left a lasting legacy. It catalyzed a theatrical renaissance, influenced the growth of regional theater, and set a precedent for using art as a tool for education and activism. Though the Federal Theatre Project shut down in 1939, its impact on Chicagoland was astonishing.

Presenter: Andrew Dever
Sponsor: Noe Pliego Campos (History)
Title: *The Damnation of Democracy: The Partition of Babylon and Athens*

Between 336 and 323 B.C., Alexander the Great expanded the Macedonian Empire from Greece to modern India, incorporating historical powers like Athens, Egypt, and Persia into his domain. Due to Athens’ status as a prominent Mediterranean power, Alexander afforded the city-state (polis) preferred status within the empire, allowing Athens to rebuild and flourish. After his death, his successors, called the Diadochi, divided Alexander’s empire into smaller kingdoms, inspiring Athenian aspirations for a return to glory.

By featuring a section from my recently completed History Senior Seminar paper, “The Dance of the Diadochi: How the Partition of Babylon Changed the Fate of the Hellenistic World,” this presentation will demonstrate how Macedonian rule initiated by the Partition weakened Athenian democracy and its political institutions, transforming the once powerful polis into a center for philosophy, art, and intellectual life. Through examining the period between the Lamian War (323/2 B.C.) and the triumph of Cassander in 317 B.C., the presentation will detail why the governance instituted by the Partition of Babylon trapped Athens in a cycle of rebellion and repression that continued unabated until Rome’s victory over King Perseus in 168 B.C.

Oral Presentations & Performances

Presenter: Ashton Moore
Sponsor: Crystal Benedicks (English)
Title: Relatively Banal but Ultimately Irreconcilable Differences: Judgement and Punishment in Albert Camus' *The Fall*

This presentation will be a condensed version of a senior seminar paper on judgement and punishment. The presentation will address Albert Camus' philosophical novel, *The Fall*. The novel focuses on the character Jean-Baptiste Clamence and his existential crisis. The story is written as a series of dramatic monologues from Clamence as he reflects on the man he was before his crisis, which was sparked by several incidents that forced him to consider his views on his fellow human beings as well as the sincerity behind his actions. The presentation will look at virtue, misanthropy, and loss of faith in humanity, and whether a deeply individualistic thought process is beneficial to both the individual and collective. There is also time spent of addressing punishment through Franz Kafka's *In the Penal Colony* and whether punishment is supposed to help people grow or to prevent further suffering.

Presenters: Ashton Moore & Austin Pickett
Sponsor: Zachery Koppelman (Writing Center)
Title: Academics and Student Culture in Greece: Insights from Interviews and Analytics with the Student Academic Support Services of the American College of Greece

Through a presentation, we will be presenting the research we conducted at the American College of Greece with the Student Academic Support Services (SASS). We did this through interviews with staff and students, observing sessions, as well as analytical research that SASS could provide. Through these methods, we wish to present what we learned from SASS and what we believe we might be able to implement culturally or methodically at the Wabash College Writing Center to improve student retention and learning outcomes. Several key moments and pieces of information include: A personal session between a SASS learning facilitator and Ashton Moore over a creative writing piece, several statistical notes (such as numbers of bookings per subject at SASS) on what students make use of at SASS, and observations conducted between facilitators and students that highlighted cultural and methodological differences between the Wabash College Writing Center and SASS.

Presenter: Augustin Sanchez
Sponsor: Gaylon Ross (Physics)
Title: Precision Measurements of Atomic Matrix Elements

In quantum perturbation theory, matrix elements give information about which atomic transitions are allowed and the strength of a transition. The matrix elements of cesium are of particular interest to physicists because they are used in testing the strength of transitions that are induced by the parity non-conserving weak force. To make a precision measurement of a matrix element using absorption spectra, one must precisely know difficult to control system variables such as length and atomic vapor density of a cesium vapor cell. A way to avoid having to control and measure these properties is by alternating between measuring the absorption of a transition with a well-known matrix element and the absorption of the new transition. In order to be on resonance with the transition, external cavity laser diodes which have controllable lasing frequencies were swept through a range of ~ 5 GHz were used. As long as the switch between measuring transitions occurs quickly enough as to not allow significant changes in vapor cell length and density, the ratio of absorption between two consecutive measurements can be used to find the matrix element of the new transition.

Oral Presentations & Performances

Presenter: Brennan Beausir
Sponsor: Nick Snow (Economics)
Title: Pitcher's Peril How MLB's Offensive Awakening Jeopardizes Its Moundsmen

The presentation explores how rule changes in Major League Baseball (MLB) aimed at increasing offensive output and entertainment value have adversely affected pitchers. My analysis highlights how the institutionalized focus on offense has led to informal norms and practices that put pitchers at a higher risk of injuries and unfair compensation. I argue that these developments are detrimental to the game itself, as the allure of dominant starting pitchers has historically been a significant draw for fans. I call for changes to address the alarming rate of pitching injuries, in order to preserve the essence and appeal of baseball. I propose reintroducing a focus on the art of pitching separate from overexertion, revising player development strategies, and advocating for rule adjustments to protect pitchers' health while maintaining the game's increasing appeal in recent years.

Presenter: Carson Wirtz
Sponsor: James Cherry (Theater)
Title: *It Can't Happen Here: A Dramatic History in the Federal Theater Project*

During the Great Depression, the FDR Presidency established the Works Progress Administration (WPA), with the goal of providing work and income to a struggling American population. A sub-section of the WPA was the Federal Theater Project (FTP), which employed creatives by local cities to create federally funded theater. The FTP was split into various regions throughout the country, but on a federal level, oversaw a mass opening of a play called *It Can't Happen Here*, written by Sinclair Lewis and John C. Moffitt. The play, which debuted nationally on October 27, 1936, was based on Lewis' 1935 novel of the same name, and was a critique on the fragility of American democracy and a warning about a potential rise in fascism. This novel sold very well, partially due to its controversial themes, but after failing to be picked up for a film adaptation, went on to be one of the FTP's biggest plays. In this research, we study *It Can't Happen Here*, and some of productions' stories of success, and failure, across the 21 theaters that opened this anti-fascist show at the same time.

Presenter: Christopher Board
Sponsor: Michele Pittard (Education Studies)
Title: Fixing the IPS Attendance Rate

The Indianapolis Public School system sports a 48% attendance rate for their students. This lies well below both the state and national attendance rates, and IPS is the second-most populated school system in the state. This presentation is the culmination of a project that used civic mapping as a research tool and argues for a conversation to happen between the school system and the community. By initiating a grassroots conversation that engages both the school system and the community, stakeholders can collaborate and devise ways to improve these attendance rates, and from there, improve test scores, graduation rates, median income, and much more. Intertwining community resources and the schools is key to getting students to attend school.

Oral Presentations & Performances

Presenter: Don Silas
Sponsor: Jill Rogers (Global Health Initiative)
Title: Empowering Appalachian Communities Through Nursing Education: A Retrospective on SOAR's Impact

This presentation reflects on my work, alongside four of my Wabash brothers (Kody Witham '22, Thomas Gastineau '23, Casimiro Soliz '23, and Morgan Lamon '24) as Health Interns with Shaping Our Appalachian Region (SOAR), an organization dedicated to improving economic, health, and business opportunities in Eastern Kentucky. During my time with SOAR, I organized and executed a nursing academy that empowered 17 students from underserved Appalachian communities to pursue sustainable careers in high-demand fields, such as healthcare, while developing leadership skills. Additionally, I facilitated critical discussions between private and governmental leaders, fostering collaboration on pressing regional issues.

While this presentation comes two years after the program's execution, it offers an opportunity to reflect on its successes and challenges. Delayed by the weight of academic and personal responsibilities, this retrospective explores the lasting impact of the program, my professional growth through project management and community engagement, and the lessons learned about addressing systemic challenges in underserved communities. This work underscores the power of education, collaboration, and persistence in shaping brighter futures for Appalachian students and their communities.

