

LUTHER COLLEGE

To the Luther Community:

Welcome to the annual Student Research Symposium at Luther College, one of the highlights of our academic year. The day will be filled with oral presentations, posters, hands-on demonstrations, and artistic performances that demonstrate the life of discovery, reflection, and creation that Luther students pursue under the inspired and skillful guidance of our faculty.

The day begins with a plenary session for all to share, and this year we have chosen two outstanding student projects to be presented to the community as the “keynote” addresses. The first is a joint project by three students analyzing the history, identity, and community role of Decorah’s own local food cooperative, the Oneota Co-op—demonstrating the insights that can be gained through close study of local culture. The second is an analysis of efforts to control the spread of the most prevalent mosquito-borne viral disease that affects humans, dengue fever—illustrating the important contributions that the field of applied mathematics can make to global public health issues.

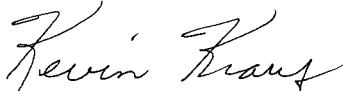
The opening session this year also celebrates the leadership of President Richard Torgerson as he ends his tenure at Luther this summer after 14 years of service. In recognition of his commitment and tireless efforts on behalf of student learning and research opportunities at Luther College, it is fitting to honor him on this day and to provide this opportunity for the community of students, faculty, staff, and friends of the college to express our gratitude. During this convocation, Norwegian Honorary Consul Quentin Boyken will award President Torgerson the Royal Norwegian Order of Merit, on behalf of His Majesty King Harald V of Norway. Following the session, the entire community is invited to a reception in honor of President and Mrs. Torgerson on Bendahl Commons in the center of campus.

The reception is followed by multiple sessions of talks, posters, and performances by many of the top students at Luther in majors across the college. Session topics and descriptions of each presentation are included in this program. In addition to these sessions, please see also the separate brochure listing sessions that feature the top research papers from our common first-year spring course, Paideia 112: Enduring Questions.

The day will conclude with two evening performances: Offenbach’s comic opera *Orpheus in the Underworld*, performed by students in our music program’s opera workshop; and the contemporary play *Arcadia*, by Tom Stoppard, presented by students in our visual and performing arts program.

We are delighted that you have joined us today to see and to celebrate the fruits of our students’ labors this academic year.

Sincerely,



Kevin Kraus
Dean of the College

STUDENT RESEARCH SYMPOSIUM

SESSION I: 9:00 – 10:15 A.M.

OPENING CONVOCATION: CELEBRATION AND KEYNOTE ADDRESSES

Center for Faith and Life Main Hall

Special presentation to President Richard Torgerson

“*More Than a Cooperative: The Role of the Oneota Co-op in the Decorah Community,*”

Melanie Grangaard '13, Matthew Lind '13, Adam Sorenson '14

“*Optimal Control of Dengue Fever Epidemics,*” Shane Wilson '13

Collegiate Chorale (Andrew Last, conductor)

COMMUNITY GATHERING 10:15 – 11:00 A.M.

Bendahl Commons, central campus

Reception in honor of President and Mrs. Torgerson

SESSION II: 11:00A.M.–NOON

<i>Dahl Centennial Union, Peace</i>	<i>Dahl Centennial Union, Mott-Borlaug</i>	<i>Center for Faith and Life Recital Hall</i>	<i>Olin 101</i>	<i>Olin 102</i>	
Inclusion, Exclusion, and Liberation	Engaging Youth	Muskets, Mormons, and Heretics	App Happy	From Medicine to Poetry	

COMMUNITY LUNCH: NOON–1:00 P.M.

Bentdahl Commons, Central Campus

SESSION III: 1:00–2:00 P.M.

<i>Dahl Centennial Union, Peace</i>	<i>Dahl Centennial Union, Mott-Borlaug</i>	<i>Center for Faith and Life Recital Hall</i>	<i>Olin 101</i>	<i>Olin 102</i>	
Frankly Francophone	Health and Healing in South Africa	Exploratory Oratory	Second Language Acquisition	Bright Numbers, Bright Stars	

SESSION IV: 2:15-3:15 PM

<i>Dahl Centennial Union, Peace</i>	<i>Dahl Centennial Union, Mott-Borlaug</i>	<i>Center for Faith and Life Recital Hall</i>	<i>Olin 101</i>	<i>Olin 102</i>	
Examining Catholic Europe	Poverty and Human Rights	Living Live in Decorah	App Happy Too	Soil, Food, and Population	

SESSION V: 3:30–5:00 P.M.

Poster Session in Sampson Hoffland Laboratories Carlson Atrium/Valders Hall of Science concourse

Posters, with refreshments, demonstrations, and chamber music ensembles

EVENING EVENTS: 7:30 P.M.

Opera Workshop Performance: *Orpheus in the Underworld* (Center for Faith and Life Main Hall)

Theatre Performance: *Arcadia* (Center for the Arts Jewell Theatre)

DAY-AT-A-GLANCE

	<i>Olin 107</i>	<i>Preus Library, Hovde Lounge</i>	<i>Jenson-Noble Recital Hall</i>	<i>Language Learning Center, Main 215</i>	<i>Valders classrooms</i>
	Liberating Lit	(De)constructing Gender	Copeland, Cowboys, and Communism	VoiceThreads	Paideia 112 Research (see separate brochure)
	<i>Olin 107</i>	<i>Preus Library, Hovde Lounge</i>	<i>Jenson-Noble Recital Hall</i>	<i>Center for the Arts, Studio II</i>	<i>Valders classrooms</i>
	Matters of Life and Death	Power and Identity	Culture and Composition	Empathetic Kinesthetics	Paideia 112 Research (see separate brochure)
	<i>Olin 107</i>	<i>Preus Library, Hovde Lounge</i>	<i>Jenson-Noble Recital Hall</i>		<i>Valders classrooms</i>
	Que(e)rying Culture	Arts and Community	Concert, in Concert		Paideia 112 Research (see separate brochure)

SYMPOSIUM SCHEDULE

9:00–10:15 A.M.
SESSION I

Center for Faith and Life Main Hall
**Opening Convocation: Celebration and
Keynote Addresses**

- **Special presentation to President Richard Torgerson**
- **More Than a Cooperative: The Role of the Oneota Co-op in the Decorah Community**, Melanie Grangaard, Matthew Lind, Adam Sorenson
- **Optimal Control of Dengue Fever Epidemics**, Shane Wilson
- **Collegiate Choir (Andrew Last, conductor)**

10:15–11:00 A.M.

Bentdahl Commons, central campus
Community Gathering
Reception in honor of President and
Mrs. Torgerson

11:00 A.M.–NOON
SESSION II

Dahl Centennial Union, Peace
Inclusion, Exclusion, and Liberation
Faculty Moderator: Britt Rhodes

Maia Mastel
The Old as Vessels

Tyler Funke
Throwing a Cyberball: The Effects of Social
Exclusion

Emily Streeper
Women in Business: A Perpetual Evolution?

Dahl Centennial Union, Mott-Borlaug
Engaging Youth
Faculty Moderator: Stephanie Travers

Saheka Smith
That's Real: The Effectiveness of Hip-Hop
Therapy with Troubled Youth

Chelsey Kohnen
Power Struggles in Paradise: Engaging Youth
Toward Solutions in Kashmir

Rachel Miessler
Empowering Youth in Service and
Leadership: Global Linked-Decorah

Center for Faith and Life Recital Hall
Muskets, Mormons and Heretics
Faculty Moderator: Robert Shedinger

Daniel Hess
The Rifle Musket: Its Use and Effectiveness
During the American Civil War

Austin Swenson
The Causes of Anti-Mormon Reaction in the
19th Century

Nicholas Erickson
Heresy as Defined by American Churches
During the First World War

Olin 101
App Happy
Faculty Moderator: Kent Lee

**Nathan Haines, Alysse Haferman, Scott
Gerike, Erik Streufert**
Construction Management Web Application

**James Penning, David Duba, Zack Kuntz,
Andrew Zutz, Brit Indrelie, Charles Banta,
Tim VanCleave, Joel Anderson**
NorseSquare

Olin 102
From Medicine to Poetry
Faculty Moderator: Clara Van Zanten

Alexander Greiner
The Pathogenic Actin Mutation E117K
Exhibits Aberrant Behavior

Charlie Bruer
Long Term Outcomes of Infants Who
Aspirate

Virginia Morrell
Collected Poems on the Human Condition
and My Experiences as a Student Nurse

Olin 107

Liberating Lit

Faculty Moderator: Peter Scholl

Kathleen Towell

Text as a Vehicle of Oppression and Liberation

Chelsea Tegels

What's Really Happening at Dover

Lauren Nielsen

90 Degrees of Square Stories

Preus Library, Hovde Lounge

(De-)constructing Gender

Faculty Moderator: Matthew Simpson

Sarah Webb

Gender Constructions: Viability of the Male Pill

Mara Dobervich

The Male Pill: Male Attitudes Toward Hormonal Contraception

Aaron Budihis

Queering the College Dorm: Social Space and the Constitution of the Gendered Subject

Jenson-Noble Recital Hall

Copeland, Cowboys, and Communism

Faculty Moderator: Laurie Iudin-Nelson

Kiki Cavanagh

Feminine Music: Does Gender Affect the Act and Teaching of Music Composition?

Tara Laughlin

The Americana Genre: An Adventure into Libby Larsen's *Cowboy Songs*

Jake DeBacher

Exploring the Development of the Soviet Union's Arts Culture through Case Studies in Piano Literature

Language Learning Center, Main 215

VoiceThreads

Faculty Moderator: David Thompson

Allison Wright

VoiceThread Tutorials for Spanish Language Learners

Valders Classrooms

Paideia 112 Research (see separate brochure)

NOON-1:00 P.M.

Bentdahl Commons, Central Campus

Community Lunch

1:00-2:00 P.M.

SESSION III

Dahl Centennial Union, Peace

Frankly Francophone

Faculty Moderator: Anne-Marine Feat

Chelsea Tegels

Louis-Philippe's Impartiality in Fragmented Paris

Matthew Lind

The French Headscarf Affair: Muslim Identity in Secular France

Kimberly Rooney

The Reconciliation of *Laïcité* and Islam in Senegalese Education

Dahl Centennial Union, Mott-Borlaug

Health and Healing in South Africa

Faculty Moderator: Maryna Bazylevych

Sarah Floden

"If I Test, I Will Be Destroyed": The Role of Trust in South Africans' Willingness to Test for HIV

Amanda Schaefer

Gaining Prestige and Power Amidst Gender Inequality: The Predominance of Female Sangomas in KwaZulu-Natal, South Africa

Maria Brown

Is There a Place for *Sangomas* and Traditional Healers in the Future of Biomedicine?

Lindsey Colyer

Analysis of Traditional Healers as Preferred Healthcare Practitioners

Chloe Gumpert

Education as the Key to a "Healthy" Partnership: The Interactions Between Western and Traditional Medicine in KwaZulu-Natal, South Africa

Center for Faith and Life Recital Hall

Exploratory Oratory

Faculty Moderator: Jennifer Cantine

Jordy Barry, Tiffany Ackerman, Erik Ehresmann, Ethan Bettenga, Jake Putnam, Rachel Williams, Max Kemp, Jason Leuthold, Tyler Anderson, Ruonan Zheng, Shelly Yao

Exploratory into the Oratory: The Trials and Tribulations of Luther's Pioneering Speech and Debate Team

Olin 101

Second Language Acquisition

Faculty Moderator: Laurie Zaring

Sarah Corfman

The Impact of Phonetics and Comparative Linguistics on American English-Speakers' Pronunciation of Chinese

Aaron Kvale

The Nature of Lexical Entries in the Bilingual Mental Lexicon

Olin 102

Bright Numbers, Bright Stars

Faculty Moderator: Jeff Wilkerson

Jenny Rustad

Coloring by Numbers: Proving van der Waerden's Theorem Using Recurrence Properties

Clara Olson

Classifying Abrupt Stellar Signal Changes

Donald Lee-Brown

Modeling Long Period Variables Discovered in the Field of Open Star Cluster M23

Olin 107

Matters of Life and Death

Faculty Moderator: Nancy Gates Madsen

Kirsten Hash

Hamlet's Fall: The Unjust Deaths of Rosencrantz and Guildenstern

Andrea Malek

The Inescapable Force: Manipulation in *Rosaura a las diez*, by Marco Denevi

Callie Mabry

The Connections between Nature Imagery and Themes of Mortality and Survival in Juan Rulfo's Photography and Narrative, "No oyes ladrar los perros"

Preus Library, Hovde Lounge

Power and Identity

Faculty Moderator: Hongmei Yu

Michelle Boike

Exploring Race, Power, and Oppression in the Harry Potter Series

Aaron Budihis

Heterosexuality: Discipline, Habit, and Identity

Benjamin Nordquist

Women's Education in Postconflict Iraq

Jenson-Noble Recital Hall

Culture and Composition

Faculty Moderator: Michael O'Brien

Victor Hernandez-Sang

New and Changing Performance Contexts for the Dominican *Fiesta de Palos*

Kimberly Osberg, Daniel Gallagher, Aaron Mertenich, Emily Wonder, Leif Larson

Defined by Darkness: A Crossroad of Musical Elements

Daniel Gallagher, Bianca Najera, Victoria Nelson

An Exploration of Contemporary Flute Repertoire Through the Performance of László Zempléni's *Trio for Flutes*

Center for the Arts, Studio II

Empathetic Kinesthetics

Faculty Moderator: Amanda Hamp

Katie Wicklund

Tappin' Out Differences: How Tap Dance Steps toward Cultural Integration in America

Calli Micale

Unwrapping the Essence of God with Bodily, Phenomenological Epistemology through Touch Practices

Joshua Dale

An Integrated Body for the Empathetic Singer

Valders Classrooms

Paideia 112 Research (see separate brochure)

2:15–3:15 P.M.
SESSION IV

Dahl Centennial Union, Peace
Examining Catholic Europe

Faculty Moderator: Sean Burke

Tyler Simpson

Singing Their Way to Hell: Spreading the Reformation Through the Hymns of Martin Luther

Stephen Uhl

A Ceremony of Carols

Kevin Wenger

Franco, the Spanish Family, and the Catholic Church: the Transition's Impact on the Modern Spanish Family

Dahl Centennial Union, Mott-Borlaug

Poverty and Human Rights

Faculty Moderator: Brian Caton

N'sira Kourouma

The Idea of the West Alleviating Poverty in Developing Countries is Almost a Conspiracy

Natalino Guterres

Development Issues and Plan for East Timor

Darren Wang

A Policy Analysis on the 1951 Convention Relating to the Status of Refugees in the Context of Hong Kong

Center for Faith and Life Recital Hall

Living Live in Decorah

Faculty Moderator: Don Jones

Kirk Lehmann

More Than the Java Jive: Coffeehouses in Decorah

Michael Crowe

Documentary Filmmaking: A Study in Producing Creative Nonfiction Films

Lindsay Sheridan, Dan Fernelius

Water Street Music Series: Connecting Communities through Social Entrepreneurship

Olin 101

App Happy Too

Faculty Moderator: Michael Johnson

Vivek Bisen, Thupstan Chotak

Create your Wish List

Hannah Ranum, Jake Nowosatka, Evan

Larson, Matt Rubins, Zachary Hruska

Epic Study! An Online Application to Manage and Study Flashcards

Olin 102

Soil, Food, and Population

Faculty Moderator: Beth Lynch

Luke Hanson

Soil and Subsidies: An Analysis of Chemical and Non-Chemical Agricultural Systems in Indian Punjab

Daniel Schoess

A Population Assessment of the Upper St. Croix River Lake Sturgeon

Tess Romanski

The Motivations for Local Food Production in Northeastern Iowa

Olin 107

Que(e)rying Culture

Faculty Moderator: Ginger Meyette

Alicia Findley

Same-sex Marriage in Minnesota: Discriminatory Problems with a Simple Solution

Marley Crossland

Institutional Obstacles as Systematized Oppression: Difficulties in Constructing Lesbian Parent Families

Sophia Brown, Charles Banta

LGBT Social and Political Views in Europe and the Mediterranean

Preus Library, Hovde Lounge

Arts and Community

Faculty Moderator: Kate Elliott

Aaron Zauner

Student Curators in the Classroom: *The Barbizon School—An Invented France*

Ashley Wright

The Nonprofit and the Theatre: An In-depth Examination of the Des Moines Community Playhouse

Lindsay Sheridan

The Saint Paul Chamber Orchestra

Jenson-Noble Recital Hall

Concert, in Concert

Faculty Moderator: Ruth Caldwell

Karla Dietmeyer

Communication in Small Ensembles:
A Vocabulary for Student Musicians

Phuc Phan

Whose Piece Is It, Anyway?

