



## Program of Events

# DISCOVERY DAY SYMPOSIUM

April 5, 2017



## *Welcome to Discovery Day 2017*

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

Every spring semester, the anticipation builds: What have our students come up with this year? It is impossible to attend Discovery Day and not be proud of what Benedictine College is accomplishing in the lives of our students.

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.

I invite the entire College community to join me in supporting Discovery Day.

President Stephen D. Minnis



Discovery Day 2017 marks the twenty-second year of the Discovery Day Symposium. Since 1996, more than 2700 students have presented or co-authored a Discovery Project, involving virtually all the faculty and representing all academic departments. Discovery Day 2017 will present 80 projects, the result of the work of 199 students, 61 faculty/staff, and 25 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  
Dean of the College

## *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 Patrick O'Malley (Engineering), Bryan Park (Art), Michael Stigman (English), Virginia Winder (Biology), and Terrence Malloy and Julia Bowen (Discovery Program Co-Directors).

### *Discovery Grants*

The Discovery Program committee awarded over \$20,000 in Discovery grants to students this year in support of 44 Discovery projects. The 2016–2017 Discovery grant recipients are the following:

Madison Abbott	Jeffrey Fennewald	Emily Kennebeck
Kira Alexander	Michael Fontana	Bethany Kuhn
Eden Anderson	Lane Fry	Austin Lager
Karol Arensberg	Genevieve G'Sell	Nicholas Lahr
Brandon Betsch	Daniela Garcia-Perez	Kyle Lauterwasser
Benjamin Bogner	Blake Gollhofer	Gabriel LeBeau
Margaret Boone	Henry Goracke	Caitlin Leconte
Madison Bower	Galen Gossman	Kathryn Lenertz
Michaela Bretey	Austin Green	Patricia Lombardo
Nicholas Brose	Lorenzo Gregory	Annemarie Lower
Mary Bugos	Molly Hair	Joseph Marak
Adam Burke	David Hall	Jacqueline Marko
Andrew Buss	Lauren Hanks	Jacob Martin
Joshua Caasi	Andrew Hawkins	Graham Matlock
Maggie Carpenter	Daniel Hayes	Whitney Matous
Therese Carson	Gabriel Heffernan	Daniel Mauro
Michael Caughey	Marcela Heffernan	Alexia McAndrews
Katharine Caughran	Elizabeth Helfenberger	Margaret McCabe
Rebecca Chouinard	Rachel Hernandez	William Medina
Elaine Connelly	Rosemary Herold	Thaddeus Messer
Matthew Corbett	Paul Heuser	Patrick Michaels
Bienvenido Cortes	Jonah Hintgen	Andrew Miller
Kathleen Crank	Katharine Hirl	Kaitlyn Miller
Trini Crocker	Mark Horton	Paul Modlin
Jacob Cushing	Callum Hubka	Alexander Moudry
Hannah Dahlor	Elise Huntley	Alissa Muggli
Hannah Dea	Kristen Hylen	Kylie Mulholland
Isabella DeBenedetti	Charles Iner	Claire Nacanaynay
Caelan Doran	Matthew Jarecki	Stephanie Nelson
Landon Downing	Matthew Johll	Angelica Nguyen
Hunter Eisenmenger	Kayla Johnson	Mairead Norton
Erin Farrell	Anastasia Kastl	Kimberley Olson

Mayra Ortiz	Grace Sammoury	Austin Steele
Jonathan Otto	Matthew Scavuzzo	Maddy Stella
Laurencia Ouedraogo	Kurtis Schmitz	Nathaniel Strandquist
Eva Pecha	Alexandria Schneider	Evan Sutherland
Kristina Pikula	Cameron Schoene	Laura Tibbs
Marie Rioux	Shannon Schrader	Samantha Turner
Brennan Roche	Claire Schroettner	Sarah Vall
Angela Rodriguez	Jude Severson	Hannah Vogt
Erica Rohde	James Sowinski	Claire Vouk
Jenna Rudolph	Ryan Spellman	Miriam Walski
Peter Rumpza	Daniel St. Hilaire	Morgan Wentz
Michael Salemi	JohnPaul Stedwill	Paul Wessel



## Discovery Scholars

Last year marked the fourteenth 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 2016, these seniors were honored as Discovery Scholars:

Elizabeth Benda .....	Cleveland, OH
Mackenzie Caylor .....	Fort Collins, CO
Erin Daly .....	Saint Charles, MO
Sierra Esau .....	Reno, NV
Natalie Gallatin .....	Hartsburg, MO
Catherine Glenn .....	Omaha, NE
Samantha Kelly .....	Omaha, NE
Scott Kuefler .....	Lawrence, KS
Joseph Locascio .....	Independence, MO
Therese McCance.....	Bend, OR
Elizabeth Medina .....	Chino Hills, CA
Mary Minnis .....	Atchison, KS
James Nistler .....	Helena, MT
Carlyn Olson .....	Olsburg, KS
Melissa Ott .....	Modesto, CA
Angela Poffenberger .....	Earlham, IA
Anastasia Ratcliff .....	Washington, MO
Laura Romaine .....	Darien, IL
Trevor Sowers .....	Liberty, MO
Jeremy Spalding .....	Shawnee, KS
Jacob Wildhaber .....	Collinsville, IL
Madison Zubradt .....	Lenexa, KS

## Wangari Maathai Discovery Award

When Wangari Maathai accepted the Nobel Peace Prize on December 10, 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. On December 10, 2014, the college marked the 10th Anniversary of the Nobel ceremony by announcing the winners of two new Maathai Discovery Awards.



Maathai returned to Benedictine College in 2007 to give an address that drew thousands and made national news. She 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. Now, a donor has stepped up and given the funds for Mount St. Scholastica to endow two awards in her name. Sister Helen Mueting, OSB, announced the first recipients of the awards, which are tied to Benedictine's Discovery Program, on December 10.

This year's winners of the Maathai Discovery Awards are Kayla Johnson and Jacob Martin. Both students are presenting the results of their research during today's Discovery Symposium.

Johnson worked on a project called "Intentional Campus Sustainability: Environmental Stewardship in the Benedictine Tradition." The project focused on better understanding Wangari Maathai's impact along with the influence of Benedictine philosophy on Benedictine College's environmental stewardship and sustainability practices. It also sought to assess the school's environmental sustainability and compare its efforts with those of other institutions. Her faculty sponsor is Dr. Laura Moley, ESL Director.

Martin worked on a project called "Renewable Polymers." The goal of this project was to work on developing a biodegradable polymer, which has similar, or better, properties than petroleum-based polymers, but with a shorter degradation time. The benefit of creating such a polymer would be reducing petroleum-based polymer products remaining in the ecosystem. His faculty sponsor is Dr. Patrisha Bugayong, an assistant professor in the Chemistry and Biochemistry Department.

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.

## Keynote Address

### **Robert S. Lanciotti, Ph.D.**

Chief, Diagnostic Laboratory  
Centers for Disease Control and Prevention



“The Zika Virus Epidemic: An Inside Look at How the CDC Responds to Global Virus Epidemics”

Welcoming remarks by Kimberly Shankman  
Dean of the College

1:00–2:20 PM

O’Malley–McAllister Auditorium

Dr. Lanciotti is the Chief of the Diagnostic Laboratory within the Arbovirus Diseases

Branch at the Centers for Disease Control & Prevention. His research has focused on arthropod-borne viruses (arboviruses); specifically the development of new and rapid diagnostic assays, as well as studying the biology, evolution, and phylogeny of these diverse viruses.

Over the past 28 years Dr. Lanciotti and his laboratory have been responsible for the identification and characterization of several emerging arboviruses, including West Nile virus in New York (1999), chikungunya virus in the Western Hemisphere (2014) and currently Zika virus. His laboratory has also been responsible for the discovery of several new arboviruses, most recently Bourbon virus in Kansas.

He is the author/coauthor of 98 scientific manuscripts and has authored six textbook chapters on diagnostic technology of the arboviruses.

He has been married to his lovely wife Ruth for 32 years and together they have four children; among whom are two Benedictine students: Elizabeth (graduated 2011) and Maria (class of 2018). Since 2013 Dr. Lanciotti has also been in formation for the Permanent Diaconate, and God willing, will be ordained into Holy Orders as a Permanent Deacon in the Archdiocese of Denver in June 2017.

# Discovery Day Schedule

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

## Continental Breakfast

☞ 8:30 AM — Napier Foyer (4th floor), Ferrell Academic Center ☜

## Morning Sessions

### 8:40–9:35 ☞ Poster/Exhibit Session #1 McAllister Board Room (4th floor)

- 1. Searching for Antibiotics in the Soil: Isolation of *Actinomyces* Species From Northeastern Kansas Soil**  
*Kira Alexander, William Penwell, Biology*
- 2. The Effect of SR9243 on the Proliferative Ability of HeLa Cells in Vitro Through the Use of a MTT Assay**  
*Brandon Betsch, Jacob Cushing, Martha Carletti, Biology*
- 3. Electrical Signaling in Plants**  
*Madison Bowser, Whitney Matous, Hannah Dea, Matthew Richard, Physics and Astronomy*
- 4. The Effect of Increasing Temperature on the Brood Size of *Daphnia Magna***  
*Nicholas Brose, Cameron Schoene, Jonah Hintgen, William Penwell, Biology*
- 5. Common Core State Standards: Now What?**  
*Velia Colunga, Jennifer Ahlers, Christi Adams, Education*
- 6. Analysis of the Role of TES-1 in *C. elegans* Epithelial Cell Morphogenesis via Fluorescent Microscopy**  
*Bienvenido Cortes, Brennan Roche, Mark Schramp, Biology*
- 7. Survey of Microbial Communities of the Benedictine Bottoms**  
*Kathleen Crank, Janet Paper, Biology*
- 8. CCR5- $\Delta$ 32 Mutation and Immune-System Related Diseases at Benedictine College.**  
*Jacob Cushing, Martha Carletti, Biology*
- 9. Caffeine Use and the Impact on Anxiety, Sleep, and Concentration in College Students**  
*Shannon Groe, Natalie Malone, Jillian O'Malley, Kayla Carlson, Lynne Connelly, Nursing*

- 10. Raspberry Pi Computer Cluster**  
*Andrew Hawkins, Paul Modlin, Myron Fanton, Engineering*
- 11. Development of an Enzymatically Coupled Chromogenic Bile Salt Hydrolase Assay**  
*Rachel Hernandez, Karol Arensberg, Larry Sutton, Chemistry and Biochemistry*
- 12. Preliminary Investigations Into Phosphorescent Chromophores in Organic Photovoltaic Cells**  
*Anastasia Kastl, Joshua Caasi, Michael Salemi, Kolbe Scheetz, Chemistry and Biochemistry*
- 13. The Role of the bauF Gene in the Human Pathogen *Acinetobacter baumannii***  
*Gabriel LeBeau, JohnPaul Stedwill, Daniel Mauro, William Penwell, Biology*
- 14. Screening of Soil and Water Isolates to Test for Antimicrobial Capabilities Against Common Pathogenic Bacteria**  
*Caitlin Leconte, William Penwell, Biology*
- 15. Impact of pH Changes on Anaerobic Microbial Community Development in a Simulated Aquifer Environment**  
*Annemarie Lower, Janet Paper, Matthew Kirk, Biology, Kansas State University Geology Department*
- 16. Comparison of Refugee Camps**  
*Jazmine Luebbert, Karen Wood, Sociology and Criminology*
- 17. Renewable Polymers**  
*Jacob Martin, Matthew Corbett, Patrisha Bugayong, Chemistry and Biochemistry*
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- 18. Capital Allocation Works (CAW) Group**  
*John Hubbard, Brian Henry, School of Business*  
9:45–10:05 \* Room 109
- 19. Study of the Viability of Anaerobic Digestion at Benedictine College Phase 2: The Realities of Research**  
*Katharine Hirl, Maggie Carpenter, Samantha Turner, Kaitlyn Miller, Jonathan Otto, Caelan Doran, Ryan Spellman, Scott Blonigen, Engineering*  
9:45–10:05 \* Room 124
- 20. Intentional Campus Sustainability: Environmental Stewardship in the Benedictine Tradition**  
*Kayla Johnson, Isabella DeBenedetti, Madison Abbott, Grace Sammoury, Jacqueline Marko, Laura Moley, Geography*  
9:45–10:05 \* Room 125

- 21. Ecological Surveys of Mitigation Efforts at Benedictine and Elwood Wildlife Areas**  
*Elizabeth Schuetz, Tyler Henness, Katherine Lang, Jenna Rudolph, Virginia Winder, Terrence Malloy, Biology*  
9:45–10:05 \* Room 208
- 22. The Hand You Are Dealt: A Study on the Achievement Gap**  
*Elizabeth Allard, Christi Adams, Karen Wood, Education, Sociology and Criminology*  
9:45–10:05 \* Room 219
- 23. The Nature of Friendship in the Works of Saint Aelred of Rievaulx**  
*Collin Backus, Andrew Salzmann, Jamie Spiering, Jeremy Sienkiewicz, Theology, Philosophy*  
9:45–10:35 \* Gangel Seminar Room
- 24. “St. Louis Blues”: Bachata, R&B and the Identity of a Foreign Fan**  
*Lorenzo Gregory, Julie Sellers, World and Classical Languages and Cultures*  
10:15–10:35 \* Room 109
- 25. Catholic Voting in the 114th Congress**  
*Caroline Cundiff, Isabella Rossini, Blake VanJacobs, John Settich, Political Science*  
10:15–10:35 \* Room 124
- 26. Black Lives Matter: A Lie?**  
*Celeste Martinez, Madaline Walter, English*  
10:15–10:35 \* Room 125
- 27. Prayer and Work: Roman Mosaic Art the Benedictine Way**  
*Miriam Walski, Bryan Park, Art*  
10:15–10:35 \* Room 208
- 28. Understanding the Manual Transmission**  
*Paul Wessel, Andrew Buss, Paul Heuser, Matthew Johl, Charles Sprouse, Engineering*  
10:15–10:35 \* Room 219
- 29. Three Nerds and an Oven**  
*Hannah Vogt, Clay Johnston, School of Business*  
10:15–11:15 \* Room 323
- 30. Modeling Ion Production in Titan’s Ionosphere**  
*Austin Windsor, Matthew Richard, Physics and Astronomy*  
10:45–11:05 \* Room 109

31. **Why American Youth Avoid the Booth and Office: A Look at Political Pessimism Among 18- to 24-Year-Olds**  
*Kirsten Zerr, Maryclaire Muskett, Grayson Feist, Ryan Orr, Isis Perez, William Raymond*, Political Science  
 10:45–11:05 \* Room 124
32. **A Piece of the American Dream: The Econometrics of Atchison Housing Prices**  
*Maria Mayhak, Miranda Borsh, Brigid Ueland, Sophia Glaser, David Harris*, Economics  
 10:45–11:05 \* Room 125
33. **Project Haiti: A Christian Approach on the War on Poverty**  
*Jude Severson, Jeffrey Fennewald, Michael Fontana, Karen Wood*, Sociology and Criminology  
 10:45–11:05 \* Room 208
34. **Artists at the Turn of the Century: Willa Cather’s Literary Response to Modernism**  
*Hannah Voss, Sarah Young*, English  
 10:45–11:15 \* Room 219
35. **Historical Telenovela**  
*Claire Schroettner, Hannah Vogt, Lorenzo Gregory, Henry Goracke, Nicholas Lahr, Kristina Pikula, Julie Sellers*, World and Classical Languages and Cultures  
 10:45–11:25 \* Gangel Seminar Room



**11:15–12:10 🍷 Poster/Exhibit Session #2**  
**McAllister Board Room (4th floor)**

36. **The Effect of Protandim on Reactive Oxygen Species and DNA Mutation Rate**  
*Eden Anderson, Kira Alexander, Kristen Hysten, Laurencia Ouedraogo, Martha Carletti*, Biology
37. **Raising Awareness: Childhood Malnutrition in Guatemala**  
*Victoria Masucci, Michele Hinds*, Nursing
38. **Vinyl Records: Visual and Tactile Enhancement of Music**  
*Graham Matlock, Galen Gossman, Jay Wallace*, Art
39. **Internal Curing With Lightweight Aggregates**  
*Thaddeus Messer, Patrick Michaels, Morgan Wentz, Adam Burke, Scott Newbolds*, Engineering