Presenter: Elijah Wetzel
Sponsor: Jonathan Baer (Religion)
Title: Counterintuitive Justice: How the Supreme Court's Free Exercise Jurisprudence Bucks America's Cultural and Religious Trends

I examine the evolution of the Supreme Court's First Amendment religious free exercise jurisprudence through several major cases, first tracing the history of the legal test the Court uses to decide such cases, then analyzing two prominent recent cases—*Tandon v. Newsom* and *Fulton v. City of Philadelphia*—and their legal implications. I contrast the Court's openness to religious exemptions to generally applicable laws and the rise in successful religious free exercise claims (especially from Christian groups) against the stark trend of religious disaffiliation and secularization in contemporary American society. Finally, I analyze some of the most prominent explanations as to why the Court's recent jurisprudence has cut so sharply against the movement of popular culture. Ultimately, I suggest the most probable explanation for the Court's spike in favor towards religious claimants is not overt political action or religious activism on the justices' part, but rather the Court's realization that their current religious free exercise doctrine insufficiently manages the complexity of religious freedom claims. Thus, the success of religious claimants stems primarily from a legal-ideological factor, not personal or political factors.

Presenter: Evan Baldwin
Sponsor: Dennis Krause (Physics)
Title: Waves in the Dark – Introducing the Dark Matter Wake Force and Why It's Important

The dark matter wake force is a newly theorized force that occurs when one particle is hit by an incoming ultralight dark matter wave. Like a boat on choppy water, the particle will warp the wave, causing it to behave differently. If a second particle is introduced, a force on that second particle will occur. So far, this force has been explained well in the context of quantum mechanics, my summer research was about showing that this force can also be described only using classical mechanics. I also expanded on the previous research done, describing how the wake force behaves in various different situations. Finally, I can show that this force can assist us in answering one of the largest and most mysterious unknowns in physics: the identity of dark matter.

Oral Presentations & Performances

Presenters: Gavin Tindall & Ethan Kimmerle
Sponsor: Michele Pittard (Education Studies)
Title: Utilizing AI to Enhance Golfing Performance

Throughout this past semester, my roommates and I began to fall in love with the game of golf, visiting the local municipal course on a weekly basis to improve our game. In our pursuit to be the best golfer we could be, we were consistently challenged when selecting the appropriate club. This was especially difficult in the windy conditions that the Crawfordsville municipal course presented. One day our shots would be 10 yards short, and on another, we would shoot 15 yards long. Ethan and I were determined to create a resolution for this issue by creating a golf app that acted as a digital caddie. The app we developed utilizes the temperature and wind conditions to provide users a recommended club based on their average distances. Thanks in part to our Wabash college education, we leveraged expertise in our respective fields to enhance the golfer experience.

Presenter: Gavinn Alstott
Sponsors: Lorraine McCrary & Hwei-Jyun Ye (Political Science)
Title: Candidate Religiosity and Voter Choice in America

This research project brings to light who exactly votes for religious candidates who express or perform religiosity in the public realm. Meanwhile, it also acknowledges the rise of people who believe in “nothing in particular,” and the impact of secularism within the political sphere. The literature highlights that a voter’s own religion and ideology shapes partisan voting, and that a candidate’s religious characteristics can exert powerful effects on voting. However, the literature fails to explain the factors that determine who votes for religious candidates, and whether those are equal for both sides in a two-party system. So, this study observes how various levels of candidate religiosity influence vote choice through the direct and indirect use of religion in politics. I conducted a survey experiment at Wabash College, asking students to choose between hypothetical candidates according to their party affiliation. These hypothetical candidates, both Democrat and Republican, contained varying amounts of religious language within a candidate’s campaign message according to otherwise more traditional Democrat and Republican messaging. My analysis revealed four voter types that transcend the Democrat and Republican parties: religious crusaders who are religious and vote for religious candidates, secular seekers who are secular but prefer religious candidates, religious separatists who are religious but prefer secular candidates, and secular reformists who are secular and prefer secular candidates. My results conclude that there is not one identity group, religious or non-religious, Democrat or Republican, that is attracted to political candidates speaking in religious language. Rather, I find four diverse approaches to candidate religiosity. By analyzing data and narrative explanations that respondents offered about their political preferences in candidate religiosity, I construct categories that transcend obvious differences in the literature.

Presenter: Henry Giesel
Sponsor: Anne Bost (Biology)
Title: Establishing a Model for Tick-Borne Bunyavirus Reassortment

Reassortment is the primary evolutionary mechanism for segmented viruses like bunyaviruses, enabling the exchange of genome segments during co-infection, driving their evolution. Despite its significance, the molecular mechanisms governing bunyavirus reassortment remain unclear. With many bunyaviruses being significant human pathogens, deciphering how reassortment influences viral transmissibility and virulence is essential for preempting the emergence of novel pathogens. We aim to elucidate the determinants of tick-borne bunyavirus reassortment, with a focus on Heartland virus (HRTV) and Severe Fever with Thrombocytopenia Syndrome virus (SFTSV). Both HRTV and SFTSV are tri-segmented, negative-sense RNA viruses and Biosafety Level 3 (BSL-3) priority pathogens that emerged within the last decade. Given the high containment requirements, we leveraged the use of the BSL-2 pathogen Lone Star virus (LSV) as a model system to establish reassortment parameters that can be applied to HRTV and SFTSV. We aimed to develop a reverse genetics system for LSV and to characterize recombinant (r) LSV in mammalian cell lines. We successfully generated plasmids encoding the LSV genome, enabling the successful recovery of rLSV. In parallel, we optimized our novel hybridization chain reaction (HCR) assay to visualize viral genomes (vRNA) within tissues from infected animals, which we will now leverage to visualize LSV.

Oral Presentations & Performances

Presenter: Jacob Sitzman
Sponsor: Jeff Drury (Rhetoric)
Title: The Freedom in Remembering Jesus: Examining the Themes of Tolerance of He Gets Us Ads through a Lens of Critical Rhetoric

Jesus has been a prominent cultural figure for almost two-thousand years. During this time, he has been represented in a number of different ways. The multi-media company He Gets Us looks to represent Jesus in the modern context of today that relates to everyone, regardless of beliefs or backgrounds. This analysis aims to explore He Gets Us as an emancipatory model for how public memory can be used for promoting tolerance in society. By combining public memory analysis and critical rhetoric, I show that the He Gets Us videos present a framing of Jesus that differs from the public memory of Jesus in a way that allows for a demystifying of current systems of power and offers opportunities for new conversations towards social change. Through this analysis, I not only show the power that public memory has in determining our understanding of the world, but also the emancipated environments that public memory can create.

Presenter: Jacob Weber
Sponsor: Sara Drury (Rhetoric)
Title: Layers of The Onion: Generic Deviation and the Burlesque Frame in the U.S. Supreme Court

The genre of legal rhetoric has been subject of previous scholarship, though few artifacts of legal rhetoric are worthy of analysis through Burke's burlesque frame of rejection. This rhetorical analysis uses a combination of generic criticism and the burlesque frame to analyze an amicus curiae brief filed in the Supreme Court by The Onion, a satirical news platform, in 2022. Analysis reveals that The Onion's brief strategically accepts and rejects generic expectations to be accepted as legal rhetoric while opening the door to critiquing the genre itself. This is then combined with a burlesque argumentation style to invite ridicule and mockery of the brief's opposing arguments and the U.S. legal system. This analysis also identifies a need for further research on the burlesque, as while it is the frame of choice for conservative rhetors, The Onion's arguments are progressive in nature. Through taking this new approach to legal argumentation, The Onion's brief showcases the rhetorical power of burlesque arguments and their potential utility in legal frameworks. Future advocates should be cautious in their use of burlesque arguments in legal discourse, as it does open the door to the erosion of public trust in the legal system.

Presenter: John Schnerre
Sponsor: Jeremy Hartnett (Classics)
Title: A Latin Inscription from Puteoli in Late Antiquity: Geological, Historical, and Economic Considerations of a Roman Port

What can an inscription – Latin words carved into a stone – about shipping docks tell us about the geological, political, and economical contexts of an ancient Roman port? A great deal, actually. Much of our current understanding of the classical world comes from translating and interpreting seemingly-bland inscriptions that have withstood the test of time to still survive today. This presentation concerns one inscription from the major port of Puteoli, a site that advanced Greek and Latin students visited last spring as part of their immersion experience in the Bay of Naples. The inscription, which documents a 4th-century CE restoration of the port's quays, speaks to Puteoli's continued importance in Late Antiquity, the literarily-shifting landscape in this volcanologically-rich zone, and the desire of a city administrator to leave a record of his work. On a larger level, the inscription demonstrates how careful investigation of a small piece of evidence can help classicists to uncover vast amounts of information about the ancient world.