**Maxwell Lafontant, Kimberly Osberg,
Sydney Kjerstad, Jordan Buchholtz**

Collaboration in Concert

Valders Classrooms

**Paideia 112 Research (see separate
brochure)**

3:30–5:00 P.M.
SESSION V

Sampson Hoffland Laboratories Carlson

Atrium/Valders Hall of Science Concourse

Poster Session

Posters, with refreshments, demonstrations, and
chamber music ensembles

*Faculty Moderators: Kirk Larsen and Laura
Peterson*

Hannah Axt

Dancing with Bach: How Traditional
Baroque Dances Influence the Flutist's
Performance of Baroque Music

Joseph Ballandby

Stratigraphic Analysis of Speleo Alluvial
Sediments in Grotta della Beata Vergine
di Frasassi

Andrew Bentz

Management of Non-native, Invasive
Pastinaca sativa (wild parsnip) Using Multiple
Control Methods

Maria Brown

The Role of Nurses in Educating and
Managing Diabetic Individuals during
Ramadan

Rebekah Campbell

HIV in Adolescents

Nicholas Erickson

German Songs in World War I

Hannah Fisher

Chemical Composition of Mineral Water and
Its Relation to Bedrock, Agriculture, and the
Sustainability of a Source

James Flanary

Correlation of Testosterone and Progesterone
with Schadenfreude

Hylia (Shibo) Gao

The Development of Energy Storage PEDOT
Nanofiber-Structured Super Capacitors by
Electron-Spinning Technique

Dan Gibson, Joe Marshall

Imaging Tardigrades Using Scanning Electron
and Light Microscopy

**Chloe Gumpert, Peter Douglas, Nicole
Woodson, Timothy Cutler**

Substituted Glycolides Derived from Fatty
Acids as Potential Monomers for the
Production of Biodegradable Polymers

**Marcus Hanson, Hannah Myott, Bjorn
Myhre**

Bertolt Brecht's epic play, *Leben des Galilei*

Meredith Hoyland

Exercise Habits in Young Adults: The
Relationship Between Physical Activity and
Cognitive Well-Being

Madeline Lambert

Ignatian Examen

**Katy Lindstrom, Jonathan Nerdig, Emily
Kratovil, Brian Kurtz, Marty Mitchell**

Use of Human Gesture and Gaze
Information in a Two-Choice Hidden Food
Task by Blue Jays

Erik Linn-Molin

The Surprisingly Reversible Frictional
Properties of Aluminum Oxide

Sarah McRoberts

The Effects of Boundary Conditions
in Conway's Game of Life

Victoria Nelson

Can Supermodels Make You Feel Sick?
Perceived Vulnerability to Disease Triggered
by Seeing Extremely Underweight People

**Jacob Nowosatka, Joel Anderson, Charles
Banta, Vivek Bisen, Thupstan Chotak,
David Duba, Scott Gericke, Alysse
Haferman, Nathan Haines, Zach Hruska,
Brit Indrelie, Zach Kuntz, Evan Larson,
James Penning, Hannah Ranum, Matt
Rubins, Erik Streufert, Tim Van Cleave,
Andrew Zu**

Computer Science Senior Project
Demonstrations

Jacob Nowosatka, Helen Van Der Griend
An Exploration of Beauty: Thomas Mann's
Death in Venice

Alexandra Nyman
Music and Emotion: Physiological and
Cognitive Response to Differing Minor Keys

**Ann Okoneski, Nikki Thompson,
Anuradha Anatharaman**
Forgiveness and Physical and Mental Health
Across Cultures

Calla Olson
Comparing the Effect of Native and
Introduced Grasses on the Development of
Two Grass Skippers (*Lepidoptera: Hesperinae*):
the Least Skipper (*Anycloxypha numitor*) and
Sachem Skipper (*Atalopedes campestris*)

Charlotte Page
Nursing Implications for Addressing Poor
Health Literacy in The United States

**Katie Perschbacher, Nick Andresen, Jessica
Ulrich**
The Effect of N6-methyladenosine in Target
mRNAs on the Binding Affinity of RISC-
miRNA Complex

Trinda Phelon
Osteopathic Veterinary Medicine: A
Comparison of French and North American
Cultures.

Mackenzie Pierson
Knee Injury Prevention in Female Athletes:
Based on a 12-Week Weightlifting,
Conditioning, and Plyometric Program

Nicole Powers
General Morphology of Late Holocene
Diatom Frustules from Lake Bottom Cores

**Ellen Pritchard, Gabe Dorn, Logan
Kochendorfer**
Run Like the Wind, Bull's Eye: A Study
of Motivation's Effect on Performance

Amanda Schaefer
Molecular Mechanisms of Benzo[a]pyrene's
Increase in HPV Oncoprotein Expression:
Connecting Cigarette Smoking, HPV, and
Cervical Cancer on a Molecular Level

Laura Swanson, Melene Thompson
Calcium-regulated Gene Expression in *Vibrio
parahaemolyticus*

Kaila Vogt
Gall Fly (*Eurosta solidagini*) Affects Seed
Production in Goldenrods (*Solidago altissima*)

Matthew Weitzel
Altering Natural Foot Strike Pattern
Decreases Running Economy

Jessica Zenchak
Public Health Implications of Drinking
Water Pollutants in Brittany, France

Samuel Zook, Ellen Behrens
Effects of North Atlantic Oscillation on
Precipitation and *Quercus Cerris* (Turkey
Oak) Growth Near Frontale, Italy

**Additional poster displays presented by
students from the following classes:**

Biology 112: Insects, Humans and the
Environment

Biology 239: Restoration and Conservation
Biology

Biology 239: Biophysics

Biology 354: Evolutionary Biology

Math 358: Chaotic Dynamical Systems

Psychology 353: Social Psychology

Physics 385: Astrostatistics

Physics 282: Modern Physics II

7:30 P.M.

OPERA PERFORMANCE

Center for Faith and Life, Main Hall
Orpheus in the Underworld

See synopsis, p. 40

7:30 P.M.

THEATRE PERFORMANCE

Center for the Arts, Jewell Theatre
Arcadia

See synopsis, p. 40

PARTICIPANTS AND ABSTRACTS

Arranged alphabetically by student last name, and for presentations involving more than one student, arranged by lead student's last name (alphabetically within presentation)

HANNAH AXT '14

Dancing with Bach: How Traditional Baroque Dances Influence the Flutist's Performance of Baroque Music

On Feb. 23, I attended the 2013 Iowa Flute Festival at Grinnell College, which hosted students and professionals from the University of Iowa, Iowa State University, University of Northern Iowa, Drake University, Grinnell College, and many other schools. This year's theme, Flute Out of the Box, strove to teach flutists new and innovative ideas for interpreting and performing flute repertoire. I had been preparing a Bach piece from the baroque era in the weeks before my attendance, and one of the master classes I participated in was centered around how baroque dances influenced the composition and performance of baroque flute music. In the 21st century, baroque dances have fallen away from public knowledge, but taking the time to research them (and even learn to dance them!) provides vital help to the musician in understanding the theory behind a piece, as well as in giving a better performance. My presentation will be a display on a few of the most popular baroque dances and how they relate to Bach's Partita in A minor for flute.

Faculty sponsor: Carol Hester

JOSEPH BALLANDBY '14

Stratigraphic Analysis of Speleo Alluvial Sediments in Grotta della Beata Vergine di Frasassi

Part of the karstic Frasassi cave system in the Marche region of Italy, the Grotta della Beata Vergine di Frasassi contains a rich deposit of sediments that until now has been relatively unstudied. A clear stratigraphy that measured around four meters was recorded and analyzed, with 12 representative samples being sieved and then analyzed under petrographic and stereo microscopes. Sieving revealed that all layers were rich in clay-sized particles, with layers containing between 61.55 and 99.98 weight-percent clay. Petrographic microscopy showed that all samples contained at least 75 percent carbonate materials (limestone, calcite, and fossils), while stereo microscopy was used to

extract ostracods from the sample. Observation of the grain composition revealed the presence of foraminifera, radiolarians, silicate minerals, and pelagic limestones, all of which are foreign to the immediate region surrounding the cave. Coupled with the presence of ostracods and fish teeth, it is apparent that these are alluvial sediments, deposited during a time when the river ran at the same elevation as the cave.

Faculty sponsor: Laura Peterson

JORDY BARRY '15

TIFFANY ACKERMAN '15, TYLER ANDERSON '15, ETHAN BETTENGA '16, ERIK EHRESMANN '15, MAX KEMP '16, JASON LEUTHOLD '16, JAKE PUTNAM '15, RACHEL WILLIAMS '15, SHELLY YAO '16, RUONAN ZHENG '15

Exploratory into the Oratory: The Trials and Tribulations of Luther's Pioneering Speech and Debate Team

Luther's Speech and Debate team was approved in February of 2012, with an executive board to efficiently plan tournaments as well as teach the structure of each event. Our three central goals were to gain visibility on campus, build a sustainable team, and conduct outreach to other college forensics teams. We set out to determine the intricacies involved in creating a competitive team and competing in collegiate-level speech and debate events. Through the year, we realized the importance of team cohesion. When team members work together and share ideas, they are more likely to be successful. We also learned the importance of distinguishing between personal and professional relationships (since most members of the team are friends as well as teammates), discovering that incorporating the strengths of both relationships helped make the team more successful. Finally, we learned at our first tournament that there are rules that exist outside of the rulebook. As a result, we learned from our mistakes and began learning the norms of speech and debate. In this presentation, we will discuss the creation, competitions, and dynamics of the team, as well as perform snippets from some of the events in which we've competed.

Faculty sponsor: Kim Powell

ANDREW BENTZ '13

Management of Non-native, Invasive *Pastinaca sativa* (Wild Parsnip) Using Multiple Control Methods

Mortality of non-native, invasive species can result from targeted death of the entire plant, but also from methods that damage regrowth, by severing active growth from resources stored in roots. Monocarpic perennial species may be more vulnerable to loss of stored resources, especially if treated after flower-stalk bolting, when a majority of resources are stored aboveground and root resources are no longer available to the growing plant. *Pastinaca sativa* is a monocarpic perennial and problematic invasive species in Iowa grasslands, but quantitative tests of its effective control are rare. To compare management methods, we applied three alternate control measures to *P. sativa* after flower-stalk bolting, systemic herbicide, root cutting that separated aboveground vegetation from the root below the soil surface, and scything that removed most aboveground vegetation but did not sever the root. Abundance of *P. sativa* was measured before and after treatments in five-by-five-meter treatment plots. After two years of treatments, abundance of *P. sativa* was significantly reduced using all control methods. Our results support the conclusion that severing aboveground vegetation from stored resources in roots can have similar results as use of herbicides.

Faculty sponsor: Molly McNicoll

VIVEK BISEN '13

THUPSTAN CHOTAK '13

Create Your Wish List

For our senior project in computer science, we created a website that lets a user (wisher) create a list of gifts that they would like to receive for a certain occasion. We knew the basic functionalities that we wanted to include and started with a sketch of the website. With HTML and JavaScript code, we made the basic building blocks of our application. As we needed more functionalities, we learned programming languages PHP and jQuery. Toward the end, we thoroughly tested our code for marginal cases that may potentially break our program. The website lets users (wishers) create a list of gifts that they would like to receive for an occasion. Once the wishlist is created, two links are generated, one for gifters and the other for the wisher. When gifters click the link, they see a webpage with gifts selected by a wisher and can select a gift that they wish to offer. They have to provide a

passcode so that their gift preference is locked. When others go to that link, they will see the rows of other gifters and their gift preferences and can do the same. The wishers can go to their side and administer the table. They can add or remove gifts.

Faculty sponsor: Kent Lee

MICHELLE BOIKE '13

Exploring Race, Power, and Oppression in the Harry Potter Series

The Harry Potter series by J. K. Rowling has gained international fame and attention within the last decade. The books touch on themes such as power, love, friendship, and forgiveness. My research focuses on how the themes of race, power, and oppression affect the three main characters, Harry Potter, Ron Weasley, and Hermione Granger. The three are from different backgrounds, and these themes affect each of them differently. Many readers have connected well with the characters in this series, and it is important to think about the implications of that for our society. Why are the struggles of these characters affecting readers, especially young readers, so forcefully? How have racial conflicts, power struggles, and oppression in these books affected our society, and what does it say about the world we live in today? My research will consider and explore these ideas using the Harry Potter texts, criticism of the books, and ideas and texts from the field of social work that touch on these issues. My findings will hopefully shed light on ways in which popular literature is a mirror for society and the implications that holds.

Faculty sponsor: Lise Kildegaard

MARIA BROWN '13

Is There a Place for *Sangomas* and Traditional Healers in the Future of Biomedicine?

Is there a place for *sangomas* and traditional healers in the future of biomedicine in Africa? This is a question being asked by many traditional healers, biomedical experts, Africans, anthropologists, students, and more. More than 10 years ago, the idea of collaboration between traditional healers and biomedicine would have shocked many. Because of the HIV/AIDS and tuberculosis epidemics, collaboration has been happening in a few areas of South Africa, but without this epidemic, would these two health systems be working together? Once the epidemic is controlled, is there a role for traditional healers in the future of biomedicine? If there is a role,

how would it look? The answer to the question is not a simple yes or no, nor is it a black-and-white consideration. This paper attempts to answer this question based on the ethnographic research conducted during the 2013 January Term course, Culture and Healing in South Africa. Research methods include personal interviews, fieldwork observations, shared experiences from peers, lectures of local scholars and experts, and previous academic research.

Faculty sponsor: Maryna Bazylevych

MARIA BROWN '13

The Role of Nurses in Educating and Managing Diabetic Individuals during Ramadan

In today's health care environment, an awareness of cultural diversity is necessary to interact with individuals and understand their health needs. People who practice Islam make up one-quarter of the world's population. For non-Islamic health care providers, including nurses, awareness of Islamic beliefs is critical owing to the nature of Ramadan, one of Islam's practices. Ramadan, the Islamic Holy Month, entails fasting and abstaining from worldly privileges for 28–31 days from sunrise to sunset. Fasting is expected of any healthy adult. Diabetics are considered exempt, although many still participate. The diabetics who fast during Ramadan need continuous observation while fasting. Without proper care and management, a diabetic's health during Ramadan may be compromised, and that can lead to repercussions such as hyperglycemia, hypoglycemia, or dehydration. Nurses have a vital role in education and management of diabetes during the Holy Month of Ramadan. This poster summarizes the role of nurses, the importance of nurses leading education, and recommendations for managing diabetes during Ramadan. This is the culmination of a senior project.

Faculty sponsor: Corine Carlson

SOPHIA BROWN '13

CHARLES BANTA '13

LGBT Social and Political Views in Europe and the Mediterranean

For January Term 2013, we proposed an independent study to explore lesbian, gay, bisexual, and transgendered social and political issues in Europe. We conducted interviews with various human rights organizations, agencies, and citizens that helped us learn about their personal perspectives and the societal views of their country. Our interviews addressed LGBT social

and political issues in each of the eight countries we visited (Italy, Greece, Turkey, Germany, France, Portugal, the Netherlands, and the United Kingdom) and helped us gain an understanding of the origin and variety of views held in other cultures. In each country, we approached our interviewees with questions ranging from religious involvement and curriculum in schools to military procedure and legislation (marriage, civil union, tax benefits, etc.), documenting their responses through both video and paper. The findings we gathered provide viewpoints that expand our understanding of the global LGBT community.