- 40. An Interactive Demonstration of How Nanoparticles Behave in a Liquid**  
*Andrew Miller, Gail Blaustein, Chemistry and Biochemistry*
- 41. Physical, Academic, and Social Effects of the Murphy Recreation Center on BC Students**  
*Kylie Mulholland, Matthew Scavuzzo, Kyle Lauterwasser, Bethany Kuhn, Angela Broaddus, Mary Flynn, Mathematics and Computer Science, Health, Wellness, and Exercise Science*
- 42. Isolation of Probiotics From Yogurt and Testing Their Antibiotic Resistance**  
*Eva Pecha, Daniela Garcia-Perez, Blake Gollhofer, Joseph Marak, William Penwell, Biology*
- 43. Test Anxiety at Benedictine College: A Comparison Between General Education Students and Nursing Students**  
*Susan Pistek, Anna Hagenkord, Allison Leitz, Hanah Suarez, Lynne Connelly, Nursing*
- 44. The Effects of Medical Honey on Wounds**  
*Lindsey Proffitt, Sadie Hilliard, Lynne Connelly, Amanda Schuster, Nursing*
- 45. Developing Plastics With Fluorescent Dye for Use as Luminescent Solar Concentrators**  
*Marie Rioux, Nathaniel Strandquist, Kurtis Schmitz, Alissa Muggli, Katharine Caughron, Georgiy Shcherbatyuk, Physics and Astronomy*
- 46. Identifying LIM-domain Proteins That Regulate Epithelial Morphogenesis in *C. elegans***  
*Brennan Roche, Lane Fry, Matthew Jarecki, Bienvenido Cortes, Mark Schramp, Engineering*
- 47. CNC: The Robotic Sculptor**  
*Aidan Shaughnessy, Meyer Freeman, Steve Spencer, Engineering*
- 48. The Effects of the Level of Education on the Anxiety and Fear of Death and Dying**  
*Rachel Snyder, Krista Kosek, Alexandra Faraj-Musleh, Sydney Moser, Lynne Connelly, Nursing*
- 49. Progress Towards an All-natural Disinfectant to Reduce Foodborne Illnesses**  
*Nathaniel Stacy, Fiona Fitzgerald, Larry Sutton, Cody Sherlock, Chemistry and Biochemistry*

**50. Tabletop Nuclear Fusion: Phase 1**

*Evan Sutherland, Benjamin Bogner, Matthew Richard, Physics and Astronomy*

**51. Tardigrades of Iowa**

*Laura Tibbs, Bienvenido Cortes, Terrence Malloy, Biology*

**52. Can Background Music Really Affect Your Concentration and Mood?**

*Justin Vinson, Courtney Farmer, Eva Rickert, Kimberly Russell, Anna Wyatt, Rachel Zook, Eva Chian-Hui Chen, Psychological Sciences*

**53. Connecting Science and Art: A Concrete Canoe**

*Morgan Wentz, Patrick Michaels, Thaddeus Messer, Scott Newbolds, Jay Wallace, Engineering, Art*



**11:30 AM–12:50 PM ❖ Lunch – Dining Hall**

♪ Jazz Band Entertainment ♪



**Keynote Address**

“The Zika Virus Epidemic: An Inside Look at How the CDC Responds to Global Virus Epidemics”

**Robert S. Lanciotti, Ph.D.**

1:00–2:20 PM

O’Malley-McAllister Auditorium

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**Afternoon Sessions**  
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**54. Cell Migration of NIH3T3 Mouse Embryonic Cells**

*Mark Horton, Therese Carson, Michaela Bretey, Mark Schramp, Biology*

2:35–2:55 \* Room 109

**55. Luminescent Solar Concentrators**

*Nathaniel Strandquist, Marie Rioux, Kurtis Schmitz, Alissa Muggli, Katharine Caughran, Georgiy Shcherbatyuk, Physics and Astronomy*

2:35–2:55 \* Room 124

- 56. The Art of Mount St. Scholastica: The St. Scholastica Chapel**  
*Margaret McCabe, Claire Nacanaynay, Kimberley Olson, Kathryn Lenertz, Christa Kagin, Art*  
2:35–2:55 \* Room 125
- 57. “In Muted Tone”: Composition for Voice and Guitar**  
*Charles Iner, Austin Steele, Timothy Tharaldson, Music*  
2:35–2:55 \* St. Benedict’s Church
- 58. The Scandalous Truths of the Gospels: The Criterion of Embarrassment as Applied to the Synoptics**  
*Michael Caughey, Benjamin Blosser, Theology*  
2:35–2:55 \* Room 219
- 59. Senior Thesis Defense: The Principles of Distinction in Material Substances in the Philosophy of St. Thomas and St. Albert**  
*Thomas DePauw, Jean Rioux, Philosophy*  
2:35–3:35 \* Gangel Seminar Room
- 60. The Problem of Inequality: Strictly Monetary or Something More?**  
*Miranda Borsh, Maria Mayhak, David Harris, Economics*  
3:05–3:25 \* Room 109
- 61. Building a Champion**  
*Austin Green, Nathaniel Strandquist, Matthew Richard, Physics and Astronomy*  
3:05–3:25 \* Room 124
- 62. Mathematical Analysis and Visualization of the Benedictine College Course Catalog**  
*Kasandra Short, Heidi Hulsizer, Mathematics and Computer Science*  
3:05–3:25 \* Room 125
- 63. Redesigning the Discovery Medal**  
*Madeline Stella, Miriam Walski, Elizabeth Helfenberger, Mayra Ortiz, Claire Schroettner, Bryan Park, Art*  
3:05–3:25 \* Room 208
- 64. Vortex Chiller: A Thermal Phenomenon**  
*Adam Burke, Andrew Buss, Daniel Hayes, Steve Spencer, Engineering*  
3:05–3:25 \* Room 219
- 65. Surviving Sexual Assault**  
*Elise Huntley, Kristen Hysten, Elaine Connelly, Erin Farrell, Genevieve G’Sell, Jennifer Schmidt, Counseling Center*  
3:35–3:55 \* Room 109

- 66. Fork It Over**  
*Kathleen Wells, Gabriella Ferraro, Richard Coronado*, Economics  
 3:35–3:55 \* Room 124
- 67. Caring for Dying Patients**  
*Ruth Gross, Jamie Spiering, Lynne Connelly*, Philosophy, Nursing  
 3:35–3:55 \* Room 125
- 68. Holier Than Thou: Are Certain Personalities Holier Than Others?**  
*Sarah Starrs, Sarah Vall, Katherine Greenwood, Ann Marie Guernsey, Jeremy Sienkiewicz*, Theology  
 3:35–3:55 \* Room 208
- 69. The Virtual Choir: Using Artificial Voices to Perform an Original Choral Composition, “Anima Christi”**  
*Hunter Eisenmenger, Austin Lager, Benjamin Bogner, Daniel St. Hilaire, William Medina, Matthew Johll, Ryan Maderak, Peter Rumpza, Patricia Lombardo, Alexia McAndrews, Rosemary Herold, Angela Rodriguez, Trini Crocker, Shannon Schrader, Erica Rohde, Lauren Hankes, Hannah Dahlor, Marcela Heffernan, Miriam Walski, Molly Hair, Emily Kennebeck, Claire Vouk, Landon Downing, Austin Steele, Charles Iner, Anthony Crifasi, Callum Hubka, Gabriel Heffernan, Timothy Tharaldson*, Music  
 3:35–3:55 \* St. Benedict’s Church
- 70. The Economics of Abortion: A Micro and Macro View**  
*Kyle Vonnahme, Joseph Lemming, James Young*, Economics  
 4:05–4:25 \* Room 109
- 71. From Fury to Jury: Staging Aeschylus’ Eumenides**  
*Angelica Nguyen, Mairead Norton, Edward Mulholland*, World and Classical Languages and Cultures  
 4:05–4:25 \* Room 124
- 72. Holographic Computer Screen**  
*Ayden Pugh, Amy Robbins, Dennis Dunleavy, Ryan Maderak*, Journalism and Mass Communications, Physics and Astronomy  
 4:05–4:25 \* Room 125
- 73. Engaging the iPad Generation: The Impact of Technology on Students**  
*Callie Baumberger, Piper Wentz*, Education  
 4:05–4:25 \* Room 208
- 74. The Seven Calls**  
*William Medina, Theodore Hanman*, Music  
 4:05–5:35 \* O’Malley-McAllister Auditorium

**75. Forest Wanderer**

*Margaret Boone, Sarah Vall, William Medina, Rebecca Chouinard, Jenna Rudolph, Alexandria Schneider, Michaela Bretey, Trini Crocker, Marcela Heffernan, Stephanie Nelson, David Hall, Christopher Greco, Music*

4:05–5:35 \* O'Malley-McAllister Auditorium

**76. "Talking Cities": An Exploration of Indeterminacy**

*Alexandria Schneider, Christopher Greco, Music*

4:05–5:35 \* O'Malley-McAllister Auditorium

**77. Sentiments of the Soul**

*MeiLi Kok, Stephanie Nelson, flute; Isabella Coccia, piano, Christopher Greco, Music*

4:05–5:35 \* O'Malley-McAllister Auditorium

**78. The U.S. Corporate Tax Rate: Time for a Change**

*Nicholas Callaghan, Susan Traffas, Michael King, Chris Glenski, Political Science, School of Business*

4:35–4:55 \* Room 109

**79. Christian Dietrich Grabbe**

*William Green, Scott Cox, Theatre Arts and Dance*

4:35–4:55 \* Room 124

**80. St. John's Research and Restoration Project**

*James Sowinski, Mary Bugos, Joseph Wurtz, John Haigh, Bryan Park, Gregorian Fellows, Architecture, Art*

4:35–4:55 \* Room 125





## Presentation Abstracts

**8:40–9:35 AM** 🏹 **Poster/Exhibit Session #1**  
**McAllister Board Room (4th floor)**

### **1. Searching for Antibiotics in the Soil: Isolation of *Actinomyces* Species From Northeastern Kansas Soil**

*Kira Alexander, William Penwell, Biology*

In recent years, it has become apparent that the war against bacteria we once thought we had won is beginning again due to a lack of antibiotics to treat bacterial infections. Antibiotic resistance is a serious threat to global health, and major pharmaceutical companies are dropping out of the fight against resistance and are no longer focused on producing new antibiotics. In fact, in the past few years alone, the number of companies designing and developing new antibiotics has steadily dropped. Because the difficulty of discovering new antibiotics is great, new antibiotics are becoming few and far between. This could have disastrous effects as more and more bacterial pathogens develop resistance to antibiotics. Without renewed antibiotic research, the world could easily be on the verge of another pandemic of colossal proportions. From the beginning, antibiotics have originated from the environment, specifically from the soil. One of the antibiotic-producing species found commonly in the soil is *Actinomyces*. A number of antibiotics have been isolated from *Actinomyces* spp., including paromomycin, carbomycin, and kanamycin, which are all used as antimicrobial agents to treat infections. Because *Actinomyces* have shown themselves to be so prolific in yielding antibiotics, the goal of this research was to isolate *Actinomyces* from soil samples around northeastern Kansas. Dilutions of soil samples were created, then streaked across agar plates of differing medias. This was met with varying degrees of success. The most successful agar-plated soil sample dilutions tended to come from a solution made of a combination of nutrient agar and antibiotics, created to limit the growth of unwanted species. Later, to ensure growth of *Actinomyces* species, *Actinomyces* Isolation Agar was used for the initial growth of the unknown bacteria. This ended up being most optimal for growth and was used for the duration of the study. Once growth was obtained, the unknown species were isolated and grown on separate plates. These unknown organisms were placed in contact with five different pathogens: *Acinetobacter baumannii*, *Enterococcus faecalis*, *Escherichia coli*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa*. After incubation, the results in potential antimicrobial activity were observed. Those with positive antimicrobial results underwent a second trial to increase validity. Through the many trials of isolates from multiple Kansan locations, few were found with antimicrobial activity. This is illustrative of the fundamental problems we face with antibiotic resistance. Finding new antibiotics is an arduous process, but on the edge of antibiotic-resistant pandemics, it is a battle we cannot forfeit.

## 2. The Effect of SR9243 on the Proliferative Ability of HeLa Cells in Vitro Through the Use of a MTT Assay

*Brandon Betsch, Jacob Cushing, Martha Carletti, Biology*

The human body meets its energy demand through the hydrolysis of approximately 200 moles of ATP per day. To keep up with this mandate, human cells avoid *de novo* synthesis of ATP and synthesize most of their ATP by recycling ADP molecules. The most efficient mechanism by which this is done comes from glycolysis directly followed by the citric acid cycle and the electron transport chain. However, a hallmark of many cancers is the high frequency of glycolysis followed by fermentation despite being in the presence of oxygen. This common observation of aerobic glycolysis among cancer cells is known as the Warburg Effect. The cancer cells compensate for the sharp decline of ATP derived per glucose molecule by taking in much larger amounts of glucose. Consequently, the cancer cells go through many more cycles of glycolysis. This not only serves to meet the energy demand of cancer cells in potentially hypoxic environments, but the high levels of intermediates found within the cycle serve as precursors to many anabolic pathways in the cell. To pull off this feat, cancer cells that utilize aerobic glycolysis display large increases in the expression of glycolytic enzymes. A drug that can potentially target cancer cells by taking advantage of their increased dependence on glycolysis is SR9243. This drug is an inverse agonist of the liver X receptor (LXR). The LXR receptor is a nuclear receptor normally activated by the binding of various cholesterol molecules. The activated LXR receptor has been shown directly to bind to the promoter region of many glycolytic genes and increase their expression. It has been demonstrated that SR9243 has the ability competitively to bind to the LXR receptor and produce an inactive form of LXR. Treatment with SR9243 has resulted in multiple cancer cell lines returning to an ordinary expression of glycolytic enzymes without showing toxicity to normal cells. The purpose of this project is to demonstrate the effects of SR9243 on the proliferative ability of HeLa cells in vitro through the use of a MTT assay. This research will add to our understanding of the potential therapeutic effect of SR9243 in relation to cervical cancer.

## 3. Electrical Signaling in Plants

*Madison Bowser, Whitney Matous, Hannah Dea, Matthew Richard, Physics and Astronomy*

Communication has been observed on the cellular level. Cells are able to produce signals and send these to nearby cells as well as to cells at a far distance from the signaling cell. One way in which this occurs is through ion channels. The ions involved in this transfer often have charges. Thus the ions lend to a cellular membrane potential when the inside of a cell and outside of a cell have different concentrations of these charged ions. This results in voltages of a cell, and cell voltage changes with ion movement. In this project, we investigate extracellular voltage changes in organisms of the Kingdom Plantae. Recent improvements in methodology for collecting these signals have improved the knowledge of these processes. After looking at current scientific published papers on this topic, we

noticed that the literature only examined the signals between plants of the same species. We wanted to investigate in what ways response signals differ between different plant types. In order to investigate different plant types, we selected plants from different families in the hierarchy of biological taxa, including saxifragales, malighiales, and araceae. After examining current methods in the field, we synthesized our own method to collect data. This then allowed us to investigate whether different plants will provide different electrical responses to flaming. The method we used connected a silver chloride electrode on the plant leaf to a multiple channel recording device. This recorded the voltage signal and sent the recorded data to the computing system. We used National Institute's program Labview in conjunction with the National Institute multiple channel recording device. Voltage recordings were then analyzed to examine variations in the responses of the various plants.

#### **4. The Effect of Increasing Temperature on the Brood Size of *Daphnia Magna***

*Nicholas Brose, Cameron Schoene, Jonah Hintgen, William Penwell, Biology*

This project aimed to analyze differences in the number of young in *Daphnia magna* broods in an increased water temperature. As the planet's temperature rises, there are many unforeseen effects on aquatic organisms. The small crustacean *Daphnia magna* is found in many water sources. This zooplankton forms the base of several food chains, meaning that any impact on the *D. magna* population will have a ripple effect that affects aquatic species that feed upon this crustacean or its predators. Previous studies have shown that increased temperature reduced the fitness of the *D. magna* with limited amounts of food. Another study showed that higher temperatures increase metabolism and reduce the time needed for gestation of clutch development. To determine the effect of higher temperature, three *D. magna* cultures were acclimated for two weeks at 16°C. After acclimation, pregnant *D. magna* had their eggs counted under a dissection scope and then were placed in 200 mL beakers of spring water in groups of four per beaker. These beakers were placed in a water bath set to 21°C. Each beaker was fed with 0.02 grams of premade *Daphnia* food pellets. After the young had hatched, they were left at 21°C until they reached maturity that was determined by the onset of reproduction. At this point the number of eggs in each offspring was recorded. Based on these two temperatures, there appears to be a slight increase in the brood size at 21°C when compared to 16°C. The average number of young increased from 3.7 at 16°C to 4.1 at 21°C. If this trend holds true, increased water temperatures would lead to both decreased gestation times as shown in previous studies and increased brood sizes. These combined factors would make *D. magna* more prolific at higher temperatures, increasing the available food supply for its predators.

