



# DISCOVERY DAY SYMPOSIUM

Program of Events

April 9, 2025



# Welcome to Discovery Day 2025

Thank you to all who contributed their time and effort to make the critical difference for the success of the Discovery Program, which is a key component of the Benedictine College experience.

Every spring semester, the anticipation builds: What have our students come up with this year? Will there be another new play? Have music majors composed new music to premiere? Will a concrete canoe float and be able to win a race? Whose mini robot will prove the best in the Robot Battle competition? What amazing research projects will be covered in the poster exhibits? It is always a fun and interesting day.

The true test for any academic program here is the mission of Benedictine College. The collaboration with faculty in a common academic project is the key to the Discovery Program and essential to our mission to educate men and women within a community of faith and scholarship.

The entire College community has been invited to join me in supporting Discovery Day, attending the presentations, listening to the keynote address, and witnessing the joy of academic pursuit in our students' areas of interest. It is impossible to attend Discovery Day and not be proud of what Benedictine College is accomplishing in the lives of our students.

President Stephen D. Minnis



Discovery Day 2025 marks the 29<sup>th</sup> year of the Discovery Day Symposium. Since 1996, more than 3600 students have presented or co-authored a Discovery Project, involving virtually all the faculty and representing all academic departments. Discovery Day 2025 will present 87 projects, the result of the work of 153 students, 63 faculty/staff, and 22 academic departments. The Discovery Committee invites you to join in recognizing our students for their creative efforts being showcased today.

Discovery Week is always the highlight of our academic year. For months (or, in some cases, years) students and faculty have worked together to find out something new about the world. Now they are ready to share their findings, and we all have a chance to learn something that no one ever knew before their project was undertaken. We are so proud, at Benedictine College, that we offer all of our students the opportunity not only to learn what others have discovered in the past, but also to add to what people will know in the future. Discovery Day gives us all the opportunity to see the fruits of this work.

The Discovery Program is an integral part of Benedictine College, and its benefits go far beyond the results of the projects you will see during this symposium. Original research fosters and strengthens the curiosity and love of learning that are the foundation of a liberal arts education. Collaborative work develops the bonds of community among students and faculty that make Benedictine such a special place.

Through our commitment to developing students' confidence in their ability to make an original contribution to our understanding of the world and how it works, we are preparing leaders who will know they can draw on their knowledge and creativity to face the challenges that await the future.

On behalf of the faculty and administration of Benedictine College, I encourage you to participate fully in the activities of this day. Special thanks are in order for the Discovery Program Committee and the Discovery Directors: their efforts throughout the year have culminated in this unique and exciting academic experience.

Kimberly C. Shankman  
Provost/Dean of the College

# Discovery Day Schedule

All presentations will take place in the Ferrell Academic Center unless otherwise indicated.

## Continental Breakfast

Napier Foyer (4<sup>th</sup> floor), Ferrell Academic Center  
8:30 AM

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## MORNING SESSIONS

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### Poster/Exhibit Session #1

McAllister Board Room (4<sup>th</sup> floor)  
8:30–9:35 AM

- 1. Quantitating *Drosophila melanogaster* Locomotor Disruption Following Traumatic Brain Injury (TBI)**  
*Emma Antczak, Jeremy Stubblefield, Biology*
- 2. Generating Thrust Using Electrohydrodynamics**  
*Quinn Bailey, John Rogers, School of Engineering*
- 3. Research Proposal for a Comparison Between Virtual vs. Tangible Displays for Biofeedback: Does It Make a Difference?**  
*Je'Zhon Baker, Grace Volkmer, Hans Stadthagen, Tony Bujana, Psychological Sciences, School of Engineering*
- 4. The Luminescence Restoration of a 1,2-HOPO Lanthanide-Based Probe Via NO Binding**  
*Emma Baucom, Faith Quinn, Deaglan Sullivan, Miriam Bourke, Sarah Harris, Chemistry and Biochemistry*
- 5. Concrete Canoe Inverter and Display Stand**  
*Joseph Campbell, Paul Hanson, Rebecca Madden, Charles Sprouse, Steve Spencer, School of Engineering*
- 6. Mortality of *Drosophila melanogaster* in Different Daily Light/Dark Cycles**  
*Peter Clements, Jeremy Stubblefield, Biology*
- 7. qRT-PCR Analysis of Gene Expression in *Drosophila melanogaster* Following HIT Events**  
*Caroline Cunningham, Jeremy Stubblefield, Biology*
- 8. Examining the Effects of Coffee-Based Biochar on Concrete Strength**  
*Samuel Gagnon, Scott Newbolds, School of Engineering*

- 9. Concrete Bowling Ball**  
*Sean Galloway, Rebecca Madden, Scott Newbolds, School of Engineering*
- 10. Hydration Chamber**  
*Sarah Hanson, Andrew Downs, School of Engineering*
- 11. Effectiveness of Different Promotional Methods at Benedictine College**  
*Christopher Holzman, Joseph Wurtz, Gregorian Fellows*
- 12. The Carp Invasion: A Data Battle to Save Our Waterways**  
*Jonah Honerman, Henry Greger, Noah Schultz, Terrence Malloy, Biology*
- 13. Economic Sustainability in Daily Life – A Case Study of Mount St. Scholastica**  
*Abigaile Hygema, Louis Roth, Jad Ziolkowska, Economics*
- 14. Impact of a Synthetic Dye on the Growth of a Keystone Bacterial Species**  
*Regan Kearney, Kevin Sanchez, Chemistry and Biochemistry*
- 15. Geospatial Temporal Analysis of Wireless Network Performance**  
*Isabel Kliethermes, Brian Henry, School of Business*
- 16. Oscillator Characterization and Control**  
*Damien Langfels, Conner VanNocker, Tobias Langfels, Michael Jarboe, Megan Paciaroni, A. Max Saylor, School of Engineering, Physics and Astronomy*
- 17. Where Mice Kill: Effects of Plant Communities on Waste Grain Removal**  
*Thomas Lopez, Sophia Valdivia, Lauren Sullivan, Larissa Kahan, Allison Wise, Brent Mortensen, Biology*
- 18. Weight-Driven Pendulum Clock**  
*Conner VanNocker, A. Max Saylor, Physics and Astronomy*
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- 19. Expediting Diapause in *Osmia lignaria* Through Temperature Manipulation**  
*Kirstyn Crane, Juliette Lange, Fiona Metzinger, Evelyn Parsons, Virginia Huddleston, Biology*
- 9:45–10:05 ♦ Room 109
- 20. How the Dead Speak to Us**  
*John Bruemmer, John Romano, History*
- 9:45–10:05 ♦ Room 125

- 21. Challenging the Morality and Constitutionality of the FACE Act**  
*Elizabeth Peterson, Randall Terry II, Paul Bytnar, Kimberly Shankman,*  
 Political Science  
 9:45–10:05 ♦ Room 208
- 22. To Identify With the Beloved: A Look Into the Renewal of Catholicism in France at the Turn of the 20<sup>th</sup> Century**  
*Maggie McClelland, Daphne McConnell,* World Languages and Cultures  
 9:45–10:05 ♦ Room 219
- 23. Thesis Defense: Does Anything Exist? The Implications of Quantum Mechanics for Reality**  
*Lucia Fisher, Anthony Crifasi, Joseph Strandquist,* Philosophy, Physics and Astronomy  
 9:45–10:35 ♦ Gangel Seminar Room
- 24. Polymerizing MMA Into Functional Transparent Plastic**  
*Faith Quinn, Mary Van Auken, Liam Philbin, Georgiy Shcherbatyuk,* Physics and Astronomy  
 9:45–10:05 ♦ Room 307
- 25. Examining the Core of Dyslexia Through the Lens of Different Languages**  
*Brooklyn Caskey, Gabriel Maday, Piper Wentz,* School of Education  
 9:45–10:05 ♦ Room 324
- 26. Apoptosis of HeLa, Cervical Cancer, in the Presence of NADH**  
*William Cullen, Bernard Rempe, Gracie George, Martha Carletti,* Biology  
 10:15–10:35 ♦ Room 109
- 27. The Medieval Sword and Architectural Proportions**  
*John Newbolds, Clare Newbolds, John Romano,* History  
 10:15–10:35 ♦ Room 125
- 28. Is Michelangelo a Theologian?**  
*Anne Marie LeDoux, Mariele Courtois, Charles Stewart, Jason Baxter,*  
 Theology, Art and Design, Center for Beauty and Culture  
 10:15–10:35 ♦ Room 208
- 29. Akira Kurosawa: Films That Face Life**  
*Anne Brungardt, Richard White,* Theology  
 10:15–10:35 ♦ Room 219

- 30. Validation of the Temperature-Emission Peak Correlation in Pb(II)O Quantum Dots Synthesized Through the Hines-Scholes Method**  
*Grace Quinn, Mark Amery, John Kline, Georgiy Shcherbatyuk*, Physics and Astronomy  
10:15–10:35 ♦ Room 307
- 31. Building Hope: The Journey to Establishing a School in Rural Liberia**  
*Joel Thomas, Sarah Wise, Karen Wood*, School of Education, Sociology and Criminology  
10:15–10:35 ♦ Room 324
- 32. Injuries Suck. Period.: How BC Athletes Are Using Menstrual Cycle Tracking to Determine a Possible Relationship With Injury**  
*Michaela Palmer, Lillian Prickett, Kera Willoughby, Mae Danaher, Martha Carletti*, Biology  
10:45–11:05 ♦ Room 109
- 33. *Viriditas*: Hildegard von Bingen’s Intertwined Spiritual and Physical Worlds**  
*Rebekah Brown, John Romano*, History  
10:45–11:05 ♦ Room 125
- 34. Waste Oil Powered Furnace**  
*Augustine Blosser, Elias Ford, Ryan Fricker, Gabriel Guzman, Bryan Park, John Rogers*, Art and Design, School of Engineering  
10:45–11:05 ♦ Room 208
- 35. Honors Project — The Preservation of Churches: Josef Pieper and Martin Heidegger on Culture, Art, and Worship**  
*Isaac Michael, James Madden, Mariele Courtois, Stephen Mirarchi, Jamie Spiering, Andrew Salzman, Anthony Crifasi*, Philosophy, Honors Program  
10:45–11:15 ♦ Room 219
- 36. Non-Intrusive Mechanization of Pianos II**  
*Domenico Ricciardi, John Modlin*, School of Engineering  
10:45–11:05 ♦ Gangel Seminar Room
- 37. Developing a Swarm Response in Independent Autonomous Robots for Emergency Applications**  
*Mark Amery, John Kline, Georgiy Shcherbatyuk*, Physics and Astronomy  
10:45–11:05 ♦ Room 307
- 38. The Honest and Grim Reality of Southeast Asian Orphanages**  
*Christina Roberts, Karina Hernandez, Summer Urban, Edward Mulholland*, Classics  
10:45–11:05 ♦ Room 324



**Poster/Exhibit Session #2**  
McAllister Board Room (4<sup>th</sup> floor)  
11:15 AM–12:10 PM

- 39. Effect of Sex Hormone on *Drosophila melanogaster* With TBI**  
*Sean Maddock, Jeremy Stubblefield, Biology*
- 40. Lethal Beauty: Insect-Killing Flowers and How pH Affects Their Deadly Abilities**  
*Jessica Mannella, Tess Scheske, Anna Wingbermuehle, Virginia Huddleston, Biology*
- 41. Benedictine College Housing Surveying Project**  
*Juliet Messerly, Jerusalem Rebollar Garcia, Jacob Campbell, Nicholas Katze, Patrick Hirl, School of Engineering*
- 42. Determination of the Copper (II) Binding Efficiency of a Lanthanide-Based Luminescent Probe**  
*Catherine Moraghan, Ricardo Serdan Solana, Gabriel Sydzzyk, Grace Quinn, Sarah Harris, Chemistry and Biochemistry*
- 43. Socio-Economic Benefits of Establishing the Childcare Facility of St. Benedict's Abbey in Atchison, KS**  
*Lauren Morris, Anna Kumar, Jad Ziolkowska, Economics*
- 44. The Future of Pacing Using Drone and Machine-Learning Technology**  
*Micah Munoz, Sebastian Michael, Joseph Accurso, Nicolaas tenBroek, Mathematics and Computer Science*
- 45. HeLa Cells and the Effect of Polysaccharide-K**  
*Evelyn Parsons, Liberty Lyon, Mary Grace Gramlich, Joanna Mainzer, Martha Carletti, Biology*
- 46. Ideal Sleeping Temperature for College Students**  
*Julianne Peichel, Jeremy Stubblefield, Biology*
- 47. 3-D Printed Bridge**  
*Elliott Peters, Nicholas Ackerman, Patrick O'Malley, School of Engineering*
- 48. Design and Open-Source Publication of a Mechatronics Learning Apparatus**  
*Domenico Ricciardi, John Rogers, School of Engineering*
- 49. A Little R&R: A Look at Rest and What It Means for Your Relationships**  
*Thomas Richardson, Jeremy Stubblefield, Biology*

- 50. Efficacy of Non-Glyphosate Herbicide on Mitigation of Invasive Bush Honeysuckle**  
*Alexandra Rohn, Terrence Malloy, Biology*
- 51. Does a Fertility Awareness-Based Methods Class Actually Increase Students' Knowledge of Fertility Awareness-Based Methods?**  
*Julia Simpson, Jackie Harris, School of Nursing*
- 52. Alpha Wave Measuring Apparatus**  
*Jacob Steffen, Hans Stadthagen, Tony Bujana, Psychological Sciences, School of Engineering*
- 53. Combining Concepts: Increasing Interest and Understanding of Chemistry Through a Comprehensive Visual and Mathematical Gas Activity**  
*Seville Tarrant, Sarah Harris, Hans Stadthagen, Chemistry and Biochemistry, Psychological Sciences*
- 54. Thrust Vectoring or Control Surfaces**  
*Carlos Valdivia, Dante Bullara, Louis Muggli, Charles Sprouse, School of Engineering*
- 55. Femtosecond Laser Amplifier Characterization**  
*Conner VanNocker, Damien Langfels, Andrew Steeves, A. Max Saylor, Georgiy Shcherbatyuk, Megan Paciaroni, Physics and Astronomy, School of Engineering*
- 56. Development of an Object Retrieval Robot**  
*Emmanuel Vista, Andrew Downs, School of Engineering*



**Lunch**

Dining Hall

11:30 AM–12:50 PM



**Keynote Address**

**The Stapletons**

“Song and Story”

O'Malley-McAllister Auditorium

1:00–2:20 PM

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AFTERNOON SESSIONS

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57. **Student Leadership: Personality Correlates and Motivations for Leading**  
*Donald Gerle, Sean Madore, Gabriel Maday, Amy Posey*, Psychological Sciences  
2:35–2:55 ♦ Room 109
58. **DFT Investigation of Hydrogen Abstraction and Radical Coupling Pathways for 2,6-Substituted Pyridinium-Derived Radicals**  
*Catherine Moraghan, Gail Blaustein*, Chemistry and Biochemistry  
2:35–2:55 ♦ Room 125
59. **Building a Thermal-Controlled Heat Mantle for Quantum Dot Synthesis**  
*Jadyn Searing, John Kline, Joseph Strandquist*, Physics and Astronomy  
2:35–2:55 ♦ Room 208
60. **Catholic News — Is Revival Possible?**  
*Jack Figge, John Meinert*, Theology  
2:35–2:55 ♦ Room 219
61. **Thesis Defense: God Is the Creator**  
*Peter Herron, Jean Rioux, Aaron Maddeford, Andrew Swafford*, Philosophy, Theology  
2:35–3:25 ♦ Gangel Seminar Room
62. **The Art of Songwriting in Another Language**  
*Matt Meyer, Julie Sellers*, World Languages and Cultures  
2:35–2:55 ♦ Room 307
63. **Modeling and Simulating Elliptical-Laser-Driven Electron-Dynamics**  
*Nicolaas tenBroek, A. Max Saylor*, Physics and Astronomy  
2:35–2:55 ♦ Room 324
64. **Shaped by Stereotypes: The Influence of Masculine and Feminine Stereotypes on Moral Evaluations**  
*Chloe Barrett, Anna Scherer, Maria Trautman, J. Dean Elmore*, Psychological Sciences  
3:05–3:25 ♦ Room 109
65. **Theoretical Study of Solvation and Substituent Effects on Internal Hydrogen Bonding of Cyclophanes**  
*Matt Knehans, Gail Blaustein*, Chemistry and Biochemistry  
3:05–3:25 ♦ Room 125