Faculty sponsor: Ben Moore

CHARLIE BRUER '13

Long-Term Outcomes of Infants Who Aspirate

Neonates and young children presenting with oral-motor dysfunction and difficulty swallowing foods and liquids are at high risk of repeatedly aspirating those substances into their respiratory tract. While most infants who aspirate do so secondary to another diagnosis, some are afflicted with chronic aspiration as a primary diagnosis (unexplained aspiration). To evaluate the effectiveness of preventative therapies on improving the outcome of nonsyndromic infants diagnosed with chronic unexplained aspiration, the medical records of infants identified with the condition were retrospectively reviewed to determine the progression of their chronic aspiration. Co-morbidities were reviewed to minimize the inclusion of patients diagnosed with aspiration secondary to another diagnosis. Infants, aged birth to six months and born at 30 or more weeks gestation were eligible to be included in the study. A total of 43 patients met inclusion criteria. 97.6 percent (42) of the charts reviewed showed resolution of the chronic aspiration, within 18 months, following standard treatment. Just 2.4 percent (1) of the charts reviewed exhibited continued aspiration and a failed resolution of the symptoms. These findings suggest that nonsurgical, preventive therapies are successful at not only correcting unexplained aspiration but also at preventing costly and painful surgical procedures.

Faculty sponsor: Mark Eichinger

AARON BUDIHAS '15

Heterosexuality: Discipline, Habit, and Identity

The nature of sexuality is a controversial topic relevant to all areas of society. Of particular

interest is the origin of sexual identity. While there is an ever-growing literature related to sexual minorities, marginalization, and deviancy, I hope to continue the effort to denaturalize heterosexuality by exploring sexual identity as a practice of internalized bodily discipline situated within discourses of power. In this study, I will attempt to answer the question: How do individuals in the West come to think of themselves as heterosexual? The paper will illustrate how an individual may construct a heterosexual identity, consciously or not, in relation to the social and cultural discourses of the individual's environment. I will rely upon the theoretical contributions of Michel Foucault to understand how power constitutes identity, Pierre Bourdieu to illustrate how the discursive individual embodies and experiences social imperatives, and Judith Butler to examine both the relationship between heterosexuality and gender coherence and also the space for individual agency in sexual identity. This exploration will illuminate the very social and political character of something as personal as sexual identity.

Faculty sponsor: Maryna Bazylevych

AARON BUDIHAS '15

Queering the College Dorm: Social Space and the Constitution of the Gendered Subject

Gender segregation of public space is a ubiquitous and often unacknowledged aspect of contemporary American society. From bathrooms to college dorms, changing rooms to the military, American social space is divided along gendered lines. Explanations for such segregation include appeals to correct sexual conduct, morality, increased productivity in education, or just simple "decency." While much other research involves examining the validity of the previous claims, my paper will use gender segregation in college residence halls to examine the nature of the interaction between the gendered subject and the gendered social space. I will argue that such segregation, by organizing and disciplining social life, actually plays a role in constituting the gendered subjects it supposedly segregates. The role of gender-segregated college residence halls in promoting coherently gendered subjects, obviously man or obviously woman, will be explored through the experiences of transgender and queer individuals. This exploration will implicate gendered social space as a contributor to social inequality and oppression.

Faculty sponsor: Holly Moore

REBEKAH CAMPBELL '13

HIV in Adolescents

It is estimated that 76,900 adolescents aged 13 to 24 in the U.S. were living with human immunodeficiency virus (HIV) at the end of 2008. It is believed that more than half of all HIV-infected adolescents are unaware that they are HIV positive, and have never been tested for the disease. Although there is no cure for HIV/AIDS, early diagnosis and careful treatment can extend the life expectancy greatly. Delayed treatment places these adolescents at risk for HIV complications and decreases life expectancy, which is a public health concern. The purpose of this presentation is to provide information about the risks and prevalence of HIV in adolescents in the United States and to make nursing recommendations to address this public health concern.

Faculty sponsor: Angela Kueny

KIKI CAVANAGH '13

Feminine Music: Does Gender Affect the Act and Teaching of Music Composition?

When thinking about famous composers, the vast majority that come to mind are men whom society and history have projected as "the most important." Society seems to project women differently in regard to music, even suggesting at times that women compose differently than men; in history, it was thought that women could not teach composition. Through the study of Nadia Boulanger's impact on Aaron Copland's musical development and my own experience as a female composer, I argue that there are issues with this idea that have been held as truth throughout history. Although musical structure and subject matter can suggest the "female experience," there are always other factors to consider. The male influence on music can also be reflected upon. Further study into the topic forces people to reflect on how a person's individual experiences, including time and place, affect musical composition. This presentation will include visual and auditory musical examples.

Faculty sponsor: Amy Engelsdorfer

LINDSEY COLYER '15

Analysis of Traditional Healers as Preferred Health Care Practitioners

It is believed that as many as 80 percent of South African people consult traditional healers, either in addition to or instead of "Western" biomedical physicians. Even when health services

are accessible, millions of people still choose to confer with traditional healers. Why do so many South Africans choose to go to traditional healers for their health care needs rather than physicians, who use modern, scientifically proven medicines and treatments? Based upon my experience interacting with traditional healers and “Western” physicians in KwaZulu-Natal, South Africa, I will attempt to explain the reasons for seeking traditional healers for health care needs in terms of accessibility to quality care, cultural competency, and understanding of illness, and what implications these factors have for the future of the health care system in South Africa. In a newly democratic nation overwhelmed by an HIV/AIDS epidemic and associated opportunistic infections, being able to understand health-seeking behaviors among a majority of the population is crucial to maximizing treatment and healing.

Faculty sponsor: Maryna Bazylevych

SARAH CORFMAN '13

The Impact of Phonetics and Comparative Linguistics on American English Speakers' Pronunciation of Chinese

Learning a foreign language as an adult can be challenging, especially when seeking to produce a native-like accent. Chinese poses particular difficulty for speakers of American English; the sounds of the language and the concept of tone are completely foreign to an English speaker ... or are they? Research in second-language acquisition suggests that people learning Chinese as a second language find tone and oral stop consonants to be challenging. Recordings of Luther students confirm this observation and reveal other difficulties as well. In this study, I develop tutoring methods based on the comparative articulatory phonetics of English and Chinese. I work with current Luther students learning Chinese to investigate common errors they make and to explore the usefulness of applying cross-language comparison and description of physical production of speech sounds. Finally, I determine the effectiveness of this strategy in helping them overcome pronunciation difficulties.

Faculty sponsor: Laurie Zaring

MARLEY CROSSLAND '15

Institutional Obstacles as Systematized Oppression: Difficulties in Constructing Lesbian-Parent Families

In this essay, I examine the unique challenges

presented to lesbian couples trying to reproduce through adoption or assisted reproductive technologies with a health care system that functions through heteronormativity and privileges biological relatedness. I argue that some of these challenges are in fact a form of systematized discrimination against lesbian couples and are a result of the rhetoric, which is thought eliminated by some, that lesbian couples cannot function as parents in the same way that heterosexual couples can. I highlight these challenges to point out the reform that must take place within the reproductive health care system, and I offer suggestions as to what type of reform may be effective. I arrive at these conclusions by drawing on both original research and literature within the fields of anthropology and queer studies. This research focuses only on the developed Western world and does not address the social and economic privilege that reproducing requires when one identifies as lesbian, which is a separate, though pressing, issue.

Faculty sponsor: Maryna Bazylevych

MICHAEL CROWE '13

Documentary Filmmaking: A Study in Producing Creative Nonfiction Films

Documentary filmmaking has been described as creative nonfiction for the visual medium. As a result, storytellers in this medium must consider not only the story they tell, but the methods they utilize in telling it. Working as partners last summer, Thomas Johnson and Michael Crowe sought to examine the intricacies of documentary filmmaking as creative nonfiction. To do this, they produced three short, single-subject documentary films that examine where Luther professors find balance in their daily summer routines. Through this project, they explored the ethics and mechanics of portraying real-life characters on screen, and the importance of the production process, including scripting, research, preproduction, production, and postproduction. Additionally, they scrutinized the manner in which the different aspects of a documentary work together to effectively move the viewer, including music, visuals, and structure. This presentation will include a short screening of films, with a discussion of filmmaking methods and a Q&A to follow.

Faculty sponsor: Thomas Johnson

JOSHUA DALE '14

An Integrated Body for the Empathetic Singer

Throughout the Western history of the art form, singing has developed and expanded, moving from the church to the concert hall and secular stage. This has entailed a move from viewing the voice as a spiritual phenomenon to seeing it as a worldly expression. The singer must also change along the way. In opera, musical theatre, and experimental performance work, the singer is asked to cross and blend disciplines. While singing is already a physical activity, classical training does not allow for the physical expansion and dexterity required of these interdisciplinary forms. With six student and faculty musicians as participants, I will demonstrate the integration of kinesthetic movements and vocal onset and will identify human developmental patterns that empower the individual to meet new physical demands. Drawn from pedagogical sources in both music and somatics, practice methods include exercises that focus on the breath, integrate breath with movement, and involve repetition of developmental movement patterns and phonating and sustaining sound while moving. This practice opens pathways for expression and enables the individual to make physical and theatrical choices while singing, allowing the singer to be more fully present in performance.

Faculty sponsor: Amanda Hamp

JAKE DEBACHER '13

Exploring the Development of the Soviet Union's Arts Culture through Case Studies in Piano Literature

The relationship between the Soviet government and its artists is enormously complex and frequently paradoxical. Nonetheless, it was an important period for artistic development that saw first an intensely progressive experimentalism and then a regression to very conservative tendencies with a utilitarian bent. Typically, this period is explored in a way that neglects the early 20th century and the social contexts from which the Soviet Union emerged, focusing rather on the series of arts policies developed in the 1930s and 1940s. I believe a more accurate and complete portrait can emerge from an approach that extends from the convergence of socio-historical trends and music written in the period. Piano music was the form that allowed composers the most intimacy, and thus is the most valuable tool for exploring the Soviet progression. My approach uses Nikolai Myaskovsky to examine the unique Conservatory culture that existed

before the Soviet revolution; Sergei Prokofiev as a demonstration of the ambiguous culture before precedents were set in Soviet doctrine; Dmitri Shostakovich as an example of what resulted under the Stalin regime's iron fist; and German Galynin as proof of the repressed avant-garde.

Faculty sponsor: Jim Griesheimer

KARLA DIETMEYER '13

**Communication in Small Ensembles:
A Vocabulary for Student Musicians**

For a music student, playing in a chamber ensemble is one of the most gratifying experiences available at college. What musicians sometimes forget, though, is that there is more to ensemble playing than simply being able to read the notes. Constructive communication in a small ensemble is key to having a successful experience. In this project, research was done to identify the necessary elements of communication among members of an ensemble, and the results are a new vocabulary for student musicians. Using personal experiences as well as scholarly articles regarding general communication in addition to communication between musicians, I devised a definitive vocabulary of my own design. The vocabulary includes two specific skill sets: ensemble skills and social skills. Each skill set has three subsets that further break down: ensemble skills contain speech, visual, and connection skills; social skills contain leadership management, trust, and awareness skills. This research and resulting vocabulary demonstrates the necessity for musicians, especially students, to understand these aspects of communication in order to have a successful chamber ensemble.

Faculty sponsor: Amy Engelsdorfer

MARA DOBERVICH '13

**The Male Pill: Male Attitudes toward
Hormonal Contraception**

The "male pill"—the oral contraceptive pill for men—has been ready to test for product safety for 20 years. Study trials have shown that male hormonal contraceptives are not less safe than female contraceptives, and yet our society has not taken steps to make this alternative option a reality. Advertising for male hormonal contraception has been aimed primarily toward white, married men. As a college student with concerns about sexual activity and the use of female oral contraception, I question what holds our culture back from furthering research on options for young men. I will argue that despite

the related health concerns, the main reason for difference in availability between male and female hormonal contraceptives is cultural and institutionalized gender roles. This study will be based on research on contraceptive testing, advertising strategies, and survey results of college-age males' attitudes toward male hormonal contraception. In addition, the complications of advertising male contraception to college-age consumers will be discussed.

Faculty sponsor: Maryna Bazylevych

NICHOLAS ERICKSON '13

Heresy as Defined by American Churches during the First World War

When the United States entered World War I in April of 1917, its government immediately took steps to ensure that the nation would support the cause wholeheartedly and without question. This was achieved through legislation that limited civil liberties and a massive propaganda campaign. America's churches, forsaking separation of church and state, allied with the government and played a key role in the dissemination of propaganda. In this paper, I explain the extent of the church/government collaboration, and illustrate my point using two case studies: the wartime sermons of evangelist Billy Sunday, and the opinions of the students and faculty at Luther College (as an institution owned and run by a Lutheran synod). My research draws extensively from Sunday's notes, which are contained in his archive (available on microfilm). Luther College's newspaper, *College Chips*, also provides extensive examples of the ways in which this issue was debated at the time. The study will demonstrate that America's churches eventually equated patriotism with religious righteousness, and Germany with the Devil and his minions in Hell, ultimately transforming World War I into a literal holy war.

Faculty sponsor: Marv Slind

NICHOLAS ERICKSON '13

German Songs in World War I

Among those things that World War I is remembered for is its music. Songs like "Over There" and other allied tunes have become part of popular patriotic repertoire. But absent from most of the participants' cultural memory are the German songs of the period. This aspect of World War I has been overlooked, and little study, if any, has been devoted to determining the German mindset through the study of

popular war tunes. My research was conducted with the goal of examining the lyrics of these long-forgotten songs in order to develop a tool by which they can be examined and classified in order to better understand the German mindset of the period. I assembled a corpus of 49 German soldiers' songs to translate and examine. I then set about identifying common themes and moods. Ultimately, 12 rhetorical themes and seven moods were identified, which I believe represent the whole of the thematic pool on which popular German songwriters of the period drew. Each song is assigned one mood and may contain several rhetorical themes. Once mood and themes are identified, patterns begin to emerge that define the rhetorical boundaries that songwriters generally adhered to during the war.

Faculty sponsor: Soeren Steding

ALICIA FINDLEY '13

Same-Sex Marriage in Minnesota: Discriminatory Problems with a Simple Solution

As support for gay rights increases across the United States, states like Minnesota are being criticized for their policies involving same-sex marriage. The Minnesota Defense of Marriage Act (DOMA) specifically bans marriage between individuals of the same sex and defines marriage as between a man and woman. There are nearly 14,000 same-sex couples in the state that are denied rights on a daily basis because they are not married. This policy analysis addresses the issues related to same-sex marriage in Minnesota at the present time. The analysis focuses on the Minnesota DOMA and the proposed constitutional amendment involving the definition of marriage that was voted on by citizens in the 2012 election. For same-sex marriage to be legal in Minnesota, the state DOMA would have to be repealed, the constitutional amendment had to be defeated, and state statutes involving rights with marriage should be examined and revised. Based on this policy analysis, recommendations for change are discussed.

Faculty sponsor: Ginger Meyette

HANNAH FISHER '14

Chemical Composition of Mineral Water and Its Relation to Bedrock, Agriculture, and the Sustainability of a Source

Mineral water is not just plain tap water, as most people may think. Mineral water, by law, must

come from an underground source, which means that the water also contains many dissolved minerals. These dissolved minerals tell a story. We gathered 19 samples of mineral water and looked at the mineral contents of each. We looked at the potassium, silica, and total dissolved solids of each sample. In comparing the samples we looked at the bedrock, the agricultural effects, and the sustainability of the industry. We found that the mineral content of the water correlated with the mineral types in the bedrock. We also found that with large amounts of agriculture around the location came larger amounts of minerals that are found in fertilizers. Using our criteria for what defines an older source versus a younger source (amounts of total dissolved solids and concentrations of nitrates and sulfates), we found that none of our sources would be considered old sources, meaning that they were sustainable sources.