#### **5. Common Core State Standards: Now What?**

*Velia Colunga, Jennifer Ahlers, Christi Adams, Education*

Common Core State Standards (CCSS) have been in effect since 2009 providing educational standards in the areas of Math and English Language Arts for

Kindergarten–12th grade students. Currently, forty-two states have adopted CCSS. This initiative has evoked strong educational and political critiques since its inception. Beginning with a description of how the federal and state governments interact within the field of education, our research sought to answer the questions, “What are the educational and political implications of Common Core?” and “What is the anticipated trajectory of this initiative?” Distinguishing between standards and curriculum, this project seeks to identify and correct some common misconceptions about Common Core in light of public perception, including some state initiatives to abolish these common standards. Drawing on interviews of current teachers, this project examines how educational standards affect teaching, learning, and assessment in the classroom. Finally, research into the current political context and public perceptions of this initiative shed light on the anticipated next steps concerning Common Core in a time of a new presidential administration.

## **6. Analysis of the Role of TES-1 in *C. elegans* Epithelial Cell Morphogenesis via Fluorescent Microscopy**

*Bienvenido Cortes, Brennan Roche, Mark Schramp, Biology*

During cellular differentiation, a myriad of signals and proteins cause cells to form specific structures that enable them to perform their necessary functions. Vital processes that occur in the morphogenesis of epithelial cells, which include cell migration, adhesion, and invasion, necessitate the formation and dissolution of F-actin as well as cell-matrix and cell-cell adhesions. Using the model organism *Caenorhabditis elegans*, this project aims to elucidate the regulation mechanisms and functions of components of epithelial morphogenesis. Previous research has focused on the *tes-1* gene and its role in cellular differentiation. It was determined that TES-1 contains a PET domain at its C-terminus and three tandem repeat LIM domains that interact with other LIM-domain proteins. Many of these LIM-domain proteins are known to regulate the actin cytoskeleton, indicating that TES-1 is involved in actin regulation as well. Our research also demonstrates that, during morphogenesis, both vulval precursor cells found in L3 stage worms and vulval cells in the L4 and adult stages express the *tes-1* gene. Furthermore, TES-1 localizes to sites of epithelial cell-cell and cell-matrix adhesion. In cell-cell adhesion, cells will bind tightly to each other at focal adhesions via cadherin proteins, and the protein AJM-1 helps mediate this process by localizing the cadherins to specific points in the cell membranes. To further elucidate the function of TES-1, we are comparing its position at the site cell-cell adhesions to that of AJM-1. We hypothesized that if TES-1 is found in the the same location as AJM-1, then TES-1 may also mediate cadherin proteins in a similar fashion. By linking green fluorescent protein to TES-1 during protein production and using antibody staining specific for TES-1, we are continuing to observe the location of TES-1 in L3 and L4 stage *C. elegans* cells using fluorescent microscopy. This technique allows us to continue our study of the localization of TES-1 and its potential similarity to AJM-1.

## 7. Survey of Microbial Communities of the Benedictine Bottoms

*Kathleen Crank, Janet Paper, Biology*

Our world is comprised of many organisms, many of which are invisible to the naked eye. These bacteria, algae, fungi, and protists have a large effect on everything around them—from bacteria fermenting dietary fiber in the human gut to fungi providing nitrogen to trees via mycorrhizal relationships around the roots. These microorganisms affect larger organisms and the environment they are living in, but environmental changes will also impact the composition of the microbial community. Flooding is a large-scale environmental change that disrupts the soil environment and its microbiome. The effects of flooding disturbs the microbial community through changes in soil chemistry, introduction of different microbial species, and changes in the oxygen levels of the environment. Due to its location along the Missouri River, occasional flooding affects the microbiome of the Benedictine Bottoms. The largest recent flood was in 2011, possibly leading to a more diverse microbial community in the areas surrounding the Missouri River today.

To investigate the impact of flooding on soil microbes in the Benedictine Bottoms, one water sample and three soil samples were obtained in order to collect an initial survey of the microbiome. Samples were collected at different distances from the Missouri River. The water sample was collected from the river and soil samples were collected at the bank of the river, 120 meters away from the river, and 240 meters from the river. The DNA of microbes was isolated from each sample using a PowerSoil DNA isolation kit before being sent for Illumina sequencing. The primers used in sequencing were for 16S ribosomal DNA. 16S ribosomal DNA can be used to identify most of the microbes in the samples because these genes contain variable regions specific to individual prokaryotes. After the sequences of the microbes are obtained, they will be analyzed using Qiime genetic bioinformatics software to organize the taxonomy of the soil microbes.

While previous projects have created a survey of microorganisms in the Benedictine Bottoms, none have been done via DNA sequencing. With the progression of science and technology, we hope to use this initial data to further investigate the effects of flooding in the Benedictine Bottoms.

## 8. CCR5-Δ32 Mutation and Immune-System Related Diseases at Benedictine College

*Jacob Cushing, Martha Carletti, Biology*

The purpose of this study is to observe the relationship between the CCR5-Δ32 mutation and immune-system related diseases. CCR5, or chemokine receptor type 5, is a receptor for chemokines among lymphocytes in the immune system. The binding of chemokines to CCR5 and other related receptors mediate several functions, such as leukocyte trafficking and immune response. Research has shown that the CCR5 receptor is used by viruses, such as HIV, to enter and infect cells. However, a particular mutation known as CCR5-Δ32 has been shown to inhibit the infection of HIV. Those that are homozygous for the recessive allele have shown significant resistance to HIV and minor resistance to Hepatitis C. To study the relationship between the CCR5-Δ32 mutation and immune-system

related diseases, we used PCR and gel electrophoresis on buccal cells to identify the CCR5 gene mutation. A survey was used to determine if participants with the CCR5-Δ32 mutation are correlated with any immune diseases. A positive trend between being heterozygous for the CCR5-Δ32 mutation and the increased presence of immune-system related diseases was found.

## **9. Caffeine Use and the Impact on Anxiety, Sleep, and Concentration in College Students**

*Shannon Groe, Natalie Malone, Jillian O'Malley, Kayla Carlson, Lynne Connelly, Nursing*

Caffeine consumption among college students is a popular practice in order to increase energy, productivity, and to counter irregular sleep schedules. Because the drug is self-administered, it is possible that the student may overconsume, creating an adverse reaction, including increased anxiety, tachycardia, and fine motor tremors. The adverse reactions of caffeine consumption, as well as the occurrences of overconsumption, are not well studied among college students. The purpose of this study is to evaluate the way that caffeine consumption influences the mental, social, and physical health of college students as manifested by anxiety levels and sleeping patterns. In this descriptive research study, data was collected by survey using Survey Monkey® that was communicated by the college FYI e-mail. Participation was voluntary. The sample for the study is approximately 207 Benedictine College students. Respondents were evenly distributed across the four years of college. The majority were females (79%), and 62% consumed three or more caffeine drinks. For respondents, 85% reported feeling anxious or jittery after drinking caffeine beverages. Descriptive correlational statistics will be used to analyze the data to explore the reactions that students experience from caffeine, how caffeine affects test taking, anxiety, sleeping patterns, and other aspects of students' life. It is hoped that this presentation will increase awareness of the problems with excessive caffeine consumption.

## **10. Raspberry Pi Computer Cluster**

*Andrew Hawkins, Paul Modlin, Myron Fanton, Engineering*

A computer cluster is a group of computers setup to work together as one powerful computer to solve a common task. A task is sent to the main computer that breaks it down and distributes the work to the other computers via a local area network (LAN). Computer clustering offers more performance than a standard computer, allowing the machine to solve complex simulations at a faster rate by distributing the operations. While high-performance clusters are very expensive, a low-cost machine created from \$5 Raspberry Pi Zeros, as we have built, allows for students to practice coding for cluster computing without having to rent time on bigger, corporate machines. Our machine consists of a power supply, a 25-port network switch, and 24 Raspberry Pi Zeros. Some of the difficulties that were overcome during the build included purchasing 24 Raspberry Pis as well as powering them and creating a network between them. While the machine is not yet fully programmable, all the hardware has been assembled and interface with the computers has been established.

## 11. Development of an Enzymatically Coupled Chromogenic Bile Salt Hydrolase Assay

*Rachel Hernandez, Karol Arensberg, Larry Sutton, Chemistry and Biochemistry*

Antibiotics are the foundation upon which modern medicine was built. Unfortunately, 80% of all antibiotics used in the United States is for the purpose of enhancing rate of growth and feed conversion efficiencies in livestock. This results in tremendous selective pressure for bacteria to evolve antibiotic resistance, making industrial farms ideal breeding grounds for multi-drug-resistant pathogenic bacteria.

Bile salt hydrolase (BSH) is a promising nonlethal bacterial target to replace antibiotic usage for growth promotion and feed conversion. BSH deconjugates bile acids, resulting in disruption of the chyme emulsion necessary for efficient host digestion, giving bacteria an advantage in competition for the host's feed.

We have devised the following reaction scheme to monitor conveniently BSH activity wherein GO and HRP are glycine oxidase and horseradish peroxidase, respectively.

Glycocholate ---BSH---> Glycine ---GO---> Hydrogen peroxide ---HRP---> Colored product

In this reaction scheme GO and HRP concentrations must be in large excess such that the BSH step is rate-limiting. The first, BSH, step reaction was confirmed using turbidometry, which takes advantage of the poor emulsifying properties of cholate produced, which then precipitates out of solution scattering light. The HRP reaction was confirmed using hydrogen peroxide and o-dianisidine substrates and following the formation of color spectrophotometrically at 460 nm. All reactions were performed in pH 8.0, 50 mM phosphate buffer.

Because there are no inexpensive commercial sources of GO, we inserted the wild-type sequence into pET-28B(+) plasmid vector with a poly-histidine tag and the resulting recombinant DNA was transformed into *E. coli* BL21 cells via electroporation. Protein synthesis was induced using IPTG and isolated using Ni-NTA-agarose affinity chromatography to produce a single band on SDS-PAGE. However, the GO activity was not sufficient to produce exceed rate-limitation. The GO H244K mutant is reported to have enhance activity versus the wild type. GO H244K was likewise cloned and expressed. We are currently in the process of isolating and testing this mutant in our assay. This new enzyme-coupled, chromogenic BSH assay system appears feasible once the GO expression is optimized.

## 12. Preliminary Investigations Into Phosphorescent Chromophores in Organic Photovoltaic Cells

*Anastasia Kastl, Joshua Caasi, Michael Salemi, Kolbe Scheetz, Chemistry and Biochemistry*

The use of renewable energy sources, such as wind, biofuels, and solar, have been used over the past few generations to combat the increase in energy consumption.

Growing concern of climate change and the emission of greenhouse gasses warrants efforts to increase the implementation of renewable energy sources. The harvesting of solar energy is expected to be a large contributor to the energy supply in the future. There are two major types of solar cells: inorganic cells and organic cells. Inorganic cells currently enjoy a monopoly in the market as their power conversion efficiency is much greater than their organic counterparts. Although organic cells are expected to be cheaper and easier to manufacture than inorganic cells, until the power conversion efficiency of organic cells improves, they will not be able to compete with inorganic cells. One way to improve the efficiency of the organic cells is to increase exciton mobility within the cell. Our research goal was to observe how to extend the lifetime of excitons as a means of increasing the charge mobility. Several cells have been fabricated and tested.

### **13. The Role of the *bauF* Gene in the Human Pathogen *Acinetobacter baumannii***

*Gabriel LeBeau, JohnPaul Stedwill, Daniel Mauro, William Penwell, Biology*

*Acinetobacter baumannii* is a gram-negative opportunist pathogen that causes severe infections in immuno-compromised patients. This pathogen has the ability to grow in a wide range of conditions, which include iron-limiting conditions imposed on the bacteria by the environment specifically the human host. To acquire this essential micronutrient, *A. baumannii* utilizes a siderophore-mediated iron acquisition system, known as acinetobactin, which has a high affinity for iron. The genome of the type strain ATCC 19606<sup>T</sup> harbors a cluster of genes coding for biosynthesis and export of acinetobactin and uptake of iron-acinetobactin complexes. This cluster also includes the gene, *bauF*, which was predicted to encode a putative esterase that could potentially be involved in the release of iron from this iron-siderophore complex. To test the hypothesis that the BauF protein is needed for the release of iron from acinetobactin, the coding region of *bauF* was disrupted by allelic exchange in the type strain ATCC 19606<sup>T</sup>. This was possible by the isolation and insertion of the kanamycin gene from the plasmid pKD4 into the *A. baumannii* ATCC 19606<sup>T</sup> and thus generated the isogenic derivative, which has a *bauF* mutation. The generation of this mutant was done with a specific recombination-mediated genome editing system, known as RecET. This isogenic derivative was confirmed via PCR. The *bauF* isogenic derivative showed reduced growth when compared to the parental strain under iron-chelated conditions in LB medium when containing increasing concentrations of the synthetic iron chelator 2, 2'-dipyridyl (DIP). In conclusion, these results support the role of *bauF* in the acquisition of iron by *A. baumannii*.

### **14. Screening of Soil and Water Isolates to Test for Antimicrobial Capabilities Against Common Pathogenic Bacteria**

*Caitlin Lecote, William Penwell, Biology*

The discovery of new antibiotics has traditionally been accomplished by chemical synthesis or isolation from natural sources, such as water or soil, but in the past few decades, research into new antibiotics has decreased significantly. Unfortunately,

this coincides with an alarming pattern of increasing antibiotic resistance by many bacterial pathogens, which makes the need for new antibiotics incredibly important. To help combat this, this project focused on screening bacteria from environmental samples to find new antimicrobials.

To do this, we collected four soil or water samples from the different environments from which to isolate bacteria. One-gram amounts of the samples were serially diluted in saline solution, plated onto nutrient agar (NA) or tryptic soy agar (TSA), and incubated for 24–72 hours in a 37° incubator. Colonies that grew on these plates were re-streaked onto mother plates using a grid-line pattern, and the mother plates were then incubated for 24–72 hours in a 37° incubator. Each bacterial colony was then streaked down the center of a brain-heart infusion (BHI) agar plate and grown for 72 hours in a 28° incubator. These plates were given this extended period of time to allow for colony maturation so they could begin producing antimicrobial compounds.

Once the colonies matured, five different human pathogens were streaked perpendicularly to the center streak of bacteria. The pathogens chosen were *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Acinetobacter baumannii*, and *Escherichia coli*. The plates were incubated for 24–48 hours in a 28° incubator. Any bacteria that inhibited the growth of pathogens during the preliminary testing were marked. These bacteria were re-tested to support the preliminary results, and any that inhibited again were marked as positive for inhibition.

During the preliminary screening process, we identified 28 bacterial strains that inhibited the growth of one or more of the aforementioned human pathogens. One of the bacterial strains tested was found to inhibit the growth of all five pathogens. Secondary test results indicated that four of the bacteria were successful in the inhibition of pathogens. The methodology of the experiment will be used in future testing to continue isolation of antimicrobials. In addition, the antimicrobial-producing bacteria identified in the research will be studied further in future experiments to determine if the antimicrobial compound is a novel or pre-existing antimicrobial compound used in antibiotic production. The screening of bacteria to find new antimicrobial properties is important to the production of new antibiotics, which needs to be increased significantly in the upcoming years to avoid a regression to a form of medicine where antibiotics can no longer be used to fight infections. This research aided in the search for new human antibiotics by screening environmental bacteria for antimicrobial properties against human pathogens.