- 66. The Foaming Properties of Turkish Coffee**  
*Kalli Hart, Seville Tarrant, Joseph Strandquist*, Physics and Astronomy  
 3:05–3:25 ♦ Room 208
- 67. Synthesis and Characterization of Renewable Polyester Scaffolds for Use in Bone Tissue Grafting**  
*Cade Bond, Eli Heger, Patrisha Bugayong, Kevin Sanchez*, Chemistry and Biochemistry  
 3:05–3:25 ♦ Room 219
- 68. Recreating Traditional Animation Techniques**  
*Peter Pustejovsky, Liam Philbin, Jay Wallace, John Rogers*, Art and Design, School of Engineering  
 3:05–3:25 ♦ Room 307
- 69. Using a Thrustometer to Measure Thrust Ejection From Static Testing Solid Rocket Propellant**  
*Dante Bullara, Mason Charvat, Kieran Pavlick, Charles Sprouse*, School of Engineering  
 3:05–3:25 ♦ Room 324
- 70. Performing Raytracing Using a Low-Cost Computing Cluster**  
*Liam Philbin, Joseph Bourke, Nicolaas tenBroek*, Mathematics and Computer Science  
 3:35–3:55 ♦ Room 109
- 71. Cracking the Code: How EspB, EspK, and EspJ Mediate Mycobacterial Virulence**  
*Sophia Valdivia, Erica Willard, Kevin Sanchez*, Chemistry and Biochemistry  
 3:35–3:55 ♦ Room 125
- 72. To Go or For Here? Why Modern Culture Needs Coffee Shops**  
*Tatiana Tawney, Stephen Mirarchi*, English  
 3:35–3:55 ♦ Room 208
- 73. The Death of a Star: Photometric and Spectroscopic Study of the SRd Variable Star UU Herculis**  
*Magdalen Heckman, Stephanie Schrader, Ryan Maderak*, Physics and Astronomy  
 3:35–3:55 ♦ Room 219
- 74. La Tierra que nuestros hijos nos han prestado (The World That Was Inherited From Our Children)**  
*Elianna Watson, London Gutekunst, Jude Tawney, Mary Danner, Filiberto Mares Hernandez*, World Languages and Cultures  
 3:35–3:55 ♦ Gangel Seminar Room

- 75. Printmaking With Electricity**  
*Gabrielle Dawes, Rachel Rogers, Jay Wallace, Art and Design*  
 3:35–3:55 ♦ Room 307
- 76. Evaluating Theoretical vs. Measured Altitudes in Mid-Power Rocketry: A Flight Computer Data Analysis**  
*Mason Charvat, Dante Bullara, Kieran Pavlick, Paul Hanson, Charles Sprouse, School of Engineering*  
 3:35–3:55 ♦ Room 324
- 77. Honors Project — *Theology of the Body*, Dr. Brené Brown, & the Role of Shame in Educational Settings**  
*Bridget Goldkamp, Sharon Houlahan, Andrew Salzman, Anthony Crifasi, Stephen Mirarchi, Mariele Courtois, Jamie Spiering, Psychological Sciences, Honors Program*  
 4:05–4:35 ♦ Room 109
- 78. Building an Accessible Protein Purification Pipeline: Low-Cost Solutions for Scalable Biochemical Research**  
*Katie Youll, Bridget Walker, Kevin Sanchez, Chemistry and Biochemistry*  
 4:05–4:25 ♦ Room 125
- 79. Chess Mate**  
*William Anderson, Justin Post, Jacob Hawley, Joseph Wurtz, Gregorian Fellows*  
 4:05–4:25 ♦ Room 208
- 80. Indian Thought, Greek Thought, and Whether It Can Fit Into Catholicism**  
*Alicia Alvarez, Matthew Ramage, Theology*  
 4:05–4:25 ♦ Room 219
- 81. “Hard crackers, come again no more!”: The Culinary Life of a Civil War Soldier**  
*Mary Ellen Raymo, Dermot Trainor, History*  
 4:05–4:25 ♦ Gangel Seminar Room
- 82. An Invitation to Mystery: A Look at the History and Techniques of Frame Making**  
*Maggie Tobin, Charles Stewart, Art and Design*  
 4:05–4:25 ♦ Room 307
- 83. On the Use of Group Theory in Cryptography**  
*Mark Westerman, Heidi Grossman, Eric West, Mathematics and Computer Science*  
 4:05–4:25 ♦ Room 324

**84. Realizing Beauty Through Music**

*Jaiden Miller, Thomas Davoren, Music*

4:45–5:45 ✦ O'Malley-McAllister Auditorium

**85. “First Dance” — Composition for Percussion Ensemble**

*André Bauer, Benedictine College Percussion Ensemble, Thomas Davoren, Music*

4:45–5:45 ✦ O'Malley-McAllister Auditorium

**86. “Flying Looking Longing”**

*Zavier Tarrant, Elijah Hoagland, Jacquelyn McCoy, Finnegan Ritchie, Liberty Lyon, Ronan Greuel, Thomas Davoren, Thomas McMurray, Music*

4:45–5:45 ✦ O'Malley-McAllister Auditorium

**87. Quartet for Mixed Instruments**

*Kathleen Smith, John Morris, Jaiden Miller, Lindsay Walczak, Hannah Hiester, Timothy Tharaldson, Music*

4:45–5:45 ✦ O'Malley-McAllister Auditorium



**Spring Band Concert**

O'Malley-McAllister Auditorium



# Presentation Abstracts

Poster/Exhibit Session #1  
McAllister Board Room (4<sup>th</sup> floor)  
8:30–9:35 AM

## 1. Quantitating *Drosophila melanogaster* Locomotor Disruption Following Traumatic Brain Injury (TBI)

*Emma Antczak, Jeremy Stubblefield, Biology*

Each year, there are approximately 61,000 deaths in the United States associated with Traumatic Brain Injury (TBI). These injuries are associated with both acute and long-term damage, disrupting proper brain function. Throughout the past 30 years, proposed treatments for TBI in humans have struggled to reach approval. This has created a need for further research done in TBI-induced injuries. TBI can occur at different times of day, and the brain's response to an injury may vary depending on time of day. This is due to a 24-hour internal cycle in the human body called the circadian system. We sought to assess disruption in normal locomotion in the fruit fly, *Drosophila melanogaster*, post-TBI by looking at climbing behavior (negative geotaxis) following TBI administered at different phases of the circadian cycle. The question we asked was the following: Does locomotor impairment following TBI in fruit flies change when TBI occurs at different times of day? To answer this question, we kept the flies in an environmental chamber that had a 12:12 light:dark schedule to synchronize their circadian rhythms. The flies were then given TBI in hits of 0, 2, or 5 hits through a High Impact Trauma (HIT) device at different light phases. The deficits in locomotor behavior were assessed using a Rapid Iterative Negative Geotaxis (RING) assay to quantitate climbing behavior post hits. The circadian clock controls many physiological processes, including motor function. Our hope is that through examining time-of-day effects of TBI on motor function we will discover a novel role for the circadian clock in regulating impairment and recovery following TBI.

## 2. Generating Thrust Using Electrohydrodynamics

*Quinn Bailey, John Rogers, School of Engineering*

One of the most interesting and exciting developments in the field of airplane propulsion over the past decade has been electrohydrodynamic propulsion (EHD). Unlike traditional fossil-fuel power units, EHD systems operate using the movement of ions accelerated in an electric field. This leads to a power unit with no moving parts, emissions, and virtually no noise. While many aircraft would benefit from this sort of propulsion system, especially ones operating in urban environments, there are limitations to this technology, specifically the thrust-to-power ratio and thrust density. In this project, an EHD propulsion system was built to study the properties and limitations of such systems.

### **3. Research Proposal for a Comparison Between Virtual vs. Tangible Displays for Biofeedback: Does It Make a Difference?**

*Je'Zhon Baker, Grace Volkmer, Hans Stadthagen, Tony Bujana, Psychological Sciences, School of Engineering*

This study examines whether there is a difference in the effect of biofeedback on relaxation depending on how the physiological signals are displayed. Biofeedback is the presentation of quantitative information about a person's own physiological responses that can then be used to modify said responses. For example, prior research has shown that if a person gains knowledge of variations in the magnitude of their own alpha brainwaves, which have been shown to be positively correlated with higher levels of relaxation, they are able to relax even further. Thus, the more relaxed participants are, the higher the amplitude of their alpha waves. Typically, this type of biofeedback has been presented on digital screens. However, some research claims that because humans have evolved in a tangible environment, the way we process information may be categorically different when it is presented on screens as opposed to physical objects. In this project, we intend to use a simple EEG (electroencephalography) machine built by a Benedictine College engineering student to collect and display the magnitude of alpha waves in two different modalities. Half of the participants will receive biofeedback displayed on a digital screen and the other half as a moving tangible object. We will ask participants to relax as much as possible while listening to a recording of a crying baby, which usually increases one's level of stress. We hypothesize that participants will display a higher average amplitude of alpha waves when they use the physical display than the virtual display and, thus, the physical display is a more effective form of biofeedback.

### **4. The Luminescence Restoration of a 1,2-HOPO Lanthanide-Based Probe Via NO Binding**

*Emma Baucom, Faith Quinn, Deaglan Sullivan, Miriam Bourke, Sarah Harris, Chemistry and Biochemistry*

The oxidative damage caused by overproduction of reactive oxidative species (ROS) and reactive nitrogen species (RNS) have been linked to diseases, such as stroke, but methods for *in vivo* monitoring of specific RNS concentrations are lacking. A lanthanide-based luminescent probe utilizing a 1,2-HOPO ligand will be synthesized, the luminescence of which is quenched by the binding of  $\text{Cu}^{2+}$  and restored by the binding of the RNS nitric oxide (NO). The testing of a quenched probe under UV light in the presence of NO and analysis of the lanthanide phosphorescence will provide insight into the specificity of the probe for NO. A successful restoration of luminescence will constitute an operational probe capable of releasing the  $\text{Cu}^{2+}$  ion upon binding to NO, thus signaling the presence of this RNS. The probe then will be tested for selectivity with respect to NO by comparing the luminescence response to other ROS and RNS species present in the brain.

## 5. Concrete Canoe Inverter and Display Stand

*Joseph Campbell, Paul Hanson, Rebecca Madden, Charles Sprouse, Steve Spencer,*  
School of Engineering

This Discovery project aspired to solve two different physics and engineering problems. The first problem, which has more complexities and intricacies, was designing equipment that enables inversion of the canoe in a safe manner for both the canoe and the users. This problem consisted of the challenges posed by the sheer weight of the canoe, complexity of the shape, and the vulnerability of the concrete to impact and point loads. The second problem was making the equipment used to do this into new display stands for the Benedictine College Concrete Canoe Team. The display stand needs to have an ergonomic height and be highly stable, durable, and aesthetically pleasing. These problems were solved with a design that installs a wheel on either end of the canoe. These wheels are raised and lowered onto a track with the display stands using a ratcheting jack mechanism.

## 6. Mortality of *Drosophila melanogaster* in Different Daily Light/Dark Cycles

*Peter Clements, Jeremy Stubblefield,* Biology

In far-northern locations, such as Alaska, people are exposed to only a few hours of natural sunlight during the winter. Sunlight exposure, especially early in the day, is thought to be vital for the maintenance of proper circadian rhythms; the lack of adequate sunlight during extreme winters has been linked to disrupted sleep, lowered vitamin D levels, and Seasonal Affective Disorder (SAD). It is thought that these problems may impact brain function, particularly the response to traumatic brain injury (TBI). Within the research setting, one of the responses is simply the variation in survival *vs.* mortality following a TBI.

This research took a deep dive into these findings, examining the correlation between time of day and neural protection in *Drosophila melanogaster* (fruit flies). *D. melanogaster* is a model organism for TBI. The question the research sought to answer was the following: Does the 24-hour mortality index in a 2:22 light/dark cycle for *D. melanogaster* mimic the 24-hour mortality index in a 12:12 light/dark cycle at specific times of day? It also examined whether this phenomenon is consistent for both male and female *D. melanogaster*.

The 12:12 cycle imitates the average among a range of seasonal daylengths, while the 2:22 cycle — 2 hours of light followed by 22 hours of darkness — imitates the extreme winters of Alaska and other northern climates. *D. melanogaster* were raised in two different light chambers providing these cycles. The first provided a 12:12 light cycle; half of the flies in this chamber were hit early in the light phase, while the other half were hit late in the light phase. The second chamber provided a 2:22 light cycle; the flies in this chamber were hit in the middle of the short light phase. After adapting to the light phase, flies were subjected to either 0, 2, or 5 hits using the biology department's High-Impact Trauma (HIT) device. Twenty-four hours after the hits, the 24-hour mortality index (MI24) of the flies was

analyzed. MI24 is simply the number of dead flies per given treatment divided by the total number of flies subjected to that treatment. This data was used to answer the question of whether the MI24 in a 2:22 cycle for *D. melanogaster* mimics the MI24 in a 12:12 cycle at specific times of day.

## **7. qRT-PCR Analysis of Gene Expression in *Drosophila melanogaster* Following HIT Events**

*Caroline Cunningham, Jeremy Stubblefield, Biology*

Our research sought to answer the question: Does the expression of genes associated with immunity, neurotransmitter metabolism, and/or synapse regulation change following neurotrauma administered at different phases of the circadian cycle in the fruit fly *Drosophila melanogaster*?

There are three goals we wish to achieve in answering this question. We wished to quantitate the mRNA expression of the genes NF- $\kappa$ B, glutamine synthetase, and Draper in fruit flies after 0, 2, and 5 High Impact Trauma (HIT) events administered either early or late in the light phase. NF- $\kappa$ B is a key regulator of the immune response, glutamine synthetase breaks down the excitatory neurotransmitter glutamate after uptake by neuronal and glial cells, and Draper is a key regulator of synapse degradation.

RNA from *Drosophila melanogaster* was successfully isolated and will be used to quantitate and view gene expression in fruit flies following the administration of 0, 2, and 5 HIT events at varying times in the circadian cycle.

## **8. Examining the Effects of Coffee-Based Biochar on Concrete Strength**

*Samuel Gagnon, Scott Newbolds, School of Engineering*

Infrastructure is a necessity in society; where there is a constant reliance on roads, buildings, and utilities for daily needs. An essential component of infrastructure is concrete, which is key to new construction and repairs. Because this resource is used so often, it would be beneficial to create strong concrete mixes at a low cost. One solution to this problem would be utilizing biochar, a charcoal-based substance derived from organic waste compounds, in concrete mixes. Theoretically, adding biochar to concrete mixes can effectively improve concrete strength while also providing a method to recycle organic waste. For this research project, spent coffee grounds were used to make biochar through a process called pyrolysis, in which organic materials are reduced to simpler compounds, such as carbon, in an oxygen-free environment. The resulting biochar was incorporated into concrete mixes, which were used to make test cylinders. After 28 days of curing, the compressive strengths of the cylinders were tested. The primary question was “what is the optimal temperature at which biochar should be pyrolysed to achieve maximum concrete compressive strength?” To answer this question, five batches of concrete cylinders were created: one containing no biochar, and the rest containing four different types of biochar, each pyrolysed at a different temperature: 350°C, 400°C, 450°C, and 500°C. The hypotheses were that the cylinders containing biochar would be stronger than the control mixes and that

the temperature of pyrolysis would affect the corresponding concrete strengths. Successful utilization of biochar in concrete could pave the way to interesting applications of organic food waste in the construction industry.

## **9. Concrete Bowling Ball**

*Sean Galloway, Rebecca Madden, Scott Newbolds, School of Engineering*

In essence, bowling is a very simple game. You grab a ball and throw it down a straight path, trying to hit pins standing at the other end. When you bowl, you're intended to overlook the complexity and the engineering behind all of it: how the balls have different masses, cores, spinning behavior, how the alley is intended to allow the ball to spin till a specific point, and how the pins and feeding system work. All these details have been poured over and researched, with major companies making it their entire goal to manufacture and perfect an individual component. It is this process that I sought to learn and improve when responding to a challenge given out by the American Society of Civil Engineers. Every year, they host a Student Symposium that has schools from different regions around the US and some from around the world compete in a variety of competitions that require help build engineering skills when completing them. One, the concrete bowling ball, caught my eye because I had previously been fascinated by the complexity of making a bowling ball, and constructing one from concrete seemed like an interesting challenge.

This project explores the design and engineering process behind making a concrete bowling ball for the ASCE competition, focusing on creating the strongest and most circular bowling ball while meeting specific design criteria. Using a 50% poraver mix comprised of our own mix of concrete, fly ash, fiberglass fibers, poraver, and aggregate, we determined our mix to have a density of 1642.23 kg/m<sup>3</sup> and that the ball needed a volume of 0.003166 m<sup>3</sup> to meet the weight requirement of 5200 grams ( $\pm 200$  g). Given a target diameter of 215 mm, we calculated that we needed a 157 mm interior core to meet the weight requirement. We created two bowling balls, according to the competition regulations, with one being used in a bowling competition on the 1<sup>st</sup> day of the competition and the other being strength tested to determine the deflection rate of the concrete. This project has helped us explore the benefits of fiber reinforcement in concrete and has served to introduce most of our team to concrete and other material testing and design processes.

## **10. Hydration Chamber**

*Sarah Hanson, Andrew Downs, School of Engineering*

When working with concrete, it is important to maintain the conditions and environment needed for optimal curing. Curing concrete is a crucial step when it comes to making concrete. The strength of the concrete depends on how the curing process goes. For optimal curing, concrete should be kept in a warm, humid environment. Last year, the Benedictine College Concrete Canoe Team tried to maintain this environment. However, this environment was difficult to maintain

and was wasteful. This year, the Concrete Canoe Team decided to build a hydration chamber that would maintain these conditions and be less wasteful. The design can be used for many years to come.

## **11. Effectiveness of Different Promotional Methods at Benedictine College**

*Christopher Holzman, Joseph Wurtz, Gregorian Fellows*

When planning an event or similar item at Benedictine College, one of the most common questions asked regards what the best means of promoting the item to the student body. Where should a team spend their time and effort in order to most successfully advertise their group or event? This project examines different methods of promotion to determine what means of spreading word of various matters on campus are the most effective among the current student body. Different methods of communicating with students will be explored, such as the campus bulletin boards, FYI email, large group chats, and individual conversations with students about a particular event. This project will analyze statistical information gathered via surveys to reference the actual amount of student engagement against their total potential engagement. It will explore the effectiveness of posters and conversations in various areas where students may gather or where bulletin boards are located. Finally, this project will propose new ways of advertising on campus that may prove to be more effective than are less utilized by students.