Oral Presentations & Performances

Presenter: Kayden Beatty
Sponsor: Zachery Koppelman (Writing Center)
Title: Bridging Methodologies: A Comparative Analysis of Writing Center Practices in Greece

This presentation explores the methodologies employed by a writing center in Greece, with a focus on training learning facilitators and fostering an inclusive environment. Key aspects of collaborative learning, feedback techniques, and multilingual facilitation are analyzed, alongside a review of cultural awareness practices that enhance accessibility for diverse student populations. Findings highlight the significance of adaptability, preparation, and cultural competency in effective facilitation. The discussion also identifies opportunities for enhancing multilingual training, cultural awareness, and long-term impact assessments within our institution. By leveraging these insights, this study aims to advance writing center practices, promoting inclusivity and academic success.

Presenter: Kobe Perez
Sponsors: Jennifer Abbott (Rhetoric), Agata Szczeszak-Brewer (English), & Joyce Burnett (Economics)
Title: Gender and Job Advertising

My research examines the relationship between gendered language in job advertisements and the higher representation of women in manufacturing jobs in Montgomery County, Indiana (37%) compared to the national average (32%). Using feminist analysis through the help of the works of bell hooks, Kimberlé Crenshaw, and Sylvia Walby, my research analyzes 50 manufacturing job advertisements from LinkedIn and Indeed to understand how language and framing might influence gender representation in the manufacturing industry. My study identifies four key language patterns in local job advertisements: safety focused language, collaborative wording, emphasis on growth opportunities, and inclusiveness phrasing. Through careful analysis of these patterns, the research finds that Montgomery County manufacturing job advertisements generally employ language that creates a more welcoming environment for women, challenging traditional gender barriers in manufacturing. My findings suggest that specific word choices and phrasing can influence gender representation in traditionally male dominated industries. My research contributes to our understanding of how wording in recruitment materials can either perpetuate or challenge gender disparities in the workforce, offering insights for creating more inclusive hiring practices in manufacturing and other male dominated industries.

Presenter: Lance Williams
Sponsor: Zachery Koppelman (Writing Center)
Title: How the American College of Greece Navigates the Rise of AI

ChatGPT was released to the public back in 2022. From the moment it touched the internet, it shook the foundation of content creation, business, and most noticeably, schoolwork. Since the release of ChatGPT, students have been using it to assist with schoolwork. Abuse of the software has presented a problem to educators, and it has become increasingly common for students to have ChatGPT do their schoolwork for them. This has affected the way teachers handle schoolwork, but what are schools in other countries doing? Are they handling this differently?

We know how the AI situation has been widespread in the U.S., but we haven't paid enough attention to how it is being handled on a global scale. To gain an understanding of how schools in other parts of the world have reacted to the rise of AI, I went to the American College of Greece to witness their policies. Arriving there, I interviewed students that the school identifies as 'learning facilitators', who have a similar job to Writing Consultants here at Wabash College. Each of these students specializes in tutoring for a specific area of study. This can include math, language, science, and other areas. These students proved to be valuable resources, since they are students but find themselves in a similar position to teachers. So they experience the impact of AI from both viewpoints.

As one would expect, the school itself is heavily against the use of AI and implements policies to fight it. Something interesting about this college, though, is the existence of an AI task force that is spearheaded by Dr. Gregory Kafkas. What I found out about this AI Task Force significantly contrasts from how many other colleges at the time were treating the AI issue. Rather than completely reject its existence, Dr. Kafkas realized AI would go nowhere anytime soon. Thus, he aims to live with and incorporate it to serve as a tool for the college.

Oral Presentations & Performances

Presenter: Logan Weilbaker
Sponsor: James Cherry (Theater)
Title: Max Reinhardt at Wabash: The Lasting Innovations of a 20th Century Director

Though his name is little known outside theater circles, the impacts of Austrian director Max Reinhardt (1873–1943) are pervasive in nearly every aspect of the directorial process throughout the 20th century and beyond. Throughout his career, Reinhardt experimented with aspects of the creative process, producing innovations in light, sound, costumes, and set design. Many of the techniques he pioneered are all still in use today at all levels of theater — including here at Wabash. Using examples from recent Wabash Theater Department productions like *Something Rotten!*, *Airness*, and *The 39 Steps*, this presentation reveals the hidden legacy of one of theater's most influential artists.

Presenter: Luis Sanchez
Sponsor: Jeff Gower (Philosophy)
Title: Disability as a Social Construct: A Critique of Capitalism and Utilitarianism through the Privilege Game

This essay analyzes how capitalism and utilitarianism perpetuate the economic and social exclusion of people with disabilities, justifying it in the name of the "common good." Based on Elizabeth Barnes' theoretical framework, which conceptualizes disability as a social construct, it examines oppressive dynamics in economic systems and the pharmaceutical industry, where profitability takes precedence over well-being. Furthermore, a pedagogical tool inspired by the 'Privilege Game' is proposed to illustrate quality-of-life challenges in different regions. Finally, the role of educational institutions is a key agent in promoting inclusive and equitable societies.

Presenter: Neal Laymon
Sponsor: Karen Quandt (French)
Title: The Pertinence of Michel De Montaigne's Skepticism in Modern Society

This presentation explores the enduring relevance of Michel de Montaigne's skepticism, focusing on its applicability to contemporary issues. Montaigne's philosophy, encapsulated in the question *Que sais-je?* ("What do I know?"), emphasizes humility, self-reflection, and doubt as essential tools for navigating uncertainty. His skepticism, rooted in Renaissance humanism, provides a framework for addressing modern challenges such as identity formation, misinformation, trust in scientific authority, and ideological polarization. By examining Montaigne's views on the fluidity of personal identity, the limits of knowledge, the evolving nature of scientific understanding, and the necessity of tolerance, this paper argues that his philosophy encourages critical inquiry while fostering intellectual humility and empathy. In a world characterized by information overload and societal division, Montaigne's insights offer a timeless guide for embracing complexity, questioning assumptions, and cultivating meaningful connections with oneself and others.

Presenter: Nicholas Green
Sponsor: Jonathan Baer (Religion)
Title: Race and Rust: How the American Social Gospel Reacted to Reconstruction

Throughout last semester, I conducted research on the Social Gospel Movement for Religion 181. This social reform movement was led by American protestants and sought to address the numerous social issues America faced in the aftermath of the Civil War, such as poverty, prostitution, and racial discrimination. In this oral presentation, I will provide a broad explanation of the Social Gospel Movement before focusing on some of its specific leaders, such as Washington Gladden, Walter Rauschenbusch, Charles M. Sheldon, and Reverdy C. Ransom. These leaders all shared similar theological beliefs and reform methods, though they all focused on different social issues. I will describe the theology, approaches, and targeted issues of each of these figures, before concluding with a discussion of the legacy of the Social Gospel Movement within American society and broader American history.

Oral Presentations & Performances

Presenter: Noah McRoberts
Sponsor: Warren Campbell (Religion)
Title: Cracking the Mind of Paul: An Example of Study in Religion

Is studying religion only for future pastors? For the religiously devout? Or maybe just those who want an easy Gen Ed grade? Obviously, as a religion major I don't think that's the case. My presentation titled "Cracking the Mind of Paul: An Example of Study in Religion" is going to use my classwork research in religion as an example of the rigorous academic study that can be done in the department of religion. My plan is to briefly start broad, looking at what can be studied in religion, before quickly focusing in on a specific topic, in a specific domain of religion, namely, the case of St. Paul. Surveying some research regarding him, I will suggest that Pauline Biblical studies is ultimately an attempt to 'crack open' the mind of Paul; to understand what he was thinking when he wrote his letters just over 2000 years ago. Thus, I hope to educate an array of people about what can be studied in the broad field of religion, using my personal experience investigating the mind of St. Paul.