Faculty sponsor: Laura Peterson

JAMES FLANARY '13

Correlation of Testosterone and Progesterone with Schadenfreude

The goal of the study is to assess whether the feeling of schadenfreude (delight in the fall of others) is correlated with or predicted by baseline testosterone or progesterone levels in males. We distinguish between two forms of schadenfreude that vary in their level of maliciousness (second- and third-party forms). This distinction is made because the two forms may be differentially associated with testosterone and progesterone. In the current study, subjects will participate in a rigged game of jeopardy over a period of two days. In the first day, they will lose a game of jeopardy to a confederate (second party) whom they later see lose at a subsequent jeopardy game. On the second day, participants will be exposed to the loss of a third party competing in the tournament who, although not directly competing against the participant, is viewed as a rival. Saliva samples will be taken at the beginning of both days to measure baseline hormones. In addition, samples will be taken after exposure to the loss of the confederate, when the Freudenfreude and Schadenfreude Test (FAST) will be given.

Faculty sponsor: David Bishop, Mark Eichinger

SARAH FLODEN '15

“If I Test, I Will Be Destroyed”: The Role of Trust in South Africans’ Willingness to Test for HIV

This paper explores the role of trust in South Africans’ health-seeking behavior as it pertains to HIV testing. I argue that mistrust is a real and destructive force in the lives of South Africans. I examine trust-related issues present in various spheres of human relationships, including sexual relationships, the family unit, regional South African communities, and South Africans’ interactions with the global community. I clarify mechanisms of mistrust created by the frequency of polygamous sexual relationships, the disease etiology of traditional South African medicine, and remnants of apartheid, and show how each instance of mistrust discourages South Africans from testing for HIV. My research is based on ethnographic fieldwork data collected in the South African provinces of Western Cape and KwaZulu-Natal in January of 2013. I gathered information from semistructured interviews, informal conversations, presentations by local experts, and the previous work of medical anthropologists. In light of these findings, I further conclude that *sangomas*, highly respected and trusted members of African society, have an important role to play in dismantling mistrust and bringing HIV tests to those who need them.

Faculty sponsor: Maryna Bazylevych

TYLER FUNKE '13

Throwing a Cyberball: The Effects of Social Exclusion

This research was to replicate Kipling D. Williams’s cyberostracism study. The TRIM-18 and offense-specific forgiveness measures were added to determine if social exclusion affected participants’ forgiveness levels toward those who excluded them. Cyberball was used to simulate social inclusion or exclusion. Ninety participants were randomly assigned to the control or experimental group. Control-group participants received the ball 25 percent of the time and were equally included among other players. Experimental-group participants received the ball 5 percent of the time immediately after the game began, signifying active social exclusion. Before playing cyberball, subjects filled out a pre-experimental questionnaire containing Rosenberg’s self-esteem scale and questions taken from Williams’s study measuring belongingness, meaningful existence, control, self-esteem, and mood. There was no statistically significant effect

on the independent variables. The effect size of exclusion was largely significant ($r^2 = 0.40$). This shows participants in the experimental group felt extremely excluded ($F(1,39) = 30.231, p < 0.001$). Group cohesion between groups also showed a significant effect ($F(1,39) = 5.578, p = 0.023$). The results of this study seem counterintuitive because previous studies on social exclusion have shown exclusion significantly affecting participants' mood, sense of control, and belonging. The effect size of this study implies participants felt extreme exclusion with no effect on other variables.

Faculty sponsor: Loren Toussaint

DANIEL GALLAGHER '14
BIANCA NAJERA '13,
VICTORIA NELSON '13

An Exploration of Contemporary Flute Repertoire through the Performance of László Zempléni's *Trio for Flutes*

On Feb. 23, our group performed László Zempléni's *Trio for Flutes* in the Iowa Flutists in Concert portion of the 2013 Iowa Flute Festival at Grinnell College. The theme of this year's Iowa Flute Festival, Flute Out of the Box: New Paths for the 21st-Century Flutist, aimed to expand participants' musicianship and understanding of flute playing through the presentation of workshops and master classes focusing on baroque and contemporary flute music. In the Iowa Flutists in Concert portion of the festival, faculty members as well as graduate and undergraduate student groups from the University of Iowa, Iowa State University, the University of Northern Iowa, Drake University, Grinnell College, and Luther College performed flute repertoire from these two vastly different musical genres. Our presentation will be a performance of the second and third movements from László Zempléni's *Trio for Flutes*. Zempléni, a contemporary Hungarian composer, presents characteristics of contemporary music through his compositional techniques in this work, including sharp dynamic contrasts between the different voices, syncopated accents, and the persistent "bickering" of themes and motives across all of the voices.

Faculty sponsor: Carol Hester

HYLIA (SHIBO) GAO '14 The Development of Energy Storage PEDOT Nanofiber-Structured Super Capacitors by Electron-Spinning Technique

Science has allowed solar power to be transformed into electricity and stored in

nano-structured fibers. Nanofibers have been put into many fields of application due to their flexibility, diversity in shape, and variety of different characteristics based on their polymer properties. In this research, PEDOT (poly 3, 4-ethylenedioxythiophene) nanofibers are hypothesized to have a significant amount of capacity, especially due to their high porosity. The flexibility of PEDOT also made it a high-quality weaving material. The fiber was generated by electron-spinning technique, which involves drawing fibers from liquid chemical solutions in high voltage via electrostatic interactions. The fiber was then made into electric devices by assembling three layers of material together: aluminum foil used as electron-spinning collector, the PEDOT nanofibers as active material, and polyacrylonitrile (PAN) nanofiber membranes as the separator. The capacity test showed positive results, which demonstrated the ability of PEDOT nanofibers to store large amounts of electricity. This electrical storage ability is of very practical use. For example, clothing made of this type of fiber may allow people to charge their phones or use the electricity stored for emergency purposes.

Faculty sponsor: Brooke Shields

DAN GIBSON '15
JOE MARSHALL '14

Imaging Tardigrades Using Scanning Electron and Light Microscopy

Tardigrades, commonly referred to as water bears, are microscopic metazoans that are ubiquitous across the planet. They are famous for their ability to enter anhydrobiosis, a state in which they lose more than 90 percent of their body water and virtually stop metabolic function. This state is incredibly durable and may be maintained for several decades. The objective of this study was to find local tardigrades and develop methods for imaging them with light and scanning electron microscopy. Methods of isolation were refined throughout the process, becoming more efficient with experience and novel techniques. Wet mounts were used for compound light microscopy imaging. Tardigrades for electron microscopy imaging were preserved in Karnovsky's fixative and prepared for SEM. The species under observation was identified down to the genus level. Images also revealed several anatomical structures in great detail.

Faculty sponsor: Robert Fitton

MELANIE GRANGAARD '13
MATTHEW LIND '13,
ADAM SORENSON '14

More than a Cooperative: The Role of the Oneota Co-op in the Decorah Community

Over the past several decades, the Oneota Food Cooperative has evolved from a small buying club to a successful and popular Decorah institution. Our study addresses the changes that have taken place in defining the identity of the co-op and its relationship to the Decorah-area community. It asks specifically how the role of the co-op has changed to accommodate a changing membership and surrounding community. Using interviews with current and former co-op members and leaders, and documents from throughout the co-op's history, the study will demonstrate that while the co-op has changed its structure, it has nevertheless maintained its fundamental ecological and social identity. The findings suggest that the combination of continual core values and financial and membership growth have been largely responsible for fixing the co-op as a regional institution that greatly impacts the culture of the Decorah area.

Faculty sponsor: John Moeller

ALEXANDER GREINER '14
The Pathogenic Actin Mutation E117K Exhibits Aberrant Behavior

Actin, an essential protein found in mammalian cells, is associated with critical cellular functions. Actin in *Saccharomyces cerevisiae* (baker's yeast) is 89 percent similar to a form of human actin, making it ideal for the study of actin mutations. Actin mutations in humans can have profound physiological effects, and are implicated in aortic aneurysm and nonsyndromic hearing loss. In addition, the β -actin mutation E117K causes symptoms similar, but not identical to, Baraitser-Syndrome, a severe developmental disorder. E117 lies in the helix of amino acids 113–118, in which are located many pathogenic mutations. E117K mutant cells exhibit decreased growth and reduced mitochondrial function. In this study, the effect of the E117K mutation on the building (polymerization) of actin chains (polymers) was studied. Abnormal results from UV studies designed to determine the amount of E117K actin present after purification from yeast cells suggested the presence of a contaminant, which we hypothesized to be RNA. The successful removal of RNA resolved issues causing aberrant behavior in E117K actin. These data suggest the E117K mutation is pathogenic in nature. This

severe change in actin characteristics may be responsible for the drastically altered growth of cells containing this mutant protein.

Faculty sponsor: Brad Chamberlain

CHLOE GUMPERT '14
Education as the Key to a “Healthy” Partnership: The Interactions between Western and Traditional Medicine in KwaZulu-Natal, South Africa

A dichotomy currently exists within the South African medical system, comprising biomedical physicians and traditional healers. Efforts in the province of KwaZulu-Natal have been made to bridge the gap between these areas of health care to help conquer various health issues, especially HIV/AIDS, as 80 percent of the population in this province call on traditional healers for various health issues, including HIV. My research explores these interactions, focusing on the question: Is it in the public health system's best interest to further utilize traditional healers in cooperation with biomedicine to combat the HIV epidemic in South Africa? Etiologies and methods of treatment for HIV in both traditional and Western medicine will be discussed. Current programs working toward a partnership between both areas of care will then be explained and critiqued. Future action will ultimately be proposed, with a final goal of hindering the spread of HIV and providing the most proficient treatment available for those in need. This research is based on ethnographic research conducted in South Africa, including at traditional-healing schools; a large public hospital in Pietermaritzburg, KwaZulu-Natal province, which serves a region of more than 900,000 people; the hospital's surrounding clinics; and numerous encounters with the people residing there.

Faculty sponsor: Maryna Bazylevych

CHLOE GUMPERT '14
TIMOTHY CUTLER '13, PETER DOUGLAS '14, NICOLE WOODSON '13
Substituted Glycolides Derived from Fatty Acids as Potential Monomers for the Production of Biodegradable Polymers

Biodegradable polymers derived from renewable resources provide a foundation for sustainable commercial technologies. These technologies, in turn, alleviate environmental problems associated with the increasing demands of industrialized society for carbon-based chemical

processes. Recently, rapid advances have been made in the development of biodegradable polymers, most notably the commercialization of polylactide. Polylactide (PLA) is a polyester with considerable potential in fiber, film, and packaging applications. It is prepared via the ring-opening polymerization of D,L-lactide, a cyclic ester ultimately derived from the fermentation of corn. Despite its promise, PLA may presently displace only a limited range of petroleum-based products. Several strategies have been employed to modify the physical properties of PLA (such as the softening temperature). One strategy alters the three-dimensional orientation of the methyl substituents along the polymer chain; considerable effort has been devoted to controlling PLA microstructure. Another strategy replaces some or even all of the methyl substituents on the polymer chain with bulkier groups. Herein we report our efforts to prepare an analog of D,L-lactide, ditetradecylglycolide, which is ultimately derived from palmitic acid, a fatty acid that is readily obtained from botanical sources. Upon polymerization, ditetradecylglycolide is expected to yield a new bio-based polymer with a potentially expanded range of physical properties.

Faculty sponsor: Brad Chamberlain

NATALINO GUTERRES '13

Development Issues and Plan for East Timor

After gaining its freedom from Indonesia—a long process that took an estimated 250,000 civilians and damaged much of the country's infrastructure—East Timor, one of the world's newest nations, became one of the poorest countries of Southeast Asia, with 41 percent of the population living below the poverty line. The challenges were potentially overwhelming: one of the poorest economic indicators in Southeast Asia, one of the world's highest fertility rates and maternal/infant mortality rates, high numbers of youth unemployment, and poor quality of education and health services. Today, East Timor is an emerging economy that attracts many foreign investors, thanks to its considerable wealth of natural resources such as oil and gas. However, due to problems such as corruption, foreign exploitation, and inequality, East Timor has a lower-middle-income economy and is positioned 147th on the Human Development Index, indicating a low level of human development. Using both facts and reading materials by different development scholars, this study analyzes the different development issues

of East Timor from historical, cultural, political, and economic perspectives, and proposes a strategic development plan that covers three key areas—social capital, sustainable infrastructure development, and economic development—based on the development experience of other countries, both developed and developing.

Faculty sponsor: Victoria Christman

NATHAN HAINES '13

SCOTT GERIKE '13, ALYSSE

HAFERMAN '13, ERIK STREUFERT '13

Construction Management Web Application

For our senior project in computer science, we worked with Finholt Construction in Decorah to design and implement a web-management solution for the company. The solution integrates several technologies to accomplish this goal. We worked closely with the company manager to incorporate several features to streamline his document-exchange process. Previously, all construction documents were exchanged via e-mail, and our web system created a central repository where documents can be uploaded, created, and/or exchanged. We also implemented features to make it easier for the people involved in a project to communicate. This includes a project calendar as well as a news feed to alert users to recent activity within their projects. We also provide photo-upload capabilities using the photo-hosting site Flickr to reduce the strain on the company's storage space. This software will help Finholt Construction serve its clients more efficiently and effectively. Our presentation will showcase these features and will include a discussion regarding the development process that we followed from the beginning of the school year.

Faculty sponsor: Kent Lee

LUKE HANSON '14

Soil and Subsidies: An Analysis of Chemical and Nonchemical Agricultural Systems in Indian Punjab

In the 1960s, the government of India responded to severe food shortages by implementing large-scale, input-intensive farming systems in the north Indian state of Punjab, in what came to be known as India's "Green Revolution." Now the dominant system of agriculture in Punjab, it utilizes machinery, high-yielding hybrid seed varieties, and synthetic chemical fertilizers and pesticides to achieve high yields of major cash crops, especially wheat and rice. In recent years, however, this system of farming has come

under criticism, as yields have stagnated and as negative environmental, socioeconomic, and health impacts have been identified. This has led to a reemergence of “nonchemical farming” in Punjab, a system of agriculture that relies on nature instead of market inputs. This study observes the methods and inputs of chemical and nonchemical farming systems and closely analyzes their advantages and disadvantages. Finally, the study evaluates government policies and subsidies related to agriculture and suggests changes to encourage agriculture that is more environmentally and socioeconomically beneficial.

Faculty sponsor: Victoria Christman

MARCUS HANSON '13

BJORN MYHRE '16, HANNAH MYOTT '13

Bertolt Brecht's Epic Play, *Leben des Galilei*

We examined German playwright Bertolt Brecht's epic play, *Life of Galileo*, in the context of Brecht's own life, the context of his writing, and his obvious focus on the famous physicist Galileo Galilei. Most known for popularizing the heliocentric model of the solar system, Galileo also was among the first people to see the uses of the telescope. Faced with charges of heresy for outwardly denying the geocentric solar system model taught by the Catholic Church, he eventually recanted to avoid punishment. Brecht's play strongly promotes Marxist ideals and romanticizes scientific inquiry to serve as a tool of empowering the people and as an essential pursuit of knowledge. Other themes also focus on the role of citizens versus the power of government. We also looked into Brecht's use of the epic theatrical style. Finally, we examined the play's historical and contemporary critical reception—exposing the historical view that the play represented a critique of the Nazi regime—and its popularity, which persists to this day in both English- and German-speaking countries.

Faculty sponsor: Ruth Kath

KIRSTEN HASH '13

Hamlet's Fall: The Unjust Deaths of Rosencrantz and Guildenstern

William Shakespeare's celebrated play *Hamlet* is certainly a tragedy. Murder, revenge, and madness all make appearances early in the proceedings, and of course almost everyone dies by the end. Amid all that anguish, however, Prince Hamlet sending his school friends Rosencrantz and Guildenstern to their deaths proves the most troubling, and the most overlooked. Why did

Hamlet remorselessly arrange for their executions, and why aren't more people, both characters and audience members, more appalled at him for doing so? Were Rosencrantz and Guildenstern really that bad? This paper looks at the long line of literary criticism that has argued for and against the untimely demise of Rosencrantz and Guildenstern and concludes that the real tragedy of *Hamlet* is the Danish prince's fall from morality; Hamlet the victim becomes Hamlet the architect of death to innocents. In directly facilitating Rosencrantz and Guildenstern's deaths and not feeling any subsequent remorse, Hamlet demonstrates a newfound moral degradation rivaling that of Claudius. This study shows how the deaths of some seemingly minor characters are certainly not minor.