## **12. The Carp Invasion: A Data Battle to Save Our Waterways**

*Jonah Honerman, Henry Greger, Noah Schultz, Terrence Malloy, Biology*

Carp are native to Asia and Eurasia and were introduced into North American waterways starting in 1877 with the common carp and most recently, the silver carp was introduced in 2006. Some of the introduced carp are considered invasive because they pose a large ecological threat. These species belong to the family Xenocyprididae, and are Silver Carp, Bighead Carp, and Black Carp. Two of the other introduced species, common and grass carp, have a smaller impact on waterway ecosystems and are tending towards naturalization. Common carp belong to the family Cyprinidae while grass carp are included in the family Xenocyprididae. Invasive Carp have been found to harm freshwater ecosystems throughout the United States. They out-compete native fish species by consuming organisms of the lowest trophic levels, including plankton and snails. Because more species rely on organisms at the lowest trophic levels for food, introduced species that exclusively consume these organisms will cause the most damage. This study set out to determine whether invasive carp species use the tributaries of the Missouri River and, if so, how season (temperature) dictates their movements within the tributaries. Due to time and resource constraint, we chose to focus on two specific sites, both of which are along Deer Creek. This creek is a spring fed, first order tributary of Independence Creek, which empties into the Missouri River. We took five samples at each site along the creek and visited each site four times as temperatures rose during the transition from winter to early spring. Each fish species caught was identified and its relative abundance

recorded. When invasive carp were caught, length measurements were recorded. Statistical analysis of our data will be discussed in the presentation.

### **13. Economic Sustainability in Daily Life — A Case Study of Mount St. Scholastica**

*Abigaile Hygema, Louis Roth, Jad Ziolkowska, Economics*

Sustainability has been an important topic of policy regulations and international debates since the United Nations Brundtland Commission Report in 1987. The report provided the very first definition of sustainable development. Currently many companies and businesses implement the goals of sustainability in their daily practices.

Mount Saint Scholastica, the community of Benedictine sisters in Atchison, KS, has been applying sustainability rules in their daily lives for many years. This includes, for example, the generation of renewable energy, baking with bulk ingredients, utilizing labor of volunteers from the Atchison community, and homemade production of fruits, vegetables, and honey.

The research question of this project is how sustainability at Mount St. Scholastica can be quantified and monetized. This question has not been investigated before. The discovery made in this project is that the Benedictine community is able to save almost \$38,000 annually. Savings on food expenses make up the greatest percentage (42%) of all the sustainability activities at the Mount, followed by savings on energy, clothing, labor expenses, and transportation.

To reach this outcome, we explored and then compared costs and benefits of traditional versus sustainable ways of living along with different sustainability steps that the community has taken towards this goal through improving economic efficiency and self-efficiency.

This research can be helpful to encourage other communities, businesses, and individuals striving to implement sustainability practices in their daily lives and operations.

### **14. Impact of a Synthetic Dye on the Growth of a Keystone Bacterial Species**

*Regan Kearney, Kevin Sanchez, Chemistry and Biochemistry*

The use of synthetic dyes in food is abundant, especially in America. They are extensively present in drinks, candy, chips, and more. As these dyes have become more mainstream, they have driven some health concerns for many. A number of food dyes have been found to or suspected to contribute to health disorders, such as cancer, genetic damage, allergies, and possibly even attention disorders. While this is truly a multifaceted issue, one way this could be occurring is through the alteration of the gut microbiome. The gut microbiome contains most of the body's bacteria, including many bacteria that are beneficial to human digestion and immune systems. As such, catastrophic changes to the microbiome are associated with a variety of health issues. Our overarching hypothesis is that food

dyes are thought to alter the growth of ‘healthy’ keystone bacterial species and, in doing so, lead to harmful effects on the body. One such keystone species is *Bifidobacterium longum*, the most abundant ‘healthy’ bacterium in the gut at birth. Any alterations to the growth of this species would presumably impact the normal positive benefits of the gut microbiome. For this project, we hypothesize that the rate of growth of *Bifidobacterium longum* is hindered by the presence of Blue #2 food dye. To test this hypothesis, we will be using bacterial growth assays of *Bifidobacterium longum* in the presence of multiple concentrations of Blue #2 dye. If the growth rate of *Bifidobacterium longum* is lessened or slowed, this could lead to a better and more integrated understanding of the impacts of Blue #2 on human health.

## **15. Geospatial Temporal Analysis of Wireless Network Performance**

*Isabel Kliethermes, Brian Henry, School of Business*

This project investigates the performance of the campus wireless network across different geographic locations and temporal conditions to determine where and when it exhibits optimal characteristics. By collecting and analyzing data from various campus locations, including academic buildings, dormitories, and recreational areas, alongside time-based metrics, such as peak usage hours and off-peak periods, we aim to identify trends in network performance. Key performance indicators, such as signal strength and latency, as well as connection stability will be assessed to pinpoint high-performance zones and optimal time frames. The findings will provide insights into potential infrastructure improvements, resource allocation, and best practices for users seeking the most reliable wireless connectivity on campus.

## **16. Oscillator Characterization and Control**

*Damien Langfels, Conner VanNocker, Tobias Langfels, Michael Jarboe, Megan Paciaroni, A. Max Saylor, School of Engineering, Physics and Astronomy*

This project focuses on enhancing the laser oscillator’s cooling system and integrating two calibrated Pockels cells. The previous cooling system suffered from a major leak, prompting the development of a new design that uses metal heat sinks to improve temperature control and prevent overheating. Additionally, the two Pockels cells selected during last year’s Discovery project, based on their superior performance, are being installed and calibrated to optimize the oscillator’s functionality. Together, these improvements aim to ensure the reliable and efficient operation of the oscillator.

## **17. Where Mice Kill: Effects of Plant Communities on Waste Grain Removal**

*Thomas Lopez, Sophia Valdivia, Lauren Sullivan, Larissa Kahan, Allison Wise, Brent Mortensen, Biology*

Small mammals have strong effects on plant community assembly through seed predation (i.e., removing viable seeds from the soil). Such predation is an advantage to agriculture if it results in undesired waste grain being removed

from agricultural fields, reducing weeds and growth outside of planted rows. We hypothesized that perennial plant communities will increase waste grain removal (i.e., seed predation) in agricultural fields by providing habitat for small mammals. We ran trials on seed predation in two different locations: first, in early to mid-November 2024 at Kellogg Biological Research Station in central Michigan, comparing fields with and without perennial plant communities (tallgrass prairie) planted in strips ~8m wide in the middle of the field. The second trial was in Kansas in late February where we compared predation near the edge of the field, where there were perennial plant communities, to the tilled interior of the field. In both locations, we measured predation by mixing 50 corn seeds in sand placed in plastic trays and leaving trays out for 5–6 nights. Natural plant communities experienced greater seed predation than crop fields in late fall; however, predation was limited almost exclusively to natural communities. This limitation had the effect of drawing small mammals away from crop fields so that seed predation was greater in the absence of natural communities. By late winter, we observed no differences in fields with and without natural communities. Thus, we conclude that natural plant communities have strong effects on waste grain removal by small mammals; however, these effects were not consistent with our predicted outcomes. Moreover, effects of natural communities as mediated by small mammals were not consistent over time. Additional data collection will be necessary to resolve these relationships; however, the methods we used were successful in that they are easy to implement, replicate, and detect seed predation.

## 18. Weight-Driven Pendulum Clock

*Conner VanNocker, A. Max Saylor, Physics and Astronomy*

This project focuses on the design and construction of a weight-driven pendulum clock, blending mechanical principles with design and construction techniques. The clock utilizes a descending weight as its energy source, transferring potential energy into controlled motion via a gear train. The pendulum serves as the time-keeping element, ensuring accuracy through consistent oscillations. Key design considerations include optimizing the escapement mechanism for smooth energy transfer, precision arrangement of gears, and careful calibration of the pendulum's length and mass. This clock serves as a functional demonstration of physics in motion, offering educational and aesthetic value.



## 19. Expediting Diapause in *Osmia lignaria* Through Temperature Manipulation

*Kirstyn Crane, Juliette Lange, Fiona Metzinger, Evelyn Parsons, Virginia Huddleston, Biology*

9:45–10:05 ♦ Room 109

Temperature has been thought to play a key role in diapausal emergence for insects and has been tested in several species; however, its relative importance compared to other factors is still widely disputed. We analyzed the effects of expediting diapause in the hymenopteran species *Osmia lignaria*, a popular pollinator used in

commercial and amateur agriculture or gardening. Our previous study (the first of its kind) found that mimicking seasonal temperatures in a shortened period resulted in early emergence from diapause. We specifically looked at the effects of expedited diapause on longevity, emergence synchronization, and emergence rates using three different treatment groups: a control, following standard overwintering processes; a natural treatment group, undergoing expedited seasonal temperatures with daily fluctuations; and a treatment group undergoing stable expedited seasonal temperatures. Each group contained around 40 bees. The controls were kept at 1.1°C throughout November–April, then taken out to begin the emergence process. For the stable treatment group, we decreased the temperature by 12°C every five days to 1.1°C and left them for a month, increased the temperature to 3.9 °C, and left them for another month. Following this, we increased the temperature every three days by 12°C until we reached 21°C. The day/night fluctuating group followed the same schedule listed above; however, for each day, a high and low temperature was predetermined using a random number generator. Analysis is ongoing. If our results show it is possible to get *O. lignaria* out four to five months early with minimal impacts on efficiency, longevity, and synchronization, this could change the solitary bee and agricultural industry completely. *O. lignaria* could pollinate and improve the crop quality of crops previously inaccessible to them, allow for staggered generations, and more control on when and what *O. lignaria* emerges and pollinates.

## **20. How the Dead Speak to Us**

*John Bruemmer, John Romano, History*

9:45–10:05 ♦ Room 125

Modern American graveyards seem to have an eerie atmosphere to them. People generally try to avoid spending too much time in them with the fear that they might disrespect the dead. This certainly was not the case for Americans during the nineteenth and twentieth centuries when graveyards were known as great places for walks, picnics, and even dates. Graveyards during this time were known for attracting visitors with beautiful monuments to the dead. One such graveyard happens to be just down the road at Mount Vernon Cemetery. Originally established during the American Civil War, it features many graves of significant figures from Kansas' history. These figures include Senator John J. Ingalls, Governor George W. Glick, and more. In this project I sought to find out just how these notable locals chose to be memorialized and how their memorials compare to other graves at the time.

## **21. Challenging the Morality and Constitutionality of the FACE Act**

*Elizabeth Peterson, Randall Terry II, Paul Bytnar, Kimberly Shankman, Political Science*

9:45–10:05 ♦ Room 208

We will take a two-pronged approach in our presentation, examining the constitutional issues with the FACE (Freedom of Access to Clinics Entrance) Act

through a First Amendment lens and also examining the moral issues raised by the FACE Act. We will discuss both legal documents and Church teaching in an attempt to bring a holistic challenge to FACE.

## **22. To Identify With the Beloved: A Look Into the Renewal of Catholicism in France at the Turn of the 20<sup>th</sup> Century**

*Maggie McClelland, Daphne McConnell, World Languages and Cultures*

9:45–10:05 ♦ Room 219

At the turn of the twentieth century, France experienced the legal separation of the Church and State in 1905, codifying in law an idea that had existed in France for many years. While this move dealt a blow to the Church in many ways, including the influx of “Laïcité,” which was a widespread movement of secularism among the French people, paradoxically, yet perhaps not coincidentally, France experienced a renewal in Catholicism in the fields of literature, philosophy, and mission work. Major figures of this movement include Charles Péguy, Paul Claudel, Leon Bloy, Jaques Maritain, and St. Charles de Foucauld. While the movement of Laïcité was occurring in France, opposing the idea of the Church as a controlling and oppressive institution, these figures emphasize themes of poverty, simplicity, innocence, solidarity, and others in their work, which stem from their personal conversions to Catholicism from the common Atheism at the time, and their need for the faith, and for Christ Himself, to have a deep personal meaning to life.

This paper will address three objectives: First, it will present the roots of this renewal, the major figures, their contributing works, and the overall milieu of Catholicism in France in the early 1900s. Second, it will demonstrate the connections between these figures and the holistic nature of this renewal to show that while this renewal is not overall a formally recognized movement in the Church, it nevertheless can be seen as a work of the Holy Spirit to which attention should be paid by the faithful. Finally, this paper will address the implications of this renewal in the fields of theology, philosophy, literature, and personal spirituality, which can still be felt in the Church in the modern world.

## **23. Thesis Defense: Does Anything Exist? The Implications of Quantum Mechanics for Reality**

*Lucia Fisher, Anthony Crifasi, Joseph Strandquist, Philosophy, Physics and Astronomy*

9:45–10:35 ♦ Gangel Seminar Room

The strangeness of quantum mechanics is undeniable. The classical physics concepts of position and momentum (for example) cannot be known accurately at the quantum level without sacrificing knowledge of the other—and this is not merely an equipment limitation, but a fundamental one. The definite state of a particle is not merely unknowable, but undetermined until measured. Fully determinate causality has been shown to be impossible given the probabilistic nature of a wave function. And though the quantum math seems to imply the impossible, the atomic bomb was built using it.

How does one respond to such an overturning of our intuitive assumptions about reality? One must pick a side: the micro (quantum) changes the macro (classical) concepts, or vice versa. In other words, anti-realism or the return of Aristotelian concepts. These two options come in many flavors, from constructive empiricism (Van Fraassen) to straight anti-realism (Laudan), from a straightforward retention of classical concepts (Augros) to a bending of such concepts to match quantum (Koons).

If we allow the micro concepts fundamentally to change our macro concepts, we will have to doubt everything our senses tell us. Given that we use our sense data to find out about the micro concepts in the first place, surely that would undermine the very point that the micro (which is found using the macro) is more reliable than the macro. Ironically, quantum physics, a product of the scientific method, has shown us that the scientific method is lacking in its description of reality if it is not complemented by classical philosophical concepts.

#### **24. Polymerizing MMA Into Functional Transparent Plastic**

*Faith Quinn, Mary Van Auken, Liam Philbin, Georgiy Shcherbatyuk, Physics and Astronomy*

9:45–10:05 ♦ Room 307

Our project focused on the successful polymerization of a sheet of plastic to be used as the structural foundation of a luminescent solar concentrator (LSC). This required the plastic to be of even thickness and transparent optical clarity so as to improve the LSC's efficiency. Previous work provided an improved mold and an adjusted polymerization process to increase reproducibility and decrease the formation of bubbles. In the past year, we set up a new filtration method for the unpolymerized MMA using a silica column. This improved the plastic's final quality through more effective removal of the anti-caking agent. Future work will see the quantum dots synthesized by our co-project integrated into the plastic, forming a functional LSC and opening up further avenues for tests of the device's quality and efficiency.

#### **25. Examining the Core of Dyslexia Through the Lens of Different Languages**

*Brooklyn Caskey, Gabriel Maday, Piper Wentz, School of Education*

9:45–10:05 ♦ Room 324

Learning to read is complex—and it is more difficult for some individuals than others. Developmental dyslexia is a common phonological deficit with an unclear definition, affecting anywhere from 5–20% of people in varying severity, depending on how it is diagnosed. And English, being one of the most challenging languages to learn, presents obstacles to even the best students, but especially those with dyslexia. In this project, we will explore questions, such as the following: Does the difficulty of learning English affect dyslexia rates in English-speaking regions when compared to those of other languages? Is dyslexia as a language-learning impairment independent from the language being learned? We aim to

examine these questions, as well as provide a brief overview of the best practices for identifying and intervening for students with dyslexia.

## **26. Apoptosis of HeLa, Cervical Cancer, in the Presence of NADH**

*William Cullen, Bernard Rempe, Gracie George, Martha Carletti, Biology*

10:15–10:35 ♦ Room 109

Cervical cancer is a significant global health concern, responsible for the deaths of 4,000 women per year. Investigating natural metabolites with potential anticancer properties offers a promising avenue for developing effective therapeutic approaches. In this experiment, HeLa cervical cancer cells were grown in flasks and cultured in media containing fetal bovine serum, DMSO, and EMEM. Throughout their growth, the cells were treated with NADH (Nicotinamide Adenine Dinucleotide), a natural metabolite with an essential role in cellular energy production. The study hypothesized that elevating NADH levels will confer a constitutive, enduring utilization of oxidative phosphorylation, which will induce apoptosis in the cancer cells. A group of untreated HeLa cells served as the negative control for comparison. NADH was administered at three different concentrations: 5 µg/ml, 10 µg/ml, and 20 µg/ml, by mixing it into the cell media. The cancer cell proliferation and apoptosis was assessed using a Biotium XTT cell viability assay kit.

## **27. The Medieval Sword and Architectural Proportions**

*John Newbolds, Clare Newbolds, John Romano, History*

10:15–10:35 ♦ Room 125

There is a common myth that the medieval sword is an unwieldy slab of steel. This, however, couldn't be farther from the truth. The degree of craftsmanship that went into the blades of the West was significant but has become largely forgotten. The sciences, geometries, and symbolism that helped guide design for architects also helped smiths. The goal was to answer both questions: How close can modern architects use their skills in designing structures to design a historically plausible blade? Would this design assist in the sword performing properly? Through the process, we also hoped to relearn many of the missing modes of thought in sword making. Plans using common geometric proportions of architecture were used to blueprint a sword. A blade was then smithed, using historic hammer and anvil work and avoiding power tools when possible. Comparisons of this sword were then made to historical examples, all to answer exactly how much correlation is shared between the two disciplines.