## **15. Impact of pH Changes on Anaerobic Microbial Community Development in a Simulated Aquifer Environment**

*Annemarie Lower, Janet Paper, Matthew Kirk, Biology, Kansas State University Geology Department*

Aquifers contain a large portion of the Earth's liquid freshwater; thus, they are an important human resource. Microbes catalyze many of the chemical reactions

that take place in aquifers; therefore, microbial communities found in aquifers ultimately affect water quality. Environmental changes can affect these microbial communities, in turn changing water quality. For example, as carbon dioxide increases in the atmosphere, pH of the water on the Earth's surface will decrease.

We are investigating the impact of pH change on water chemistry and microbial community composition. At lower pH, reactions such as iron reduction are more energetically favorable than sulfate reduction or methanogenesis. As pH increases, those reactions become more thermodynamically equal. Therefore, a shift in pH may change the microbial communities responsible for these reactions.

To simulate pH changes in aquifers, anaerobic bioreactors were constructed at Kansas State University using marsh sediment as a natural inoculum and simulated aquifer water containing 2.5 mM sulfate and 0.25 mM acetate at pH 6.0 and pH 7.5. These reactors were semi-continuously sampled and fed fresh medium for 91 days. Water chemistry analysis was done at each sampling period. At the end of the experiment, microbes were collected from each reactor. We extracted DNA from each microbial sample using a Powersoil™ DNA isolation kit and sent it for 16S ribosomal amplification and sequencing. Finally, we analyzed the sequence data obtained using the bioinformatics software, QIIME to identify the microorganisms in each sample.

Although our analysis of the data is ongoing, we have identified as many as 665 different organisms in our reactors. Initial comparisons between the pH 6.0 and 7.5 bioreactors suggest community differences corresponding to changes in water chemistry observed. The communities at each pH also changed significantly from the initial sediment inoculum. A more detailed community analysis will be presented at each pH level. This data will contribute to the larger study conducted at Kansas State and will help us to better understand natural aquifer water quality.

## **16. Comparison of Refugee Camps**

*Jazmine Luebbert, Karen Wood, Sociology and Criminology*

The main purpose of this project was to investigate the conditions of refugee camps and of the lives of those who live there. A comparison was made between the worst refugee camps and the best refugee camps in terms of amenities available, external funding, internal conditions, elements of exploitation, and reasons for the residents becoming refugees.

The first comparison detailed in this project was the varying amenities within refugee camps, such as whether or not the camps had schools, religious buildings (such as mosques), or healthcare facilities.

Another factor taken into account was whether camps were funded by the government, funded by non-government organizations (NGOs), or not funded at all.

The most important micro aspect of the refugee camps that was compared and contrasted was the living conditions, such as what type of housing is provided or not provided, the quality of water and food, and the job outlooks.

The last thing considered for this comparison were the differing (macro) problems within the camps, such as the degrees of exploitation of refugees, the spread of diseases, and other previously mentioned factors, such as water contamination and lack of opportunities for work.

Other important factors mentioned outside of the comparisons included the question of where refugees are coming from and where they are going, the duration of a refugee's stay in a camp, the reasons why refugees are fleeing, common food within refugee camps, and what refugees do during the day or how they try to make a living.

The hypothesis of this project was that, although some refugee camps are better than others, they all have less than ideal living conditions. Even in the best refugee camps, such as the ones in Turkey, the refugee residents confess that although the camps are nice, they are not home. Refugees do not willingly leave their home countries. They are forced out due to awful circumstances, such as religious persecution, civil war, famine, or economic hardship. In order to protect themselves and their families, they have no choice but to flee in search of a better life. This means leaving behind their home and everything they know. Instead of being welcomed and greeted with assistance, they face complicated and cold political policies and inhumane conditions. The results of this study highlight these injustices forced upon refugees in various camp settings.

## 17. Renewable Polymers

*Jacob Martin, Matthew Corbett, Patrisha Bugayong, Chemistry and Biochemistry*

Our dependence on polymers made from petroleum-based resources and their lengthened residence time has become a big issue. The degradation of these generates smaller polymers, which are no longer being evident, can accumulate in various ecosystems in great quantities. Biodegradable polymers are plastics with similar or better properties but with shorter degradation times that could be used to mitigate the existing problem. These polymers are great biomaterials due to the many ester groups present, which make them hydrolytically degradable. In our study, we synthesized and explored renewable polymers made from monomers found in agro-industrial waste and by-products. The synthetic method utilized glycerol, citric acid, and trans-aconitic acid, mixed at different ratios heated to a fixed temperature with continuous stirring, then cured in an oven to reach a higher degree of polymerization (post-polymerization). The method was shown to be economical and practical. After synthesis, a degradation study was performed as well as spectroscopy measurements. The Young's Modulus was also tested to determine tensile strength and compared with the tensile strength of other industrial polymers, such as polystyrene.



## **18. Capital Allocation Works (CAW) Group**

*John Hubbard, Brian Henry, School of Business*

**9:45–10:05 \* Room 109**

Since August, the Capital Allocation Works (CAW) group has been managing a \$100,000 portion of the Benedictine College endowment. This group of twelve students, led by professor Brian Henry, has established a portfolio of value stocks through a tailored process of analysis, discussion, and like all investments, a tiny bit of luck. This presentation aims to educate attendees about how the CAW fund operates. It will cover the overall investment strategy the group aims for, as well as showing the research and analysis methods used, and will conclude with a summary of the fund's performance to date compared to the S&P 500.

## **19. Study of the Viability of Anaerobic Digestion at Benedictine College**

### **Phase 2: The Realities of Research**

*Katharine Hirl, Maggie Carpenter, Samantha Turner, Kaitlyn Miller, Jonathan Otto, Caelan Doran, Ryan Spellman, Scott Blonigen, Engineering*

**9:45–10:05 \* Room 124**

The overall objective of this project was to determine if food waste produced by the Benedictine College Dining Services could be a viable source of renewable energy via anaerobic digestion. In anaerobic digestion organic material is broken down by bacteria, which in turn produce carbon dioxide and methane, referred to as biogas. The first phase of this project focused on preparing the necessary procedures and equipment to perform the study. The original goals of the second phase were to determine the methane yield for food waste collected from the Dining Hall, measure the purity of the biogas in terms of methane concentration, and develop kinetic models for the process. The project experienced many difficulties throughout this phase. Due to these challenges, the project shifted focus from gathering and interpreting data to learning about the procedure of research. Through this experience, we learned about the emergent nature of research plans, system troubleshooting, and the final step of the engineering design process, testing, and redesign.

## **20. Intentional Campus Sustainability: Environmental Stewardship in the Benedictine Tradition**

*Kayla Johnson, Isabella DeBenedetti, Madison Abbott, Grace Sammoury, Jacqueline Marko, Laura Moley, Geography*

**9:45–10:05 \* Room 125**

Benedictine College is the proud alma mater of 2009 Nobel Peace Prize recipient Wangari Maathai, who founded the Green Belt Movement to preserve the world's forests. The goal of this project is to take a deeper look at how Maathai's environmental legacy continues at Benedictine College and other institutions. Did her example of environmental stewardship leave an imprint on sustainability practices? How environmentally sustainable is Benedictine College? To better understand Maathai's impact at Benedictine College, along with the influence of Benedictine philosophy, and to better assess the school's environmental

sustainability, and compare its efforts with those of other institutions, this project has been divided into four parts. The first part of our project is a survey of the student body to better understand students' individual practices in terms of environmental sustainability and personal motivations. This survey will explore student awareness and perceptions of the environmental practices and stewardship efforts of Benedictine College. The second part of this project surveys other campuses around the nation in order to see how the stewardship and sustainability practices at Benedictine compare with other colleges, universities, and religious communities. The third part seeks to better understand what environmentally sustainable practices the colleges have in place, how they developed, and how they tie in with ideas of stewardship, through interviews with responsible campus officials. Finally, the project looks at understanding the theology behind environmental sustainability and stewardship and to what extent they motivate our environmental actions as an institution.

## **21. Ecological Surveys of Mitigation Efforts at Benedictine and Elwood Wildlife Areas**

*Elizabeth Schuetz, Tyler Henness, Katherine Lang, Jenna Rudolph, Virginia Winder, Terrence Malloy, Biology*

**9:45–10:05 \* Room 208**

Restoration and mitigation of floodplains are important to riparian ecosystems. Because channelization and modifications degrade natural floodplain habitats along major river systems, ecological studies are used to assess the effectiveness and progress of mitigation projects in these systems. We conducted a field study (May–July 2016) to compare vegetative cover and invertebrate abundance and diversity at Elwood and Benedictine Bottoms Wildlife Areas in northeast Kansas. One goal of our study was to determine if Elwood Bottoms contains habitat that could support a Ring-necked Pheasant (*Phasianus colchicus*) population. We collected data on vegetative cover and invertebrates at 26 random points at both study sites during two timeframes – early and late growing season. We found detritus was more prevalent at Benedictine Bottoms while the living classes of ground cover was similar at both sites. Invertebrate biodiversity was similar between study sites. Several of the most abundant invertebrate groups at both sites are important dietary items for pheasants during the breeding season. We found that Elwood Bottoms contains comparable nesting and foraging habitat to Benedictine Bottoms. We hypothesize that the lack of connectivity to other pheasant populations is the main impediment to the natural colonization and establishment of pheasant populations at Elwood Bottoms.

## **22. The Hand You Are Dealt: A Study on the Achievement Gap**

*Elizabeth Allard, Christi Adams, Karen Wood, Education, Sociology and Criminology*

**9:45–10:05 \* Room 219**

Educators have searched for ways to bring racial equity to American schools since the times of court-mandated desegregation in the 1950s. Considering events of

the last few decades, claims of operating in a post-racial society are looking less and less viable. In the field of education, racial inequality is thrown into sharp relief when looking at school quality and *de facto* segregation even today, six decades after schools were ordered to desegregate. These issues come to a head in the differences in academic success between white students and students of color, a concept known as the achievement gap. This project explores this idea, its causes, and its effects on students both in the short and long term. This report will synthesize information from the United States Department of Education, the National Center for Achievement Statistics, Urban Studies research, and other sources, with particular focus on Detroit public schools, to explore the complex issue of racial disparity in education and potential solutions in American schools.

### **23. The Nature of Friendship in the Works of Saint Aelred of Rievaulx**

*Collin Backus, Andrew Salzmann, Jamie Spiering, Jeremy Sienkiewicz,*  
Theology, Philosophy

**9:45–10:35 \* Gangel Seminar Room**

In an authentic consideration of friendship, Aelred's principle is the 'goodness,' or virtue, of persons involved. Love of self coming before spiritual friendship is even a possibility. However, Christian humility is framed in an essential rejection of self-centeredness and focus of one's love on others. There seems to be a rift in Aelred's work because he makes use of self-love in a positive connotation, and yet humility is the implicit groundwork for friendship.

The difficulty of this problem is increased by Aelred's apparent contradiction of his own conclusions in the earlier work *Mirror of Charity*. In that treatise Aelred claims that "love of self precedes love of neighbor (albeit in sequence, not in excellence)." However, in *Spiritual Friendship* his claim is that baseness is the result of one who "regard[s] his friend only in the same way he regards himself, since each ought to have a low opinion of himself and a high opinion of his friend." *Spiritual Friendship* is supposed to be a culmination of the life's work of Aelred. Did the saint simply forgo his earlier notion of necessary self-love? The only way to explain these difficulties is to view self-love in the light of Christian humility.

I propose that Aelred faces no contradiction of conclusions. The point he makes about self-love advances the strength of his notion of spiritual friendship, while containing the necessary teaching on Christian humility. The experience of spiritual friendship presupposes a necessary love of self. First, it is necessary to understand exactly what Aelred means by love of self and its place among the three types of love. Then, once one has pure intentions, which is the fruit of authentic self-love, true friendship is attainable with "friend cleaving to friend in the spirit of Christ."

My thesis is that ultimately, for an authentically Christian friendship, one must have both humility and self-love: humility to recognize one's need for others, and ultimately Another, and love of self, which is the pursuit of the human end.

## **24. “St. Louis Blues”: Bachata, R&B and the Identity of a Foreign Fan**

*Lorenzo Gregory, Julie Sellers, World and Classical Languages and Cultures*

**10:15–10:35 \* Room 109**

It is believed that truly to understand bachata, people must be born with this feeling of bachata inside of them. Numerous bachateros or bachata artists have expressed such a feeling, and defining bachata as “ a feeling of love and heartbreak. If you do not sing with your soul, it is not bachata” (Jr., “Depresión”). Does this feeling still exist today? Is it possible for a man from another culture, such as the author, to find this feeling within him?

R&B and bachata are comprised of numerous similar elements, such as poverty, discriminations, as well as love and heartbreak. R&B born in the 1940s when African-Americans were not allowed the same rights as their right counterparts. It was from this mistreatment and pain that R&B was born and expressed the reality of marginalization, much like bachata. The development of R&B and bachata demonstrates how these two genres of music, although from different countries, has developed and influenced bachata. Bachateros, such as Romeo Santos, Prince Royce, Henry Santos, and Jr., have all used elements from both genres to help form their own style in the bachata world and express themselves. Utilizing interviews with varying bachateros, bachata dancers, and resources detailing R&B and bachata, the author will explore how these two genres became so intertwined, the true feeling of bachata, as well as how a young African-American from north America who was raised in St. Louis has incorporated both genres to form his own identity.

## **25. Catholic Voting in the 114th Congress**

*Caroline Cundiff, Isabella Rossini, Blake VanJacobs, John Settich, Political Science*

**10:15–10:35 \* Room 124**

Nearly one-third (31%) of all members of the 114th U.S. Congress (2015–2016) were Roman Catholics, the largest single denomination in the House and in the Senate. Our research examines how and whether their religiosity, awareness of Catholic teachings, affected their votes on key issues in the Congress. We selected six key bills to evaluate. We connect current Church teachings to the core of each legislative issue. During this period, His Holiness Pope Francis has been very clear, in his writings and other messages, encouraging Catholics to be involved in public policy and to serve as good stewards of Christ’s teachings. We judge whether and how well Catholic members of the Congress responded to their faith.

## **26. Black Lives Matter: A Lie?**

*Celeste Martinez, Madaline Walter, English*

**10:15–10:35 \* Room 125**

People are biased. What is often forgotten, however, is the influence that people have on each other. They do not often realize that the opinions of others also shape their own beliefs. It is not necessarily a negative thing as it happens to

everyone over the span of a lifetime. As children, teens, and adults, the opinions of others affect what is liked, disliked, and even what is deeply believed. Everyone shapes each other in many small ways. However, what about the big influences? What kind of impact do big influences, like the media, have on the formation and understanding of “news”? Can opinions be considered “right”? Can they be considered “wrong”? Does the opinion of others extensively shape the way people choose to perceive something? This research project will aim to answer as many of these questions in as insightful a manner as possible. Using gathered survey data, I will observe if the media, and perhaps other sources, have had any significant impact on the opinions that people hold on certain things, such as controversial topics like the Black Lives Matter movement.

## **27. Prayer and Work: Roman Mosaic Art the Benedictine Way**

*Miriam Walski, Bryan Park, Art*

**10:15–10:35 \* Room 208**

This Discovery project explores the history and methodology of Roman floor and wall mosaics through guided research and the creation of two original pieces of mosaic artwork. Along the lines of “ora et labora,” prayer and work, the mosaic is an art form particularly suited to a Benedictine approach; the meticulous planning and placement of stones or glass tesserae requires deep attention to detail and commitment to tedious work. Research follows the development of mosaic artwork in the Roman world, considering the influence of Greek and Byzantine mosaic traditions. The project culminates in the creation of a marble stone floor mosaic and a smaller but more complex framed wall mosaic of smalti, the traditional glass squares used in Italian wall mosaics.

The original compositions follow the style of 5th century AD Roman mosaics, contemporaneous with the lifetime of St. Benedict. To honor the legacy of the Benedictines of Atchison, who have pointed the way to Christ in this place for over 150 years, the subject of both mosaics is John the Baptist. According to tradition and the writings of St. Gregory, a deep devotion to St. John inspired St. Benedict to dedicate an altar to him, who also was chosen as the patron of the first parish founded by Fr. Henry Lemke in Doniphan.