Presenters: Patrick Countryman & Ayden Lutes
Sponsor: Joe Scanlon (Chemistry)
Title: Effects of Substituents on Halogen Bond Tethered Electron Donor-Acceptor Complexes

Electron Donor-Acceptor (EDA) complexes can be made when one molecule contains a partial positive charge, and another molecule contains a partial negative charge. This electrostatic interaction can complex them together. If these two molecules are tethered together, they can become molecular switches with two states. In one state, they are complexed, and in another, they are not. These switches are part of a field called molecular machines that have potential applications from drug delivery to transistors. In this study, the complexes were tethered together using a halogen bond. It is known that substituents on the tether affect the halogen bond, however, it is unknown if substituents would affect the EDA complex. We studied two systems called Hex-I and Trap-I with dimethyl amine and trifluoromethyl substituents. We used computational chemistry to determine any structural or energetic changes to the halogen bond or EDA complexes.

Presenter: Prasun Panthi
Sponsor: Dennis Krause (Physics)
Title: Ultralight Dark Matter Halo Model and Properties

Ultralight dark matter (ULDM) and ULDM Halos have emerged as promising candidates to resolve several issues in cosmology and galaxy formation. This paper investigates the properties and formation mechanisms of such ULDM halos, emphasizing the role of wave-like behavior in shaping their structures. We explore the dynamics of fuzzy dark matter (FDM) and axion-like particles (ALPs). Our study includes the calculation of coherence lengths, times, and occupation numbers, providing insights into the unique features of ULDM halos. We also address how ULDM models mitigate challenges faced by cold dark matter (CDM) theories, such as the core-cusp, missing satellite, and too-big-to-fail problems.

Presenter: Preston Parker
Sponsor: James Cherry (Theater)
Title: Let Nothing Stand in Your Way: Getting *Angels in America* to Wabash College

I will be presenting on the history and legacy of the production of *Angels in America Part One: Millennium Approaches* at Wabash College in 1996. There exists a rich history behind the process of getting this play to Ball Theater, its production, and the reactions about this production from the local and national scale that shouldn't be forgotten. Through presenting my collection of e-mails, documents, and newspaper articles from the Robert T Ramsay, Jr. Archival Center and in-person/online interviews, I intend to detail how Dr. James Fisher and others put on the most historically significant and influential theater production in Wabash College's history and how, in learning this history, it teaches us about the nature of progress at Wabash in our present day.

Oral Presentations & Performances

Presenter: Preston Reynolds
Sponsor: Noe Pliego Campos (History)
Title: Anxiety, Fear, and Understanding: Late-18th Century Republican Discourse

In the late 18th century, republican intellectuals thoroughly discussed possible alternatives to absolute monarchy. Despite the collaboration of international celebrities like Jean-Jacques Rousseau, U.S. American intellectuals expressed only vitriol for many "old world" republicans. This study seeks to explain the divergence between similar intellectual communities while exploring our modern political system's foundations. Discussions on the "Age of Revolution" (1765 – 1849) focus extensively on North American and French intellectuals. Yet, the wider global contact between late-18th century republicans has received less attention. Narrowing in on particular disagreements of French, Polish-Lithuanian, and U.S. American sources on the "Partitions of Poland" (1772, 1793, 1795), reveals contrasting “open circuit” and “closed circuit” discourses between agrarian elites. This contrast informs a nuanced discussion on pre-industrial republicanism and exposes the fickle nature of discourse in a world before the official nationalism we now find familiar.

Presenter: Quinn Manford
Sponsor: Huei-Jyun Ye (Political Science)
Title: *Democracy Promotion with ASEAN and the EU: A Comparative Study*

This study examines how policy frameworks affect regional international organizations' (RIOs) effectiveness in promoting democracy among member states, specifically comparing organizations with non-interference policies to those without. Through a comparative analysis of the Association of Southeast Asian Nations (ASEAN) and the European Union (EU), focusing on their responses to democratic backsliding in Myanmar and Hungary, respectively, the research reveals that institutional design significantly impacts both the tools available and willingness to use them in democracy promotion efforts. While both organizations showed limited concrete actions against democratic backsliding, their approaches differed significantly. The EU's direct confrontational stance enabled the containment of Hungary's influence through international isolation and constant pressure despite lacking major official sanctions. Conversely, ASEAN's careful neutrality toward Myanmar's competing regimes demonstrates not a failure but rather the successful implementation of its non-interference policy—even at the cost of democratic principles. These findings suggest that effective democracy promotion requires explicitly prioritizing democratic principles over other considerations like non-interference or consensus-building. This research contributes to our understanding of how institutional frameworks shape RIOs' capacity to influence domestic political developments in member states, with important implications for the design and reform of regional organizations.

Presenter: Tanner Quackenbush
Sponsor: Annie Strader (Art)
Title: Blue Ridge Mountains: An Unexpected Hub for Creativity and Professional Growth

Penland School of Craft is a renowned art education center in North Carolina's Blue Ridge Mountains. I participated in the workshop "Storytelling as Identity: Process, Performance, and Paint" by Michael Dixon from July 28 to August 9, 2024. This workshop focused on creating self-portraits using modern oil painting techniques, including observation drawing, figure study, composition, and color theory, while incorporating performance to enhance storytelling.

The trip was filled with excitement and uncertainty. After a ten-hour drive, I followed a rigorous daily schedule of studio work and performances. Each challenge, from quick sketches to detailed paintings, allowed me to become vulnerable and helped me connect meaningfully with peers and instructors, fostering my personal and professional growth.

I reflect on the immersive experience at Penland, the challenges faced, and its profound impact on my artistic journey, preparing me for my semester abroad in Florence, Italy.

Oral Presentations & Performances

Presenter: Ryan Frazier
Sponsor: Michele Pittard (Education Studies)
Title: Bridging the Literacy Gap: A Community Conversation for Change

This project outlines The Great Conversation, a community-driven initiative designed to address literacy challenges within the Lake Ridge School District. Using civic mapping as a research tool, the project encourages stakeholder collaboration, cultural inclusivity, and sustainable solutions to close reading proficiency gaps caused by socioeconomic disparities and resource limitations. Through partnerships with local libraries, organizations, and families, The Great Conversation seeks to improve literacy rates, create stronger school-community relationships, and empower students, educators, and parents to advocate for change. This initiative represents a critical step toward equitable education and long-term community growth.

Presenter: William Chapman
Sponsor: Jeff Gower (Philosophy)
Title: Designing Effective Carbon Pricing: Balancing Environmental Goals and Social Equity

This research examines how carbon pricing can resolve the apparent tension between environmental effectiveness and social equity through the dynamic interaction of three key mechanisms. Analysis of empirical evidence reveals that successful implementation depends on the reinforcing relationship between context-specific policy design, strategic revenue recycling, and international cooperation frameworks. The study demonstrates that carbon pricing policies can simultaneously advance climate and equity goals when these mechanisms are implemented as an integrated system rather than as isolated policies. Evidence from developed and developing economies shows that carefully structured carbon pricing frameworks can reduce emissions while promoting social equity, mainly supported by international cooperation mechanisms enabling knowledge sharing and capacity building.

Poster Presentations & Exhibitions (Alphabetical by Presenter)

Presenter: Andrew Dever
Sponsor: Jane Hardy (Spanish)
Title: Snapshots of Democracy: The Athens Democracy Forum and Global Democracy

This past semester, I was privileged to represent Wabash College at the Athens Democracy Forum, an international forum of non-profits, politicians, activists, and students from Europe, Asia, Africa, and the United States. One consistent message throughout the three-day event was that democracy is a global practice with unique and diverse challenges and situations. Yet, at Wabash, democracy is rarely considered outside American and European considerations. Furthermore, many speakers discussed the importance of the "youth perspective" in informing and shaping prominent discourse about global democracy.

Consequently, inspired by the message presented at the New York Times and Democracy and Culture's Athens Democracy Forum, this presentation strives to educate the Wabash community about the struggles and successes of democracies worldwide in 2024. As a result, my poster will highlight, educate, and create a conversation surrounding the status of democracies, including (but not limited to) South Korea, Ecuador, and Ghana. Since American political discourse is too often fixated solely on the status of our country, I hope to inspire conversation about the unique circumstances facing democratic countries on other continents. As participants approach the presentation, I hope to engage with them in productive discourse about the successes and failures of democracy outside of the American context.