## **28. Is Michelangelo a Theologian?**

*Anne Marie LeDoux, Mariele Courtois, Charles Stewart, Jason Baxter, Theology, Art and Design, Center for Beauty and Culture*

10:15–10:35 ♦ Room 208

Is Michelangelo a theologian? What does art have to do with theology? Why doesn't America have beautiful churches like Europe? In a technocratic age,

these questions are more relevant than ever. Striving to explore the vocation of a Catholic artist in our specific time, this thesis argues that the vocation of the Catholic artist is to give viewers an experience that helps them to see as God sees. Art illustrates what theology is. While theology and art both communicate truth, theology speaks to reason while art speaks to the intuition. Art does not give the viewer a summary of the Catechism or a verbal answer, but an experience. This same experience causes Jeremy Begbie to write in his book, *A Peculiar Orthodoxy*, “It is not only theologians and ecclesiastical councils who lead the way in doctrinal development but also painters, storytellers, and other artists—the works of creative imagination are integral and indispensable to the process.” Art gives the viewer an experience that raises questions for doctrine to answer.

Drawing from recent popes Benedict XVI and St. John Paul II, the thesis first explores the roles of moral theologians and artists. The task of the moral theologian is dialogue: he brings into “familial discussion” new questions of the age. One of these questions has to do with something probably in your back pocket: technology. In an age where data is at our fingertips, ready to bestow a quantitative value on everything, man’s task has become calculation rather than creation. This thesis then discusses the role of art in restoring man’s desire for beauty and fulfilling his vocation to share in God’s creative power. Art shows man a glimpse of the mystery of creation and reaches all the way to his intuition, far from what can be mechanistically achieved by the formulas so sought-after in a digital age. This mysterious theology of the artist causes St. John Paul II to write in his *Letter to Artists* that “every genuine art form in its own way is a path to the inmost reality of man and of the world.”

## **29. Akira Kurosawa: Films That Face Life**

*Anne Brungardt, Richard White, Theology*

10:15–10:35 ♦ Room 219

A concern for the separation of a Catholic/non-Catholic film, a spiritual/secular film, or a religious/non-religious film (a distinction oftentimes made merely by whether the writer/director is Catholic or if the story is about a saint) dissolves when we are met with simply human films like those of Japanese filmmaker Akira Kurosawa. Over the course of 50 years, Akira Kurosawa wrote and directed 30 films (1943–1993) that have become some of the most respected, praised, and influential in the history of cinema for his masterful technique and innovation but even more so for his storytelling, for how he captured the drama of man.

In each work of Kurosawa he is always asking “How?” He wants to show how humans react in their circumstances. Kurosawa always unfolds in a journey of education and conversion for the protagonist(s). Kurosawa brings us face-to-face with some of the fundamental human experiences, such as loneliness, fear of death, the risk of entrusting over knowing, the loss of identity, friendship, happiness, or hopelessness to which men respond with anger, violence, hard-heartedness, disobedience, mistrust, or despair, but other times respond with forgiveness, gratitude, hope, or a new awareness/a rebirth of life. Kurosawa invites

us to an event of encountering our humanity, the parts of our heart that we may not want to look at, we don't know how to look at, or that we may intentionally keep hidden and further how we share this with others.

By watching Kurosawa's 30-film corpus accompanied by secondary sources on the life of Kurosawa and his films, this project seeks to show that Kurosawa made films that are Catholic and that there is Catholic value in them. I will highlight three of Kurosawa's works to show how they hold a Catholic value. Kurosawa's film humanism should be welcomed among Catholicism, that which is universal, because this unhelpful dichotomy of Catholic/non-Catholic is transcended in the work given to us by Kurosawa.

### **30. Validation of the Temperature-Emission Peak Correlation in Pb(II)O Quantum Dots Synthesized Through the Hines-Scholes Method**

*Grace Quinn, Mark Amery, John Kline, Georgiy Shcherbatyuk*, Physics and Astronomy

10:15–10:35 ♦ Room 307

The goal of this project is to verify the reliable synthesis of lead sulfide quantum dots with the Hines-Scholes method for eventual use in plastic luminescent solar concentrators (LSCs). Quantum dots (QDs) are nanostructures with optical properties that span between individual atoms and bulk materials. They have many, varied uses in quantum computing, biomarking, and, what we are primarily interested in, the collection of solar energy with LSCs. QD properties are highly dependent on size and distribution while in solution, and the goal of our research this year was to explore how the temperature at the final step of the Hines-Scholes affected the size and final properties of the synthesized QDs. Successful syntheses at room temperature throughout this year also opened up questions about optimizing the procedure sustainably.

### **31. Building Hope: The Journey to Establishing a School in Rural Liberia**

*Joel Thomas, Sarah Wise, Karen Wood*, School of Education, Sociology and Criminology

10:15–10:35 ♦ Room 324

Many children in rural Liberia lack access to quality education, limiting their future opportunities. My Discovery project explores the impact of accessible education by examining how the Martha Garkpi Community School in Garkpi Village, Liberia, will transform the local community.

During my winter break, I traveled to Liberia to conduct qualitative research through interviews with community members, children, educators, and school administrators. Key questions included: How would a free local school change lives? What barriers prevent children from attending school? What challenges exist in establishing and running a school in rural Liberia? Additionally, I consulted education experts and school leaders to understand the legal and operational requirements of starting a school.

This research will inform Martha's Love's efforts to build a fully equipped K-8 school that offers foundational education, secondary pathways, and vocational training. Findings will be presented through a written report and video documentation, capturing firsthand perspectives on the importance of education.

For this project, I conducted brief, informal interviews with individuals in Liberia to gather insights on the significance of accessible education. The purpose was solely to understand perspectives on education in rural communities to support the development of the Martha Garkpi Community School.

This study will provide valuable insights into the real-world impact of education and align with Benedictine College's mission of service and academic excellence.

### **32. Injuries Suck. Period.: How BC Athletes Are Using Menstrual Cycle Tracking to Determine a Possible Relationship With Injury**

*Michaela Palmer, Lillian Prickett, Kera Willoughby, Mae Danaher, Martha Carletti, Biology*

10:45–11:05 ♦ Room 109

The participation of female athletes in competitive sports has grown significantly over the past century, leading to groundbreaking achievements and record-setting performances. However, this increased involvement also has been accompanied by a higher incidence of sports-related injuries. Female athletes demonstrate greater susceptibility to specific injuries, such as anterior cruciate ligament (ACL) tears, bone stress injuries, and concussions, at rates exceeding those of their male counterparts. Extensive research has explored the risk factors, incidence rates, and preventive strategies associated with these injuries, identifying biomechanical differences, training methodologies, and physiological characteristics as key contributors. Despite these advancements, the role of hormonal fluctuations in injury susceptibility remains an underexplored area. Variations in estrogen, progesterone, follicle-stimulating hormone (FSH), and luteinizing hormone (LH) may influence injury risk, yet further research is needed to elucidate their precise impact. Last year we conducted a 5-week study with a null hypothesis stating that the cycle phase is not related to the number of athletic injuries incurred. Our survey data produced significant results that there was a difference between expected injuries per cycle phase and observed values. We found a significant correlation between injury occurrence and menstrual cycle phase, with a chi-squared value of 14.257 ( $df = 3, p = 0.0026$ ), rejecting the null hypothesis. We expected 16% of injuries to occur during menstruation based on cycle length, yet 42% were reported, whereas the follicular phase showed significantly fewer injuries than anticipated. These findings led us to pursue a larger sample size and carry out our experiment on a larger scale. Our study this year includes using Garmin watches and phone applications to record cycle, daily activity, and notes the athletes observe over the course of three months in season and three months out of season. We hope to examine the interplay between hormonal fluctuations and sports injuries in female athletes, highlighting potential mechanisms and implications for injury prevention strategies and keep our athletes safe.

### **33. *Viriditas*: Hildegard von Bingen’s Intertwined Spiritual and Physical Worlds**

*Rebekah Brown, John Romano, History*

10:45–11:05 ♦ Room 125

*Viriditas* was a crucial dimension of Hildegard von Bingen’s philosophy. This “green vigour” represented God’s connection to the natural world and humanity. Throughout her work, Hildegard used the divine impressions she received in mystic visions to build an understanding of Creation with its intertwined spiritual and physical worlds. In her writings, Hildegard details a complex vision of Creation and a wealth of knowledge hidden in nature. In the nine books of *Physica*, Hildegard demonstrates how human beings can experience healing in connection with nature’s life-giving force, the *viriditas* that reflects God. She suggests an inherent relationship between nature and humanity in which the earth offers a vital energy for human beings to discover and to engage. Focusing on different sections of Hildegard’s writings regarding the natural world and her visions, I hope to provide an understanding of Hildegard’s philosophy that is applicable to modern life. In a world with increasing environmental crises, Hildegard’s insights endow nature with a spiritual, theological importance. Her vegetal vision of God as inseparable from the natural world invites us to appreciate and engage with Creation and to search for spiritual fulfillment in an ecological dimension.

### **34. Waste Oil Powered Furnace**

*Augustine Blosser, Elias Ford, Ryan Fricker, Gabriel Guzman, Bryan Park, John Rogers, Art and Design, School of Engineering*

10:45–11:05 ♦ Room 208

Recycling energy sources is very important in today’s world of depleting resources and environmental degradation. The art department has a waste oil powered furnace that has been out of commission for the last several years. The furnace uses French fry oil from the cafe as a fuel source. They would like to use this furnace to create aluminum sculptures using a technique called investment casting. The goal of this Discovery project was to restore the furnace to working order and prove that it is easy and reliable to use. Several changes were made to the old furnace to improve its ability to melt aluminum. These included adding a constant flow pump to supply fuel, an adjustable blower to supply air, a preheater to decrease the viscosity of the fuel, and a new fuel tank to decrease complexity. The furnace uses a device called a Babbington Burner to atomize the oil and inject it into the drum.

### **35. Honors Project — The Preservation of Churches: Josef Pieper and Martin Heidegger on Culture, Art, and Worship**

*Isaac Michael, James Madden, Mariele Courtois, Stephen Mirarchi, Jamie Spiering, Andrew Salzmann, Anthony Crifasi, Philosophy, Honors Program*

10:45–11:15 ♦ Room 219

As Catholic disciples of the liberal arts, there is often a reverential cultural deference to the great churches of Europe. We often feel the sense of “seeing the grandeur of the Catholic Church for the first time” when encountering cathedrals, such as that of Chartres, Notre-Dame de Paris, or Lyon. In Northern France, the political heart of medieval Catholicism, these churches are said to stand as monuments to a culture that affirmed the world and man’s place in it, steeped in faith and bearing fruit in religion and art. Today, however, different forces move our social structures, and churches like these are no longer produced despite supposed advances in engineering and building construction. Further, one glance at the crowds surrounding these great medieval cathedrals reveals that they are treated more as tourist destinations than as houses of worship. In the midst of a society built instead upon technology and monetary measure, to what extent is the culture that the medieval cathedrals stood for still available to us and to our communities? Is it possible to live this culture in the modern day? If so, what is it to live such a way?

This project considers the modern cultural problem as contrasted with the culture of classical antiquity and medieval Christianity through the lens of two essays written by prominent 20<sup>th</sup> century German philosophers. In his essay, “Leisure the Basis of Culture,” Josef Pieper approaches culture, as one might expect, from the perspective of leisure. He offers a hope for modernity to recover a sense of the reality that animated the great classical cultures at their foundations. Martin Heidegger, on the other hand, examines culture in terms of the reality of everyday activity in his essay, “The Origin of the Work of Art.” Though they come from divergent philosophical schools, this project attempts a synthetic account of the two essays, looking to draw out some key principles that can guide us personally and socially toward a renewal of culture.

### **36. Non-Intrusive Mechanization of Pianos II**

*Domenico Ricciardi, John Modlin, School of Engineering*

10:45–11:05 ♦ Gangel Seminar Room

Player pianos have been a staple of mechanized instruments for over a century; however, all of them require either they be built from the ground up or an already existing piano be permanently modified. Thus, the question arises: Is it possible to mechanize the playing of any piano without having to destructively modify it? The solution to this question is to design a mechanism to depress the keys of the piano on the outside, as a human does, rather than on the inside, as player pianos do. Last year, the electronics and control portions of the device were solidified, and a proof-of-concept was built out of scrap wood. The electronics and control system consist of solenoids (mechanical pushers) controlled by an Arduino,

which converts MIDI data into a PWM signal for variable note velocity. This year the focus is on building an adjustable frame that can adapt to any standardized 88 key piano keyboard. To achieve this, 1.5" 6061-T6 T-Slotted Aluminum is used to construct a central mounting frame for the electronic components. The frame connectors allow for width and height adjustability of the frame and support positions. Multiple CNC-milled aluminum plates, which attach to the central frame, hold the solenoids above each key and allow for further fine-tuning of the solenoid height with respect to the piano keys. A wooden beam, mounted on top of the frame, holds all the PCBs in place, as well as the power supplies and Arduino. When integrated, the final result is a device that sits on top of the piano keyboard and plays the piano keys given a MIDI input.

### **37. Developing a Swarm Response in Independent Autonomous Robots for Emergency Applications**

*Mark Amery, John Kline, Georgiy Shcherbatyuk, Physics and Astronomy*

10:45–11:05 ♦ Room 307

This project aims to present a novel approach to enhancing emergency services through the development and application of a swarm response system utilizing independent autonomous robots. We explored the theory behind the design and implementation of a multi-robot system that enables real-time communication, coordination, and response to dynamic environments. The proposed autonomous robots will each independently be capable of mapping and navigating a new environment while simultaneously adapting to optimize resource allocation, search and rescue, and navigation strategies. In this project specifically, we built a single robot to develop the hardware and algorithms needed to path find and identify targets autonomously. These individual robots could later be integrated into a multi-robot system. Future research on this topic would be directed towards the implementation of a swarm system with each robot utilizing the concepts developed through this project.

### **38. The Honest and Grim Reality of Southeast Asian Orphanages**

*Christina Roberts, Karina Hernandez, Summer Urban, Edward Mulholland, Classics*

10:45–11:05 ♦ Room 324

Are orphanages truly the safe havens we believe them to be or is there more lurking behind their closed doors? In this secondary-style research project, we explored the history of Southeast Asian orphanages and compiled a body of diverse statistical and anecdotal evidence indicating that these organizations do more harm than their intended good. We identified the three most prominent and detrimental trends of these institutions and the direct effect they have on their orphans: developmental issues stemming from orphanage life, a disconnect between orphans and their cultural identity, and a potential avenue for child exploitation. Through this presentation, we aim to uncover the honest reality of orphanages in Southeast Asia and all they entail.



**Poster/Exhibit Session #2**  
McAllister Board Room (4<sup>th</sup> floor)  
11:15 AM–12:10 PM

**39. Effect of Sex Hormone on *Drosophila melanogaster* With TBI**

*Sean Maddock, Jeremy Stubblefield, Biology*

I will be exploring the effects of sex hormone on *Drosophila* that have been subjected to a Traumatic Brain Injury (TBI). When the brain experiences a TBI, a glial scar is formed, and neurotoxic signals flood the core of the injury. Certain neuroprotective genes can be activated to lessen the damage caused by the TBI and long-term impediments caused by the glial scarring. Sex hormones, testosterone in males, estrogen and progesterone in females, tend to have a positive relationship with the release of immune factors post-TBI according to previous research. The hypothesis for the experiment is that if *Drosophila* are exposed to members of the opposite sex post-TBI, they will experience an increase in sex hormone and, as a result, see lower levels of mortality and impairment.

Genes involved in TBI and neuroprotection have been selected to measure in each group of flies after they receive a TBI. Gene expression will be measured by removing the heads of the flies post-TBI, isolating the RNA, magnifying the RNA via PCR, and putting the samples through gel electrophoresis. The groups that have been selected for the experiment are as follows: Males with TBI exposed to females, males with TBI, females with TBI exposed to males, and females with TBI. All groups will fall within the range of 18–24 days old when TBIs are administered. Novel sexual activity cannot be confirmed because male flies become sexually active only three hours after emerging from the pupa. TBIs will be administered using the HIT device (a spring with hard plastic). Five trials of each group will be performed, and data will be analyzed using an ANOVA.

**40. Lethal Beauty: Insect-Killing Flowers and How pH Affects Their Deadly Abilities**

*Jessica Mannella, Tess Scheske, Anna Wingbermuehle, Virginia Huddleston, Biology*

Fertilizers that are commonly used in agriculture influence the pH levels of soil. Ammonium-based fertilizers decrease pH while nitrate-based fertilizers increase the pH of soil. In this project we aim to answer the question: How do low, high, and ideal pH environments affect a plant's ability to produce a defensive compound? Pursuing this question will allow us to observe potential connections between the ways that humans currently affect environmental conditions and what those effects may be doing to defensive compound producing flora. This project specifically looks at *Chrysanthemum cinerariifolium* and its ability to produce pyrethrum, which is a natural insecticide. In order to answer the proposed question, we germinated five groups of Chrysanthemums from seed and grew them in hydroponics systems with water of varying pH levels. After growing the

plants, we dried them to constant weight in a dehydrating oven and crushed them into a powder, keeping them separated based on pH group. We exposed separate groups of crickets to powdered plant matter from each pH treatment. We added powder to the cricket food and the substrate of their containers to allow for both surface contact and ingestive exposures. We monitored cricket survival throughout their exposure and used these data to assess lethality of pyrethrum produced under different pH treatments. These data allow us to infer how humans impact soil pH from various activity, including how the use of fertilizer may be impacting flora. If environmental factors, such as pH, effect Chrysanthemums' pyrethrum production, it could either result in Chrysanthemums not being able to repel insects well or an increase in the number of insects that are killed. Both situations could have different potential effects in a natural ecosystem.