Faculty sponsor: Peter Scholl

VICTOR HERNANDEZ-SANG '13

New and Changing Performance Contexts for the Dominican *Fiesta de Palos*

Palo (long drum) music is an essential element of the rituals of the Afro-Dominican religion *La Veintiuna Division*. During these ritual celebrations, *palo* music facilitates communication between devotees and their *misterios*. Recently, *palo* musicians have also moved into secular settings, performing in nonliturgical contexts. Some *palo* ensembles have added new instruments to their music, which are not accepted in the sacred context. Nonetheless, the repertoire they perform stays the same in both contexts. This paper, based on two months of ethnographic field research in Santiago, explores the ways that *palo* musicians navigate these new professional contexts without alienating believers. Performing for believers and nonbelievers alike, they have developed discursive strategies and metaphors for their participation that allow them to generate these flexible identities as performers. Following Timothy Rice's model for subject-centered ethnography, I argue that these flexible metaphors and identities have developed in response to the specific sociohistoric context of the Dominican Republic, where expressions of African cultural ancestry were systematically denied by intellectuals and politicians alike. As a result, practitioners have developed a flexible and pragmatic approach to music in ritual context, and musicians have developed different discursive strategies to frame their professional activity in nonliturgical contexts.

Faculty sponsor: Michael O'Brien

DANIEL HESS '13

The Rifle Musket: Its Use and Effectiveness during the American Civil War

Technologies continue to evolve each day and affect every aspect of society. The largest technological improvement during the American Civil War was the use of the rifle musket. This study seeks to discover the overall impact the rifle musket had upon casualties, battlefield tactics, and the way war was fought. Through careful analysis of primary sources, secondary sources, archaeological studies, and studying the performance of 19th-century weaponry, I address the many factors that contribute to the rifle musket's effectiveness during the American Civil War. This research has shown that although the rifle musket is superior to the smoothbore musket, it was no more effective at the beginning of the war. However, by the end of the conflict its effectiveness increased and caused both armies to adapt their tactics. The findings in this research suggest that a new perspective of the effectiveness of the rifle musket needs to be taken into account, thus making further study necessary.

Faculty sponsor: Ed Tebbenhoff

MEREDITH HOYLAND '13

**Exercise Habits in Young Adults:
The Relationship between Physical Activity and Cognitive Well-Being**

Previous research has shown that older adults who engage in physical activity are more likely to keep a high level of cognitive function (the ability to attend to certain items while ignoring others) and are less prone to develop various illnesses as they age. While exercise has shown great cognitive benefit to the older adult population, little research has been done on the relationship between exercise and cognitive abilities in young adults. This study examined 50 Luther College students, asking them to complete four questionnaires about their current exercise and athletic habits, motivations for exercising, depressive symptoms, and demographics. Participants also completed the computerized Attention Network Test to examine their cognitive functions. The results of this study will have a great importance for the Luther community by demonstrating the relationship between exercise and mental processes, which may be extended to the relationship between physical activity and positive academic performance. In addition, this study will examine the relationship between exercise and depressive symptoms, which may give evidence for exercise

as a predictor of lower depressive symptoms and greater overall well-being of Luther students.

Faculty sponsor: Stephanie Travers

CHELSEY KOHNEN '13

The Place Where Hope Is Lost: A Conflict Resolution Model For Youth Empowerment through Peace Education in Kashmir

"If we are to reach real peace in the world, we shall have to begin with the children."

—Mohandas Gandhi

To what extent has the struggle of Kashmiri youth over the past century furnished a culture of violence within the volatile region of Kashmir? How does education shape the discourse for conflict and conflict resolution within the region, and to what extent does youth engagement through a holistic peace education approach help to combat these issues? Kashmir's identity is a torn portrait of heaven on earth and one of the world's most volatile and dangerous regions. Located in the mountains of the Himalayas, Kashmir has been a mainstay of conflict between the conflicting states of India and Pakistan for more than half a century after the Partition of 1947. As the death toll now stands at more than 35,000 people, the intractability of the issue and the stagnant peace progress has impaired any sense of hope for youth in Kashmir, and their vision for the future has dimmed. Although there are multiple options for pursuing conflict resolution, this paper will argue the potential for an insular peace education approach, engaging Kashmiri youth and empowering them toward development and forming a "culture of Kashmir." Based on extensive research and original data conducted through interviews with peace activists and Kashmiris, this paper aims to show the possible strategies for engaging youth toward empowerment in the peace process.

Faculty sponsor: Maryna Bazylevych

N'SIRA KOUROUMA '13

The Idea of the West Alleviating Poverty in Developing Countries is Almost a Conspiracy

The media have always portrayed Africa as a poor continent with no infrastructure and with a lack of civilization. My paper addresses the role the West, the World Bank, and the IMF play in eradicating poverty in developing countries. Focusing on sub-Saharan Africa, I want to know: Besides the lack of infrastructure and education, why are sub-Saharan countries not progressing?

My study examines the negative effects trade liberalization has on developing countries and the economic obstacles African countries have faced since liberalizing their trades in the 1980s. The paper elaborates how the World Bank and the IMF under the leadership of developed countries have been the source of the extension of poverty, unemployment, and inflation in developing countries. I argue that these organizations have put in place a system that puts economic pressure on African nations through trade liberalization in order to manage African resources for their own interests and to create a continuous economic dependency of African nations.

Faculty sponsor: Victoria Christman

AARON KVALE '15

The Nature of Lexical Entries in the Bilingual Mental Lexicon

Most study of lexical storage and retrieval has focused on the monolingual mental lexicon; the bilingual mental lexicon remains relatively unexplored. Thus, many questions remain regarding lexical organization in the bilingual lexicon. Do bilinguals form two separate monolingual lexicons or do they store words from both of their languages within a single lexicon? This paper argues that the bilingual lexicon is best represented as a mirror of the monolingual lexicon, but comprises components of two languages instead of one, as proposed by Lowie (2000). Support for this model comes from the studies of Marchman et al. (2010) and Kan and Kohnert (2008), which find that the vocabulary and lexical retrieval of bilingual children are only comparable to those of monolingual peers when both languages are taken into account, suggesting a link between languages in the bilingual lexicon. I also argue, however, that Lowie's (2000) model must be modified to allow for interactive activation in lexical retrieval. Drawing on evidence from Aitchison (2012) and Colomé and Miozzo (2010), I present an amended version of Lowie's (2000) model that allows us to capture both the similarities and the differences between the monolingual and bilingual mental lexicons.

Faculty sponsor: Laurie Zaring

MAXWELL LAFONTANT '13

JORDAN BUCHHOLTZ '13, SYDNEY
KJERSTAD '13, KIMBERLY OSBERG '14
Collaboration in Concert

We have collaborated on a compositional endeavor, specifically a piano duo, in which we

combine our unique compositional aesthetics to create an original piece of art that plays uniformly, yet displays each of our personal styles. In our presentation, we will discuss our method, exploring the challenges and advantages that arose from composing a piece together. We will present a visual representation of the score, highlighting relevant and interesting passages. Following our verbal and visual presentation, the work will be performed in its entirety.

Faculty sponsor: Steve Smith

MADELINE LAMBERT '14

Ignatian Examen

Ignatian spirituality is a religious guide to living in our everyday life. It incorporates prayer and decision-making based on spiritual processes. Research studies have been conducted to examine whether Ignatian spirituality is linked to forgiveness. Furthermore, forgiveness has been linked to numerous positive health benefits. There may be a possibility that the Ignatian practice referred to as the Examen is capable of bringing forth greater forgiveness and health. We are interested in assessing the relationship between self-forgiveness and Ignatian spirituality. We will be using the Ignatian Examen to analyze the relationship. In our study, we will first have participants take a pretest online. This pretest will assess forgiveness toward oneself. Next, we will randomly assign participants to either view the Ignatian Examen or view the control video (a tutorial on how to tie a tie). After the video, the participants will take a posttest assessing their forgiveness levels again. We hope to find a positive effect on forgiveness of the Ignatian Examen. Ignatian spiritual practices such as the Examen may have the potential to affect self-forgiveness, which is in turn beneficial to one's health and longevity.

Faculty sponsor: Loren Toussaint

TARA LAUGHLIN '13

The Americana Genre: An Adventure into Libby Larsen's Cowboy Songs

The Americana genre is near and dear to the heart of America. Many of America's most famous outlaws are represented in this genre of music. Libby Larsen's song cycle *Cowboy Songs* is an interpretation of the famous Americana/cowboy genre. Through the exploration of the history of the Americana/cowboy genre one can see the differences between each composer's interpretation. This study will explore the

differences between Larsen's song cycles and the telltale signs of the genre, using Larsen's *Cowboy Songs* and her own words as a jumping-off point to her place in the Americana genre. The research will be presented in the form of a lecture recital, in which there will be a performance of *Cowboy Songs* along with the background research and Larsen's point of view. I argue that the cycle fits well with the Americana genre, as it follows the classic indicators of the genre. It has its own quirks but is still remarkably similar to other Americana pieces.

Faculty sponsor: Amy Engelsdorfer

DONALD LEE-BROWN '13

Modeling Long Period Variables Discovered in the Field of Open Star Cluster M23

Long period variables (LPVs) are red giant stars with pulsating outer layers that cause the luminosities of the stars to change over time. Since existing LPV pulsation models are contradictory and the long-term evolution of these stars is poorly understood, Luther College has an ongoing project to identify and classify stellar variability in the field of open star cluster M23. We have identified 55 pulsating stars, 54 of them newly discovered, using the college's nine years of photometric data for more than 1,600 stars in the field containing the cluster. Periodicity analysis has allowed us to identify 17 stars that vary with a single period, 28 stars with multiple periods, and nine stars with no evidence of regular periodicity. Analysis of period ratios within the multiperiodic group strongly suggests that excitation of multiple harmonic modes is the reason for the stars' multiperiodic behavior. Amplitude and color trends suggest that irregular variables may evolve into stars with several excited modes before finally varying with a single dominant mode. Current efforts are focused on investigating the stars' various observed behaviors through use of a perturbed oscillator model.

Faculty sponsor: Jeff Wilkerson

KIRK LEHMANN '13

More than the Java Jive: Coffeehouses in Decorah

Looking at culture in its spatial context has always been important in the field of anthropology, but recently it has become a unique area of study. One aspect of spatial anthropology explores the interaction of the social production of space, or how the space is designed to be used, with the social construction of space, which is

characterized by the users' ideas and utilization of that space. Within this framework, my research explores how and why Decorah coffeehouses present themselves, and, in turn, how customers take these presented spaces and make them places by assigning meanings through their personal use and ideas. To examine this, I conducted ethnographic fieldwork including more than 20 hours of observation at Magpie Coffeehouse and Java John's and several interviews with owners, workers, and patrons. Results suggest that coffeehouses act as comfortable, safe, and informal spaces where social and business meetings can occur. However, they also supply semipublic spaces in which individuals can paradoxically be alone with others. This study highlights the diverse uses of coffeehouses in Decorah while illustrating the importance of these particular establishments in the larger community.

Faculty sponsor: Maryna Bazylevych

MATTHEW LIND '13

The French Headscarf Affair: Muslim Identity in Secular France

In recent years, France has passed legislation restricting the expression of its Muslims and prompted scholarship into the rise of Islamophobia across the West. The issue of headscarves in public schools has been a focal point for the conflict, which addresses issues of national identity, public policy, and secularism. This study explores the fundamental elements that inform the French anti-Muslim policy and distinguish it from policies and sentiments in other Western nations, particularly the United States. Using academic scholarship, news articles, and public discourse as represented by political speeches and polling, the project follows the historical and social development of French secularism and French responses to Muslim immigration. It finds that the core French values of *laïcité* and *citoyennité*, as well as classist and economic concerns, form the legal and social basis for French anti-Muslim rhetoric and policy. It also finds that historical immigration policies have largely prevented Muslim integration into society, and that economic and social changes in the past two decades have increasingly cast Muslims as unable to successfully internalize French values.

Faculty sponsor: Victoria Christman

KATY LINDSTROM '13
EMILY KRATOVIK '14, BRIAN
KURTZ '15, MARTY MITCHELL '13,
JONATHAN NERDIG '14

**Use of Human Gesture and Gaze Information
in a Two-Choice Hidden Food Task
by Blue Jays**

Gestures and gaze direction to draw attention to external objects are utilized by humans as part of communication. Some animals seem to understand or quickly learn the gesturing or gazing of humans in order to locate hidden food. We looked at the ability of blue jays to use human touch, pointing, and gaze alternation cues in a two-choice hidden food design. The experimenter touched, pointed to, or turned their head and looked at the correct location of hidden food for three seconds before allowing the bird to make a choice. One bird chose correctly using touch information significantly better than chance within the first block of eight testing days. The same bird also appeared to be learning point information by the third block, but developed health issues and stopped responding. A different bird appeared to be learning gaze information within the third block, however was very inconsistent in responding due to fear of the experimenter's movement and lack of motivation. The remaining two birds also had problems with fear and motivation. The contribution of these individual differences to performance, especially neophobia (the fear of novel things), is thought to be a big factor in the results.

Faculty sponsor: Kristy Gould

ERIK LINN-MOLIN '14
**The Surprisingly Reversible Frictional
Properties of Aluminum Oxide**

The study of the fundamental properties of friction helps scientists and engineers develop technologies such as brake pads, tire treads, bearings, and engine lubricants. Understanding friction is especially important in designing smaller devices such as microelectromechanical systems (MEMS) which are usually made out of silicon, a material with undesirable friction and wear properties. We propose an alternative MEMS material, aluminum oxide, and are studying its frictional properties with an atomic force microscope (AFM). The AFM scans a surface with a nanoscale probe, tracking the topography and friction across the sample. Surprisingly, the friction of aluminum oxide increases during scanning. After scanning, the surface friction decreases to its original value. It was unexpected

that friction would change in such a manner, and further investigations have included scanning the surface at different loads, for different amounts of time, and by changing the relative humidity in the AFM chamber. Our findings show that friction depends strongly on humidity and imply that a reversible tribochemical reaction occurs during scanning. We plan to utilize existing theories to better understand the changing frictional properties of aluminum oxide.

Faculty sponsor: Erin Flater

CALLIE MABRY '14
**The Connections between Nature Imagery
and Themes of Mortality and Survival in Juan
Rulfo's Photography and Narrative "No oyes
ladrar los perros"**

There are many descriptions of nature and landscape in "No oyes ladrar los perros" ("You Don't Hear Dogs Howling"), by Mexican author Juan Rulfo. In this narrative, a man carries Ignacio, his wounded adult son, on his shoulders in a dangerous journey through the night. Ignacio's death is imminent as they search for medical care in a village. Suffering abounds in this journey across the desert, with the father's heavy burden of carrying Ignacio and the lack of water to drink. The presentation of nature imagery, including rocks, mountains, the moon, shadows, and water, reveals the themes of the difficulty of survival and foreboding death. Descriptions of rocks in the narrative represent difficulties, and shadows in the story symbolize the ambiguity in the plot. The inhospitable desert setting and descriptions of the lack of water indicate the impediments to survival and the impossibility of Ignacio's redemption. Rulfo's writing style and the themes present in his literary works reflect the difficulty of his youth in Jalisco, Mexico, including the deaths of his parents and uncle. He often wrote about subjects familiar to him, such as death, nature, pain, and poverty. His writing style, with meticulous details about the scenery, also reflects his interest in photography.