Through traditional symbolism and text of the Canticle of Zechariah from the Vulgate, the marble floor mosaic depicts the central mission of St. John the Baptist, to point to the Lamb of God, to direct us toward Christ, “to guide our feet into the way of peace” (Luke 1:79). Installed in the St. John the Baptist Oratory in Doniphan County, the mosaic adorns the threshold leading into the nave of the church. It serves as a stepping-stone for the faithful on pilgrimage to this historic house of God and a reminder of the powerful witness of St. John and of St. Benedict, who followed in his footsteps, leaving the world to live in the wilderness until the appointed time. The wall mosaic will be a figural image of St. John the Baptist, executed in smalti glass tesserae.

## 28. Understanding the Manual Transmission

*Paul Wessel, Andrew Buss, Paul Heuser, Matthew Johll, Charles Sprouse,*  
Engineering

10:15–10:35 \* Room 219

We rely on automobiles to get us from point A to point B almost every day, but many of us never take a step back and ask, “How?” Transmissions are vital to the proper function of automobiles as they allow the proper ratio of torque and velocity to be transmitted from the engine to the drive shaft of the vehicle. Without this function, engines would not be capable of efficiently operating at both high and low velocities. Manual transmissions were an engineering feat of the late 19th century and were dominant in the auto industry for many years due to their simplicity and reliability. For this project, a team of mechanical engineering students considered the “how” of a manual transmission and will explain the mechanism to the audience. They will use knowledge gained in the classroom as well as from the complete disassembly and computer modeling of a manual transmission from an old pickup truck.

## 29. Three Nerds and an Oven

*Hannah Vogt, Clay Johnston,* School of Business

10:15–11:15 \* Room 323

As implied by the name, the initial idea was a cafe with a twist. The products would be unique baked goods, created with themes from popular literary works, movies, and television shows. Three Nerds and an Oven has been an opportunity to develop a feasibility plan for a professional cafe for postgraduate students. The Three Nerds have studied different aspects and applications needed to construct and begin an independent business with an emphasis on a food based industry all while embracing the populous’s love of food and all things nerdy.

## 30. Modeling Ion Production in Titan’s Ionosphere

*Austin Windsor, Matthew Richard,* Physics and Astronomy

10:45–11:05 \* Room 109

The *Cassini* spacecraft was launched in 1997 and is currently orbiting Saturn. It has been collecting data on the planet and its moons ever since it reached orbit in 2004. Of particular interest is Saturn’s moon Titan, whose  $N_2$  and  $CH_4$  dominated atmosphere is thought to resemble that of an early Earth. If the understanding of the interactions occurring in the atmosphere is improved, a more superior view of an early Earth atmosphere can be resolved. As *Cassini* passes Titan, it gathers information about the composition of Titan’s upper atmosphere and ionosphere using 12 different instruments. Currently, the primary objective is to model the ionization rates due to protons entering Titan’s atmosphere at different energies. To obtain this objective, I built a Monte Carlo computer code starting in 2015 and have been continuously refining it to produce a more accurate model. This computer code uses a 4th order Runge-Kutta method to simulate the motion of hundreds of thousands of protons entering the atmosphere of Titan and to predict, based on proton energies and collision cross sections, whether or not the protons

collide with a neutral nitrogen molecule in the atmosphere to produce an ion. Once a collision is detected, it is then predicted which of seven different chemical processes occur to produce a nitrogen ion. The results being produced are plots showing the relationship between the ion production and altitude. This reveals a clear peak ionization altitude in Titan's ionosphere indicating where the highest amounts of ionization occur. Along with this, color mapping of Titan's surface is conducted to show where, relative to Titan's surface, the most ionization is occurring. It is foreseen that this computer code will eventually be applied to exoplanets to study the ion productions in their atmospheres as well.

### **31. Why American Youth Avoid the Booth and Office: A Look at Political Pessimism Among 18- to 24-Year-Olds**

*Kirsten Zerr, Maryclaire Muskett, Grayson Feist, Ryan Orr, Isis Perez, William Raymond, Political Science*

**10:45–11:05 \* Room 124**

The goal of this project is to understand why young adults between the ages of 18 and 24 are disengaged, disinterested, and disgusted with politics, and why they relate negative connotations with politicians. Young adults in this age group have the lowest voter turnout, have little interest in becoming involved in politics or running for public office, and often have a negative view of politics and the American government. However, they are still concerned with the public welfare and America's future, but they believe that the best courses of action to improve these areas are through involvement in community service and volunteering. We conducted research to find information on this issue, its causes, and possible solutions. We have read various articles and books including *The Selfie Vote: Where Millennials Are Leading America (And How Republicans Can Keep Up)*, *Running From Office: Why Young Americans are Turned Off to Politics*, and *Out of the Running: Why Millennials Reject Political Careers and Why It Matters*. We also conducted our own survey to compare Benedictine freshmen to the survey results of our generation.

### **32. A Piece of the American Dream: The Econometrics of Atchison Housing Prices**

*Maria Mayhak, Miranda Borsh, Brigid Ueland, Sophia Glaser, David Harris, Economics*

**10:45–11:05 \* Room 125**

This project serves to provide an econometric model for analyzing the housing prices in the Atchison area. With this, we will be able to benefit the Atchison community by providing a way to understand housing prices. Using various sources for data, this model looks at several variables, including house prices, the size of the house, location, and interest rates. These variables are used to determine how these homes are priced. Using econometrics, a multiple linear regression model will be developed, and then analyzed through hypothesis testing, t-tests, p-values, confidence intervals, f-tests, and R-squared values. This study uses econometrics as a way to show the relationship between housing prices and these external

variables in Atchison. Through this project, we will be able not only to better understand how housing prices in Atchison change but also to create a tool that can be used to benefit our local community.

### **33. Project Haiti: A Christian Approach on the War on Poverty**

*Jude Severson, Jeffrey Fennewald, Michael Fontana, Karen Wood, Sociology and Criminology*

**10:45–11:05 \* Room 208**

The purpose of this qualitative study is to better understand how foreign aid truly affects a country in need. (In this case, one project in one city in Haiti.) Because many aid organizations plan their projects according to their own assessments and values, we hoped to begin to turn this dynamic around by hearing from Haitians themselves. As expected, the research data gathered demonstrated that Haitians are in full knowledge of what they need. Respondents identified three major areas that impede their ability to succeed and to have agency over their own lives. These included corruption in the government, the abuse of the sanctity of marriage, and the lack of education throughout their society. The ultimate goal of this project is to create a greater awareness of, and attention to, the local needs and perceptions of aid so that Project Haiti and other aid organizations in the region can be more culturally sensitive.

### **34. Artists at the Turn of the Century: Willa Cather's Literary Response to Modernism**

*Hannah Voss, Sarah Young, English*

**10:45–11:15 \* Room 219**

A common simplification in the study of 19th century Realism and 20th century Modernism is to view the ideologies and authors within the periods as self-contained, with the latter reacting against the former, producing new generations of artists. Due to the dramatic changes in the artistic consciousness around the turn of the century, the transition between these periods is often overlooked. While 19th century Realism sought to express in literature life as it is experienced, with attention to expressing the details of the everyday, Modernism responded to a perceived instability and decay of the 20th century through innovative work that broke from established traditions and rules. This project explores how Willa Cather, a 20th century author predominantly working in the 19th century Realist tradition responded to 20th century Modernism, through an analysis of her novel *The Professor's House* and selected essays from her collection *Not Under Forty*. In *The Professor's House*, Cather's characters inhabit certain physical spaces that denote 19th and 20th literary movements in the way they are described. The role these spaces play in the narrative reveals her attitude towards the movements, lines of thought that can be clarified through two essays in specific: "148 Charles Street" and "The Novel Démablé." In these essays, Cather articulates a somewhat paradoxical response to Modernism, one in which she responds to the same concerns of the Modernists and uses Modernist techniques in a uniquely transitional way. *The Professor's House* represents a Catherian disjunction in which she

considers different ways to respond to problems of the 20th century, such as materialism and commercialism, as well as artistic debates surrounding representation and the role of art. This analysis uncovers Cather's continuously developing philosophy of artistry, revealing a multiplicity of possible 19th century responses to the various facets of 20th century Modernism.

### 35. Historical Telenovela

*Claire Schroettner, Hannah Vogt, Lorenzo Gregory, Henry Goracke, Nicholas Lahr, Kristina Pikula, Julie Sellers, World and Classical Languages and Cultures*

**10:45–11:25 \* Gangel Seminar Room**

This telenovela is created by a mix of students, some who have had experience with telenovelas, and others who are joining the group for the first time. Telenovelas are generally described as “soap operas,” but in their native context, they are so much more than overacted romantic dramas. Yes, there are some general components: love, love triangles, good versus evil, religion, lies and secrets, and the “happy ending” in which the evildoers finally get their comeuppance, but they span an audience much more diverse than soap operas. There are telenovelas for children and young adults; working class and office drama; political and historical tales. The last two categories have been used to comment on history and criticize current situations. They have much more significance than the American soap opera. Not only are telenovelas popular in their native countries, but they are a major exported good in several South American countries, with demand reaching across the globe.

Our group wanted to grow in a different way from our previous projects, so we decided to make a historical telenovela set during the Spanish Civil War. It was an event that most of us did not know much about because it happened right before WWII, which takes precedence in most history books. In order to make a video, we had to do some research into the time period in Spain. We read articles in English and Spanish, looked up newspapers from that time, and consulted with our Spanish professors. We had to research costumes and locations as well. To write the script in Spanish, we had to make sure that we used words specific to Spain. At the end of editing, we hope to present our film in black and white, which will present its own challenges.

As individuals, we changed our roles in the production. Students who had played villains previously take on the roles of protagonists and vice versa.

All in all, this project is a historical telenovela, written and filmed entirely in Spanish for authenticity, in which we learned about history, language, and culture. We hope that our audience enjoys it as much as we do.

### 36. The Effect of Protandim on Reactive Oxygen Species and DNA Mutation Rate

*Eden Anderson, Kira Alexander, Kristen Hysten, Laurencia Ouedraogo, Martha Carletti, Biology*

In a society that is always searching for the next quick fix in healthcare, the herbal over-the-counter supplement Protandim seems to be a miracle drug. It claims to “fight the effects of aging and increase health at the cellular level,” primarily by reducing the amount of reactive oxygen species in the body. Reactive oxygen species (ROS) are naturally formed during cellular respiration. However, excessive ROS can cause damage to cellular macromolecules, including DNA. This DNA damage can lead to many physiological complications, such as cardiovascular disease, immune disorders, and cancer. We used in vitro studies to test Protandim’s claims by examining the effects of Protandim on ROS levels and DNA mutagenesis. First, a cellular reactive oxygen species detection assay was used on HeLa cervical cells to test the ability of Protandim to decrease ROS levels. In this assay we induced oxidative stress by treating cells with tert-Butyl hydroperoxide and observed that Protandim significantly lowered the amounts of ROS in both treated and untreated cells after an incubation period of four hours. Next, we employed an Ames test to examine the ability of Protandim to protect DNA from mutagenesis. We saw that mutation rates were significantly decreased in the Protandim-treated cells when compared to the non-treated cells. The data collected in this study suggests that Protandim can be used to eliminate ROS, thereby reducing oxidative stress and preventing DNA damage.

### 37. Raising Awareness: Childhood Malnutrition in Guatemala

*Victoria Masucci, Michele Hinds, Nursing*

Malnutrition is a global issue seen in every country of the world. The populations most affected by malnutrition are women and children. The first 1,000 days of a child’s life (from conception to their second birthday) play a critical role in their physical health and neurodevelopment. Over 200 million children in developing nations do not meet their developmental potential (Unicef). Children are at higher risk because malnutrition affects their continuous growth. A breastfeeding mother’s nutrition can directly affect her child’s growth and development. Fifty-six percent of Guatemalan mothers breastfeed within the first hour of birth. I have travelled to Guatemala nine times and have witnessed malnutrition in children firsthand. This descriptive study examined malnutrition in Guatemala using available data resources. In some regions of Guatemala, 80% of indigenous (Mayan) children are malnourished (Unicef). The purpose of this study is to investigate viable solutions for Guatemala. Data were analyzed using descriptive statistics and compared malnutrition indicators in Guatemala with data from the United States. Malnutrition and its clinical manifestations were discussed, as well as its effects on cognition and physical development. Typical diet and food availability

were discussed. There are many contributing factors to malnutrition in Guatemala, such as poverty, women education, geographical location, and environmental factors.

### **38. Vinyl Records: Visual and Tactile Enhancement of Music**

*Graham Matlock, Galen Gossman, Jay Wallace, Art*

This Discovery project has investigated how tangible and visible design can enhance the experience of listening to music. Inspired by recent trends in the music distribution industry, we wished to learn why vinyl records are regaining market share over more convenient and less expensive digital formats. Conceived as a joint effort between art and engineering, there were two main objectives this project wished to accomplish.

From the engineering perspective, we wished to explore the differences in analog and digital recording technology, experiment with building a prototype analog sound recorder, and research the manufacturing techniques needed to create vinyl records. These findings, along with an engineering development unit of our sound recorder, will be on display to educate people on how different recording mediums work.

From an artistic perspective, we have studied the artwork of existing vinyl records that we felt made compelling statements about the music within. Taking inspiration from the design principles present in these records, we have created album covers and record blanks for several concept albums designed to enhance a listener's enjoyment and engagement with a particular type of music.

### **39. Internal Curing With Lightweight Aggregates**

*Thaddeus Messer, Patrick Michaels, Morgan Wentz, Adam Burke, Scott Newbolds, Engineering*

Concrete is made up of three main components: aggregates, cement, and water. Often time's admixtures are also added to concrete to aid in specific purposes. Aggregates are usually broken down into two categories within the concrete: coarse and fine. Gravel is generally the main coarse aggregate as the size usually ranges from 3/8" to 1.5". Fine aggregates usually consists of sand or crushed rock. This project will deal with an investigation into the affects, advantages, and disadvantages of internal curing when using lightweight aggregates.

Internal curing is defined as supplying water throughout a freshly placed cementitious mixture using reservoirs, via pre-wetted lightweight aggregates, that readily release water as needed for hydration or to replace moisture lost through evaporation or chemical reactions. This can be a very influential process if the concrete proves to increase strength and reduce cracking. This is important as lightweight concretes' popularity is growing and is often used for suspended floors, building roofs, and sometimes concrete canoes.

Over the past couple years the Benedictine Concrete Canoe team has struggled to come up with an efficient way properly to cure the canoe after placing the concrete. As a result strength and durability were most likely lost as without proper

curing as the concrete does not reach its maximum strength and also undergoes shrinkage causing cracking. In order to change this, we want to investigate the effects of internal curing. This can be done by testing this method of pre-soaking the aggregates versus methods used in the past, such as placing a wetted burlap sack on the concrete or placing the concrete in a room with a humidifier keeping the humidity as close to 100% as possible. These tests will include various proportions of the soaked lightweight aggregate in the concrete and forming compression test cylinders. These cylinders can then be tested using standard compression and tensile test methods in order to determine the curing methods effect of the compression and tensile strength of the concrete. The results of these tests will determine whether this method is suitable for future use in the construction of concrete canoes.

#### **40. An Interactive Demonstration of How Nanoparticles Behave in a Liquid**

*Andrew Miller, Gail Blaustein, Chemistry and Biochemistry*

The aggregation behavior of charged nanoparticles in a liquid medium is of great importance in environmental science as well as in commercial applications of colloidal suspensions, such as paint, cosmetics, and pharmaceuticals. Models commonly used to predict the stability of such colloidal systems are unreliable for particles significantly smaller than a micron in size due to assumptions made in approximating the critical coagulation concentration and the stability ratio—two parameters used to characterize lyophobic colloids.

The purpose of this project was to build a user-friendly interactive demonstration of nanoparticle interactions based on a more sophisticated model with the mathematical computation program Mathematica. Based on fundamental principles of physics, chemistry, and mathematics, this new model avoids assumptions and generalizations employed in currently used models to provide a more realistic prediction of nanoparticle behavior arising from the inherent complexity of the system. The model underlying the proposed demonstration predicts nanoparticle dimer formation in an aqueous electrolyte solution by applying a multi-step reaction mechanism with the classical Derjaguin-Landau-Verwey-Overbeek theory that describes surface interactions from first principles as the basis for rate constant approximations.