#### **41. Benedictine College Housing Surveying Project**

*Juliet Messerly, Jerusalem Rebolgar Garcia, Jacob Campbell, Nicholas Katze, Patrick Hirl, School of Engineering*

The purpose of this Discovery project was to create a topographic map for two main areas of the Benedictine College campus. The first plot of land being from McDonald Hall to Bishop Fink Hall and the second plot of land being from the Dining Hall to St. Scholastica Hall. To achieve this, data points from all around these two plots of land were collected by use of a GPS system. The system works by having one piece of equipment working as a benchmark for all of the other points collected by the rover to be able to provide accurate information regarding the elevation, slope, and geographical location of the points. To collect the data points, civil engineers worked in pairs to set up the equipment and collect the data over a week-long period. Following the completion of data collection, the points were imported into Civil 3D to create a topographic map. The topographic map created will be used to advise the college on future decisions regarding new housing options.

#### **42. Determination of the Copper (II) Binding Efficiency of a Lanthanide-Based Luminescent Probe**

*Catherine Moraghan, Ricardo Serdan Solana, Gabriel Sydzzyk, Grace Quinn, Sarah Harris, Chemistry and Biochemistry*

Although  $\text{Cu}^{2+}$  plays an important role in neural signaling, excessive concentration can lead to binding with  $\text{A}\beta$ -plaques and the exacerbation of Alzheimer's disease progression. As a result, an effective method is needed for monitoring  $\text{Cu}^{2+}$  concentration in the brain. Two lanthanide-based luminescent probes utilizing 1,2-HOPO ligands have been designed and will be synthesized. The luminescence of these probes should be quenched by the binding of  $\text{Cu}^{2+}$ . The product, consisting of a mix of one, two, and three HOPO arms, will be separated using column chromatography and the one and two arm probes will be bound with  $\text{Cu}^{2+}$ . Testing of both probe designs under UV light and analysis of the lanthanide phosphorescence will provide insight into the ability of each probe to bind  $\text{Cu}^{2+}$  and quench luminescence. A successfully quenched probe will

then indicate a strong binding affinity to  $\text{Cu}^{2+}$  performed by titration with  $\text{Cu}^{2+}$ . The binding affinities of both  $\text{Cu}^{2+}$  probes will be compared to determine the most efficient “turn off” response.

### **43. Socio-Economic Benefits of Establishing the Childcare Facility of St. Benedict's Abbey in Atchison, KS**

*Lauren Morris, Anna Kumar, Jad Ziolkowska, Economics*

Atchison County faces a great shortage of childcare facilities with only two facilities available for more than 1,400 children under six years old.

To mitigate this problem, First Steps with Abbey (community-based organization) will help establish the Childcare Facility of St. Benedict's Abbey. The Childcare Facility will create 188 new child spots and approximately 120 new personnel will be employed.

No research has been done so far on how this new facility will benefit the Atchison community economically and socially. This project quantifies these economic and social effects.

The project answers two questions: What benefits will the Abbey's Childcare Facility create for an average local family? What benefits and spillover effects will be generated for the local Atchison economy and the broader community?

The findings of the project show that the Abbey's Childcare Facility can generate around \$18 million in local family income, in addition to \$1 million in family income for recreation. The economic activity in Atchison could increase by more than \$4 million, and the production output of the local Atchison companies could rise by almost \$13 million. These developments could also bring about gains in labor productivity of \$48,632/yr while more than \$7 million could become available to support additional women and children's programs.

The outcomes were calculated based on various data sources from local, state, and governmental agencies and materials of St. Benedict's Abbey. A quantitative analysis was conducted to delineate direct, indirect, and induced effects on the local economy and families in Atchison.

The outcomes of this research project can help inform the Atchison community about the positive effects of establishing the new Childcare Facility of St. Benedict's Abbey. Moreover, understanding the great dimensions of economic and social effects for the local Atchison community could also encourage new projects of this kind in the future.

### **44. The Future of Pacing Using Drone and Machine-Learning Technology**

*Micah Munoz, Sebastian Michael, Joseph Accurso, Nicolaas tenBroek,*  
Mathematics and Computer Science

Modern pacing technologies provide athletes with real-time feedback that can be used to simplify workouts and remove the inherent distraction that comes with individualized pacing techniques. These technologies remove the need for

constant individual performance calculations and allow the athlete to shift their focus toward improving mechanical and aerobic techniques during intense workouts and competitions. This project aimed to develop a fully generalizable and customizable pacing assistant that provides visual guidance for training and competition on track surfaces in typical and atypical conditions. Deploying a lane-detection machine-learning model on the edge with the ESP32-CAM microcontroller allows the drone to receive flight instructions in real-time. This model helps the pacing drone respond effectively to variations in external conditions, such as wind gusts or occluded lane visibility. The laser line projected on the track surface underneath the drone provides continuous visual guidance for users and properly represents the target pace throughout the training path. The portability of the ESP32-CAM microcontroller future-proofs the development of additional high-level features, such as data logging, session recordings, mobile app integration, and more. These future implementations will increase accessibility and ease of use for athletes and coaches, providing them with the modern innovation they need to help them reach the next level of training and performance.

#### **45. HeLa Cells and the Effect of Polysaccharide-K**

*Evelyn Parsons, Liberty Lyon, Mary Grace Gramlich, Joanna Mainzner, Martha Carletti, Biology*

This research project investigated whether Polysaccharide-K (PSK) affects HeLa cervical cancer cells. Polysaccharide-K is a protein-bound polysaccharide that initiates apoptosis by activating the MAPK signaling proteins in cells, which then activate the caspase pathway; it also decreases NF- $\kappa$ B protein activation, which is used in the cell cycle. Because of its apoptotic effects, it has been used as a cancer treatment in Japan for 30 years. Polysaccharide-K is extracted from turkey tail mushroom (*Trametes versicolor*) where it is found in the mycelium of the fruiting body of the mushroom. Use of PSK for cancer treatment has not been approved in the US because further investigations are needed to examine the efficacy of its apoptotic role on cancer cells. HeLa cells (cervical cancer cells) were cultured and exposed to various concentrations of PSK (including a control group of just saline, and 400, 500, and 600 micrograms/mL of PSK). After 24 hours, apoptosis was measured using a colorimetric XTT cell viability assay kit. The comparison of cell viability between the control and experimental groups will highlight the effects of the PSK on the cancer cells. The conclusions from this experiment will help to indicate the relevance of PSK for cancer treatment.

#### **46. Ideal Sleeping Temperature for College Students**

*Julianne Peichel, Jeremy Stubblefield, Biology*

Sleep is an important, and often lacking, part of every college student's routine. This makes it especially important for students to maximize the hours of sleep they do get. While there are many factors that can affect sleep, this project focuses on temperature. This project aims to analyze the correlation between temperature and sleep. Participants wore a Fitbit tracking device for three nights to measure sleep parameters, such as total sleep duration, sleep quality, and time

spent in different sleep stages. Each participant received an assigned temperature of either 60, 65, or 72 degrees Fahrenheit at which to set their room thermostats. They also were asked to keep a continuous monitoring thermometer in their room near their bed in order to measure room temperature. After measuring and recording each participants' data for three nights, we were able to analyze the relationship between room temperature and sleep quality.

#### **47. 3-D Printed Bridge**

*Elliott Peters, Nicholas Ackerman, Patrick O'Malley, School of Engineering*

The bridge was designed as an experiment to gain further insight into the three-dimensional printed bridge industry and further opportunities in the field of 3-D printing. The bridge was designed to include a 4-in circle through the bridge and be able to hold a minimum of 25 lbs and up to 70 lbs. The bridge was designed to look like a Howe Truss and is made with 100% PLA. The bridge will be tested based on load/weight efficiency. Our goal was to obtain a deeper understanding of the efficiency of bridge designs and stress analysis, specifically the relation of stress with the particular material used for this project.

#### **48. Design and Open-Source Publication of a Mechatronics Learning Apparatus**

*Domenico Ricciardi, John Rogers, School of Engineering*

Mechatronics is the integration of mechanical systems with electronics and software control. It is a field that all engineers should be familiar with because it is so pervasive in the modern day. Given that Mechatronics is primarily a practical, hands-on field, the most effective teaching method is one that primarily focuses on having students experiment with hardware and software rather than through lecture. Unfortunately, most mechatronics kits designed to help students learn in this way are expensive. They often include extraneous components not critical to student learning and are only available from select suppliers.

The solution to these problems is a learning apparatus designed from the ground up with cost, functionality, and freedom of replication and reproduction in mind. The primary function of the apparatus is giving students the ability to learn the fundamentals of mechatronics, such as serial communication, signal generation, reading sensor data, controlling motors, and implementing feedback loops. The apparatus consists of a frame made from aluminum stock, an Arduino Uno as a controller, a built-in potentiometer and push button, a Pololu DC motor with built-in encoder, motor driver board, an LCD display, and an AC adapter for power. All these components and materials are mass produced, widely available, and cost effective as their prices range from a few dollars to a few tens of dollars. By using an Arduino Uno as the controller, any analog sensor or I2C capable sensor may also be used in addition to the built-in devices, such as photogates, pressure sensors, accelerometers, and rotary encoders. Lastly, the design, with detailed build instructions and example problems and solutions for teachers, is submitted to *HardwareX*, an open-source and peer reviewed journal. This ensures that the design remains free and available to be reproduced by anyone.

## **49. A Little R&R: A Look at Rest and What It Means For Your Relationships**

*Thomas Richardson, Jeremy Stubblefield, Biology*

Circadian rhythm in human beings has influence on various functions and feelings throughout the day and is under the influence of many different environmental and biological factors, such as personal schedule, light exposure, and the expression and prevalence of different genes. One of these genetic factors, the “Period-3” (Per3) gene, has been observed in correlation with circadian preference (or “chronotype”) in humans, specifically in determining if one is a “morning person” or a “night owl.” The goal of this project is to determine if there is a possible correlation between genetic chronotype, personality scores, and the way people view their relationships with other individuals. To test possible correlations between chronotype, personality type, and attachment style, participants were instructed to take a personality questionnaire, an attachment style questionnaire, and then a questionnaire indicating morning or night preference. After initial data collection, each participant also scraped some cheek cells from their mouth and gave it to the researcher. A miniPCR Sleep Lab kit was then used to isolate the PER3 gene from the DNA and amplify it via PCR. The “length” of the amplified DNA was then observed via gel electrophoresis, which allowed the researchers to discriminate between short and long Per3 DNA fragments. While there is some overlap, individuals with shorter Per3 genes tend more towards being night owls while individuals with longer Per3 genes tend towards being morning larks. By running a series of statistical analyses on the information obtained, I hope to observe a correlation between an individual’s chronotype, personality scores, and/or attachment style.

## **50. Efficacy of Non-Glyphosate Herbicide On Mitigation of Invasive Bush Honeysuckle**

*Alexandra Rohn, Terrence Malloy, Biology*

Bush honeysuckle, genus *Lonicera*, is a shrub-like plant that is considered invasive in North America, especially in the Midwest region. It has been effectively mitigated using glyphosate herbicides applied to freshly cut stumps so that the plants draw the herbicide into the roots through the vascular system. This experiment was conducted to test the efficacy of a non-glyphosate herbicide using the same mitigation method in the elimination of this invasive species. A grove of bush honeysuckle grows on top of the bluff east of the academic buildings at Benedictine College, on land belonging to St. Benedict’s Abbey, and these plants were the subjects of this experiment. One hundred plants were cut down and a mixture of non-glyphosate herbicide and blue dye was applied to the freshly cut stumps. An additional group of 25 plants were cut, but the stumps were left untreated in order to create a control group. Each stump was marked with a flag, and the distance between each stump was measured and recorded on a hand-written map. No regrowth data has been collected at this time, but future plans for this experiment include using the map and flags to identify treated versus

untreated stumps in order to check for regrowth. Each stump will be identified as either re-sprouting or not re-sprouting, and the quantity of each will be used to determine the efficacy of the non-glyphosate agent.

### **51. Does a Fertility Awareness-Based Methods Class Actually Increase Students' Knowledge of Fertility Awareness-Based Methods?**

*Julia Simpson, Jackie Harris, School of Nursing*

The purpose of this project was to determine if knowledge and experience increase after taking a Fertility Awareness-Based Methods (FABMs) course at Benedictine College. The participants were all enrolled in a pilot course and were assessed through a survey consisting of knowledge and experience with various fertility-based awareness methods (taught in the class) and included questions regarding fertility and women's reproductive health. Results of the survey were compared before taking the course and after taking the course to assess correlations and to see how the students' knowledge and experience increased after completing the course.

### **52. Alpha Wave Measuring Apparatus**

*Jacob Steffen, Hans Stadthagen, Tony Bujana, Psychological Sciences, School of Engineering*

For many years, researchers have used virtual representations of physical experiences to examine human behavior and brain activity. The Benedictine Psychological Sciences Department hopes to provide evidence demonstrating whether biofeedback provided through a virtual representation (e.g., a bar of varying size on a screen) is equivalent to that provided through a real object that also represents the same magnitude. The Alpha Wave Measuring Apparatus is a non-invasive, wearable peripheral that will enable this novel testing method. The apparatus uses a Raspberry Pi to process data, which then displays the magnitude of alpha brain wave activity virtually (on an LCD screen) and physically (on a linear stage actuator). This project attempts to replicate expensive medical equipment at a lower price point and to look into extracting significant data from noisy biological signals.

### **53. Combining Concepts: Increasing Interest and Understanding of Chemistry Through a Comprehensive Visual and Mathematical Gas Activity**

*Seville Tarrant, Sarah Harris, Hans Stadthagen, Chemistry and Biochemistry, Psychological Sciences*

After a whole semester of teaching general chemistry to a class full of students, many of them still bomb the same questions. In order to combat this, past ACS exams were examined to find the most problematic topics, and an activity was created that combined many of these. The students tended to struggle the most when combining concepts like stoichiometry and molarity. The activity was designed to be fun and engaging for the students, using balloons and fire to capture their attention while including chemistry concepts, such as the natural gas

law, density, stoichiometry, dilution, molarity, exothermic and endothermic reactions, and neutralization. With the main goal of increasing understanding in these concepts, the students' performance in class before and after the activity along with their final ACS scores were all examined. Then the hypothesis of an engaging activity better encouraging learning was tested through providing surveys to students before and after the activity while also giving the surveys to various control groups. One particular control group for measuring interest were two different grades of middle school students. This not only gives a great perspective for the interest portion of the study but helps foster curiosity in chemistry for the younger students.

#### **54. Thrust Vectoring or Control Surfaces**

*Carlos Valdivia, Dante Bullara, Louis Muggli, Charles Sprouse, School of Engineering*

This poster presentation includes two ways to guide/stabilize model rockets: Thrust Vectoring and Control surfaces. For rocketry clubs, a big concern is the unknown trajectory of the rocket without having done numerous calculations and having a near-perfect launch day. We will demonstrate two options to control the rockets and inform attendees of government regulations to keep in mind. There also will be information on the real-life applications around the world, such as in Ukraine.

#### **55. Femtosecond Laser Amplifier Characterization**

*Conner VanNocker, Damien Langfels, Andrew Steeves, A. Max Sayler, Georgiy Shcherbatyuk, Megan Paciaroni, Physics and Astronomy, School of Engineering*

This project centers on the detailed characterization of a femtosecond laser amplifier with the aim of optimizing its operation and performance. Beyond describing the proper procedures for operating such an amplifier, we will present the apparatuses that have been specifically developed or modified to measure key parameters of the laser pulses. These include the intensity, pulse duration, and time-dependent frequency variation. By addressing both the theoretical aspects and practical implementation of these measurement techniques, this work seeks to provide a comprehensive understanding of the amplifier's capabilities, paving the way for improved functionality of this laser system.

#### **56. Development of an Object Retrieval Robot**

*Emmanuel Vista, Andrew Downs, School of Engineering*

Often overlooked, object retrieval is an integral part of daily life encompassing most everyday activities. Typically, retrieving an object is done instantaneously and only once as an object cannot be retrieved if it is already retrieved. However, certain activities might involve retrieving the same object multiple times and from different locations. An example of this is shooting a basketball: when shot in the hoop, the basketball usually lands below the net. However, when missed, the ball will bounce to a different location on the court depending on the shot. Getting the ball for every missed shot can be tedious and tiring to the individual,

draining his or her energy towards an unintended task. With many other activities like this, it was inquired if a solution can be developed to mitigate this tiresome repetitiveness.

The proposed solution is an object retrieval robot. The robot consists of a chassis controlled by an ESP32: a microcontroller that uses the Arduino IDE but also has Wi-Fi capabilities. The ESP32 drives the motors through H-bridges: components that control the direction of current flow to an applied load, which in this case are the motors. Also attached to the robot is the ESP32 CAM, which is an ESP32 that has camera capabilities. Installed into it is a library containing objects the robot will be able to identify through edge detection. The robot is controlled by a user interface consisting of another ESP32 and a joystick. Both ESP32s communicate with each other through the ESP32 Now protocol, which allows a Wi-Fi connection without using the internet and enhances connection characteristics, such as the range between the controller and robot. Through the controller, the user is to be able to select the object for the robot to retrieve as well as have manual control of the robot's movement. Upon this solution, the limitations of the robot were experimented with, such as the range it can track an object and what type of objects it is capable of tracking.