Faculty sponsor: David Thompson

ANDREA MALEK '15
**The Inescapable Force: Manipulation in
Rosaura a las diez, by Marco Denevi**
Rosaura a las diez (Rosa at Ten O'Clock), by Marco Denevi, presents an engaging hybrid of murder mystery and romance, in which characters and reader alike find themselves entangled in an enigmatic maze of manipulation. Is Camilo

Canegato a shy man with a blossoming new love interest, or a furtive killer responsible for the slaying of a young woman? The presentation of each character's perspective reveals exciting discoveries until the tale climaxes in the most unpredictable of conclusions. My investigation of this novel focuses on the interplay of manipulation between characters and its inexorable effect on those involved. Furthermore, as the reader is buffeted to and from possible conclusions with each new perspective, every revelation leads to more uncertainty. This incites an unsettling question: Could the reader unknowingly be the greatest victim of manipulation of them all? My presentation will discuss these striking concepts and argue that manipulation in *Rosaura a las diez* has a destructive power over all characters involved, finally leading to the demise of the manipulator and the manipulated.

Faculty sponsor: Nancy Gates Madsen

MAIA MASTEL '14

The Old as Vessels

This presentation seeks to explore the functionalist and symbolic interactionist interpretations of the role of elders in contemporary American society. It will provide some historical background and contrast with other cultures, but the main focus will be on modern American elders and their links, perceived and otherwise, to the past. It will tie into other stereotypes about the elderly (*i.e.*, sickness, wisdom, etc.), contrasting these with the old's function as repositories of knowledge. The value of historical knowledge and other "elderly" traits will be compared and contrasted with qualities associated with the young. The presentation will conclude with an attempt to demarcate the place of the elderly in a society as diverse, forward-looking, and fast-paced as modern America.

Faculty sponsor: Maryna Bazylevych

SARAH MCROBERTS '14

The Effects of Boundary Conditions in Conway's Game of Life

Conway's Game of Life is an example of cellular automata that uses simple rules to determine the development of cells across a grid. A cellular automata tracks the number and location of different markers on the grid, which represent the relative positions of each species at different time intervals called generations. In each successive

generation, whether or not a cell contains a particular marker is determined by the number of neighboring cells containing each type of marker. While the Game of Life is usually played on an infinite grid, we investigate how different types of boundary conditions affect the growth of a population. We created a computer program to record final, stable arrangements, called oscillators and still-lives, using various different boundary conditions. Specifically, we observed the still-lives and oscillators resulting from the same initial configuration, called the R-pentamino seed, starting in each possible place on bordered grids of various shapes. Resulting stable arrangements were often fragments of well-known forms found on infinite grids; however, several new still-lives and oscillators were discovered.

Faculty sponsor: Michael Johnson

CALLI MICALE '13

Unwrapping the Essence of God with Bodily, Phenomenological Epistemology through Touch Practices

This project is an effort to deconstruct dualistic ideologies, especially in relation to the body-soul dichotomy, creating a more cohesive, bilateral understanding of both temporal and transcendental reality. Encompassing theologies broadly, the research operates under the assumption that God is the creator of bodies, and thus bodies might act as a primary text, offering an inexorable source of information about humanity and its creator, God. Drawing on thinkers such as French philosopher Maurice Merleau-Ponty and theologians Elizabeth Stuart and Ivone Gebara, this presentation proposes a reorientation for theological discourse that reflects the inherent bodiliness of humankind by partaking in a shared sensual experience through partner touch practices. Demonstrating five teachable practices, I hope to facilitate an experience with the potential to shift individual conceptualizations of the essence of "self." Extracted in collaborative laboratory experiences and derived from Andrea Olson's text *Body Stories: A Guide to Experiential Anatomy* and Barbara Neebel Meier's *Sacred Presence—Touch of Compassion practice*, the touch practices include: rocking the pelvis, body sweeping, combing the tissues, pressure along the bones, and beholding the skull. By bringing awareness through touch that humans experience the world in and through their bodies, this facilitation might suggest that in order for theological conversation

to be relevant for lived-in bodies, it foremost must be approached through an embodied practice.

Faculty sponsor: Jane Hawley

RACHEL MIESSLER '13

**Empowering Youth in Service and Leadership:
Global Linked–Decorah**

The current violence in Syria has left many suffering people who are hurt and frightened, with no means of fulfilling their basic needs. In contrast to this, the community of Decorah has medical and social services as well as volunteer organizations to help those in need. Guided by the Evangelical Lutheran Church in America's Global Linked project, Decorah youth from two congregations chose to connect these dramatically different communities. In the fall, they researched the history of Syria and, based on the rapidly increasing number of refugees, chose to assemble hygiene kits to send to Syrians in need. The project, part of a larger study focused on global service and youth work, concluded with a spring community service project designed, planned, and carried out by the youth, showing they can also help meet needs in Decorah. Throughout the year the youth invested countless hours and energy into this project, presented to service groups, reached out to the local community to ask for help and volunteers, and remained focused on their service to others. In this presentation, I will demonstrate how this project has helped Decorah youth develop their leadership and research skills and show compassion while learning they can make a difference both around the world and at home.

Faculty sponsor: John Moeller

VIRGINIA MORRELL '13-DECEMBER

**Collected Poems on the Human Condition and
My Experiences as a Student Nurse**

"Professional Student Nurse." Do those three words fit together? Even with all of the education prior to stepping foot inside a hospital, it can still be difficult for student nurses to put on a "suit of professionalism," especially if that suit feels like a costume sometimes. Despite this insecurity, patients still see student nurses as professional members of their health care team. Poetry can help humans make sense of the seemingly absurd experiences that we face. While it is easy to see the implications of this for a patient, poetry is also a remarkable canvas on which to explore the growth and development of a nurse, whether at the beginning or the end of that nurse's career.

Nursing is one of the most intimate forms of human interaction in critical times. How do health care professionals balance the humanity of an individual with a scientifically driven medical world? What is it about the patients we cared for today that we will be most apt to remember ten years from now? Through poetry, I have tried to capture the experience of nursing from the perspective of a student nurse among many populations: hospital patients; nursing home residents; summer camp kids, and even loved ones.

Faculty sponsor: Diane Scholl

VICTORIA NELSON '13

**Can Supermodels Make You Feel Sick?
Perceived Vulnerability to Disease Triggered
by Seeing Extremely Underweight People**

Previous research has found that body morphology differences caused by obesity trigger pathogen-avoidance mechanisms that cause people to be more sensitive to disease. Because physical differences often correlated with disease in the ancestral environment, these sensitivity-increasing mechanisms would have offered adaptive benefits that encouraged individuals to avoid infected individuals and prevent exposure to pathogens. The purpose of this study is to examine whether body morphology differences on the grossly underweight side of the weight spectrum also trigger these pathogen-avoidance mechanisms. Evolutionary theory suggests that the relationship between underweight-aversion and disease sensitivity should be even stronger than between obesity-avoidance and disease sensitivity, since the threat of malnourishment was much greater than the threat of obesity when our ancestors were hunters and scavengers in the ancestral environment.

Faculty sponsor: David Bishop

LAUREN NIELSEN '13

90 Degrees of Square Stories

As children's stories, square stories possess a simplistic quality, but because of this, they can be read and loved by people of all ages. Louis Jensen's square stories attract readers by incorporating various elements of life, while still remaining fun and original. Louis Jensen (1943–) is a prize-winning Danish author of works ranging from children's books to novels. In the literary journal *Bookbird*, Line Beck Rasmussen describes Louis Jensen as "one of the most established writers for children in Denmark." In 1992, Jensen published

his first book of square stories, titled *Hundrede Historier* (A Hundred Stories). His final goal is to write 1,001 square stories. These brief stories roam in the realms of the fantastical, but at the same time, are very rooted in a universe of logic and reason. Louis Jensen's square stories can be said to be a new genre of writing that is still in its infancy. To more thoroughly understand this new genre, I researched several renowned authors, such as Daniil Kharms, Italo Calvino, and Hans Christian Andersen, in whose tradition I would place Louis Jensen. In the same vein as Louis Jensen, and with the goal to better understand the process of writing square stories, I began writing my own 90 square stories.

Faculty sponsor: Lise Kildegaard

BENJAMIN NORDQUIST '15

Women's Education in Postconflict Iraq

The struggles experienced by Iraqi women in the 1990s following the Second Gulf War exemplify the difficulties of securing and maintaining human rights in a postconflict culture. One of Iraq's most intractable problems during postwar reconstruction was women's education due to an intertwining of fundamentalist Islam and patriarchal tradition. The Gulf War brought about a shortage of manpower, which created opportunities for female empowerment. As a result Iraqi women experienced great growth in literacy rates and social status as more women gained jobs as teachers, doctors, and other professionals. Iraq lost many men in the Gulf war and the government was generally supportive of women's increased status in society. However, once the Gulf war concluded, under pressure from reactionary Muslims and returning men who feared the loss of their former power, the Iraqi government retracted many of the rights women had gained while the men were abroad; chief among these were educational opportunities for women. The return to patriarchal ideals recreated a situation in which women outnumbered men yet possessed even fewer educational opportunities than before. Iraqi women are now seeking to regain the access to education that fundamentalist and patriarchal reactionaries stripped from them. This paper focuses on their attempts to restore women's educational rights in postconflict Iraq and to analyze the complications inherent in that effort.

Faculty sponsor: Victoria Christman

JACOB NOWOSATKA '13
JOEL ANDERSON '13, CHARLES
BANTA '13, VIVEK BIEN '13, THUPSTAN
CHOTAK '13, DAVID DUBA '13, SCOTT
GERICKE '13, ALYSSE HAFERMAN '13,
NATHAN HAINES '13, ZACH
HRUSKA '13, BRIT INDRELIE '13, ZACH
KUNTZ '13, EVAN LARSON '13, JAMES
PENNING '13, HANNAH RANUM '13,
MATT RUBINS '13, ERIK STREUFERT '13,
TIM VAN CLEAVE '13, ANDREW ZU '13

**Computer Science Senior Project
Demonstrations**

The computer science senior project is a year-long experience in which seniors work in groups to implement computer software systems. This year there were four systems: a construction project-management system, a wish list web application supporting wishers and gift buyers, a social networking web application, and a web-based flashcard system. During this session members of the four teams will be on hand to answer questions and demonstrate these applications.

Faculty sponsor: Kent Lee

JACOB NOWOSATKA '13
HELEN VAN DER GRIEND '14

**An Exploration of Beauty: Thomas Mann's
Death in Venice**

Thomas Mann's 1912 novella *Death in Venice* explores themes of beauty and homosexuality in Mann's iconic ironic fashion. The novella's ill-fated protagonist finds himself struggling to understand these themes when he travels to Venice and falls in love with the boy Tadzio. On the surface it may seem as though the novella only portrays a pedophile interest. However, underneath this facade lies the deeper question of the meaning of true beauty, how it is created or comes to be, and how we determine whether something is truly beautiful. Alongside this, Mann explores his own feelings of homosexuality and how beauty influences these feelings. We researched the novella using two methods of inquiry, both textual analysis and published scholarship concerning the themes of the novella. Through both of these methods of research, one can see how Mann explores beauty and homosexuality in a unique, ironic way. Understanding the irony in Mann's writing is important in understanding his themes.

Faculty sponsor: Ruth Kath

ALEXANDRA NYMAN '13

Music and Emotion: Physiological and Cognitive Response to Differing Minor Keys

Throughout human history, music has been revered for its influence on human emotion. In recent studies, major and minor modes have been shown to influence “happy” and “sad” emotional states. This study will address the differences within the minor mode between minor keys. Due to the slight differences between our modern tuning system, equal temperament, and the naturally occurring harmonic overtone series, each key is physically different to our ears. There are many layers to music that can produce emotion; this study strips music down to its fundamentals and asks: Do the physical differences between the harmonics of varying minor keys produce a change of emotion either subconsciously or consciously? A minor melody was composed and played through an oscillator for the participants in three different keys: A minor, D minor, and C minor. Galvanic skin response, heart rate, and blood pressure data were gathered. An emotion measure was also administered after each listening. I hope to identify emotional response at the basics of music, rather than emotional associations created through more complex music. Understanding this difference, whether it is an unconscious physiological response or a cognitive emotional response, would aid our understanding of the human musical experience and add to the fields of music therapy and evolutionary psychology.

Faculty sponsor: Stephanie Travers

ANN OKONESKI '14

NIKKI THOMPSON '15, ANURADHA

ANATHARAMAN '14

Forgiveness and Physical and Mental Health across Cultures

The present study investigates the relationship between forgiveness (both self-forgiveness and the forgiveness of others) and mental and physical health among participants across the United States and India. The respondents were administered a survey composed of 12 different subscales measuring different aspects, such as forgiveness, physical health, fatigue, stress, spirituality, coping, and sleeplessness. 627 U.S. and 586 Indian respondents completed the survey (n=1,213). This study specifically examines the relationship between reported physical health and different measures of forgiveness as well as certain mental health measures, such as distress. Our aim

is to better understand how forgiveness may be related to health across cultures.

Faculty sponsor: Loren Toussaint

CALLA OLSON '14

Comparing the Effect of Native and Introduced Grasses on the Development of Two Grass Skippers (*Lepidoptera: Hesperinae*): the Least Skipper (*Ancyloxypha numitor*) and Sachem Skipper (*Atalopedes campestris*)

The ability of the larvae of two generalist species common to northeast Iowa—the least skipper (*Ancyloxypha numitor*) and the sachem skipper (*Atalopedes campestris*)—to consume different grasses was examined in order to determine (a) whether the proliferation of certain skipper species over others is due to their ability to consume exotic grasses as well as native grasses and (b) which host plant produces the healthiest individuals. Least skipper and sachem skipper larvae were raised on little bluestem (*Schizachyrium scoparium*), a common native grass, and timothy (*Phleum pratense*), a common invasive grass. The effect each grass had on the health and survival of each species, wing length, dry weight, length of life cycle, and survival rate were measured and compared. Least skippers reared on timothy developed faster, weighed more, and had larger wingspans than those reared on little bluestem. Sachem skippers also developed faster on timothy, but there was no significant difference in weight or wingspan between those reared on timothy and those reared on little bluestem.

Faculty sponsor: Kirk Larsen

CLARA OLSON '13

Classifying Abrupt Stellar Signal Changes

In the past 10 years, the Luther College astronomical observing facilities have been used to acquire over half a million unfiltered images of the field of Open Cluster M23. We have been searching for rare transient events in stellar signal, such as flares from UV-Ceti type flare stars, on timescales from a few minutes to a few hours. Additionally, we wish to understand whether other stars, otherwise thought to be stable, might undergo relatively large eruptions that have been previously undetected due to their rarity. Using multiple detection methods, we have been able to begin placing upper limits on the frequency and duration of eruptive events in the field. I will describe the technique used for searching for these

events, along with the process for eliminating background non-astronomical events. Sample flare events will be shown of varying sizes and time lengths. This work is leading us to a better understanding of the luminosity stability of all stars on short timescales.

Faculty sponsor: Jeff Wilkerson

KIMBERLY OSBERG '14
DANIEL GALLAGHER '13, LEIF
LARSON '15, AARON MERTZENICH '13,
EMILY WONDER '13

Defined by Darkness: A Crossroad of Musical Elements

Ingrid Gordon is a professional percussionist in New York City, where she teaches part time and performs with Exponential Ensemble, as well as with her own group, Percussia. This past summer, Ms. Gordon commissioned me to write a twenty-minute piece for her group, which includes flute, viola, harp, and percussion. Ms. Gordon requested that a full range of world influences be used in writing this piece, especially Afro-Cuban and West African musical traditions. This project has consisted of consulting with texts and with professors on campus and studying the music of many different cultures in Africa and South America. Because of unimaginably deep connections between certain cultures and musical styles, simply taking rhythms or styles as I please and placing them out of the proper context could have proved to be deeply unethical; however, simply emulating the styles of these cultures would have caused my own voice as a composer to be lost. This presentation will demonstrate the ways in which I overcame these and other challenges while working on this commission. I will use a projection of the score and PowerPoint to briefly explain my research, process, and integration of these elements. The presentation will culminate in a live performance of selections from the work.