Presenters: Arlie Benson & Timothy Smith
Sponsor: Jim Brown (Physics)
Title: MoNA Collaboration: Next Generation Neutron Detector

The MoNA (Modular Neutron Array) Collaboration is a collection of educational institutions that combine research to create neutron detectors. These detectors are then used to study neutron-unbound states and explore the most neutron-rich states that can exist for certain elements. The current phase of the collaboration is to create a next-generation neutron detector, where instead of photomultiplier tubes, the detector will use silicon photomultipliers or SiPMs, which have a greater efficiency in their detections. As collaborators in this research, we tested the functionality and efficiency of C-Series and T-shape SiPMs in detecting neutrons and ran Geant4 simulations on different orientations of SiPMs. As the research progresses, we will begin using a more advanced readout system named FERS to process and analyze data.

Presenters: Atticus Blank
Sponsor: Brent Harris (Athletic Communication Director)
Title: What Effect Does a Stemming Defense Have on an Offense in the NFL?

For the NFL Big Data Bowl this is the project our team is doing. The theme for the competition this year is pre-play movement. We intend to look at how a stemming defense correlates with turnovers and pressure rate in the NFL. The definition of Stemming in Football is the movement before the snap of the ball that the defense makes. Movements include defensive lineman shifting from a shade to a three technique or the secondary rolling into cover three from a cover zero look. The two main things we are looking for is how does the stemming of a defense correlate with turnovers and the pressure rate. Stemming doesn't give the offense a clear look of what type of coverage a defense might be playing, or a defensive coordinator might stem his linebackers to hide a cornerback blitz. It causes problems especially today with a higher number of young quarterbacks. Defense that stem, we believe cause more turnovers and adds more pressure to quarterbacks, which will lead to more sacks.

Poster Presentations & Exhibitions

Presenters: Cole Shifferly & Bawithathawng Thang
Sponsors: Erika Sorensen-Kamakian (Biology) & Walter Novak (Chemistry)
Title: Peptide Tools for Big Changes: Exploring Proteostasis in Worms

Protein homeostasis (proteostasis) is the balance between healthy and damaged proteins in cells. Conditions that enhance proteostasis are associated with longevity, whereas decreased proteostasis results in the accumulation of unnecessary and dysfunctional proteins, which can lead to the onset of neurodegenerative diseases like Alzheimer's. One way that organisms break down damaged or superfluous proteins is using a large cellular machine called the proteasome. We studied proteasome activity in *C. elegans*, a nematode worm which is an effective model for aging and neurodegenerative disease. We assessed proteasome activity using small, commercially available peptide substrates. These small substrates are the classic approach for studying proteasome activity in cell lysate and emit fluorescence following proteasome breakdown. Proteasome assays combining worm lysate and these small substrates revealed enhanced substrate breakdown at higher temperatures. To control our experiment, we used a proteasome inhibitor and a protease inhibitor cocktail, which inhibits small protein enzymes. We found that both inhibitors completely prevented substrate breakdown. Our results indicate that small peptide substrate assays measure cleavage by both the proteasome and proteases in *C. elegans* lysate. Thus, researchers should consider the contribution from both proteases and the proteasome if using these substrates to study worm proteostasis.

Presenters: Cole Shifferly, Quinn Fitzgerald, & Omar Garcia
Sponsors: Brad Carlson (Biology)
Title: Scute & Seek: The Role of Microhabitat in Locating Wabash's Favorite Reptile

The Eastern Box Turtle, *Terrapene carolina carolina*, is a terrestrial reptile which has a widespread range and is commonly found in many parts of the United States. Despite the large range of this species, box turtle populations are declining, and little is known about the specific microhabitats which these turtles select. Understanding trends of box turtle habitat selection gives researchers guidance to protect environments which are vital for turtle population maintenance. Our lab investigated the relationship between box turtle personality and microhabitat selection using field assays where turtle locations were tracked and used to obtain several metrics of the environments which turtles actively chose as habitats. To corroborate and establish a control for this data, we also collected metrics from nearby locations which turtles failed to select. We hypothesized that turtles would select for microhabitats which contained high concentrations of woody or vegetative plant matter and that turtles would select against habitats that lacked these structures, such as areas with bare soil. We found subtle correlations which suggest that generally, box turtles select for habitats which are humid, and populated by ground cover or woody debris, but select against habitats where temperatures are colder.

Presenter: Cooper Jarvis
Sponsor: Sujata Saha (Economics)
Title: The Impact of Macroeconomic Indicators on Sectoral Employment: Evidence from the 2008 Crisis

During the Great Recession in 2008, different sectors were affected differently; for example, manufacturing and construction were most affected; however, the healthcare and food and beverage retailer industries were least affected. This paper studies the impact of macroeconomic indicators on sectoral employment from 1994 – 2023 using quarterly data. The major findings of this paper are that the most affected sectors saw large decreases in employment as the delinquency rate on all loans increased. Alternatively, there was no relationship between employment and the delinquency rate on all loans for the unaffected sectors. The unaffected sectors saw the largest decrease in employment as house prices increased, while the affected sectors saw an increase in employment as house prices increased. Understanding the relationship that each of these macroeconomic indicators have on certain employment sectors will help understand how to prevent or reduce their impact in the future by implementing new policies.

Poster Presentations & Exhibitions

Presenters: David Leal, John Huisden, & Robert Greene
Sponsor: Aiala Levy (History)
Title: Making Home: Charting the Relationship Between Wabash's Latino Clubs and Immigration

How have Latino student organizations at Wabash College evolved in response to immigration topics, global immigration issues, and xenophobia from 1980 to 2023? This central question guided our original research project in Digitizing Immigration History, a course dedicated to exploring the intersections of immigration, ethics, and digital storytelling. Leveraging historical documents, interviews, and archival materials, our group created an interactive timeline using TimelineJS to explain the evolution of Wabash Latino clubs within the context of U.S. immigration policy. The digital exhibit examines how Latino student organizations at Wabash College have fostered inclusivity, cross-cultural understanding, and advocacy on campus while also confronting significant challenges. Over time, these clubs experienced a cyclical pattern of activism. Periods of advocacy, including immigrant rights, were often followed by phases focused on cultural celebration or internal development. By examining their history and impact, we aim to underscore the complexities of Latino student organizations' roles in supporting immigrants on and off campus. This timeline serves not only as a celebration of Latino student contributions but also as a tool for understanding the evolving relationship between immigration issues and local communities, including Wabash College and Crawfordsville. Join us to explore this powerful narrative.

Presenter: Don Silas
Sponsor: Lynn Krushinski (Chemistry)
Title: Improving Aptamer-Based Sensor Stability with Optimization of Applied Potential

Reliable detection of toxic materials is critical for environmental protection and health care. Existing methods often involve destructive sampling, making materials unsuitable for reuse, while clinical diagnostics frequently rely on invasive techniques, causing patient discomfort and reducing treatment compliance. Our research involves the optimization of aptamer-based sensors that are highly sensitive, fast-acting, and non-destructive. Aptamer-based sensors typically suffer limited longevity due to degradation and signal loss over time. We aim to minimize degradation and signal loss by reducing the amount of voltage passed at the aptamer binding sites by optimizing the magnitude and frequency of the applied potential as well as introducing platinum nanoparticles to selectively run degradation reactions (such as the hydrogen evolution reaction). By minimizing signal loss, we aim to enhance the reliability and efficiency of these sensors, reducing chemical and economic waste. This work has significant implications for sustainability, environmental monitoring, and patient-centered healthcare.

Presenters: Drake Green, Adonis House, Devonta Bailey, Caleb Drousius, John Miller, Masun Moore, Carter Ripke, Ethan Sparks, Timothy Stohl, Andrew Williams, Kannon Chase, Grayson Dunn, Kamden Earley, Curtis Faughnan, Caden Friedt, Devin Jimenez, Clayton McPeek, Thang Sathing, Kai Warren, & Alex Worley
Sponsor: Damon Mohl (Art)
Title: Wabash Animation Video Art

This video exhibition consists of animation excerpts created in two recent courses: ART 225 - Experimental Animation and ART 225 - Drawing Animation. For the most part, these projects focus on non-narrative approaches, in which storytelling is subordinate to treating the animations like visual divergent experiments. Projects considered aesthetic principles of collage, color, movement, form, and composition, as well as developing an understanding of visual literacy. In Wabash animation courses, students learn to use digital media programs such as Adobe After Effects and Photoshop to create Art, as well as for possible future commercial applications.