## **57. Student Leadership: Personality Correlates and Motivations for Leading**

*Donald Gerle, Sean Madore, Gabriel Maday, Amy Posey, Psychological Sciences*

**2:35–2:55 ♦ Room 109**

Many college students seek out leadership roles on campus among their peers for a variety of reasons. Based on previous research, there are many different incentives for seeking out leadership roles, and these reasons may vary based on the personality of the student. Some students are motivated because of self-seeking, narcissistic reasons while other people are motivated for selfless reasons that benefit the community around them. In the present study, undergraduate students at Benedictine College completed a survey measuring levels of narcissism, volunteer motivations, and self-esteem, and reported on what areas of student leadership they were involved in, if any. In this study, we sought to discover if these traits played a role in students pursuing leadership roles on campus. We compared scores of these traits among student leaders to non-student leaders and then compared scores among student leaders of different areas of leadership. We hypothesized that students who score high on measures of self-serving volunteer functions (career and enhancement) would score highest on levels of narcissism, and those who scored high on selfless volunteer functions (values and social) would score lower on narcissism. In our presentation, we will share and describe our findings and how they contribute to the existing body of research among college students and student leaders.

## **58. DFT Investigation of Hydrogen Abstraction and Radical Coupling Pathways for 2,6-Substituted Pyridinium-Derived Radicals**

*Catherine Moraghan, Gail Blaustein, Chemistry and Biochemistry*

2:35–2:55 ♦ Room 125

The efficiency of pyridinium-derived radicals as non-aqueous redox flow battery anolytes is hindered by their susceptibility to decomposition via hydrogen abstraction (HA) and radical-coupling (RC) pathways. A deeper understanding of these pathways—particularly the impact of alkyl substituents on anolyte stability—is needed to improve anolyte design. Density functional theory was used to analyze the HA and RC pathways of the methyl, ethyl, and isopropyl forms of a 2,6-substituted pyridinium-derived radical. Enthalpy trends for the three HA pathways, determined using isodesmic reactions, will be presented. Additionally, an overview will be provided of the decomposition mechanisms and the computational strategies employed to locate transition states. Current progress toward identifying transition states for the three HA pathways and for the methyl-form RC pathway will be presented.

## **59. Building a Thermal Controlled Heat Mantle for Quantum Dot Synthesis**

*Jadyn Searing, John Kline, Joseph Strandquist, Physics and Astronomy*

2:35–2:55 ♦ Room 208

This project investigates the feasibility of constructing an affordable PID temperature controller using low-cost, off-the-shelf components for laboratory applications where the purchase of pre-assembled apparatus is costly. A prototype controller was constructed and thoroughly tested to ensure safe operation, reliability, and precise temperature control. Comparative testing was conducted against two commercially sourced controllers to assess performance differences, specifically regarding their accuracy, stability, and responsiveness. Preliminary evaluations of the PID controllers suggest that, comparatively, they are both highly accurate and stable. However, further comprehensive tests, such as Thermal Cycling, Setpoint Response, and Long-Term Stability will be conducted in the future to further test the specifications of the two PID controllers.

## **60. Catholic News — Is Revival Possible?**

*Jack Figge, John Meinert, Theology*

2:35–2:55 ♦ Room 219

Traditional media is dead, well almost. It's on its deathbed. Newsrooms are shrinking, printing presses are shuttering, and ad revenue is drying up. Instead, TikTok influencers, 30-second reels, and podcasts are dominating the landscape, including in Catholic media. A plethora of Catholic “influencers” have commandeered young Catholics’ social media feeds, kicking journalism to the curb.

But at what expense? Just like in the secular world, long form journalism is all but dead, only grandmas watch the once popular EWTN, and Catholic outlets are just trying to attract readers with catchy headlines and click-bait articles.

So is there hope? Building on my work as a freelance journalist writing for over 10 national Catholic or diocesan papers and traveling across the world to cover events, I will present on how Catholic print media can become relevant once again, particularly for young people. Not only can news become relevant once again, but it can help young people grow in their faith and love for the Church.

### **61. Thesis Defense: God Is the Creator**

*Peter Herron, Jean Rioux, Aaron Maddeford, Andrew Swafford*, Philosophy, Theology

2:35–3:25 † Gangel Seminar Room

This Discovery project is a thesis defense for the Philosophy Department. Many Catholics believe that God is the creator of heaven and earth even though most seem to take this on faith rather than on philosophical argument. However, through metaphysical argument about being, we can see that God is the creator of everything that exists (except Himself) and there is no other. All beings have the act of existence: *esse*. Because created essences are dependent on God for their being and *esse*, God is an equivocal, prior, per se, actual, and simple agent cause of creation. Moreover, there cannot be many creators because there cannot be more than one who has *esse per se*.

### **62. The Art of Songwriting in Another Language**

*Matt Meyer, Julie Sellers*, World Languages and Cultures

2:35–2:55 † Room 307

I will be showcasing a song that I have made, playing it acoustically and also showing the music video along with the professionally recorded, mixed, produced, and mastered version of my new release, “*Todo Contigo*.”

### **63. Modeling and Simulating Elliptical-Laser-Driven Electron-Dynamics**

*Nicolaas tenBroek, A. Max Sayler*, Physics and Astronomy

2:35–2:55 † Room 324

We created a computational model to simulate elliptical-laser-driven electron-dynamics using the split-step method to compute the solution to the two-dimensional time-dependent Schrödinger Equation. This method was verified through quantitative comparison to measurements of the electron yield. This model allows us to determine the effects of structure of the atomic or molecular target on the ellipticity-, angular-, and energy-dependent electron yield. Thus, quantifying the model allows us to invert the process and determine the atomic or molecular structure from the measured electron yield. This work is done in collaboration with Dr. Brett Esry of Kansas State University, who provided theoretical support, and Dr. Skruszewicz of Friedrich-Schiller University Jena, who provided experimental data.

## 64. Shaped by Stereotypes: The Influence of Masculine and Feminine Stereotypes on Moral Evaluations

*Chloe Barrett, Anna Scherer, Maria Trautman, J. Dean Elmore*, Psychological Sciences

3:05–3:25 ♦ Room 109

People often learn to expect certain behaviors from men and others from women. For example, men are often encouraged to be confident and assertive while women are often expected to be caring and nurturing. These stereotypes can shape how we view others — but do they also influence how we judge people's moral choices? Our research aimed to answer that question. Our goal was to determine whether people judge someone's moral actions differently based on 1) their appearance being more masculine or feminine or 2) if their career aligns with traditional gender roles. To explore this, we conducted two studies with college students.

In the first study, participants read fictional moral scenarios. Each scenario was paired with an image of a person whose face had exaggerated masculine or feminine traits. For example, a masculine face might have a broader jawline, while a feminine face might have a more rounded one. Surprisingly, participants judged actions paired with feminine female faces as the most morally wrong, while actions paired with masculine female faces were seen as the least wrong. However, the results were only slightly significant.

In the second study, participants read similar moral scenarios, but this time the people in the scenarios had gender-stereotypical or non-stereotypical careers. For instance, participants saw scenarios involving male nurses or female engineers. Unlike the first study, career roles did not seem to have any impact on moral judgments. Our results suggest that a person's masculine or feminine appearance may slightly influence moral judgments more than their career choice. This raises further questions about how deeply gender stereotypes shape our moral perceptions.

## 65. Theoretical Study of Solvation and Substituent Effects on Internal Hydrogen Bonding of Cyclophanes

*Matt Knehans, Gail Blaustein*, Chemistry and Biochemistry

3:05–3:25 ♦ Room 125

This study addressed the effects of electron-donating (EDGs) and electron-withdrawing (EWGs) groups and solvation of carbazolopyrindophane (CP) and diphenylaminopyridinophane (DP) derivatives on the characteristics of their internal N-H $\cdots$ N hydrogen bonds. The M06/6-31G(d,p) model chemistry was used to predict the molecular geometry and N-H $\cdots$ N bond length of CP, with the results validated by comparison to X-ray crystallography data for CP. EDGs and EWGs were added to CP and DP, and the results indicated that the addition of EDGs to the cyclophanes caused a decrease in N-H $\cdots$ N bond length, and the addition of EWGs increased the N-H $\cdots$ N bond length. However, it was observed in the CP and DP derivatives the effect of substituents on the twist angle was

inconsistent and rather trivial. The effects of the solvation of the CP and DP derivatives in water, heptane, and chloroform shed light onto trends where the CP derivatives exhibited shorter N-H...N bonds in more polar solvents, such as water. In contrast, solvation had a negligible impact on the N-H...N bond length in DP derivatives. The calculated basis set superposition error corrected energies confirmed that EDGs have a decreasing effect on the internal hydrogen bond energies and EWGs have an increasing effect. The study furthermore demonstrated the importance of solvent polarity in modulating non-covalent interactions, suggesting potential implications on the tunability of the internal hydrogen bond in CP and DP derivatives. The findings highlight the complexity of modeling non-covalent interactions in various solvents, offering valuable insights for the development of reusable cyclophane-based hydrazine sensors.

## **66. The Foaming Properties of Turkish Coffee**

*Kalli Hart, Seville Tarrant, Joseph Strandquist, Physics and Astronomy*

3:05–3:25 ♦ Room 208

Turkish coffee is a unique way of brewing coffee as the grounds are never separated from the water in the brewing process as well as having a light brown foam that forms along the top of the coffee. The proposed project seeks to understand how the coffee grounds impact the volume and consistency of the foam. The hypothesis is that the smaller the grind size, the greater the volume of the foam and the greater amount of grounds suspended in the foam there will be. This is due to the smaller grind sizes having a greater surface area to be in contact with the water. This would allow more carbon dioxide to be drawn from the grounds, producing more foam. Additionally, the smaller the grounds, the lighter they will be, allowing them to be suspended in the foam. The independent variable will be the grind size while the intensity of the flame used, number of brewing cycles, type of water, equipment, and frequency of stirring will be held constant. Other independent variables have been tested, but grind size will be the focus because it has not yet been tested due to a lack of a sufficient grinder. Control trials were conducted with pre-ground Turkish coffee under similar conditions. After the coffee was brewed, the foam was measured in a graduated cylinder for comparison with other trials. The consistency of the foam was measured by observation secondary to the volume of the foam.

## **67. Synthesis and Characterization of Renewable Polyester Scaffolds for Use in Bone Tissue Grafting**

*Cade Bond, Eli Heger, Patrisha Bugayong, Kevin Sanchez, Chemistry and Biochemistry*

3:05–3:25 ♦ Room 219

Bone grafts are essential for many medical procedures throughout the orthopedic realm. Historically, autografts and allografts have been used; however, there are multiple limits to their bone scaffold capabilities, such as quantity constraints, high cost, and immunorejection. Thus, the development of viable synthetic scaffold polymers that encourage osteocyte proliferation and possess mechanical

properties applicable for weight-bearing purposes is gaining traction. Citric acid (CA) and trans-aconitic acid (TA) are both byproducts of sugar cane processing, making these substrates economically efficient and renewable. Additionally, they are predicted to be biocompatible as they are both present in regular cell metabolism. Both of these acids can be polymerized with glycerol to produce a porous, bone-like material. The development of a bone scaffold with these substrates will make a significant contribution to orthopedic techniques as well as provide an affordable bone graft option for underprivileged populations around the world. Different ratios of CA and TA substrates were reacted with glycerol, a waste product of biodiesel production and fatty acid metabolism, and the most viable option was chosen for further testing. Hydroxyapatite was incorporated into both versions of the scaffold as it has been proven to promote osteocyte proliferation and differentiation. Physical qualities, IR and NMR characterization, mechanical strength, rate of proliferation of bone cells, and degradation tendencies were analyzed for each scaffold. This led to the determination of the most applicable citrate and trans-aconitic acid bone grafts for bone tissue engineering. By use of sustainable materials, such as TA, CA, and glycerol, a successful synthetic bone scaffold polymer can be synthesized with greater accessibility in worldwide communities.

### **68. Recreating Traditional Animation Techniques**

*Peter Pustejovsky, Liam Philbin, Jay Wallace, John Rogers, Art and Design, School of Engineering*

3:05–3:25 ♦ Room 307

Throughout the 20<sup>th</sup> century, most classic animated features were created using cel animation. This domination of the animation industry lasted until the early 1990s when studios began to replace it with digital alternatives. Unlike other analog mediums, such as stop-motion, where smaller studios and independent animators preserve the technical know-how, cel animation is slowly being forgotten. This project's goal is to rediscover the methods used to make traditional animation. It will feature the process of planning and creating a sequence and improvements to my multi-plane camera prototype.

### **69. Using a Thrustometer to Measure Thrust Ejection From Static Testing Solid Rocket Propellant**

*Dante Bullara, Mason Charvat, Kieran Pavlick, Charles Sprouse, School of Engineering*

3:05–3:25 ♦ Room 324

Our project seeks to build and test various solid rocket motors and attempt to make thrust consistent enough for rocket flight. Solid rocket motors require many static tests before they can be used for flight. Our project uses a thrustometer to quantify the best method of thrust we can get from a motor. Using a load cell, the rocket motors thrust can be measured in force over a time interval.

## 70. Performing Raytracing Using a Low-Cost Computing Cluster

*Liam Philbin, Joseph Bourke, Nicolaas tenBroek*, Mathematics and Computer Science

3:35–3:55 ♦ Room 109

The field of 3D computer graphics primarily concerns itself with the procedural generation of 2-dimensional images of objects represented as a set of 3-dimensional model data as quickly and accurately as possible. A technique commonly employed to achieve this goal is raytracing — raytracing generates an image of a given set of objects (often referred to as a scene in computer graphics) by simulating (i.e., “tracing”) the paths of the light rays as they would reflect off objects in the scene based on basic optical principles. In this approach, raytracing differs significantly from other rendering methods, which generate 2-dimensional images of objects by projecting their geometry onto a 2D plane, adding visual effects, and outputting the final image.

It is this approach that makes raytracing by far one of the most simple and accurate rendering methods; raytracing does not have to “fake” common optical effects (such as reflection, refraction, and shadows) because it simulates these effects naturally in the scene it is rendering. However, these benefits come at an incredibly high computational cost compared to traditional methods. To speed up this rendering process, raytracing calculations are often carried out in parallel on the GPU. GPUs, however, are difficult to program and often require complex APIs to interface with them.

While designing a raytracing program exclusively to utilize a computer’s CPU and not its GPU will fail to capitalize on the full power of the computer, it makes the program far easier to write and test, ensures consistent performance across different machines, and allows for easier implementation, testing, and demonstration of the fundamental mathematics behind the raytracing process.

The goal of this project was to build a small cluster of computers to perform CPU-based raytracing calculations in parallel. This project aimed to render various images with this cluster to demonstrate the capabilities of the raytracing program as well as to test the feasibility of Raspberry Pi’s as the basis for a computing cluster.

## 71. Cracking the Code: How EspB, EspK, and EspJ Mediate Mycobacterial Virulence

*Sophia Valdivia, Erica Willard, Kevin Sanchez*, Chemistry and Biochemistry

3:35–3:55 ♦ Room 125

Tuberculosis (TB) remains the deadliest infectious disease, responsible for 1.3 million deaths in 2022. Caused by *Mycobacterium tuberculosis* (Mtb), TB primarily affects the lungs but can spread to other organs, such as the kidneys, spine, and brain. The airborne transmission of Mtb makes it highly contagious, particularly in densely populated regions, such as India, Indonesia, China, and the Philippines. Despite various therapeutic approaches, an effective and affordable

treatment remains elusive. A key factor in Mtb's virulence is its ability to evade the immune system through the ESX-1 secretion system, which facilitates phagosome lysis within macrophages. ESX-1 secretes protein substrates, including EspE and EspF, which are hypothesized to mediate phagosome membrane disruption. However, while these substrates are secreted from the bacterial cytoplasm via ESX-1 in the inner membrane, the mechanism by which they cross the outer membrane remains unknown. Recent studies suggest that certain ESX-1 substrates may form a pore in the outer membrane, allowing EspE and EspF to exit and disrupt the phagosome membrane. This study aims to investigate whether EspB and EspJ interact, which would suggest that they facilitate pore formation. The proposed model indicates that EspB and EspJ exit the cytoplasm, bind to themselves or each other, and assemble a passage through the outer membrane, enabling EspE and EspF to reach their target. A bacterial hybrid system will be used to analyze potential binding interactions between EspB and EspJ to test this hypothesis. Understanding this interaction could provide critical insight into the ESX-1 mechanism and reveal new therapeutic targets. If EspB and EspJ are essential for pore formation, disrupting their function could serve as a novel approach to weakening Mtb's immune evasion capabilities.

## **72. To Go or For Here? Why Modern Culture Needs Coffee Shops**

*Tatiana Tawney, Stephen Mirarchi, English*

3:35–3:55 ♦ Room 208

The coffeehouse has been a staple of European and American culture since the 17<sup>th</sup> century. As hubs of gathering, the old coffeehouses served as “penny universities”: places for discussion and exploration of ideas. This project seeks to explore the nature of coffee shops as anthropological places and the importance of their role in modern culture. It examines the works of scholar Marc Augé, who defines anthropological places as specific communal spaces in culture and contrasts them with detrimental, individual-centered “non-places.” It also focuses on the works of scholar Ray Oldenburg, who analyzes the need for a “third place” in American society: a place of conversation and connection away from the home and the office. Additionally, it will use observations from personal travel experience in Costa Rica and Seattle to investigate how the coffee shop functions in modern society. We argue that the sit-down coffee shop has a particular ability to function as a “third place” in modern society whereas an efficiency-centered drive-through coffee window functions as a deleterious non-place. We conclude that the traditional coffee shop is able to fulfill the desire of modern culture for these “third places” by fostering communal connection instead of solitary contractuality.