The graphical user interface (GUI) consists of a collection of radio buttons and sliders, allowing the user to choose the material of the nanoparticles, the concentration of particles, the size of the particles, the system temperature, and the concentration and type of salt in water with the nanoparticles. As the sliders and buttons are moved, the program predicts the attractive and repulsive forces experienced between two nanoparticles as well as conditions influencing nanoparticle dispersion, reversible flocculation, and irreversible aggregation.

In addition, the underlying model of the demonstration was tested and validated by comparing predicted nanoparticle behavior with experimental results from the literature.

#### **41. Physical, Academic, and Social Effects of the Murphy Recreation Center on BC Students**

*Kylie Mulholland, Matthew Scavuzzo, Kyle Lauterwasser, Bethany Kuhn, Angela Broaddus, Mary Flynn, Mathematics and Computer Science, Health, Wellness, and Exercise Science*

The purpose of this Discovery project was to study the impact of the Murphy Recreation Center on the students of Benedictine College. We went about this by creating a survey with questions pertaining to the students' own traits and well-being as affected by the presence of a new workout facility on campus. A total of 286 students responded to the survey with approximately equal distribution among classes. The sample included a majority of females and non-student athletes. The Murphy Recreation Center was the most popular place to work out among the students who responded to the survey, and most of the respondents stated that the Murphy Recreation Center motivated them to work out. Students reported working out elsewhere, including outdoors, sports practice, and the Amino Center. About ninety percent of the students who completed the survey reported that they found the Murphy Recreation Center not to be intimidating. Furthermore, about one-third of the students reported having the opportunity to meet new people while making use of the facilities.

#### **42. Isolation of Probiotics From Yogurt and Testing Their Antibiotic Resistance**

*Eva Pecha, Daniela Garcia-Perez, Blake Gollhofer, Joseph Marak, William Penwell, Biology*

With antibiotic resistance becoming a growing problem in the medical field, we are interested in discovering how live cultures of probiotics are affected by varying concentrations of different kinds of antibiotics. The purpose of our research was to isolate *Lactobacillus* from yogurt cultures and test their antibiotic resistance with different antibiotics, such as tetracycline, ampicillin, ciprofloxacin, chloramphenicol, and cycloheximide. We changed the antibiotics to ampicillin, tetracycline, spectinomycin, and chloramphenicol. The antibiotics that we chose were meant to show an array of different functions in the cell. The yogurt cultures that we used were from Danon, Activia, Chobani, Best Choice, and Yoplait. However, due to the fact that we could not confirm *Lactobacillus* cultures from the Best Choice yogurt, we did not continue testing on Best Choice. To isolate the probiotics from the yogurt, we used a saline mixture of 45 mL and added 5 g of the yogurt to resuspend the yogurt samples. Serial dilutions were performed for each of the yogurt mixtures and plated the dilution onto de Man, Rogosa, and Shapre (MRS) agar plates and incubated at 28°C for 48 hours. From the growth on the MRS agar plates, we tooth-picked and created daughter plates. After growth, we performed gram-stain to confirm that a *Lactobacillus* species was indeed isolated from the yogurt samples. Once *Lactobacillus* cultures were confirmed, we determined the minimal inhibitory concentration (MIC) of different antibiotics using a broth dilution method. Our results showed that each *Lactobacillus* species provided different MIC for each antibiotic tested. For all *Lactobacillus* tested, we

determined that the MIC for streptomycin was 6.75 g/mL; the MIC for ampicillin and ciprofloxacin was 3.125 g/mL; the MIC for tetracycline was 0.197 g/mL; the MIC for chloramphenicol was 7.25 g/mL. Further research will determine the resistance frequencies. If our research proves effective, it could bring us one step closer to understanding the effect of probiotic bacteria found in yogurts that could aid in benefiting human health. Future research could indicate how resistant probiotics can become to certain antibiotics.

#### **43. Test Anxiety at Benedictine College: A Comparison Between General Education Students and Nursing Students**

*Susan Pistek, Anna Hagenkord, Allison Leitz, Hanah Suarez, Lynne Connelly, Nursing*

There is a lack of consistent research on the effects of test anxiety among college students when comparing different majors, particularly nursing. In one review, highly anxious students scored 12 percentile points below their low-anxiety peers, making this a serious academic issue. We conducted a study on the effects of test anxiety on students' academic performance at Benedictine College. A cross-sectional study method was used with a sample of approximately 100–150 surveys based on power analysis of similar studies. We distributed a test anxiety survey to various students from different major departments. The Westside Test Anxiety Scale is a 10-item instrument that identifies different variables that students identify would raise their anxiety levels and has been used in other studies with adequate reliability and validity. Demographic questions were also included. The survey was administered online through the Benedictine College's FYI service with a link connecting the user to the Survey Monkey® website. We plan to do a comparative analysis using correlational and descriptive statistics of our study data in order to distinguish if different majors have an effect of higher anxiety levels, and, in turn, academic performance. We also will perform a systematic review of the literature to compare our findings to research that has already been done on this subject.

#### **44. The Effects of Medical Honey on Wounds**

*Lindsey Proffitt, Sadie Hilliard, Lynne Connelly, Amanda Schuster, Nursing*

Currently, the healing of pressure ulcers costs hospitals extensive amounts of money per year. Unhealed pressure ulcers can lead to hospital acquired infections, and wounds often need multidimensional care of debridement and infection control. Also, there is a large gap between the efficiency of wound management in hospitals and the efficacy of wound healing in clinical trial. Our Discovery project is an evidence-based practice study focused on the effects of medical grade honey and its healing and bacterial growth properties. The aim of the project is to report on recent medical and nursing studies to compare the effectiveness of medical grade honey on the bacterial growth, size, and stage of healing in wounds with conventional forms of wound treatment.

Before the study, we wanted to know if medical grade honey would decrease bacterial growth and increase pressure ulcer healing as efficiently as or more

efficiently than other forms of conventional treatment. Our hypothesis stated, “Medical grade honey will decrease bacterial growth and increase healing in pressure ulcers as efficiently as other forms of conventional treatment.” In our project, we reviewed 12 articles within the last 10 years using EBSCOHOST and CINAHL databases. Medical grade honey was proven to be effective in reducing healing time in ten out of the twelve articles. In one study, medical grade honey was shown to be equally as effective as silver-coated bandages. Fifty-five percent of patients in another study experienced a decrease in pain while using Medihoney. Medihoney was found effective in awakening and cleaning out the wound bed to promote healing. Medihoney was also proven to be successful debridement in 86% of wounds. Limitations of the study include: research of medical honey is not easily generalized and is mostly descriptive. More research is needed for its use on specific types of wounds. Medihoney is becoming a mainstream treatment option for wounds. Nurses should have knowledge about this wound treatment option as it can make them a better patient advocate.

#### **45. Developing Plastics With Fluorescent Dye for Use as Luminescent Solar Concentrators**

*Marie Rioux, Nathaniel Strandquist, Kurtis Schmitz, Alissa Muggli, Katharine Caghron, Georgiy Shcherbatyuk, Physics and Astronomy*

Due to an increasing demand for renewable energy, investigation into the sustainability of solar-energy gathering techniques has become ever more relevant. Regarding cost and efficiency, the approaches for solar-energy gathering vary drastically, but among them, luminescent solar concentrators (LSCs) show much promise because they use less-expensive materials—predominately plastics—and can collect solar-energy even outside of direct sunlight.

The LSCs that we made were a species of plexiglass: polymerized polymethyl-methacrylate (PMMA) with bioluminescent Rhodamine B dye incorporated prior to polymerization. We focused primarily on developing an optically clear, uniform, solid sample of PMMA.

Employing a method detailed by Meinardi et al. in “Nature Photonics” as a rough outline, we determined which elements from this approach were indispensable for our purposes. These were time, temperature, and the ratios of the ingredients used: methyl 2-methylpropenoate (MMA), an initiator azobisisobutyronitrile (AIBN), and a fluorescent dye (Rhodamine B). The use of toluene was initially introduced because the LSCs would in the future incorporate quantum dots, dissolved in toluene. This was discarded, however, because Rhodamine B dissolves poorly in toluene.

Due to a lack of specifications regarding ratios, temperature, and time, in the Meinardi et al. approach, we developed a method through empirical verification producing sufficiently transparent, uniform samples.

This method is intended to be further modified and will incorporate quantum dots, which have a greater potency for efficiency as LSCs.

#### **46. Identifying LIM-domain Proteins That Regulate Epithelial Morphogenesis in *C. elegans***

*Brennan Roche, Lane Fry, Matthew Jarecki, Bienvenido Cortes, Mark Schramp, Biology*

Epithelial cells are a type of cells that are arranged in one or more layers that form different coverings or lining of body surfaces. To accomplish these processes, epithelial cells must adopt unique characteristics to perform a specific function. We are interested in understanding how epithelial cell morphogenesis, the formation of a unique shape, contributes to organogenesis, the formation of a unique organ consisting of many different tissues working together. In order to accomplish this, we use the model organism *C. elegans*. Previous studies have shown that the UNC-115 protein contains LIM domains that are similar to the LIM domains present in the TES-1 protein, which is known to play a role in the regulation of epithelial morphogenesis. UNC-115 is also known to bind actin filaments and is required for RAS signaling and is involved in axon pathfinding. To determine whether UNC-115 plays a role in epithelial morphogenesis, UNC-115 was evaluated using a basic RNAi procedure. The results of the UNC-115 trials were compared with results of identical RNAi tests that evaluated the L4440 and UNC-34 proteins. The L4440 results were used as the negative control of the experiment and UNC-34 results were taken as the positive control for the experiment.

#### **47. CNC: The Robotic Sculptor**

*Aidan Shaughnessy, Meyer Freeman, Steve Spencer, Engineering*

As automated machinery are becoming larger and larger parts of manufacturing processes, it is increasingly important for engineers to understand these systems. To understand better how these automated CNC machines work, a project was conducted to design and build a do-it-yourself, cost-efficient version. Three-dimensional design software was used to model how the machine would look and fit together. A variety of manufacturing processes were used to build the machine, including mills, lathes, and 3D printers. The presentation includes problems encountered, how it was built, how it works, a demonstration, and the practical application capabilities of the CNC. The purpose of this project was to better understand automated technology, apply engineering techniques, and to create a cost-efficient CNC.

#### **48. The Effects of the Level of Education on the Anxiety and Fear of Death and Dying**

*Rachel Snyder, Krista Kosek, Alexandra Faraj-Musleh, Sydney Moser, Lynne Connelly, Nursing*

The purpose of this study is to examine the relationship among anxiety and fear of death and the education level attained by participants. The topic of death is often associated with anxiety among college students due to fear of the unknown and unpredictability. Many developmental psychologists have studied how death affects children, and, as a result, care has been able to be more greatly catered

to a child's age level when nursing interventions are necessary related to death. However, there have been minimal studies on how fears of death affect college-aged people. Establishing if and how education level plays a role in the level of anxiety and fear of death is important to address properly this population's needs. Responding to the need for more research and using a quantitative research model, we have used the 42-item Multidimensional Fear of Death survey with added demographic questions to determine whether there is a correlation between life experiences and levels of fear of death and dying. The survey was sent to students at Benedictine College as well as Christendom College in Front Royal, Virginia. The data was analyzed through descriptive and correlational statistical tests. In further analysis, the findings from Benedictine College will be compared to the findings from Christendom College as well as the research literature.

#### **49. Progress Towards an All-natural Disinfectant to Reduce Foodborne Illnesses**

*Nathaniel Stacy, Fiona Fitzgerald, Larry Sutton, Cody Sherlock*, Chemistry and Biochemistry

Our food is a major source of preventable infectious diseases. According to the Centers for Disease Control and Prevention, 48 million people are sickened each year with foodborne infections, resulting in 128,000 hospitalizations and 3,000 deaths. One important source of foodborne diseases is the consumption of raw fruits, nuts, and vegetables, which cause 1.2 million (33%) cases of bacterial and 5.3 million (96%) viral infections.

Using organic spinach as a model, bacterial colonization was studied. Colony counts demonstrated bacterial loads up to 50,000 colony forming units per gram of leaf. Neither water rinses nor acidic (pH 4.5 malate) buffer significantly reduced microbial counts. Gram-stains showed both Gram-positive and Gram-negative bacilli as well as Gram-positive cocci. Selective media demonstrated the presence of coliforms, including *E. coli*, but no *Salmonella* was identified. Hydrogen peroxide (0.3%) sterilized the leaves with decreasing microbial reductions down to 0.003%.

Glucose oxidase is an antibacterial enzyme found in honey. It produces  $H_2O_2$  using glucose and oxygen as substrates. Various conditions were tested in order to optimize bacterial reduction. The use of 60 units/mL glucose oxidase in pH 4.5 malate buffer with 3% Gum Arabic as a wetting agent yielded 80% reduction in colony counts, predominantly Gram-positive reduction. While addition of lysozyme had no effect, lactoperoxidase with halogens or pseudohalogens enhanced bacterial reduction. Unfortunately, there are no industrial suppliers of food-grade lactoperoxidase to use to optimize the formulation.

Work continues towards cloning and producing lactoperoxidase with an overall project goal of achieving a 99% reduction in bacterial counts.

## 50. Tabletop Nuclear Fusion: Phase 1

*Evan Sutherland, Benjamin Bogner, Matthew Richard, Physics and Astronomy*

What do stars, power plants, and bombs have in common? They are all powered by the combination of smaller atomic nuclei into bigger atomic nuclei, in a process known as nuclear fusion. With advances in technology over the past 50 years, it is possible to achieve nuclear fusion within the comfort of your home. The Farnsworth-Hirsch fusor reactor uses inertial electrostatic confinement of ionized gas to create a plasma that, given enough power, can generate the necessary conditions for nuclear fusion. In Phase 1 of our project, we are laying the groundwork for full completion of a Farnsworth-Hirsch fusor reactor by building a vacuum ionization chamber that can sustain a high-vacuum environment and generate a plasma from ionized gas.

## 51. Tardigrades of Iowa

*Laura Tibbs, Bienvenido Cortes, Terrence Malloy, Biology*

Tardigrades, commonly known as water bears, are microscopic animals that live in moss and lichen but are best known for their ability to survive extreme conditions, including temperatures near absolute zero and even the vacuum of space. Iowa was the site of one of the earliest collections of tardigrades in the United States in 1873, but only one additional paper on the tardigrades of this state has been published in the last 140 years. Both papers focused on tardigrades in central Iowa, living in either freshwater algae or in deciduous trees. This project expands upon the known tardigrade diversity of the state through collection efforts in northern Iowa trees. Twenty-nine moss and lichen samples were collected from deciduous and coniferous trees in Hardin County during December 2015, and tardigrades were extracted from these samples. Five hundred sixty specimens were collected, which included six new species records for the state of Iowa (*Macrobotus sp.*, *Paramacrobotus sp.*, and four species in the genus *Milnesium*) as well as one new genus for the state (*Ramazzottius sp.*). Pseudoplates, tardigrade structures that were only described for the first time in 2016, were also observed in some of the specimens.

## 52. Can Background Music Really Affect Your Concentration and Mood?

*Justin Vinson, Courtney Farmer, Eva Rickert, Kimberly Russell, Anna Wyatt, Rachel Zook, Eva Chian-Hui Chen, Psychological Sciences*

Listening to music while studying is nothing new among college students. However, little is known about whether the music facilitates or hinders students' learning. The objective of this study was to determine if background music has an effect on college students' level of concentration and mood changes. A total of 60 students were recruited to participate in the study. These participants entered a lab where the mellow, energetic, or no music (manipulated variable) was played. The participant was asked to play a video game (i.e., *Traffic Rush II*) and then fill out a survey asking about their awareness of the music and mood changes. Participants' performance on the game was recorded and analyzed, along with the survey results to discern whether listening to music while studying really affects learning effectiveness.

### **53. Connecting Science and Art: A Concrete Canoe**

*Morgan Wentz, Patrick Michaels, Thaddeus Messer, Scott Newbolds, Jay Wallace, Engineering, Art*

A concrete canoe will be constructed for the ASCE competition. This year, we will be using a female mold. Because of the different type of mold, we are able to add a different type of art design to the canoe. By using cutouts when we originally construct the canoe, we will use an inlay process to leave cavities in the canoe. Wax inlays will be placed in the concrete when it is originally poured, then removed after curing, leaving an imprint in the canoe. We will fill these negatives using a different color patch mix, and therefore create designs. We will be able to create complex designs that are actually part of the canoe, not just painted on top. The Art and Engineering Departments haven't tried this method of adding design to a canoe before. It will take collaboration on both parts to make this a successful project.