Faculty sponsor: Brooke Joyce

CHARLOTTE PAGE '13 Nursing Implications for Addressing Poor Health Literacy in the United States

Approximately nine out of every 10 American adults experience difficulty comprehending basic health information. In a country where an increasing number of citizens are seeking medical attention, the failure of providers to address the health illiteracy of their patients is having detrimental effects. With a specific focus

on nursing, this paper explores the failure of the American health system to address patient health illiteracy and reviews strategies that promote health education in patients. The interventions suggested fulfill the requirements established by the Quality and Safety for Nursing (QSEN), a project constructed to prepare future nurses with the knowledge, skills, and attitudes (KSAs) necessary to continuously improve the quality and safety of their patient care. The QSEN KSAs discussed in this paper include the establishment of effective communication, the ability for nurses to assess their own levels of communication, and the importance of valuing continuous improvement of their own communication and conflict resolution skills. With these QSEN competencies in mind, the paper explores strategies nurses can utilize to promote health literacy in nursing research, clinical work, and education.

Faculty sponsor: Corine Carlson

JAMES PENNING '13
JOEL ANDERSON '13, CHARLES
BANTA '13, DAVID DUBA '13, BRIT
INDERLIE '13, ZACK KUNTZ '13,
TIM VAN CLEAVE '13, ANDREW ZUTZ '13
NorseSquare

For our senior project in computer science, we gathered around an idea to further connect our campus. Until now there has been no central way to connect with everyone on campus other than through e-mail or Facebook. We have found a way to better connect people, friends or not, through the use of our application NorseSquare. Through GPS and WiFi triangulation, we have been able to allow people to check in to buildings on campus and let people know their location. This works very well for people in large classes looking to join a study session or meet a group of friends for dinner in the cafeteria. It lets people take their own initiative instead of relying on prior planning to connect with others. Knowing the popularity of smart phones, we have developed our application on two separate platforms. We used the Agile Development Process to plan, implement, and test our application. Our application has been developed through the techniques and skills that we have learned throughout our classes in the Computer Science Department.

Faculty sponsor: Kent Lee

KATEI PERSCHBACHER '13
NICK ANDRESEN '13,
JESSICA ULRICH '13

The Effect of N6-methyladenosine in Target mRNAs on the Binding Affinity of RISC-miRNA Complex

MicroRNA (miRNA) interference is a critical form of post-transcriptional gene regulation in eukaryotes. Small double-stranded RNA molecules bind to a protein complex RISC (RNA-induced silencing complex), and mediate the destruction or inaccessibility of mRNAs that have complementary sequences to the bound miRNA. In this study, we ask if the affinity of RISC to its target mRNA will change if adenosine is replaced with m6-methyladenosine in the target sequence. Two specific microRNA sequences were synthesized to bind RISC complex: one is a known human miRNA (miRNA-30a) and the second contains the consensus sequence for mRNA methylation. Several strategies were used to clone the two complementary DNA target sequences into pLITMUS 38i, which contains T7 promoters to allow *in vitro* transcription. No intact recombinant plasmids were isolated. Preliminary results using pLITMUS 38i indicate that T7 RNA polymerase incorporates m6-methyl adenosine during transcription, as indicated by denaturing RNA gel electrophoresis.

Faculty sponsor: Marian Kaehler

PHUC PHAN '13 Whose Piece Is It, Anyway?

Unlike different types of visual arts or plastic arts in which there is a direct connection between the creator of the artwork and his or her audiences, music requires an additional factor. It is often the case that a composer does not him- or herself present the work to an audience, but the job is given to a performer who is an expert on his/her own instrument. At a performance, the performer “re-creates” the piece in time, and that is how audiences get access to the piece. It is possible that in the performer’s hands and his/her own perception, the piece is represented in a manner that deviates from the composer’s initial idea of the piece. The performer’s involvement does not stop there, however. In many cases, he/she works directly with the composer in the process of writing the piece; hence they become the “co-creators” of the piece. This research aims to further explore this very interesting relationship between the composer and the performer: Whose piece is it, anyway?

Faculty sponsor: Eric Kutz

TRINDA PHELON '13

Osteopathic Veterinary Medicine: A Comparison of French and North American Cultures

The practice of osteopathic medicine originated in the United States after Andrew Taylor Still determined that the musculoskeletal system plays a major role in maintaining health and avoiding disease. Osteopathy programs became available in veterinary medicine in the United States in 2003. However, in Europe, the practices were available to veterinarians before then. This research focuses on whether osteopathic treatments were used as a stand-alone treatment instead of modern prescription drugs. Using data gathered from field research during January 2013, as well as references from scholarly literature, I investigated how the French view osteopathy compared with Americans. Since France is known to over-prescribe antibiotics, it was expected that osteopathic veterinary medicine would be used instead of modern prescriptions. However, I found that osteopathic treatments were used as a supplement to modern treatments, rather than a stand-alone treatment. In further work it would be interesting to see if the use of antibiotics could be decreased or eliminated due to the apparent success of osteopathic treatments.

Faculty sponsor: Anne-Marine Feat

MACKENZIE PIERSON '13 Knee-Injury Prevention in Female Athletes, Based on a 12-Week Weightlifting, Conditioning, and Plyometric Program

A deep interest in knee injuries arose when many teammates suffered ACL, MCL, and meniscal tears. The injury seemed too prevalent to be a coincidence. After a 12-week conditioning, weight-training, and plyometric program that explored whether risk of injury to the knee in female athletes could be lowered, positive conclusions were drawn. Pre- and postdata were taken on middle school and high school girls from Mason City, IA, following a structured summer weight training program. My findings indicate that a decrease in knee injuries occurred in all athletes due to an increase in their kinesthetic awareness, strength, and coordination.

Faculty sponsor: Brian Solberg

NICOLE POWERS '14

General Morphology of Late Holocene Diatom Frustules from Lake Bottom Cores

This study focuses on the examination of the morphology of freshwater diatom frustules, or shells, collected from the soil of a lake bottom core from northern Minnesota. Radiocarbon dating estimates the age of the diatoms sampled to be between 2,400 and 2,900 years old. Diatoms were imaged and their morphology was analyzed using scanning electron and differential interference contrast microscopy.

Faculty sponsor: Robert Fitton

ELLEN PRITCHARD '15

GABE DORN '14, LOGAN

KOCHENDORFER '15

Run like the Wind, Bull's Eye: A Study of Motivation's Effect on Performance

In any competitive sport, forms of motivation are used to improve an athlete's performance against another person or themselves. This study addresses the role of motivation in an athlete's career—specifically Luther track and field sprinters. It asks: Is some form of motivation the answer to improving an athlete's performance? Using the track team, we had them run a 200-meter dash and then go through a motivational process. The control group read boring articles and an experimental group watched a motivational video or performed visualization exercises. They were then asked to run another 200-meter dash. This study did not find that motivation does, in fact, affect the performance of the runners. We anticipate that other forms of motivational tools play a key role in an athlete's performance.

Faculty sponsor: Loren Toussaint

HANNAH RANUM '13

ZACHARY HRUSKA '13, EVAN

LARSON '13, JAKE NOWOSATKA '13,

MATT RUBINS '13

Epic Study! An Online Application to Manage and Study Flashcards

For our senior project in computer science we created EpicStudy!, an online application designed to manage flashcards. As a group of five, we worked together to create the application from design to implementation. We will explain our process and how we worked together to accomplish our ideas. The application strives to give students a more enjoyable and efficient way to store and study flashcards, and it is

perfect for classes in which memorization is a key component. We will also demonstrate the different features of our application and show how it allows users to create and organize flashcards for different classes using a container-and-box approach. We will explain all of the study features, such as multidimensional flashcards and study plans, and show how cards can be shared among students.

Faculty sponsor: Kent Lee

TESS ROMANSKI '13

The Motivations for Local Food Production in Northeastern Iowa

This project will focus on the political, economic, and ecological impacts of sustainable agricultural practices around the wider Decorah area. The research is based largely on personal interviews with members of the Decorah community who produce or sell local food, primarily produce. I will try to answer the question of what incentives, programs, or policies will be most effective in increasing the number of farmers producing for the local market. The environmental impact of local food production is very positive, and so politicians, both local as well as state and federal, should be aware of the challenges.

Faculty sponsor: Jon Jensen

KIMBERLY ROONEY '13

The Reconciliation of *Laïcité* and Islam in Senegalese Education

The combination of traditional African, Islamic, and French influences in Senegal generates a complex national identity that affects many of the country's institutions. This research addresses education in Senegal and the tension between the concept of *laïcité* (secularism) inherited from the French and the fact that 95 percent of the population is Muslim. While *laïcité* in the schools may secure the inclusion of all students no matter their religion, analysis of current reforms suggests that Senegal believes an education consistent with students' experiences will maximize student engagement and perpetuate their distinct culture. This study asks specifically how Senegal has adapted their curriculum to create a democratic national identity in a postcolonial context. Information was gathered while volunteering at a public school in Dakar, in a Senegalese education course (Spring 2012), and through additional interviews and observations conducted in Dakar in January 2013. The research suggests that providing Islamic courses in schools contributes

to higher student engagement and opportunities to nurture citizenship. However, the rest of the curriculum is still based around specific competencies, which reinforces a dichotomy between the intended democratic goals of Senegalese schooling and the often utilitarian, skill-based program—a disconnect reflecting the ongoing pursuit of a distinct postcolonial Senegalese identity.

Faculty sponsor: Anne-Marine Feat

JENNY RUSTAD '14

Coloring by Numbers: Proving van der Waerden's Theorem Using Recurrence Properties

If we paint each natural number (1, 2, 3, etc.) one of finitely many colors, which properties can a set of same-colored numbers share with the entire set of natural numbers? The “coloring theorems” explore questions of this form. For instance, van der Waerden's theorem states that no matter how the natural numbers are painted, there exists a color whose set of numbers contains arbitrarily long arithmetic progressions of the form $a, a+j, a+2j, \dots, a+kj$. Although this theorem was originally proven in 1927 using combinatorial techniques, Hillel Furstenberg and Benjamin Weiss proved the same result in 1978 using recurrence properties of dynamical systems. Dynamical systems is the study of the future behavior of points under the repeated application of a fixed rule. This project studies the dynamical ideas used to complete this proof, culminating in a streamlined proof starting from basic dynamical systems theory and ending with van der Waerden's theorem. In this presentation, I will discuss the correspondence principle connecting combinatorics and dynamical systems and explain the intuition leading to van der Waerden's theorem.

Faculty sponsor: Michael Johnson

AMANDA SCHAEFER '13

Gaining Prestige and Power amid Gender Inequality: The Predominance of Female Sangomas in KwaZulu-Natal, South Africa

A *sangoma* is a traditional healer who uses ancestral divination as well as medical herbs to treat patients. Traditional healers like *sangomas* play a large role in South African life, with as much as 80 percent of the population seeking a traditional healer before using biomedicine.

Interestingly, 80 percent of *sangomas* in South Africa are female. How can this high proportion of female *sangomas* be explained? This research will tackle this question, focusing on South African history to understand how current gender norms developed. This information will be compared to ethnographic data collected in both rural and urban areas in the province of KwaZulu-Natal, South Africa, during January 2013. I will argue that the history of the migrant labor system and apartheid in South Africa served to disenfranchise males, resulting in the current gender norm of male-dominated power structures. For women in South Africa who have few opportunities to gain power, becoming a *sangoma* is a culturally appropriate way to gain respect and prestige. The power that is gained by becoming a *sangoma* may be one explanation for the prevalence of female *sangomas*. Understanding the motivations for South African women to become *sangomas* may direct future research that will examine the impact of this prevalence.

Faculty sponsor: Maryna Bazylevych

AMANDA SCHAEFER '13

Molecular Mechanisms of Benzo[a]pyrene's Increase in HPV Oncoprotein Expression: Connecting Cigarette Smoking, HPV, and Cervical Cancer on a Molecular Level

Cervical cancer is the second most common cause of cancer-related deaths for women worldwide. Infection with the human papillomavirus (HPV) is the strongest associated risk factor for the development of cervical cancer. Research indicates that genetic or environmental factors may increase the risk of HPV becoming cancerous. Cigarette smoking is one environmental factor that has been shown to be associated with a higher rate of cervical cancer. Cigarette smoke contains many carcinogenic compounds, and one compound, benzo[a]pyrene (BaP), has been detected in cervical mucus samples of women who smoke, indicating that cervical cells can be directly exposed to this compound. Recent studies reveal that when cervical cancer cell lines are exposed to BaP, there is an increase in HPV proteins associated with cervical cancer development. While there is evidence that BaP exposure increases HPV cancer protein expression, the molecular mechanisms are yet to be determined. This study examined the molecular mechanisms of benzo[a]pyrene's increase in HPV cancer proteins. Preliminary evidence from this study suggests that BaP activates that aryl hydrocarbon receptor (AhR)

which may lead to the increased expression of HPV cancer proteins. Identifying these molecular mechanisms may help us better understand why certain populations of women have higher rates of HPV-to-cancer development as well as guide work toward decreasing the number of women with cervical cancer.

Faculty sponsor: Molly McNicoll

DANIEL SCHOESS '13

A Population Assessment of the Upper St. Croix River Lake Sturgeon

Lake sturgeon (*Acipenser fulvescens*) are a long-lived freshwater fish found in large, clear lakes and rivers throughout the United States and Canada. Due to heavy commercial fishing, lake sturgeon populations were decimated in the late 19th century. I participated in a mark-and-recapture assessment of the lake sturgeon population in the Upper St. Croix River. Sturgeon were caught via hook-and-line angling, measured, weighed, and aged. During the nine years of the study, 617 different fish were sampled, with 67 recaptures. I used the Jolly-Seber population model to estimate the total population and compared it to other riverine sturgeon populations in the United States and Canada. Efforts to improve fish passage in the Upper St. Croix River should be evaluated to increase access to spawning sites and connect populations isolated by dams.

Faculty sponsor: Beth Lynch

LINDSAY SHERIDAN '13

The Saint Paul Chamber Orchestra

The Saint Paul Chamber Orchestra (SPCO) has a history of more than 50 years of musical innovation and has been praised for its collaborative model, varied and accessible concert venues, and radical revenue model. Despite these past successes, the SPCO is currently facing a tumultuous situation: in the fall of 2012, labor disputes barred a new musician contract from being agreed upon, and the orchestra cancelled all concerts until further notice. This is not a new problem among American orchestras: in the past few years, many major orchestras have had fatal or near-fatal labor disputes. The SPCO's lockout continues to today. This project explores what other orchestras (and emerging arts leaders) can learn from the unique case of the SPCO. Positively, the SPCO has a long tradition of innovation, with particularly intriguing developments in the past 10 years, including a complete change of artistic leadership structures and more accessible ticket pricing. Negatively,

the almost six-month lockout will have a serious long-term impact. What factors led to this? Declining donations, decreased ticket sales, poor management? Resources used in this study include direct interviews with SPCO staff and audience advocates, industry- and SPCO-generated reports, news surrounding the lockout, books about SPCO's history, and a comprehensive review of resources put out by constituents involved in the lockout, which include musicians, management, and audience.

Faculty sponsor: Daniel Baldwin

LINDSAY SHERIDAN '13

DAN FERNELIUS '13

Water Street Music Series: Connecting Community Through Social Entrepreneurship

Founded in Decorah in 2012 by Luther students Dan Fernelius and Lindsay Sheridan, Water Street Music Series (WSMS) is an experiment in social entrepreneurship. WSMS is an arts-presenting organization that connects the college campus and larger musical community through a collaborative concert series. In its first season, WSMS produced six concerts in venues on Water Street. Each performance served as a catalyst for new collaborations between students, faculty, Decorah musicians, and community-minded venues and businesses. Audiences ranged from 60 to 250, and five of the six concerts sold out. Through this venture we have experienced all aspects of building and operating a professional arts organization, including marketing, development, artistic planning, and event management. To gain a broader perspective of how our work in an incubator like Decorah relates to developments in the larger arts world, we attended the Emerging Arts Leaders Symposium in Washington, D.C., this spring. In this presentation, we will share insights from our engagement with industry leaders and fellow students about the educational value of our entrepreneurial endeavor and how WSMS's work aligns with the spirit of innovation, imagination, and collaboration—all variables that are key to the future of the arts.