Poster Presentations & Exhibitions

Presenter: Elijah Arnold
Sponsor: Neil Schmitzer-Torbert (Psychology)
Title: Examination of Vicarious-Trial-and-Error Through Gaze Behavior and Deliberation in a Translational Virtual Navigation Task

VTE (vicarious trial-and-error) is widely used as a behavioural measure of deliberation in rodent and human spatial navigation. In primates, visual search patterns, such as those seen in SFS ('saccade-fixation-saccade') tasks, which involve rapid gaze shifts and brief fixations, have also been proposed as alternative indices of deliberation. However, at the present time, the relationship between VTE and eye movement patterns has not been established. To assess the relationship of VTE and eye movements to deliberation in humans, we measured both behaviours in humans performing a translational virtual navigation foraging task (the Movie Row). In the Movie Row, humans navigate a square track, visiting four different "movie theatres," where videos of different types are available (e.g. kittens, bike fails, dancing, and landscapes). Participants were presented with a random delay after arriving at each reward location, and had the option to either accept the delay (and wait to watch the movie clip), or reject the offer and move on to the next reward location. VTE was assessed from the time the offer was made until participants made a decision, and eye-tracking data were used to characterise gaze variables (such as dwelling on the offer information). A total of 46 undergraduate males have been tested to date, and analyses are ongoing. We predict that deliberation will be greater for difficult offers (ones that are close to a participant's threshold to accept or reject an offer) and will be associated with both greater VTE, and also with increased sampling of information about the delay presented.

Presenters: Enrique Ruiz, Mitchell Bock, Johnathan Otte, Matthew Hendrick, Alexander Straw, & Keane Albright
Sponsor: Chad Westphal (Mathematics and Computer Science)
Title: A Web Tool to Aid Multi-Orbit Interference Analysis

Our team collaborated with Space ISAC to improve their process of transforming open-source data into actionable alerts for the space community. We focused on instances of Radio Frequency (RF) interference between satellites and ground stations, using a targeted keyword list to identify relevant events. To streamline data collection, we developed a web scraper that automatically scanned a database of websites and retrieved articles containing these key terms. The collected articles were then processed by two specialized teams.

The first team applied Natural Language Processing (NLP) to classify the articles, distinguishing between natural outages and malicious incidents. Malicious cases were further categorized using established frameworks such as SPARTA and MITRE ATT&CK. Simultaneously, the second team summarized the articles, condensing critical information into concise reports. These summaries were passed to the Heat Mapping Team, which plotted RF interference events on a geographic map, linking each location to its respective summary.

This integrated approach automated and enhanced Space ISAC's data pipeline, enabling the delivery of timely, actionable insights. By visualizing and classifying RF interference events, we supported better decision-making and strengthened the space community's ability to respond to emerging threats.

Presenters: Ethan Johns & Benedict Grill
Sponsor: Laura Wysocki (Chemistry)
Title: Synthesis of Known and Novel Fluorescent Dyes

Fluorescent dyes can be used to identify structures and quantify cellular processes, making them critical tools for experimentation and imaging in biological research. Dyes can be expensive and inaccessible for many researchers. As part of an Open Chemistry initiative, we have synthesized AlexaFluor dyes to be sampled by scientists for free. With free samples of these dyes, researchers will be able to find dyes that work best for their experiments before committing their limited funds to purchasing expensive dyes. Recently, traditional dyes have been optimized to be brighter with greater photostability, forming a set of JaneliaFluor dyes. To enable efficient use in biological settings, we have begun to develop a novel linker for JaneliaFluor dyes using a water-stable ester with the ability to conjugate to biomolecules of interest. These efforts should aid biological research now and into the future.

Poster Presentations & Exhibitions

Presenters: Evan Baker & Braeden Cooper
Sponsor: Eric Wetzel (Global Health Initiative)
Title: Global Health Initiative in Perú

The Wabash College Global Health Initiative sends two students to Huánuco, Lima, and Tingo Maria Perú each summer. In Perú, the students primarily spend their time shadowing Peruvian medical personnel and working alongside teachers and college students that lead classes for children with disabilities, underserved communities, and expecting mothers. They also aid university professors in their research and travel around the country to see various ways that Wabash GHI and the Peruvian team members serve their community. The GHI has 3 programs across multiple cities in Perú: Creciendo Juntos, Vida Sana, and Corazones Excepcionales. The Wabash GHI students work with each program to gain a deeper understanding of inequalities in health in Perú so we can apply the knowledge to serving our own communities in the future.

Presenter: Evan Baldwin
Sponsor: Nate Tompkins (Physics)
Title: Savings Ships – Detecting Steel Corrosion on Naval Ships using Acoustic Impulses

In many cases, especially in the Canadian Navy, we are losing ships because rust spreads too far on them before we can detect it. My mentor, Mr. Ken Crawford (a Wabash Alumnus), has been working on this problem for years now, and has created an easy-to-use machine that can detect rust on ships before it becomes a problem. My job was to test out his model and find a way to discover the thickness of a piece of metal by detecting the frequencies of the soundwaves that occur when hit with a hammer. I also needed to be able to find this thickness in various conditions, including above water, under fresh water, and under salt water.

Presenter: Evan Dickey
Sponsor: Amanda Ingram (Biology) & Damon Mohl (Art)
Title: Strengthening Botanical Research with Scientific Illustration

With the mind of both an artist and a scientist, I enjoy taking notice of small details that make my subject unique from all other things. I also loved the idea of combining my two passions, artistic and biological studies, through the outlet of botanical illustration. For this project, I used media previously unfamiliar to me to create visual studies of several species native to Indiana. These native plants can also be found on the Wabash College campus, most of them in our very own Petty's Patch, a site on campus that has become quite a special place to me in the past year. I spent a considerable amount of time in Petty's Patch studying for class and even got to meet members of Robert Petty's family who greatly cherished the commemorative space. Through this project, I was also allowed to complete a more formal illustration suitable for inclusion in a scientific publication. The subject was a species native to Zambia and Tanzania, *Eragrostis congesta*, whose classification is currently in question. It was important to me that my illustration would add to ongoing studies of the species through the accurate depiction of its unique features. Ultimately, this project has inspired me to continue my studies in the field of botanical and scientific illustration. I learned new skills of creating works in watercolor and ink media, and my abilities to notice and accurately depict small details, even those at the microscopic level, were strengthened greatly.

Presenter: Garrett Dalton
Sponsor: Pat Burton (Biology)
Title: Cav 2.2 and Dibutyryl-cAMP Delay *Aeolosoma* (Annelida) Anterior and Neural Regeneration

Aeolosoma are a type of annelid that live in freshwater. They can fully regenerate their anterior within 120 hours after it has been bisected. Cav 2.2 is an inhibitor that blocks the N-type calcium channel which is vital to neural signaling (SelleckChem). Dibutyryl-cAMP activates Protein Kinase A (PKA) by mimicking cAMP which inhibits phosphodiesterase (PDE) (SelleckChem). This process is essential in cell regeneration, so its inhibition could lead to a lack of cell proliferation in the anterior.

Poster Presentations & Exhibitions

Presenters: Gregory Powers & Abdul Basit Tonmoy
Sponsor: Qixin Deng (Mathematics and Computer Science)
Title: Enhanced Facial Emotion Classification Method with 135 Classes

Facial emotion recognition is a critical aspect of human-computer interaction (HCI) and behavior analysis, enabling systems to interpret and respond to human emotions in a more nuanced and effective manner. While previous research predominantly focuses on classifying seven or eight primary emotions, there has been limited exploration into more detailed and varied emotional expressions. We address this gap by utilizing a recently published dataset that includes 135 distinct emotional classes, significantly increasing the complexity and granularity of emotion recognition tasks. To tackle this challenge, we propose a novel framework that combines U-Net and ResNet architectures, leveraging the strengths of each to capture intricate emotional cues and spatial features. Our approach achieves higher accuracy than current state-of-the-art (SOTA) methods, demonstrating its effectiveness for high-dimensional emotion classification in complex, real-world applications.