### **73. The Death of a Star: Photometric and Spectroscopic Study of the SRd Variable Star UU Herculis**

*Magdalen Heckman, Stephanie Schrader, Ryan Maderak*, Physics and Astronomy

3:35–3:55 ♦ Room 219

Semi-regular type d (SRd) variable stars are pulsating yellow supergiants on their “death march” towards their final stage as white dwarfs. Despite decades of research, these stars are not well understood. To gain new insight into this important phase in the life of low mass stars, a photometric and spectroscopic monitoring study of SRd variables has been underway at Benedictine College’s Daglen Observatory since summer 2020.

UU Herculis (UUHer) is one such SRd variable star under observation. We will discuss the photometric and spectroscopic data obtained for this star to date, with an emphasis on the summer 2024 season. Analysis of the star’s light curve and pulsations will be presented, as well as how this research relates to the future of our own Sun.

### **74. La Tierra que nuestros hijos nos han prestado (The World That Was Inherited From Our Children)**

*Elianna Watson, London Gutekunst, Jude Tawney, Mary Danner, Filiberto Mares Hernandez*, World Languages and Cultures

3:35–3:55 ♦ Gangel Seminar Room

In his papal encyclical *Laudato Si*, Pope Francis says that the word “environment” describes the relationship between nature and society. Society is made up of us and our descendants. Nature and society have given us the earth to borrow for a time. Our responsibility is to act as proper stewards of it. By studying recent legal cases and current environmental policy in Mexico, this project seeks to provide a federal environmental policy recommendation and a dialogue with the United States.

### **75. Printmaking With Electricity**

*Gabrielle Dawes, Rachel Rogers, Jay Wallace*, Art and Design

3:35–3:55 ♦ Room 307

Printmaking is a classical yet ever-adapting form of artwork. In recent years, studies and measures have been taken to create safer and cheaper methods to produce higher quality prints than the traditional techniques. Using research from the art and science departments at Kansas State University, made available to us by the MidAmerica Print Council, we were able to produce new etching tanks, preparation approaches, and techniques in order to best implement a contemporary practice that has been well-developed and proven to be successful. Our research analyzed the overall effectiveness of electro-etching in mezzotint and intaglio prints as compared to traditional materials. Cost, safety risks, and quality of the prints were assessed to find the contemporary, electro-etching methods as substantially more favorable for our purposes as artists.

## **76. Evaluating Theoretical vs. Measured Altitudes in Mid-Power Rocketry: A Flight Computer Data Analysis**

*Mason Charvat, Dante Bullara, Kieran Pavlick, Paul Hanson, Charles Sprouse,*  
School of Engineering

3:35–3:55 ♦ Room 324

This project examines the accuracy of rocketry flight modeling software in predicting the maximum altitude of a mid-power rocket. The theoretical altitude, calculated using OpenRocket, is compared to the actual altitude recorded by an onboard altimeter. The discrepancies between these values are analyzed, considering potential sources of error, such as motor performance variations and environmental conditions. Additionally, methods for reducing prediction error in future launches are discussed.

## **77. Honors Project — *Theology of the Body*, Dr. Brené Brown, & the Role of Shame in Educational Settings**

*Bridget Goldkamp, Sharon Houlahan, Andrew Salzmann, Anthony Crifasi,*  
*Stephen Mirarchi, Mariele Courtois, Jamie Spiering,* Psychological Sciences,  
Honors Program

4:05–4:35 ♦ Room 109

Shame is an inevitable and often insidious part of the human experience that deeply affects our ability to learn and to be in relationship with others. This project examines the connections between John Paul II's philosophically and theologically grounded understanding of the human person in *Theology of the Body* and social worker and popular podcaster Dr. Brené Brown's qualitative research on shame and relationships. Although these thinkers come from widely diverging backgrounds and use different methodologies, both provide crucial insights into the roles of relationship and shame in our lives. Through examining the connections between these two thinkers, I plan to demonstrate why it is important for educators to be aware of shame in their classrooms, how shame stunts the student's ability to learn, and how to mitigate its effects in order to provide the best learning environment for students. Ultimately, this presentation seeks to contribute to pedagogy through raising awareness about the negative impact of shame in the classroom and providing educators with concrete solutions for shame management.

## **78. Building an Accessible Protein Purification Pipeline: Low-Cost Solutions for Scalable Biochemical Research**

*Katie Youll, Bridget Walker, Kevin Sanchez,* Chemistry and Biochemistry

4:05–4:25 ♦ Room 125

Protein purification is a cornerstone of biochemistry, enabling the study of protein structure, function, and interactions across various fields, including drug development, biotechnology, and environmental biology. However, traditional protein purification methods are often costly and resource-intensive, making large-scale applications and widespread use challenging. This project aims to develop an affordable, scalable, easy-to-implement protein purification protocol

that can be applied across diverse organisms. The approach utilizes cost-effective materials and incorporates intentional cloning techniques to streamline the process. In the first phase, we will purify mCherry proteins using Ni-NTA affinity chromatography, leveraging both inducible and constitutive expression systems. In the second phase, a cloning strategy will be developed to facilitate the insertion of genes of interest into these expression vectors, allowing for the efficient purification of target proteins. The mycobacterial gene *espM* will serve as a proof of concept for this pipeline as it has been successfully purified in previous studies without adverse effects on *E. coli*. This work aims to create a versatile protein purification platform that is cost-efficient, broadly applicable, and accessible for future researchers and students, thereby expanding the accessibility of protein research across disciplines.

## **79. Chess Mate**

*William Anderson, Justin Post, Jacob Hawley, Joseph Wurtz, Gregorian Fellows*

4:05–4:25 ♦ Room 208

Can a product be created that uses modern technology while keeping the user in touch with reality? Can this be done by replacing online digital chess with online physical chess?

As the world continues to replace authentic human experiences with superficial alternatives that prioritize the technological medium above its users, it becomes increasingly easier to find ourselves separated from the ‘real world.’ With few alternatives available promising to bridge the gap between the individual and the technology he or she uses, new alternatives must be created that offer people the opportunity to ground themselves once again in reality. Seemingly, current attempts to address this problem are equally flawed, overcompensating in their response and neglecting to value modern technological advancements.

Chess is an ancient pastime, which is predicated on use of the hands, use of the mind, and personal [one-on-one] interaction. Additionally, chess is a universal medium that bridges the gap between individuals, making it an optimal centerpiece for this project. We aim to design, build, and prototype a modern chess board that wirelessly connects players worldwide. These boards when paired, can mechanically mirror the same chess game across long distances. By utilizing an (X), (Y) gantry system, pieces will be manipulated and moved completely in real time to display the opponent’s moves within the physical play-space. The overall question can be answered by gaining user feedback to determine whether game play imitates physical chess or digital chess.

## **80. Indian Thought, Greek Thought, and Whether It Can Fit Into Catholicism**

*Alicia Alvarez, Matthew Ramage, Theology*

4:05–4:25 ♦ Room 219

My project topic will be generally on Indian thought, specifically in Hinduism, and relating it to Greek thought, specifically Neoplatonism. Following the lead of Pope St. John Paul II, I will explore the idea of how Christians can draw upon the

rich heritage of Indian thought in order to enrich Christian thought. My thesis will argue that Christians can identify and use the truths found in Hinduism to further our understanding of doctrinal and practical beliefs in Christianity like meditation, prayer, monasticism, and spiritual development of the soul. My outline will include (a) early church precedent for using Greek philosophy within Christianity, (b) Vatican documents and support for inter-religious dialogue, (c) a warning against the extremes of pluralism and feeneyism, (d) similarities and philosophical insights of Hinduism, and (f) a practical application.

### **81. “Hard crackers, come again no more!”: The Culinary Life of a Civil War Soldier**

*Mary Ellen Raymo, Dermot Trainor, History*

4:05–4:25 ♦ Gangel Seminar Room

At the start of the American Civil War, the Union and the Confederacy imagined that the issue of succession would be settled in a few decisive battles. Neither were properly prepared for the years of hardship that followed the First Battle of Bull Run. On top of the marching, fighting, and boredom endured by both sides, the soldiers were faced with a lack of quality food. Even if proper rations could be obtained, the majority of the men had no idea how to prepare their food safely, much less make it palatable. Letters from both sides speak of stale bread, overcooked meat, and preserved vegetables so revolting that they were nicknamed “desecrated vegetables.” As the war dragged on, rations ran low, and the men were forced to experiment with whatever they could find in an effort to create dishes that appealed to them. Despite officially ending in 1865, the Civil War and how it is remembered still pervades American culture to this day. To better understand the war from the common soldier’s perspective, I recreated and sampled several Civil War era field recipes mentioned in soldiers’ letters.

### **82. An Invitation to Mystery: A Look at the History and Techniques of Frame Making**

*Maggie Tobin, Charles Stewart, Art and Design*

4:05–4:25 ♦ Room 307

Frames are central to our understanding of paintings because they form a bond between the painting and the room in which it is displayed. For centuries artists and craftsmen have developed an extensive tradition of creating frames that are ornate and often gilded in precious metals. Yet, when we look at art, the frames often go unnoticed. My research explores the traditions and techniques that go into the creation of these masterpieces, which function as portals that transport us into the artist’s world.

### **83. On the Use of Group Theory in Cryptography**

*Mark Westerman, Heidi Grossman, Eric West, Mathematics and Computer Science*

4:05–4:25 ♦ Room 324

Cryptography is the design and study of mathematical algorithms used to modify data in order to keep it secret. This is an important topic in the protection of

data today. Group theory is the study of abstract algebraic systems featuring a single binary operation that acts on two numbers. Cayley Tables are a means of visualizing the arithmetic behind these systems. Using this arithmetic for cryptography helps provide new ways to hide data as it varies significantly from ordinary arithmetic.

This presentation covers research on the use of concepts from mathematical group theory as a means of data encryption. It will also cover relevant sections of group theory and cryptography. The presentation is then organized by the various algorithms using Cayley Tables, with finer details on the usage and complexities of each included. The final portion also will cover the algorithmic generation of groups, including problems caused by associativity; various findings related to associativity; and an effort to minimize how much data must be sent to encrypt a message this way. Such generation of groups is very useful for cryptography as there are thousands of groups that each have their own arithmetic, allowing for the creation of a complex and nuanced encryption algorithm.

#### **84. Realizing Beauty Through Music**

*Jaiden Miller, Thomas Davoren, Music*

4:45–5:45 ✦ O'Malley-McAllister Auditorium

The piece “Disoriented Flames” is a percussion ensemble piece that is supposed to depict moving flames. Each different variation represents a different flame color similar to a person who has synesthesia, a neurological condition in which stimulation of one sense triggers experiences in another, such as seeing color when listening to music.

The piece begins with an orange flame burning bright to be quickly put out by a different color flame. Throughout the piece we hear the orange flame return multiple times and eventually hear it bloom into a beautiful bright white flame towards the end of the piece. The given tempos ranging from 102–152 are given to provide stability at times and other times provide a sense of the flame flickering or blooming. The beginning tempo of 102 bpm sets orange up nicely as the marimba notes rise from the lower register like how a fire rises from the burnt wood as it begins to burn. Whenever orange returns, we usually hear it at the same tempo or slightly faster letting the audience know which color flame is blooming.

The use of crescendos and flourishes represent the flame growing taller or fading from the fire. The piece consistently features the use of the eight, sixteenth, half, and quarter note rhythms to provide as our foundation of the fire. This is what keeps our fire burning bright no matter the color flame that is the biggest or brightest at the moment. The use of dotted quarter notes, quarter and eighth note triplets, agogic stress, polyrhythms, quintuplets, sextuplets, septuplets, and thirty-second notes are used to provide the effect of the fire swaying, burning brighter, a new color flame emerging, the fire fading, or the fire crackling. It also provides a feeling of disorientation to the performers and the audience. The piece also utilizes non traditional instruments, such as bubble wrap and plastic bags, to provide the realization of the fire.

I want to go through the process of realizing music to provide a new genre/style of music to the world. The majority of the music we hear and listen to today is dominantly aural and sometimes accompanied with a music video. I want to realize the music so that when you listen to it, you also see it visually in your mind.

This piece was originally written for solo marimba but now has been transformed into a percussion ensemble. This was necessary to capture and create the full spectrum of colors of each flame and the visual illusion of the fire that is burning, fading, and rising. The use of the ensemble allowed for all the different timbres that were necessary to create the effect of the fire to be realized and the heart/soul of it as well. Each part in the piece always grows or fades to a point. The essence of the marimba solo is still there with the virtuosic runs in the marimba 1 part, which becomes the heart of the piece and the kindling of the fire.

### **85. “First Dance” — Composition for Percussion Ensemble**

*André Bauer, Benedictine College Percussion Ensemble, Thomas Davoren, Music*

**4:45–5:45** ✦ O’Malley-McAllister Auditorium

This is an instrumental piece written for percussion ensemble under the instruction of my composition professor Dr. Davoren. It was an exercise in writing a piece under a time constraint for a particular group and performance. The piece is named “First Dance,” and it explores the way in which the percussion ensemble may be used to evoke the sentiment of a first dance while adhering to parts written to be idiomatic and consistent with standard technique facilitating ease of apprehension for the players.

### **86. “Flying Looking Longing”**

*Zavier Tarrant, Elijah Hoagland, Jacquelyn McCoy, Finnegan Ritchie, Liberty Lyon, Ronan Greuel, Thomas Davoren, Thomas McMurray, Music*

**4:45–5:45** ✦ O’Malley-McAllister Auditorium

“Flying Looking Longing” is a multi-movement chamber piece based upon my experience flying in airplanes. The many instruments and melodies represent the depiction of the scene along with my personal emotions. The first movement takes place in the plains of Michigan during the day. The use of sweeping melodies and trills help to bring out the expansiveness and simple beauty of the scene. The second movement is in the clouds during a sunset. A tenor solo is added to express the beauty of the otherworldly scene. The third movement is at night in Kansas City and takes influence from Jazz at night clubs. The variations of style help depict the contrast of light and dark in and around the city. This piece is dedicated to my parents and to the members of the Benedictine College community without whom I would not be the person or the composer I am today.

## 87. Quartet for Mixed Instruments

*Kathleen Smith, John Morris, Jaiden Miller, Lindsay Walczak, Hannah Hiester, Timothy Tharaldson, Music*

4:45–5:45 ♦ O'Malley-McAllister Auditorium

“Flowing in the Palindrome” is a quartet scored for violin, clarinet, trombone, and marimba. The piece is written in a single movement and is written in the form of a palindrome; the 2<sup>nd</sup> half of the piece is the same as the first half but played in reverse. Arpeggiated ostinato figures are repeated throughout the entire piece and are passed among all of the instruments. There are four main melodies that are presented throughout the piece in a variety of forms. All four melodies are retrograded in the second half of the piece. The piece is in B-flat Major and later modulates to the relative minor, G Minor, and stays in the natural minor before modulating back to B-flat major. This piece explores the use of retrogrades, chromaticism, non-traditional use of major/minor keys, and unconventional use of instrumentation. Rehearsals leading up to the performance were entirely student led. This piece will be performed by members of the Benedictine College Orchestra and Wind Ensemble.



## The Discovery Program Committee

The Discovery Program Committee is committed to the advancement of Discovery learning at Benedictine College. The committee's responsibilities include encouraging and supporting faculty and students in their own Discovery activities, the awarding of Discovery grants, planning the Discovery Day Symposium, and designating the Discovery Scholars. Members of the committee for the current year are Andrew Downs (Engineering), John Romano (History), Kevin Sanchez (Chemistry and Biochemistry), Jeremy Stubblefield (Biology), and Julia Bowen and Terrence Malloy (Discovery Program Co-Directors).