### **54. Cell Migration of NIH3T3 Mouse Embryonic Cells**

*Mark Horton, Therese Carson, Michaela Bretey, Mark Schramp, Biology*

**2:35–2:55 \* Room 109**

Cell migration is an essential step in the development of all multicellular organisms. During migration, cells must polarize themselves and regulate adhesion and cytoskeletal changes to move to a specific area. Studying cell migration is also applicable to cancer research because it is a vital step in cancer metastasis. The goal of our project was to study and observe the role of the actin regulating protein Tes during migration. To test this, we observed the rates of cell movement across gaps of open space and compared these rates to cells where Tes protein levels had been diminished using siRNA. siRNA is a procedure in which small RNAs that complement normal cellular mRNAs can associate with them and result in their degradation. The consequence of this is the inability to synthesize a specific protein; in this case, the protein Tes. Various plates of NIH3T3 cells were grown until completely confluent and then scratched with a pipette tip to form a void where no cells were present. At designated time intervals, the scratched plates were fixed and stained with Rhodamine Phalloidin to label F-actin and DAPI to label nucleic acids. We were then able to monitor polarity, actin rearrangements, and migration using a fluorescent compound microscope. By observing and measuring the amount of closure of the voids created by the scratch at various time points, the rates of cell migration were determined. In addition, we monitored the efficiency of Tes protein knockdown via Western Blot. This procedure allowed us to observe the level of protein present in the sample cells. The Western Blot showed that the protein Tes had been significantly reduced in our sample cells after the addition of siRNA; however, the protein was still present at low levels. We hypothesized that the loss of Tes would slow the rate of cell migration. We tested the data using a two-sample t-test to compare the mean migration at each time point. We found significant differences of migration rates between Tes and Control plates at hours 4 and 8. The p-value for hour 4 was  $<0.0005$ . Our p-value for hour 8 was  $<0.02$ . These are encouraging data; however, further research needs to be done to fine-tune the methods for consistency.

## 55. Luminescent Solar Concentrators

*Nathaniel Strandquist, Marie Rioux, Kurtis Schmitz, Alissa Muggli, Katharine Caughran, Georgiy Shcherbatyuk, Physics and Astronomy*

2:35–2:55 \* Room 124

In recent years, the use of solar energy has increased, but has been limited by the fact that non-renewable energy sources are still cheaper and require no modifications to existing infrastructure. One method of decreasing the cost of solar energy is to concentrate incoming sunlight onto panels either through lenses and mirrors or through special devices called luminescent solar concentrators (LSCs). By producing devices that use fluorescent dyes to concentrate the light on a solar panel through a block of plexiglass (Polymethylmethacrylate, or PMMA), the cost of generating solar energy can be reduced. We focused on using pre-polymerization methods to produce optically uniform and clear samples of PMMA. We then began introducing a fluorescent dye (Rhodamine B) into the polymerization process, producing photoluminescent samples capable of acting as LSCs. We used a laser and spectrometer to characterize the optical properties of different luminescent species. Finally, we used small solar cells attached to the LSC to test power generation and efficiency under both optimal and real-world conditions.

## 56. The Art of Mount St. Scholastica: The St. Scholastica Chapel

*Margaret McCabe, Claire Nacanaynay, Kimberley Olson, Kathryn Lenertz, Christa Kagin, Art*

2:35–2:55 \* Room 125

Mount St. Scholastica has been a pivotal part of not only the Atchison community, but the Benedictine College community from its start. The St. Scholastica Chapel was originally built for the female students who attended the college, for their faith formation and nurturance. Today, it's only used on special occasions. One of the pillars of the Benedictine faith is community; however, there is an obvious disconnect between the campus and the Mount, both geographically but also in interaction. It was our goal not only to research this specific space and the art within it but to make an attempt to reconnect these two communities. On February 19, 2017, we hosted a student Mass in the St. Scholastica Chapel in an effort to reconnect the chapel to its original purpose: provide a place for students to participate in the sacrifice of the Mass. Our endeavor was a success, bringing nearly 400 students, faculty, and Atchison community members together with the Sisters of the Mount.

In addition, we examined the art within the chapel, to determine its historical background, and see how it informs the participants of the sacrifice of which they are a part. Looking at the architecture, stained glass windows, mosaics, and organ, we sought to see if the original intention of each of these pieces still had their intended impact on students of today.

## **57. “In Muted Tone”: Composition for Voice and Guitar**

*Charles Iner, Austin Steele, Timothy Tharaldson, Music*

**2:35–2:55 \* St. Benedict’s Church**

“In Muted Tone” is a classical art song composed for guitar and voice, in the style of Renaissance lute songs by such composers as John Dowland, a prominent Elizabethan lutenist. An English translation of a text by the French symbolist poet Paul Verlaine set to a newly written original melody and guitar accompaniment, the piece stands in a long tradition of art songs for voice and plucked stringed instruments, combining contemporary harmonic language with the melodic sensibility and knotty instrument-voice interplay of Renaissance music.

## **58. The Scandalous Truths of the Gospels: The Criterion of Embarrassment as Applied to the Synoptics**

*Michael Caughey, Benjamin Blosser, Theology*

**2:35–2:55 \* Room 219**

The Quest for the Historical Jesus has dominated New Testament Scholarship for the past three centuries. This inquiry attempts to apply historical-critical methods to New Testament-era literature in order to give a historical account for the life of Jesus of Nazareth. This investigation includes a “tool box” of certain criteria by which the historical truths of this literature is wrung out. This particular project hones in on one of the essential tools for this probe: the criterion of embarrassment. This criterion assigns high historical probability to those details in New Testament literature regarding the life, teachings, and person of Jesus, which would have seemed embarrassing, shocking, or scandalous either to the Biblical author or to the early Church. In particular, this project seeks to look at this criterion in relation to the Synoptic Gospels. First, this project will give a detailed exposition as to what the criterion of embarrassment exactly is. Second, this project will establish principles for determining historical authenticity via the criterion of embarrassment, involving authorial intention, authorial tendencies, historical context, and redactions. Finally, this project will look at the Synoptics *prima facie* and attempt to draw its own historical fixed points from the Gospels by applying the above principles. Indeed, this project hopes to discover the limits of this criterion, attempting to go as far as it allows.

## **59. The Principles of Distinction in Material Substances in the Philosophy of St. Thomas and St. Albert**

*Thomas DePauw, Jean Rioux, Philosophy*

**2:35–3:35 \* Gangel Seminar Room**

In this paper we will argue that the problem of the one and the many, as first proposed in the West by Parmenides, can be resolved without recourse to either monism or nominalism by an appeal to distinct, though mutually ordered, principles of distinction in the realm of material substances, namely that of material individuation, distinction according to form, and suppositional distinction. This solution, based upon the writings of St. Thomas Aquinas and St. Albert the Great, maintains that while the indeterminate dimensions of matter are sufficient

for the numerical distinction of material substances, what distinguishes one material substance from any other substance absolutely and simultaneously grants it a certain participation in being such that it can be individuated is the agency of the Divine Intellect determining the act of being to the proper form for the substance. This agency elicits in the created material substance the actuality of the relation of creation, which the Divine Intellect chooses for it, and which is the cause or principle that, in inhering in the *ens creatum* as a property subsisting in it, sustains the material substance in its mode of individual being as a suppositum after it is created by formally perfecting its distinction with its reference to God the Creator.

## **60. The Problem of Inequality: Strictly Monetary or Something More?**

*Miranda Borsh, Maria Mayhak, David Harris, Economics*

**3:05–3:25 \* Room 109**

Income inequality is a growing concern today, not only in the United States but around the world. Several indices have been put forth in an attempt to measure this phenomenon. The goal of this project is to use econometrics to develop two multi-linear regression models for two specific inequality/poverty indices across different countries. The models will have several variables, including the index under consideration, unemployment rate, and life expectancy. The object of the regression models is to determine the relationship between the above-mentioned variables on the country's well-being, as measured by Gross National Income (GNI) per capita. These models will be evaluated by several statistical means, including t-tests and tests of goodness of fit.

## **61. Building a Champion**

*Austin Green, Nathaniel Strandquist, Matthew Richard, Physics and Astronomy*

**3:05–3:25 \* Room 124**

For this project, we built a replica Fender Champ guitar amplifier. The circuit layout and components were taken from a parts kit, but the chassis and speaker cabinet are an original design on our part. The Fender Champ is a 50s era amp that utilizes vacuum tubes. Vacuum tubes have departed from mainstream electronics but are still preferred as amp components over more modern solid state technology by many guitarists because of the unique way in which they amplify—and sometimes distort—audio signals. This amplification, or “gain,” is quantifiable, and we subjected it to analysis. Also, using an oscilloscope, we were able to analyze the frequency response (i.e., the frequencies that are boosted the most by our circuit).

## **62. Mathematical Analysis and Visualization of the Benedictine College Course Catalog**

*Kassandra Short, Heidi Hulsizer, Mathematics and Computer Science*

**3:05–3:25 \* Room 125**

Graph Theory is an area of mathematics that studies the connections and patterns between different variables. This presentation will explore the process and potential

application of graph theory analysis on the Benedictine College Course Catalog. Additionally, the process of creating a visualization of the Course Catalog will be examined and discussed in detail. The creation of this graph will visually detail the different methods of fulfilling course requirements for graduation and the relationships between courses in different areas of academic study. By examining the process in forming the graph and performing mathematical analysis on the final product, one will be able to visualize the connectedness of a liberal arts education and develop a deeper understanding and appreciation of mathematical analysis.

### **63. Redesigning the Discovery Medal**

*Madeline Stella, Miriam Walski, Elizabeth Helfenberger, Mayra Ortiz, Claire Schroettner, Bryan Park, Art*

**3:05–3:25 \* Room 208**

This project is the foundation work of a new design for the Discovery medal, awarded to Benedictine Discovery Scholars at graduation. Working with the Discovery committee, we considered how the vision of Benedictine’s Discovery program can be communicated visually through a new medal design. As a result, we have developed several new designs and freshly cast medals that will be a springboard for a new Discovery Scholar award medal design. Come to learn about our experience working with the Discovery committee to develop new design ideas, our research on the history of award medals, and the process of casting medals in pewter!

### **64. Vortex Chiller: A Thermal Phenomenon**

*Adam Burke, Andrew Buss, Daniel Hayes, Steve Spencer, Engineering*

**3:05–3:25 \* Room 219**

A vortex chiller is a mechanical device that when given a supply of compressed air creates two streams of air, one hot and one cold, all without the use of moving parts, chemical reactions, or external heat sources. The hot and cold air stream temperatures can reach levels of 200°F and –30°F, respectively. Since its accidental invention in 1928, there has yet to be a universally accepted theory explaining the dynamics of the vortex chiller. Despite the inherent “wow factor” of the vortex chiller, its low efficiency compared to traditional refrigeration cycles leaves its uses limited to spot cooling and pure novelty. The objectives of this project were an investigation into the engineering fundamentals behind the vortex chiller, design prototyping, and finally construction of a functioning vortex chiller. Come unravel the mystery of a thermal phenomenon!

### **65. Surviving Sexual Assault**

*Elise Huntley, Kristen Hysten, Elaine Connelly, Erin Farrell, Genevieve G’Sell, Jennifer Schmidt, Counseling Center*

**3:35–3:55 \* Room 109**

This study seeks to understand how various effects of sexual assault emerges in the lives of its victims. As sexual assault affects a wide range of individuals,

the focus of this study is on the manifestation of these effects in college-aged persons. It is well established that sexual assault is a big problem on college campuses with one in five college-aged women being victims of sexual assault. By analyzing and comparing past research papers and prior experiments, this study examines the biological, psychological, and social effects sexual assault has on its victims. Biological effects that cause or are of consequence of mental illness are explored. Mental illness, in turn, creates obstacles that may not have been present at the time of the assault, and these effects are also examined in this study. These obstacles then influence survivors' relationships with those around them, both platonic and romantic. A decrease in trust and other various negative trends have been observed in the relationships of survivors and will be the final focus in this study. The hope of this study is to answer questions about how sexual assault affects victims on biological, psychological, and social plains. Through this accumulation of knowledge and encouragement of understanding, conversation will be opened up on the Benedictine College campus.

## **66. Fork It Over**

*Kathleen Wells, Gabriella Ferraro, Richard Coronado, Economics*

**3:35–3:55 \* Room 124**

According to *National Geographic's* article, "Waste Not, Want Not," one third of the planet's food goes to waste. The Food & Agriculture Organization of the United Nations estimates that 2.9 trillion pounds of food is squandered annually – twice the amount needed to feed the individuals who suffer from hunger around the world. In the United States alone, approximately one in seven people suffer from food insecurity, yet we discard 30%–40% of our food (133 billion pounds annually). Both food waste and food supply insufficiencies are pressing global issues but also exist in our immediate community.

Through this Discovery project, we hope to explore the reality of food in a localized manner and uncover potential areas for action. We will analyze food production and consumption trends, research legal and regulatory standards, and learn from primary sources and existing initiatives. Pope Francis and other church leaders have spoken extensively of our duties as global citizens. We will examine our research in the context of these teachings in order to understand our scope of responsibility and determine how we can better fulfill our obligations.

While the coordinated reduction of food waste and insufficiencies could seem to be a simple equation on paper, the underlying influences and moving pieces present a very complicated picture. Through our project, we do not expect to develop an all-encompassing solution. But it is our duty to continually strive to make a difference in any way we can. Therefore, through educational and actionable elements, we hope to inspire our peers and others, facilitating steps toward a resolution.

## **67. Caring for Dying Patients**

*Ruth Gross, Jamie Spiering, Lynne Connelly, Philosophy, Nursing*

**3:35–3:55 \* Room 125**

This project sought to answer the question, “How can the healthcare worker best care for dying patients?” The research for this project included compiling personal interviews from people who work with the dying and are associated with Benedictine College and both philosophical and theological research. This research yielded a wide variety of answers – from treating physiological symptoms to ministering to the patient’s need for closure in relationships and addressing concerns of family members. In a world full of people who either seek to hasten death or avoid death at all costs, this research begins to reveal how the dying process itself can be meaningful.

## **68. Holier Than Thou: Are Certain Personalities Holier Than Others?**

*Sarah Starrs, Sarah Vall, Katherine Greenwood, Ann Marie Guernsey,  
Jeremy Sienkiewicz, Theology*

**3:35–3:55 \* Room 208**

Do individuals who possess certain traits advance more easily to the heights of prayer? This was the question that began our initial project. Using the writings of Gill Hall, Leslie Francis, and Charles J. Keating, researchers who have studied the relationship between personality type and different spirituality preferences, we came to the conclusion that individuals possessing different qualities of the Meyer Briggs spectrum would be more inclined to pray in a certain way. Wanting to further develop this research, we sought to determine if individuals possessing certain traits of the MBTI spectrum could attain higher levels of spiritual peace. To substantiate this question, we turned to the writings of Eugene Boylan, an Irish monk famous for his book *Difficulties in Mental Prayer*. Boylan made the bold claim that there are levels within the spiritual realm. There are beginner, intermediate, and advanced souls. With each spiritual level comes a different type of prayer. This prompted the following question: Due to the reality that different types of personalities are drawn to different types of prayers, is it easier for those individuals who are more inclined to the higher levels of spirituality to reach holiness? After in-depth analysis of Hill and Boylan writings, our answer to this question is yes. There is in fact a reality that some individuals, due to their personality, possess a tendency to pray in the manner typically associated with the higher degrees of spirituality. Our discovery did not end there. We further want to assert that, the realm of spirituality is similar to a ladder, some individuals may start at positions higher or lower on the ladder; however, all individuals have both the potential and the capacity to advance to the heights of prayer while answering the universal call to holiness.