Presenters: Henry Giesel & Ike O'Neill
Sponsors: Erika Sorensen-Kamakian (Biology) & Walter Novak (Chemistry)
Title: Switch-ing Things Up: A Novel Method of Post-Translational Control in *C. elegans*

To better understand animal development, we are piloting a novel protein control method called 'Latching Orthogonal Cage/Key pRoteins' (LOCKR). This method relies on two designed proteins, a Switch and a Key. The Switch cages a protein sequence, such as a degron for protein destruction, in the "locked" state. The Key can "unlock" the Switch to expose the degron, simultaneously destroying the Switch and any proteins fused to it. Key expression can be restricted to specific tissues, which we hypothesize will give Key-induced Switch destruction exquisite spatial control in multicellular organisms. We are piloting LOCKR in an animal model for the first time using *C. elegans*, a small worm. We developed several worm strains expressing the Key fused to green fluorescent protein and worms expressing the Switch fused to red fluorescent protein. Both the degronSwitch and the Key should be expressed throughout the body of the animal. While the Key animals glow green, our Switch animals were not red despite being positive for the degronSwitch using other measures of gene expression. To solve this problem, developed a new, optimized degronSwitch for worms. Here we report our progress establishing a novel method for regulating protein expression in an animal model.

Presenters: Jackson Leeper, Julius Hearn, & Keane Albright
Sponsor: Qixin Deng (Mathematics and Computer Science)
Title: Computer Science Senior Capstone: Game Development/Parallel

Our senior capstone was developing a thriller top-down 2D game called "Parallel." The game consists of a character trying to escape a haunted airport by using the items in the environment and completing quests from other characters. We used the Godot game engine to develop this game. Multiple elements were created to make this game functional. Keane Albright was in charge of User Interface, characters and non-player characters, and dialogue and quest system. Julius Hearn was in charge of managing the creation of the environment, textures, storytelling, and mapping the controller to the game. Jackson Leeper was in charge of the inventory system, items, enemy, and hiding mechanic.

Presenters: Jacob Ramirez, Caden Short, & Matthew McIlvenna
Sponsor: Heidi Walsh (Biology)
Title: Investigating the Role of Estrogen in Neuronal Lipotoxicity and Endoplasmic Reticulum Stress

Obesity, a rapidly increasing chronic condition found in millions of Americans, is a leading contributor to a variety of diseases. Consuming a high fat diet leads to increased fatty acid levels, and in turn leads to lipotoxicity, characterized as increased levels of fatty acids that cause adverse cellular effects such as production of reactive oxygen species, production of ceramides, inflammation and endoplasmic reticulum (ER) stress. In the brain, obesity can cause lipotoxicity in neurons, but the exact mechanisms are unclear. Estrogen can regulate inflammatory mediators, like cytokines, to protect against lipotoxicity, but it is unknown whether estrogen affects the response to saturated fatty acids in neurons. This study investigates whether estrogen influences lipotoxicity in neurons using GT1-7 cells, a model for gonadotropin-releasing hormone (GnRH) neurons, which play a critical role in regulating reproduction. We induced lipotoxicity using palmitic acid and ceramides and co-treated cells with estrogen to view its impact on ER stress markers ATF4 and CHOP as well as induction of two forms of cell death, apoptosis and necrosis.

Poster Presentations & Exhibitions

Presenters: Jonathan Parackattu & Lucas Cunningham
Sponsor: Lynn Krushinski (Chemistry)
Title: Measuring PFAS in Sugar Creek using MIP Sensors

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that exist in many household products. These “forever chemicals” are highly toxic in the environment, so the desire for efficient and effective identification methods is on the rise. Our research involves creating a MIP electrode to determine amounts of PFAS in water by measuring changes in current. We will conduct live testing of water samples from Sugar Creek in Crawfordsville to determine the effectiveness of this testing method in the real world. Molecularly imprinted polymers (MIPs) will be electrochemically synthesized by reducing o-phenylenediamine on the electrode surface in the presence of PFAS template molecules. Importantly, PFAS is not readily oxidized or reduced in water on conventional electrodes, so an electroactive reporter molecule, hexacyanoferrate (II/III), will report on the relative binding of the target PFAS molecules in river-water samples. This creates a turn-off sensing platform specific for PFAS. We aim to establish an effective testing method using existing MIP-based sensing that can be performed onsite without needing to travel back to a lab to generate results. Additionally, we hope to determine the amount of PFAS present in Sugar Creek and other local waterways. Through this project, we intend to establish an efficient and effective template for identifying PFAS concentrations in water that can be easily replicated wherever PFAS testing is required.

Presenter: Logan Weilbaker
Sponsor: Michael Abbott (Theater)
Title: Inside the Making of *12 Angry Men* at Wabash College

As you hopefully have heard by now, I will be directing the Wabash Theater Department's production of *12 Angry Men*, running in the Experimental Theater of the Fine Arts Center from February 26–March 1. The production is now more than a year in the making, and I spent my senior seminar during the fall semester preparing to direct in the months of January and February. When an audience watches a play, they are seeing the culmination of months of work, and this presentation aims to pull back the curtain and expose that work to curious observers. I will discuss elements of the pre-production process like picking a play, setting and staging your play, working with designers to develop a cohesive vision that includes set, lights, sound, and costumes, casting (including best practices for color-conscious casting in today's world), advertising, rehearsing, and more. All of these elements will be visually on display on my poster, with a loosely-flowing structure that invites questions and conversation.

Presenters: Matthew Hendrick, Samuel Decker, & Luka Difilippo
Sponsor: Qixin Deng (Mathematics and Computer Science)
Title: Bet Big or SML

Our Computer Science Capstone project was a website that users can log in to and create different NFL parlays that can be moneyline, spread, and totals. The website takes and stores player data as well as team data. This website also takes an algorithm that takes in NFL play by play data and gives the user the predicted data for the week. This includes the predicted winner of each game, the percentage of simulations they won, the average point differential, and the average total points scored in the game. The result will be a percentage chance of that parlay's odds of hitting or not.

Poster Presentations & Exhibitions

Presenter: Matthew Lepper
Sponsor: Brad Carlson (Biology)
Title: Effects of Rhizobial Diversity on Soybean Health Under Environmental Stress

Soybeans (*Glycine max*) exhibit a mutualism with rhizobia bacteria (*Bradyrhizobia japonicum*) in their soil. Rhizobia fix atmospheric nitrogen, convert it into ammonia, and provide it to the plant, which in return the soybean plant houses rhizobia in nodules within the soybean's root system. High root nodule counts have been linked to greater bean mass and production in soybeans, which is favorable for both the local farmer and the global agriculture market (Nakei et al, 2022). At the Smithsonian Environmental Research Center, the Terrestrial Ecology lab has ran a series of experiments investigating the effects of diverse rhizobial communities on soybean health and productivity. In the summer of 2024, we ran an experiment delving into how the addition of environmental stressors in conjunction with rhizobial bacteria diversity affects soybean health. This experiment was modeled under the Stress Gradient Hypothesis, which states that ecological interactions between organisms increases as environmental stress increases. For a continuous 3 week period, we introduced defoliation, salt, drought, heat, and ragweed stressors to the soybean plants, with some plants receiving multi-stress treatments of those aforementioned.

We yielded multiple statistically significant findings regarding the effect of rhizobial bacteria diversity on soybean health under environmental stress. First, we found data significantly supporting a presence/absence effect of rhizobial diversity. SPAD is a measurement representing relative chlorophyll content of the plant, which was significantly lower in plants that had 0 levels of rhizobial diversity, compared to those with 1 and 5 levels of rhizobial diversity. Further, plant height also significantly exhibited this presence/absence effect. We also found significant data regarding rhizobial diversity and multi-stress treatments. Phi2 is a measure representing the percentage of incoming sunlight that is utilized in photosynthesis, a proxy for efficiency of photosynthesis. Soybeans with high levels of diversity, in the presence of 3, 4, and 5 stress combinations, had higher values of Phi2, while plants with less rhizobial diversity suffered. These findings are important in a global context as rhizobial diversity is a natural method of increasing plant health and crop yields, and can be used to combat widespread use of artificial fertilizers that devastate ecosystems.

Presenters: Mitchell Bock, Johnathan Otte, & Enrique Ruiz
Sponsor: Qixin Deng (Mathematics and Computer Science)
Title: Humanity Indiana

This presentation represents the technical work undertaken as part of our capstone project. The project focuses on two parts, a web application and a mobile application. For our web application, one side, we developed a website that has a list of community resources that people in need could use. This comes in the form of a map that list Animal shelters, homeless shelters, food pantries, and mental health centers. The other main function of the website is it serving as a volunteer matching service. Where people can search for which places need volunteering in their area, and it will respond with either a link to their volunteering or a point of contact with whom they can ask about volunteering opportunities. The second part of our project, the mobile application, is more geared towards the Wabash/Crawfordsville community. We partnered with Leann Parish, and she provided us with a list of places in the Crawfordsville community that could use help. So we added those locations where people can give or receive help to a map where it has location and contact information. The second part of the app is also a volunteer section, where Leann Parish or other Wabash community service chairs can add events and have students or other members of the community sign up to help.