## Discovery Grants

The Discovery Program committee awarded over \$23,712 in Discovery grants to students this year in support of 54 Discovery projects. The 2024–2025 Discovery grant recipients are the following:

Joseph Accurso	Sarah Hanson	Bernard Rempe
Nicholas Ackerman	Kalli Hart	Domenico Ricciardi
Mark Amery	Eli Heger	Thomas Richardson
Emma Antczak	Jonah Honerman	Rachel Rogers
Quinn Bailey	Michael Jarboe	Alexandra Rohn
Je'Zhon Baker	Isabel Kliethermes	Tess Scheske
Emma Baucom	John Kline	Noah Schultz
Augustine Blosser	Juliette Lange	Jadyn Searing
Cade Bond	Damien Langfels	Ricardo Serdan Solana
Joseph Bourke	Tobias Langfels	Julia Simpson
Miriam Bourke	Liberty Lyon	Andrew Steeves
Rebekah Brown	Rebecca Madden	Jacob Steffen
John Bruemmer	Joanna Mainzer	Deaglan Sullivan
Dante Bullara	Jessica Mannella	Gabriel Sydzyk
Paul Bytnar	Fiona Metzinger	Seville Tarrant
Joseph Campbell	Sebastian Michael	Nicolaas tenBroek
Mason Charvat	Catherine Moraghan	Randall Terry II
Peter Clements	Louis Muggli	Joel Thomas
Kirstyn Crane	Micah Munoz	Carlos Valdivia
William Cullen	Clare Newbolds	Sophia Valdivia
Caroline Cunningham	John Newbolds	Mary Van Auken
Mae Danaher	Michaela Palmer	Conner VanNocker
Gabrielle Dawes	Evelyn Parsons	Emmanuel Vista
Elias Ford	Kieran Pavlick	Grace Volkmer
Ryan Fricker	Julianne Peichel	Bridget Walker
Samuel Gagnon	Elliott Peters	Erica Willard
Sean Galloway	Elizabeth Peterson	Kera Willoughby
Gracie George	Liam Philbin	Anna Wingbermuehle
Mary Grace Gramlich	Lillian Prickett	Katie Youll
Henry Greger	Peter Pustejovsky	
Gabriel Guzman	Faith Quinn	
Paul Hanson	Grace Quinn	





## Wangari Maathai Discovery Award

When Wangari Maathai accepted the Nobel Peace Prize in 2004, she made her alma mater the only Catholic college in America with a Peace Prize winner among its alumni. She won the Nobel for her efforts to promote democracy, peace, and sustainable development and is the first Peace Prize winner to have an environmental focus. Maathai, from Kenya, came to the United States as part of the Kennedy Airlift in 1960 and earned a degree in biology from Mount St. Scholastica College, now Benedictine College, in 1964. In 2014 the college marked the 10th Anniversary of the Nobel ceremony by announcing the winners of two new Maathai Discovery Awards.

Maathai passed away in 2011 after battling cancer. Since then, the College has remembered her in several ways. Her classmates from the Mount Class of '64 planted a tree in St. Scholastica Plaza on the college campus, and in 2015 her statue was erected next to that tree. In 2014 Sister Helen Mueting, OSB, announced the first recipients of the awards, funded by a generous donor.

This year's winners of the Maathai Discovery Award are Sophia Valdivia and Jessica Mannella, Tess Scheske, Anna Wingbermuehle. These students are presenting the results of their research during today's Discovery Symposium.

Sophia Valdivia investigated if EspB and EspJ are essential for pore formation because disrupting their function could provide a new approach to weakening the ability of *Mycobacterium tuberculosis* to evade immune systems.

Jessica Mannella, Tess Scheske, and Anna Wingbermuehle explored how low, high, and ideal pH environments affect a plant's ability to produce a defensive compound, specifically the ability of *Chrysanthemum cinerariifolium* to produce pyrethrum, a natural insecticide.

Each Maathai Discovery Award carries a \$500 stipend for the student, and up to an additional \$500 to complete the proposed Discovery Project. The award supports projects that focus on stewardship, sustainability, women's equality, and/or environmental justice.



## The Stapletons



### “Song and Story”

Kate and Casey Stapleton are musicians and documentary filmmakers. Their musical partnership combines Celtic harp and American 12-string guitar to forge a unique and beautiful sound. Their live performances interweave music and storytelling. Their debut film, *The Inner Sea*, is currently playing in festivals throughout America.



## Discovery Scholars

Last year marked the twenty-first year that students were honored as Discovery Scholars. This award recognizes students who have demonstrated an outstanding commitment to Discovery learning while at Benedictine College. Awardees receive the Discovery Scholar Medal to be worn during Commencement ceremonies, signifying their exceptional contribution to the Discovery Program. In 2024, these seniors were honored as Discovery Scholars:

Patrick Argana  
Katherine Brandenburg  
Alejandro Calderon  
Pietro Contolini  
Madeline Hays  
Richard Hernandez  
Benjamin Hoopes  
Jackson Maldonado  
Katelyn Malick  
Joshua Mansfield  
Grace Nelson

Kassidy Neuner  
Shea Nowicki  
Julia Ondracek  
Timothy Rosno  
William Scavuzzo  
Amelia Vopat  
Abby Walterscheid  
Lane Werth  
Sophia Winger  
Emily Yohon

**Discovery Day 2025 Schedule Overview** (Presentation number in parentheses)  
All presentations will take place in the Ferrell Academic Center unless otherwise indicated.

🦋 All are invited to a light breakfast in the Napier Foyer (Fourth Floor), Ferrell Academic Center (FLC) 🦋							
Poster/Exhibit Session #1 – Ferrell Academic Center (McAllister Board Room) (1–18)							
	FLC 109	FLC 125	FLC 208	FLC 219	Gangel Sem. Room	FLC 307	
8:30						FLC 324	
8:30–9:35							
9:45–10:05	Crane Expediting Diapause in <i>Osmia lignata</i> Through Temperature Manipulation Huddleston (19)	Bruemmer <i>How the Dead Speak to Us</i> Romano (20)	Peterson Challenging the Morality and Constitutionality of the FACE Act Shankman (21)	McClelland To Identify With the Beloved: A Look into the Renewal of Catholicism in France at the Turn of the 20 <sup>th</sup> Century McConnell (22)	Thesis Defense: Fisher Does Anything Exist? The Implications of Quantum Mechanics for Reality Crtfasi (23)  (9:45–10:35)	F. Quinn Polymerizing MMA Into Functional Transparent Plastic Shcherbatyuk (24)	Caskey Examining the Core of Dyslexia Through ... Different Languages Wentz (25)
10:15–10:35	Cullen Apoptosis of <i>Helicobacter pylori</i> in the Presence of Gallic Acid Carletti (26)	Newboulds <i>The Medieval Sword and Architectural Proportions</i> Romano (27)	LeDoux <i>Is Michelangelo a Theologian?</i> Courtois (28)	Brungardt <i>Akira Kurosawa: Films That Face Life</i> White (29)		G. Quinn Validation of the Temperature-Emission Peak ... Through the Hines-Scholes Method Shcherbatyuk (30)	Thomas Building Hope: The Journey to Establishing a School in Rural Liberia Wise (31)
10:45–11:05	Palmer <i>Injures Suck. Period.: How BC Athletes Are Using Menstrual Cycle Tracking to Determine a Possible Relationship With Injury</i> Carletti (32)	Brown <i>Viriditas: Hildegard von Bingen's Intertwined Spiritual and Physical Worlds</i> Romano (33)	Blosser <i>Waste Oil Powered Furnace</i> Park (34)	Honors Project: Michael <i>The Preservation of Churches: Josef Pieper and Martin Heidegger on Culture, Art, and Worship</i> Madden (35) (10:45–11:15)	Ricciardi Non-Intrusive Mechanization of Pianos II Modlin (36)	Amery <i>Developing a Swarm Response in Independent Autonomous Robots for Energy Applications</i> Shcherbatyuk (37)	Roberts <i>The Honest and Grim Reality of Southeast Asian Orphanages</i> Mulholland (38)
11:15–12:10	Poster/Exhibit Session #2 – Ferrell Academic Center (McAllister Board Room) (39–56)						
11:30–12:50	Lunch – Dining Hall						
1:00–2:20	• Keynote Address: <b>The Stapletons</b> • - O'Malley-McAllister Auditorium						

	FLC 109	FLC 125	FLC 208	FLC 219	Gangel Sem. Room	FLC 307	FLC 324
2:35-2:55	Gerle Student Leadership: Personality Correlates and Motivations for Leading Posey (57)	Moraghan DFT Investigation of Hydrogen Abstraction and Radical Coupling Pathways ... Blaustein (58)	Seating Building a Thermal Controlled Heat Mantle For Quantum Dot Synthesis Strandquist (59)	Figge Catholic Neus - Is Revital Possible? Meinert (60)	Thesis Defense: Herron God is the Creator Rioux (61)	Meyer The Art of Songwriting in Another Language Sellers (62)	tenBroek Modeling and Simulating Elliptical Laser-Driven Electron-Dynamics Saylor (63)
3:05-3:25	Barrett Shaped by Stereotypes: The Influence of ... Stereotypes on Moral Evaluations Elmore (64)	Knebhans Theoretical Study of Solvation and Substituent Effects on Internal Hydrogen Bonding of Cyclophanes Blaustein (65)	Hart The Foaming Properties of Turkish Coffee Strandquist (66)	Bond Synthesis and Characterization of Renewable Polyester Scaffolds for ... Bone Tissue Grafting Bueyong (67)	Rioux (61) (2:35-3:25)	Pustejovsky Recreating Traditional Animation Techniques Wallace (68)	Bullara Using a Thrustometer to Measure Thrust Ejection From Static Testing Solid Rocket Propellant Sprouse (69)
3:35-3:55	Philbin Performing Retracing Using a Low-Cost Computing Cluster tenBroek (70)	Valdivia Cracking the Code: How EspB, EspK, and EspJ Mediate Mycobacterial Virulence Sanchez (71)	Tawney To Go or For Here? Why Modern Culture Needs Coffee Shops Mirarchi (72)	Heckman The Death of a Star: Photometric and Spectroscopic Study of ... Star UU Herculis Maclerak (73)	Watson <i>La Tierra que nuestros hijos nos han prestado</i> Mares Hernandez (74)	Dawes Primmaking With Electricity Wallace (75)	Charvat Evaluating ... Altitudes in Mid-Power Rocketry ... Sprouse (76)
4:05-4:25	Honors Project: Goldkamp <i>Theology of the Body</i> : Dr. Brené Brown, & the Role of Shame ... Houlahan (77) (4:05-4:35)	Youll Building an Accessible Protein Purification Pipeline: Low-Cost Solutions for Scalable Biochemical Research Sanchez (78)	Anderson Chess Mate Wurtz (79)	Alvarez Indian Thought, Greek Thought, and Whether It Can Fit Into Catholicism Ramage (80)	Raymo "Hand crackers, come again no more!"; The Culinary Life of a Civil War Soldier Trainer (81)	Tobin An Invitation to Mystery ... Techniques of Frame Making Stewart (82)	Westerman On the Use of Group Theory in Cryptography Grossman (83)
4:45-5:45	Miller Realizing Beauty Through Music Davoren (84)	O'Malley-McAllister Auditorium Bauer Davoren (85)			Z. Tarrant "Flying Looking Longing" Davoren (86)	Smith Quartet for Mixed Instruments Tharaldson (87)	
Spring Band Concert							

## Index of Presenters by Session (Lead Presenters)

Accurso, Joseph	44
Ackerman, Nicholas	47
Alvarez, Alicia	80
Amery, Mark	30, 37
Anderson, William	79
Antczak, Emma	1
Bailey, Quinn	2
Baker, Je'Zhon	3
Barrett, Chloe	64
Baucom, Emma	4
Bauer, André	85
Baxter, Jason	28
BC Percussion Ensemble	85
Blaustein, Gail	58, 65
Blosser, Augustine	34
Bond, Cade	67
Bourke, Joseph	70
Bourke, Miriam	4
Brown, Rebekah	33
Bruemmer, John	20
Brungardt, Anne	29
Bugayong, Patrisha	67
Bujana, Tony	3, 52
Bullara, Dante	54, 69, 76
Bytnar, Paul	21
Campbell, Jacob	41
Campbell, Joseph	5
Carletti, Martha	26, 32, 45
Caskey, Brooklyn	25
Charvat, Mason	69, 76
Clements, Peter	6
Courtois, Mariele	28, 35, 77
Crane, Kirstyn	19
Crifasi, Anthony	23, 35, 77
Cullen, William	26
Cunningham, Caroline	7
Danaher, Mae	32
Danner, Mary	74
Davoren, Thomas	84, 85, 86
Dawes, Gabrielle	75
Downs, Andrew	10, 56
Elmore, J. Dean	64
Figge, Jack	60
Fisher, Lucia	23
Ford, Elias	34
Fricker, Ryan	34

Gagnon, Samuel	8
Galloway, Sean	9
George, Gracie	26
Gerle, Donald	57
Goldkamp, Bridget	77
Gramlich, Mary Grace	45
Greger, Henry	12
Greuel, Ronan	86
Grossman, Heidi	83
Gutekunst, London	74
Guzman, Gabriel	34
Hanson, Paul	5, 76
Hanson, Sarah	10
Harris, Jackie	51
Harris, Sarah	4, 42, 53
Hart, Kalli	66
Hawley, Jacob	79
Heckman, Magdalen	73
Heger, Eli	67
Henry, Brian	15
Hernandez, Karina	38
Herron, Peter	61
Hiester, Hannah	87
Hirl, Patrick	41
Hoagland, Elijah	86
Holzman, Christopher	11
Honerman, Jonah	12
Houlahan, Sharon	77
Huddleston, Virginia	19, 40
Hygema, Abigaile	13
Jarboe, Michael	16
Kahan, Larissa	17
Katze, Nicholas	41
Kearney, Regan	14
Kliethermes, Isabel	15
Kline, John	30, 37, 59
Knehans, Matt	65
Kumar, Anna	43
Lange, Juliette	19
Langfels, Damien	16, 55
Langfels, Tobias	16
LeDoux, Anne Marie	28
Lopez, Thomas	17
Lyon, Liberty	45, 86
Maday, Gabriel	25, 57
Maddeford, Aaron	61
Madden, James	35

Madden, Rebecca	5, 9
Maddock, Sean	39
Maderak, Ryan	73
Madore, Sean	57
Mainzer, Joanna	45
Malloy, Terrence	12, 50
Mannella, Jessica	40
Mares Hernandez, Filiberto	74
McClelland, Maggie	22
McConnell, Daphne	22
McCoy, Jacquelyn	86
McMurray, Thomas	86
Meinert, John	60
Messerly, Juliet	41
Metzinger, Fiona	19
Meyer, Matt	62
Michael, Isaac	35
Michael, Sebastian	44
Miller, Jaiden	84, 87
Mirarchi, Stephen	35, 72, 77
Modlin, John	36
Moraghan, Catherine	42, 58
Morris, John	87
Morris, Lauren	43
Mortensen, Brent	17
Muggli, Louis	54
Mulholland, Edward	38
Munoz, Micah	44
Newbolds, Clare	27
Newbolds, John	27
Newbolds, Scott	8, 9
O'Malley, Patrick	47
Paciaroni, Megan	16, 55
Palmer, Michaela	32
Park, Bryan	34
Parsons, Evelyn	19, 45
Pavlick, Kieran	69, 76
Peichel, Julianne	46
Peters, Elliott	47
Peterson, Elizabeth	21
Philbin, Liam	24, 68, 70
Posey, Amy	57
Post, Justin	79
Prickett, Lillian	32
Pustejovsky, Peter	68
Quinn, Faith	4, 24
Quinn, Grace	30, 42

Ramage, Matthew	80
Raymo, Mary Ellen	81
Rebollar Garcia, Jerusalem	41
Rempe, Bernard	26
Ricciardi, Domenico	36, 48
Richardson, Thomas	49
Rioux, Jean	61
Ritchie, Finnegan	86
Roberts, Christina	38
Rogers, John	2, 34, 48, 68
Rogers, Rachel	75
Rohn, Alexandra	50
Romano, John	20, 27, 33
Roth, Louis	13
Salzmann, Andrew	35, 77
Sanchez, Kevin	14, 67, 71, 78
Sayler, A. Max	16, 18, 55, 63
Scherer, Anna	64
Scheske, Tess	40
Schrader, Stephanie	73
Schultz, Noah	12
Searing, Jady	59
Sellers, Julie	62
Serdan Solana, Ricardo	42
Shankman, Kimberly	21
Shcherbatyuk, Georgiy	24, 30, 37, 55
Simpson, Julia	51
Smith, Kathleen	87
Spencer, Steve	5
Spiering, Jamie	35, 77
Sprouse, Charles	5, 54, 69, 76
Stadthagen, Hans	3, 52, 53
Steeves, Andrew	55
Steffen, Jacob	52
Stewart, Charles	28, 82
Strandquist, Joseph	23, 59, 66
Stubblefield, Jeremy	1, 6, 7, 39, 46, 49
Sullivan, Deaglan	4
Sullivan, Lauren	17
Swafford, Andrew	61
Sydzzyk, Gabriel	42
Tarrant, Seville	53, 66
Tarrant, Zavier	86
Tawney, Jude	74
Tawney, Tatiana	72
tenBroek, Nicolaas	44, 70
tenBroek, Nicolaas	63

Terry II, Randall	21
Tharaldson, Timothy	87
Thomas, Joel	31
Tobin, Maggie	82
Trainor, Dermot	81
Trautman, Maria	64
Urban, Summer	38
Valdivia, Carlos	54
Valdivia, Sophia	17, 71
Van Auken, Mary	24
VanNocker, Conner	16, 18, 55
Vista, Emmanuel	56
Volkmer, Grace	3
Walczak, Lindsay	87
Walker, Briget	78
Wallace, Jay	68, 75
Watson, Elianna	74
Wentz, Piper	25
West, Eric	83
Westerman, Mark	83
White, Richard	29
Willard, Erica	71
Willoughby, Kera	32
Wingbermuehle, Anna	40
Wise, Allison	17
Wise, Sarah	31
Wood, Karen	31
Wurtz, Joseph	11, 79
Youll, Katie	78
Ziolkowska, Jad	13, 43



## Discovery Scholar Medal



The front of the Discovery Scholar medal combines images of a set of books and a tree with a landscape symbolizing both the academic and experiential nature of scholarship in the Discovery Program. The books are titled “Community,” “Faith,” and “Scholarship” in Greek. The rear of the medal features a soaring raven with the Latin word “Obsculta,” the first word of the *Rule of St. Benedict*, through which Benedict compels us to listen to God with the ear of our hearts, that is, to seek to discover the Lord in everything. The words “Benedictine College Discovery Scholar” are inscribed around the rim of the medal.