## **69. The Virtual Choir: Using Artificial Voices to Perform an Original Choral Composition, “Anima Christi”**

*Hunter Eisenmenger, Austin Lager, Benjamin Bogner, Daniel St. Hilaire, William Medina, Matthew Johll, Ryan Maderak, Peter Rumpza, Patricia Lombardo, Alexia McAndrews, Rosemary Herold, Angela Rodriguez, Trini Crocker, Shannon Schrader, Erica Rohde, Lauren Hanke, Hannah Dahlor, Marcela Heffernan, Miriam Walski, Molly Hair, Emily Kennebeck, Claire Vouk, Landon Downing, Austin Steele, Charles Iner, Anthony Crifasi, Callum Hubka, Gabriel Heffernan, Timothy Tharaldson, Music*

**3:35–3:55 \* St. Benedict’s Church**

Modern-day technology has given composers of all types a chance to hear a sample of what their music sounds like before it is performed live. Using music notation software, composers write for certain instruments, and they can play back what is written. However, the sound quality of the software is very artificial, unrealistic, and shrill in sound. Because of this, it is still hard for composers to get a true idea of what their compositions might sound like. On top of that, using real instruments, such as pianos, as means to compose works for other instruments, such as human voices, do not give an accurate representation of the actual, physical sound an audience would hear in a live performance.

Symphonic Choirs, a state-of-the-art music notation/audio software, offers a solution for these issues. This software allows a choral composer to input the music he or she wrote, and transform it into what sounds like real-life voices singing the words to the piece. The existence of such advanced technology may change the way choral music sounds, is written, and used in entertainment (movies, television, etc.).

Artificial voice production has its drawbacks. A sound that is “too perfect,” or so in tune that it seems unrealistic, could deter people from using such software. Or, the desired dictation and phonation of the virtually produced words may not sound accurate in the language sung.

A live performance of an original composition written by the presenter, titled “Anima Christi,” will be given to compare “real-life” with the virtual sound of Symphonic Choirs.

## **70. The Economics of Abortion: A Micro and Macro View**

*Kyle Vonnahme, Joseph Lemming, James Young, Economics*

**4:05–4:25 \* Room 109**

This presentation was inspired by two questions. Why is abortion desirable? What are its effects on macroeconomics, specifically GDP (Gross Domestic Product)? This presentation will seek the answers to these socioeconomic questions using econometric and economic analyses.

To examine the desirability of abortion, we will be using 2013 CDC abortion data and individual state political data. This data will be analyzed through econometrics, using the method of ordinary least squares. The heart of such an analysis is looking for significant correlative factors between the explanatory variables (what

we believe may explain the choice to have an abortion), and the actual choice of having an abortion. We will be using variables like location, state poverty levels, and patient age to reach our conclusions. There will be relevant discussion of the significant explanatory variables in the presentation as well as an extended discussion on possibilities for further research and our econometric model's limitations.

The approach to answering the second question, "What is its effect on the macro economy based on its impact on GDP?" is a bit different. This part of the presentation required research on the topic of secular stagnation and the necessity of population increase for economic growth. We provide counter-points to the negative views of population growth, which allows us to argue that lives lost due to abortion do make a difference in the growth of a nation's economy. This is contrasted by claims found in books, such as *Freakonomics*, which claim *Roe vs. Wade* decreased the crime rate. We believe that the authors of *Freakonomics* did not use their data correctly and miscalculated the effects of the lawsuit. Finally, we will estimate the GDP lost or gained due to abortion to examine its effects on national output. We hope that this presentation will offer a starting point to examine the socio-economic effects of the decision to have an abortion on both an individual microeconomic and larger macroeconomic scales.

## **71. From Fury to Jury: Staging Aeschylus' *Eumenides***

*Angelica Nguyen, Mairead Norton, Edward Mulholland*, World and Classical Languages and Cultures

**4:05–4:25 \* Room 124**

The intention of this project was to coordinate and perform a Greek Tragedy in the original style, continuing a tradition that was started last year with the play *Oedipus Rex*. We wished to bring the traditions of the Greek theatre to life, learn what the experience of performing Greek tragedy entails, and discover the essence of true drama. Though the earthly remnants of Ancient Greece have passed away, Greek tragedy is still important to the world because it salutes the glory of a once great nation, allows us to enter the world of the ancient Greeks, and provides us with insight to our own humanity.

Over the last few months, we prepared a performance of Aeschylus' play *The Eumenides*. We used a translation that we believe best captured the rhythm that would have come across in the original Greek. Subsequently, we cast the play and decided to perform it on the front lawn of St. Martin's Memorial Hall. Learning more details about Greek Theatre, we used a simple stage, and the actors were masked to better imitate the original style.

As a result, we found that the words of Aeschylus teach us not only about the Greeks but about humanity as a whole. Each of the actors and contributors to this project came into a deeper appreciation for the themes of vengeance, suffering, and justice and have ultimately been left with the personal mission of ordering chaos and ending the cycle of violence.

## **72. Holographic Computer Screen**

*Ayden Pugh, Amy Robbins, Dennis Dunleavy, Ryan Maderak, Journalism and Mass Communications, Physics and Astronomy*

**4:05–4:25 \* Room 125**

This project is about the replication of light patterns. The question that prompted me to do this project was “How do holographic plates work?” I was inspired in my video production class because I wanted to take a three-dimensional picture and display it on a PGholographic pyramid, but I was unsatisfied with the non-convincing result. I spent some time researching them and found that they store directional information in the chemical composition of the material. I then looked into how digitally to store directional information using lenses. I discovered the plenoptic Lytro camera which took photos that capture this information using micro-lens arrays. I found that micro-lens arrays can be used to not only capture light information but display them as well. This is my attempt to replicate how directional light information can be projected digitally.

## **73. Engaging the iPad Generation: The Impact of Technology on Students**

*Callie Baumberger, Piper Wentz, Education*

**4:05–4:25 \* Room 208**

As technology continues to develop, it becomes more integrated with every aspect of our lives. Students today are “digital natives” in this technologically-saturated environment, and so the growing impact of technology is particularly apparent in the field of education. This presentation offers commentary on effectively infusing technology tools, such as the iPad and Google Classroom, within the pedagogy of teaching and learning. Utilizing relevant literature, this presentation discusses the psychological and societal effects of educational technology on student learning and development.

## **74. The Seven Calls**

*William Medina, Theodore Hanman, Music*

**4:05–5:35 \* O’Malley-McAllister Auditorium**

This project aimed to explore the musical composition process with an emphasis on scriptural text. The research involved was in three parts: on the Book of Revelations chapters eight through ten, on extended trumpet playing techniques, and on extended musical notation techniques. Chapters eight through ten of the Book of Revelations tells of the seven trumpets that will be blown by the seven angels heralding different stages of the end of the world. This text was the inspiration behind the music. Study of the Book of Revelations also led to studying the reflections and explanations of theologians in regards to the text. The research of extended trumpet playing techniques has been an ongoing project. After having studied the historical significance and role of the trumpet, I then studied what the future significance and role of the trumpet can be. Mixing the past role of the trumpet with its possible future was also a goal of this project. The use of extended technique introduces the need for new notation—the old notation doesn’t have any way of

explaining what the new technique is. Research into this topic led to the discovery of a lack of a standardized library of notation symbols.

Using knowledge gained in trumpet lessons, orchestration, and drum corps, the researcher began working on the composition process by deciding to write music for trumpet, timpani, and bass drum. The researcher has spent time with each instrument to learn the behavior of the instruments and how they can work together.

## **75. Forest Wanderer**

*Margaret Boone, Sarah Vall, William Medina, Rebecca Chouinard, Jenna Rudolph, Alexandria Schneider, Michaela Bretey, Trini Crocker, Marcela Heffernan, Stephanie Nelson, David Hall, Christopher Greco, Music*

**4:05–5:35 \* O’Malley-McAllister Auditorium**

“Forest Wanderer” is an original composition by Margaret Boone. This Discovery project is an extension of my lessons in Musical Composition. Throughout this process, I explored various techniques of instrumental composition. I utilized instruments I have not previously worked with, as well as worked to craft a larger, more in-depth piece for a chamber ensemble. Throughout the semester, I studied scores by Igor Stravinsky, James Macmillan, and Edgard Varèse. I studied various twentieth century methods from “Techniques of the Twentieth Century Composer” by David Cope. I also researched to find new techniques and ways of enriching compositions and worked with musicians in rehearsals to bring my music to life.

“Forest Wanderer” begins with a light movement, incorporating cluster chords and extramusical ideas represented by the instruments. The second movement features pentatonic elements and is more strict. The third movement is distinctly Phrygian. The final movement closes in a minor, water-like manner, ending with the bells as it began. The entire piece is extremely contrapuntal with several themes that weave in and out per movement.

The additional part of this project is the art. Throughout the composition process I envisioned a story that the music expresses. Sarah Vall worked to capture my vision through art. Each of these four paintings represents a different movement of the piece, a different chapter of the story.

## **76. “Talking Cities”: An Exploration of Indeterminacy**

*Alexandria Schneider, Christopher Greco, Music*

**4:05–5:35 \* O’Malley-McAllister Auditorium**

American composer John Cage established the era of Indeterminacy, a process whose outcome is unpredictable in regard to one or more musical parameters. Indeterminacy in the compositional process allows the composer to suspend control, causing any combination of pitches, registers, dynamics, articulations, and durations to come about. Cage was the first to use the “I Ching,” a Chinese book of oracles, as a tool to create music determined by chance. Using a similar process of indeterminacy, a quarter, a die, and a deck of cards, “Talking Cities” was

composed as an original work for the clarinet. The presentation of this project will consist of an introduction to Indeterminacy as well as its reception and evolution through its short history. The digital premiere of “Talking Cities” will follow a look into its creation and inspiration.

## **77. Sentiments of the Soul**

*MeiLi Kok, Stephanie Nelson, flute; Isabella Coccia, piano, Christopher Greco, Music*

**4:05–5:35 \* O’Malley-McAllister Auditorium**

This presentation and performance of an original composition for flute and piano is based on a classical tonal language in two A-B-A structured movements: “Song of Lament,” which is in the key of B-flat minor, and “Song of Joy,” composed in D-flat major, the relative major of B-flat minor. “Song of Lament” demands a lyrical feeling and style from the flute in a minor key, while “Song of Joy” requires a lighter and more classical style in a major key.

The first movement is tonally focused, never leaving the key of B-flat minor. The second movement references the first movement by modulating to the key of B-flat minor within its B section. Upon returning to the A section, a modulation takes place in the original key of D-flat major.

Throughout my composition studies, I have analyzed scores by composers Aaron Copland and Johann Sebastian Bach. I have also studied and composed in a number of compositional techniques, including broadening my harmonic vocabulary and creating clearer, more lyrical musical lines to achieve a cohesive larger scale tonal piece.

“Sentiments of the Soul” captures the human condition’s deepest longings and emotions, throughout the ups and downs of the human psyche. Dedicated to my mother, Tamara Kok, who by going through life’s challenges with a joyful demeanor, was the inspiration for these movements.

## **78. The U.S. Corporate Tax Rate: Time for a Change**

*Nicholas Callaghan, Susan Traffas, Michael King, Chris Glenski, Political Science, School of Business*

**4:35–4:55 \* Room 109**

Stories abound of corporations paying less than they should on taxes, profits being kept overseas, and tax havens being used to avoid paying any taxes at all. Recent examples include the attempted inversion of Pfizer and allegations of Apple paying less than they should on their U.S. taxes. This presentation will look at how corporations are using U.S. and international tax codes to reduce their tax receipts and why simplifying these codes might help solve some of these problems. Using data and research from policy think-tanks and related scholars, I examine why the U.S. Corporate Tax Code needs to change, using three points of reform as a basis: 1) reduce the U.S. Corporate Tax rate, 2) change from a worldwide to a territorial tax system, and 3) allow for full deduction of capital investments. I examine why these three points are applicable today in talking about corporate tax code reform and how they can be beneficial in boosting economic growth long term.

## 79. Christian Dietrich Grabbe

*William Green, Scott Cox, Theatre Arts and Dance*

4:35–4:55 \* Room 124

Was Christian Dietrich Grabbe robbed of the fame and recognition that his theatrical themes and techniques should have earned him? Brechtian Epic Theatre techniques are some of the most influential theatrical inventions of the 20th century. Bertolt Brecht is given credit for these techniques, yet it seems to me that Grabbe laid the foundation well over a hundred years prior. By analyzing the works of Brecht, one can see that many elements of his aesthetic were already laid out in the writings of Grabbe. For example, a key Brechtian characteristic is a scene should be a narration of the action rather than its being acted out. A critic of Grabbe once wrote: “he does not write dramatically; he only describes dramatically.” Whether Brecht copied Grabbe or not, the man that is known for this technique is not the first one to use it. A direct comparison of elements of Brecht and Grabbe’s theoretical writings and dramatic literature will demonstrate whether or not this “drunken Shakespeare” of the 1800’s, Grabbe, was upstaged.

## 80. St. John’s Research and Restoration Project

*James Sowinski, Mary Bugos, Joseph Wurtz, John Haigh, Bryan Park, Gregorian Fellows, Architecture, Art*

4:35–4:55 \* Room 125

St. John the Baptist Church in Doniphan, Kansas, was constructed in 1867 by Benedictine monks and Catholic settlers. The town of Doniphan died, and the church is the last remaining structure from this period, so it carries significant historical and cultural value as well as religious significance. St. John’s has not seen much use since 1980, and the building has received minimal maintenance since that time. The objective of this project was to answer the following question: *How can we restore the interior of the church to a pre-1900s state that reflects the historical intentions of the monks and settlers?* We completed this project with cooperation and assistance from the Architecture Department, St. Benedict’s Abbey, the Gregorian Fellows Program, and the local community.

We began answering this question by researching the history of the Abbey, the ghost town of Doniphan, and numerous other churches started by the monks. To accomplish this, we met with abbey archivist Fr. Denis to examine various photographs and documents in the Abbey archives relating to St. John the Baptist and surrounding parishes. Visiting many of these churches gave us a better understanding of trends in color and ornamentation. This research helped us know in a general way how an older, Benedictine parish should look, but to answer fully the question above, our group had to look deeper, by examining and restoring St. John’s Church.

To do this, we tore down all of the old plastering and paint, assessed what remained of the original ornamentation detail and stencil work, and physically uncovered detail that was previously unknown. For example, the removal of plastering in

the sanctuary area revealed a previously covered window above the High Altar, and careful paint scraping and chemical paint removal enabled us to determine the color of historic paint, stain, and stencil work. This process also completed the demolition necessary for restoration. This investigation discovered what the people who built the church intended it to look like.

Next, we began to restore the church. Volunteers plastered the walls and determined paint colors. Determining the paint and stain color scheme required us to hire and consult an architecture professor, examine the quality and type of original woodwork, and match colors present in the wood ornamentation and stained glass. We then compared these colors to those that were used historically. This moved the investigation to a deeper level because it required us to go beyond the question of *what* had been done historically to discover *why and how* this was done.

Our presentation will present the findings of our research and then examine the current status of restoration efforts.



# *Notes*



• Keynote Address: **Robert S. Lanciotti, Ph.D.** •  
O'Malley-McAllister Auditorium

	FLC 109	FLC 124	FLC 125	FLC 208	FLC 219	FLC Gangel Seminar Room
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3:35–3:55	Huntley <i>Surviving Sexual Assault</i> Schmidt (65)	Wells <i>Fork It Over</i> Coronado (66)	Gross <i>Caring for Dying Patients</i> Spiering (67)	Starrs <i>Holier Than Thou: Are Certain Personalities Holier Than Others?</i> Sienkiewicz (68)		<b>St. Benedict's Church</b> Eisenmenger <i>The Virtual Choir</i> Tharaldson (69)
4:05–4:25	Vonnahme <i>The Economics of Abortion</i> Young, J. (70)	Nguyen <i>From Fury to Jury: Staging Aeschylus' Eumenides</i> Mulholland (71)	Pugh <i>Holographic Computer Screen</i> Dunleavy (72)	Baumberger <i>Engaging the iPad Generation</i> Wurtz (73)		<b>O'Malley-McAllister Auditorium</b> Medina <i>The Seven Calls</i> Hamman (74)
4:35–4:55	Callaghan <i>The U.S. Corporate Tax Rate: Time for a Change</i> Traffas (78)	Green, W. <i>Christian Dietrich Grabbe</i> Cox (79)	Sowinski <i>St. John's Research and Restoration Project</i> Wurtz (80)			Boone ----- <i>Forest Wanderer</i> Greco (75) ----- Schneider <i>Talking Cities: An Exploration of Indeterminacy</i> Greco (76) ----- Kok <i>Sentiments of the Soul</i> Greco (77) (4:05–5:35)

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