Presenter: Nathaniel Litts
Sponsor: Joe Scanlon (Chemistry)
Title: Effects of a Tether on Electron Donor-Acceptor (EDA) Complexes and their Use as a Molecular Switch

Electron Donor-Acceptor (EDA) complexes can be formed from the interaction of a molecule with a partial positive charge and a molecule with a partial negative charge which allows them to contain a charge transfer and hold themselves together. If tethered together, EDA complexes hold the potential to be used as a molecular switch. A molecular switch has two states, one where they are complexed (closed) and one where are not (open). These switches are part of an exciting field called molecular machines which have applications from drug delivery to transistors. We examined three different tethers, one composed of an alkyne-phenyl-alkyne (APA) and two others using a halogen bond, to see their effect on the EDA complex. We determined the stability of the open and closed structures, the geometries, the charge transfer, and the effect of the tether on the EDA complex using computational chemistry.

Poster Presentations & Exhibitions

Presenters: Owen Hauber & John Nabors
Sponsor: Joe Scanlon (Chemistry)
Title: Electron Donor-Acceptor Complexes as Molecular Switches?

Molecular machines, such as ATP synthase and DNA helicase, are created naturally in living organisms. A new field of chemistry has started recently, trying to synthesize molecules that can act as molecular machines. Researchers have synthesized molecules that can act as rotors, shuttles, and even cars. Molecular switches are molecular machines that can take on two distinct structures, an “open” and a “closed” state. We are studying molecular switches in the form of tethered electron donor-acceptor (EDA) complexes. We were looking to examine their orientation, charge transfer, geometry, and interaction energy. Each complex has an “open” and “closed” state where phenyl rings are all in place and apart from one another (open) or where the rings align on top of one another in a stack orientation (closed). Our research used computational chemistry focused primarily on determining interaction energies (difference in energy of the open and closed states), investigating the geometry of the closed state, charge transfer, and excited electronic states for each open and closed state complex. Studying the EDA complexes and molecular switches could lead to the development of molecular machines, complexes made up of many molecules that produce specific movements, henceforth a popular area of study in biology, medicine, and more.

Presenter: Owen Volk
Sponsor: Sujata Saha (Economics)
Title: Analysis of Changes in Personal Consumption Across US Regions

The purpose of this paper is to provide a comprehensive analysis of the different factors that affect personal consumption expenditure, and how these factors affect consumption across five different US regions. This paper also considers the effect that the 2008 Financial Crisis has on personal consumption expenditure. The findings of this paper suggest that consumption expenditure is affected differently by macroeconomic indicators based on the region considered. For example, the way in which personal income and 10-year treasury bond rates affect consumption is the same across all regions, but the way 30-year mortgage rate affects consumption is dependent on region. This analysis allows for findings on the dynamics of consumer behavior to be derived from changes in economic landscape and geographical location.

Presenters: Precious Ainabor, William Boswell, & Augustus Isaac
Sponsors: Walter Novak (Chemistry) & Erika Sorensen-Kamakian (Biology)
Title: Small Cells, Big Potential: Bringing New Protein Tools to Bacteria

Scientists are constantly developing new tools to control and study cellular function. One exciting innovation is a custom-made protein system called LOCKR (Latching Orthogonal Cage/Key pRotein), which acts like a molecular switch. LOCKR has two parts: a Switch and a Key. When the Switch is opened by the Key, LOCKR turns on and activates its programmed function. New functions can be programmed into LOCKR by changing its sequence; for example, inserting a degron sequence that causes the breakdown of proteins. Our research explores using LOCKR in bacteria, which are smaller and simpler than eukaryotic organisms. To make LOCKR function in bacteria, we needed to redesign its sequence to contain a bacterial degron (bacdegronLOCKR). We tested our new design in *E. coli*, using the Switch fused to Green Fluorescent Protein and controlling the amount of Key added. Using fluorescence, we measured how well the system carried out protein breakdown (a decrease in fluorescence) when more Key was added. As predicted, we found increasing amounts of Key activated Switch breakdown more effectively. The ability of bacdegronLOCKR to trigger protein degradation in bacteria opens a range of possibilities for novel protein studies, synthetic biology applications, and the development of novel antibiotic alternatives.

Poster Presentations & Exhibitions

Presenters: Quinn Fitzgerald, Cole Shifferly, & Omar Garcia
Sponsor: Brad Carlson (Biology)
Title: Analyzing Scute Annuli of Eastern Box Turtles

The growth rings of trees are often used to approximate the growth rate of the specimen by measuring the distance between each ring, which is created by the significantly slower growth in the dry months of the year. This study assumes the same is true of the annuli (rings) on the scutes of the Eastern Box Turtle (*Terrapene carolina carolina*). By measuring the distances between annuli of two adjacent scutes from each turtle, we can determine a correlation between the distances, indicating that they are reflective of the turtle's growth per year. This data was compared to data from behavioral assays to investigate whether or not the growth rate of a turtle during its early life, determined by measuring the distances between the first four growth rings has an impact on its personality. Data revealed a slight tendency for turtles with slower growth rates to be more shy, along with a difference in the size of natal scutes between sexes, with females having one specific natal scute being larger on average.

Presenter: Raymond Arebalo
Sponsor: Nate Tompkins (Physics)
Title: Fabrication of Microfluidic Devices with Laser Cutting

The fabrication of microfluidic devices is often time-intensive and expensive, necessitating methods that minimize resource use while ensuring functionality. This research explores a fabrication process using Kapton tape, valued for its thermal stability, aluminum tape, a 20W Snapmaker A350 laser cutter, and polydimethylsiloxane (PDMS) molding to optimize efficiency and cost. Once a functional microfluidic device is created, the study analyzes precipitate growth with an electric potential. Specifically, the reaction between sodium hydroxide and cobalt chloride to form cobalt hydroxide is investigated. The precipitate wall will extend through the entire channel. It will position itself at will when the cobalt and hydroxide make contact forming the precipitate. The precipitate growth is expected to follow a square root relationship with time, as predicted by theoretical models.

Presenter: Rhys Cadigan
Sponsor: Pat Burton (Biology)
Title: SKL2001 and CHIR-98014 Inhibition of *Aeolosoma* Annelid Regeneration

Aeolosoma, a freshwater annelid, can fully regenerate missing structures after being bisected within 120 hours. This experiment aims to see how two chemicals, SKL2001 agonistically targeting the Wnt/ β -catenin signaling pathway. CHIR-98014, which targets the GSK-3 signaling pathway. Both chemicals interact with the same stem cell system, but in different ways. Stem cells are how *Aeolosoma* regenerate and proliferate into other cells. To test whether cell proliferation is either increased or decreased, we used EdU to identify proliferating cells. We also used an acetylated tubulin antibody to identify regeneration of the nervous system. We found that both SKL2001 and CHIR-98014 have adverse effects on the typical regeneration of *Aeolosoma*.

Poster Presentations & Exhibitions

Presenter: Tanner Quackenbush
Sponsor: Annie Strader (Art)
Title: Blue Ridge Mountains: An Unexpected Hub for Creativity and Professional Growth

Penland School of Craft is a renowned art education center in North Carolina's Blue Ridge Mountains. I participated in the workshop "Storytelling as Identity: Process, Performance, and Paint" by Michael Dixon from July 28 to August 9, 2024. This workshop focused on creating self-portraits using modern oil painting techniques, including observation drawing, figure study, composition, and color theory, while incorporating performance to enhance storytelling.

The trip was filled with excitement and uncertainty. After a ten-hour drive, I followed a rigorous daily schedule of studio work and performances. Each challenge, from quick sketches to detailed paintings, allowed me to become vulnerable and helped me connect meaningfully with peers and instructors, fostering my personal and professional growth.

I reflect on the immersive experience at Penland, the challenges faced, and its profound impact on my artistic journey, preparing me for my semester abroad in Florence, Italy.