Faculty sponsor: Don Jones

TYLER SIMPSON '13

Singing Their Way to Hell: Spreading the Reformation through the Hymns of Martin Luther

The role that Martin Luther's hymns played in spreading the message of the Reformation has often been overshadowed by the study of his other

books and pamphlets, but their use as propaganda is no less important. This study will address the role of Lutheran hymnody in spreading Luther's theology in a form that was difficult for the papacy to halt, yet easy enough for even the illiterate peasant to learn and spread quickly. Specifically, it will ask why Lutheran hymns were uniquely successful in rapidly disseminating Luther's message and why that method failed when used by Catholics to attack Lutherans during the Counter-Reformation. By studying the text of Luther's hymns and the hymns of Catholic writers from the period, this study aims to demonstrate that while Catholic hymns invoked intercessions to saints, Luther's hymns tended to present spiritual problems such as sin, death, and temptation and their solution through trust in Christ's work. This unique message allowed 16th-century peasants to connect more with the text and apply it to their daily lives, and explains why Lutheran hymns were successful as tools of Reformation propaganda when Catholic hymns were not.

Faculty sponsor: Victoria Christman

SAHEKA SMITH '13

That's Real: The Effectiveness of Hip-Hop Therapy with Troubled Youth

Music therapy refers to the use of music within a therapeutic relationship to address physical, emotional, cognitive, and social needs. Creating, singing, or listening to music appears to allow individuals to express emotions or experiences that cannot be easily put into words and to help them identify their personal needs. This literature review examines how one musical form—hip-hop—is used to connect with troubled African American youth. My focus is on the therapeutic application of hip-hop to help adolescents deal with life issues that range from finding their identity to dealing with personal violence. The research suggests that because many young African Americans and other urban youth can relate directly to this art form, hip-hop is highly effective in providing support for these young people in comparison with traditional therapies.

Faculty sponsor: Stephanie Travers

EMILY STREEPER '13

Women in Business: A Perpetual Evolution?

Despite extensive study of the role of women in the workplace and its evolution, there remains discrepancy around whether or not perceived structures of gender inequality in fact exist. However, it is undeniable that the presence of these obstacles is felt to varying degrees by

women, even among women of similar academic and socioeconomic backgrounds. While there is evidence to indicate that women may in fact be disadvantaged in the professional workplace, there is also research that points to the patriarchal structure on which Corporate America was built and the differences in learning and leading styles as the cause of a great portion of experienced workplace gender inequality. Currently, female business professionals support the wide range of research that exists surrounding the glass ceiling, traditional gender roles, and the impact of family on maintaining a given career trajectory. In interviews with several working mothers, many of these topics were both confirmed and rejected as challenges. Though these topics remain points of dispute, it is apparent that a cycle of argumentation around whether or not these obstacles exist is not helping women in their careers, or helping businesses retain high-achieving female employees. Encouraging women to lead and champion their own strengths, and changing the structural assumption that every employee leads and works the same way, will move women and corporate America towards a more equitable workplace which focuses, not on obstacles, but on a more true gender equality in business.

Faculty sponsor: Mona Nelson

LAURA SWANSON '13

MELENE THOMPSON '14

Calcium-Regulated Gene Expression in *Vibrio parahaemolyticus*

Although calcium is known to play a role in a number of bacterial processes, including gene expression, how and why bacteria sense and respond to calcium is still poorly understood. *Vibrio parahaemolyticus* is a gram-negative marine bacterium that is a major cause of gastroenteritis worldwide. This organism experiences significant and fluctuating calcium levels in its natural environments, which include the ocean, estuaries, and the human GI tract. To investigate possible roles for calcium in *V. parahaemolyticus*, we screened 4,000 random mutants to identify genes that might be turned on or off by calcium. Disrupted genes were identified by amplifying and sequencing DNA adjacent to the transposon, and gene expression phenotypes were quantitatively characterized by measuring gene activity over time. Collectively, these analyses resulted in the identification and classification of 40 calcium-regulated genes, including 26 genes turned on by low-calcium conditions and 11 genes turned on

by high-calcium conditions. Since a number of the regulated genes had functions predicted to be involved with iron acquisition, we tested whether iron might also influence activity of calcium-regulated genes. Results indicated that the vast majority of calcium-regulated genes were also regulated inversely by iron. These results suggest that calcium and iron are relevant environmental signals for gene regulation in *V. parahaemolyticus*, and further, they suggest a relationship between these two signals.

Faculty sponsor: Jodi Enos-Berlage

AUSTIN SWENSON '13

The Causes of Anti-Mormon Reaction in the 19th Century

In the United States, the Second Great Awakening of the early 19th century brought previously smaller Christian sects to the forefront, as well as new religions. One of these new religions was the Church of Jesus Christ of Latter-day Saints, also known as Mormonism, led by a man named Joseph Smith. While living in New York, Smith received a vision in which he was told to found this new religion. Smith soon gained followers, and as his church grew, so did the backlash from others in the area. Smith was then forced to move his group from New York to Ohio, and later to Missouri and Illinois. It was in Missouri and Illinois especially where the Mormons faced opposition from settlers in the area. By examining through primary and secondary sources the conflicts and animosity the Mormons experienced as they traveled south and west, this paper finds that although the religion of Mormonism contained aspects that were unsettling to non-Mormons, it was the political threat that was the main cause of anti-Mormon reaction, as well as the threat of violence. This paper explores the perceived political and military threat that the Mormons presented to the rest of the United States, and why the more significant causes of anti-Mormon sentiment were political rather than theological in nature.

Faculty sponsor: Victoria Christman

CHELSEA TEGELS '13

What's Really Happening at Dover

Matthew Arnold's poem "Dover Beach" features a man looking out onto the cliffs of Dover and pondering what life means to him. That poem inspired Anthony Hecht to write "The Dover Bitch," which is clearly a parody poking fun at the themes in "Dover Beach." However, the poem could also be seen as a different form of literary

criticism. Instead of looking at other people's opinions on the subject, I dealt solely with the two texts. In the end, I found that the parody diminishes the imagery of the poem and brings to light what the words are actually saying. After repeated readings, "Dover Beach" is a lot more pessimistic than it first appears to be, which is the point Hecht is trying to make. "The Dover Bitch" should therefore be seen as both a creative and critical piece. This concept can be used for any other literary work. A literary analysis can be more than just an essay, and using the original piece's literary form can make the criticism even more compelling.

Faculty sponsor: Peter Scholl

CHELSEA TEGELS '13

Louis-Philippe's Impartiality in Fragmented Paris

In Paris in 1832, King Louis-Philippe had been on the throne for less than two years. He had been crowned after a revolution had deposed the rightful king, and he now faced Loyalists who wanted the legitimate king back and Revolutionaries who wanted a republic. This study looks into Louis-Philippe's policy of playing to both extreme parties and the effect it had on the failure of the Insurrection of July 1832. In the end, this policy caused the people to riot, but it also gave Louis-Philippe the power to stop it and any other rebellions for the next 16 years. Numerous firsthand accounts from politicians, revolutionaries, writers and others who were in Paris at the time demonstrate how miserable the French people were in 1832 but also show why Louis-Philippe was able to keep the revolution at bay for so long. Not much research has been done on Louis-Philippe's reign, and these findings show that it was his ambiguity that made him the great politician that he was.

Faculty sponsor: Jacqueline Wilkie

KATHLEEN TOWELL '13

Text as a Vehicle of Oppression and Liberation

What creates the gap between liberation and oppression? As I examined two very different texts, Frederick Douglass's autobiography, *Narrative of the Life*, and Herman Melville's short story "Bartleby, the Scrivener," I became interested in the role that text plays in the lives of Douglass and the titular character Bartleby. Text can function as a tool of oppression, but it can also function as a tool of liberation; what makes the difference is the context in which it is used. When text is used to reinforce a person's state of

dehumanization by making him fully aware of it, the text is of course oppressive. But if the person can take the information they have learned from a text and apply it to freeing himself, the text stops being an agent of oppression and becomes a tool with which to carve liberation.

Faculty sponsor: Peter Scholl

STEPHEN UHL '13, ASSISTED BY JUBILUS AND EMILY WONDER '13

A Ceremony of Carols

This project entails a brief biography of Benjamin Britten and an analysis of his *Ceremony of Carols* with references and connection to medieval Catholic Christmas liturgy, culminating in a performance with the student-led chamber choir Jubilus. Written in 1942 on a Swedish vessel, the *Ceremony of Carols* comes from the same journey as Britten's *Hymn to St. Cecilia* and a lost commission for clarinetist Benny Goodman. Little is known regarding the piece for Goodman, but the *Ceremony of Carols* is stylistically similar to the *Hymn to St. Cecilia*. My research discusses the musical and textual implications of the work. I extensively analyzed the score and listened to several different recordings of the work by reputable ensembles. I concluded that Britten expresses theological connotations through the choice of key areas for each carol. My findings have implications for the interpretation of the work, which will be reflected by Jubilus's performance assisted by Emily Wonder (harp).

Faculty sponsor: Jim Griesheimer

KAILA VOGT '14

Gall Fly (*Eurosta solidagini*) Affects Seed Production in Goldenrods (*Solidago altissima*)

Goldenrod is a native perennial forb, common in open habitats of eastern North American tall grass prairies. Goldenrods are vulnerable to gall flies, which lay eggs in the stems and cause a spherical abnormality to form. Previous research has shown how gall flies impact both seed production and how goldenrods allocate resources. In my experiment I compared seed production and seed viability in plants with and without galls. I found that the number of seeds produced was lower in plant with galls, but the viability of the seeds was not different. Because goldenrods in an area are clones of each other, fitness of the whole clone may not be affected by gall flies, but they may affect the goldenrods' ability to compete for resources against other plant species.

Faculty sponsor: Beth Lynch

DARREN WANG '13

A Policy Analysis on the 1951 Convention Relating to the Status of Refugees in the Context of Hong Kong

The 1951 Refugee Convention was designed by the United Nations to bring international relief to the refugee crises by protecting and assisting refugees from the threats they face in their countries of origin. Hong Kong currently is not a party to the convention and therefore it manages to not grant refugee status to asylum seekers. This is both a domestic and international issue as Hong Kong restricts the human rights of asylum seekers, and therefore this matter deserves the attention of policymakers in Hong Kong and the United Nations. Implications of this policy analysis will help social workers advocate for changes in redesigning a practical policy meeting the needs of Hong Kong and its asylum seekers.

Faculty sponsor: Craig Mosher

SARAH WEBB '13

Gender Constructions: Viability of the Male Pill

As the global population continues to rise, the social obligation to use discretion in procreating becomes increasingly apparent. In the early 1950's, females were offered a "safe" contraceptive pill. This pill regulates reproductive hormones associated with menstruation and fertility. The biology used in the development of this pill targets the same gonadotropins involved in sperm production in males: luteinizing hormone and follicle stimulating hormone. In spite of the parallel in reproductive biology, until recently there has not been an overwhelming push to develop and market a male contraceptive outside of condoms or vasectomies. The purpose of my research is to ascertain the social context that has led to the availability of female and now potentially male contraceptives, to examine gender constructions within our society that will either enhance or impede the plausibility of a male pill becoming a viable method of contraception.

Faculty sponsor: Maryna Bazylevych

MATTHEW WEITZEL '14

Altering Natural Foot Strike Pattern Decreases Running Economy

Running economy (RE) is the amount of oxygen an individual consumes while covering a certain distance. In this sense, a more economic runner will use less oxygen over a set distance than a

less economic runner. Many factors have been attributed to RE, including flexibility, altitude, heat, limb morphology, maximal oxygen uptake, and body composition. I looked at differences in RE in trained (n=8) and untrained (n=7) male individuals who displayed a natural toe strike (n=5) and natural heel strike (n=10). To do this, I had participants run on a treadmill with speeds ranging from zero to 10 mph while measuring their oxygen consumption. I found that one mph is statistically the least economic speed while three mph is the most economic speed. Surprisingly, there was no difference in RE between untrained and trained individuals at the time we completed our testing. Also, there was no statistical significance in RE between the natural heel and toe strike pattern. The new toe strike for natural heel strikers was significantly less efficient than naturally heel striking. Additionally, individuals who naturally toe strike are equally economic while toe striking and heel striking. Essentially, altering one's foot strike is not directly economically beneficial.

Faculty sponsors: Mark Eichinger, Brian Solberg

KEVIN WENGER '13

Franco, the Spanish Family, and the Catholic Church: The Transition's Impact on the Modern Spanish Family

In the last century, Spain underwent immense changes in regard to politics, religion, and family. Specifically, under the dictatorship of Francisco Franco Bahamonde (1939–75), the citizens experienced changes in regard to all three aspects of society. Focusing on shifts in societal norms, this work seeks to address the role of the Catholic Church during and after Franco's regime and the implications this had for the Spanish family. In what instances did Franco employ Catholicism to influence the family system as a social institution? How was this possible in a country where family has such high importance and standing in society? How has this changed after his death, and what can we learn from it? Using personal narratives, sociological studies, demographic and historical information, articles, and books, this work will demonstrate that Franco not only carried out a political regime, but also reformed and influenced the family system of Spain through use of the Catholic Church and a conservative ideology and methodology. These results grant insight into Spanish society and how it has reacted and remained strong while undergoing drastic societal changes and problems.

Faculty sponsor: David Thompson

KATIE WICKLUND '14

Tappin' Out Differences: How Tap Dance Steps toward Cultural Integration in America

Most Americans are familiar with tap dancing, but many know it only as a genre that exists on Broadway, and they do not know its historical and cultural roots. Therefore, most people do not appreciate tap's artistic richness and embodiment of cultural values. This paper will discuss how dance styles brought by immigrants from Ireland and slaves from West Africa met in New York City in the early 1800s and mixed and borrowed from each other to create a new dance form: tap. Contributing styles are first described separately—what they looked like, the positions of the torso, arm placements, and the movements of the feet. Then, the paper will explain how William Henry Lane (born c. 1825), who had learned African dance styles via his immersion in African American culture, later learned Irish dance styles through his participation as a performer in American minstrel shows, where he came to be known as Master Juba. Accounts of his performances show the blending of African and Irish styles, and the paper will discuss his significant influence on tap dance. Ultimately, this paper will argue that tap dance is an art form that reflects America's goal of being a country where different groups of people can intertwine their cultures to make something new, while still maintaining their differences and distinctions.

Faculty sponsor: Amanda Hamp

SHANE WILSON '13

Optimal Control of Dengue Fever Epidemics

Dengue fever is the most prevalent mosquito-borne viral disease that affects humans. Since there are no licensed vaccines or effective drug treatments currently available, disease control efforts have largely focused on controlling the vector of the disease, the mosquito *Aedes aegypti*. While traditional vector-control methods, such as insecticide spraying and source reduction, can have a major impact on reducing transmission of the infection, they often require an intensive control effort and are difficult to maintain on a long-term basis. A novel control method involves infecting the native mosquito population with the bacterium *Wolbachia*, which has been shown to reduce transmission of dengue virus. Using a theoretical ordinary differential equation model and principles from optimal-control theory, we show that replacing a native mosquito population with one that is entirely infected with *Wolbachia* will lead to decreased incidence of dengue.

Additionally, we consider the impact on dengue transmission of quarantining dengue-infected humans and weigh control strategies against each other in order to effectively utilize available resources.

Faculty sponsor: Kyle Fey

ALLISON WRIGHT '14
WITH PROFESSOR DAVID THOMPSON
VoiceThread Tutorials for Spanish Language Learners

The goal of this project was to produce a series of online tutorials for intermediate- and advanced-level students of Spanish. We sought to understand whether the web tool VoiceThread offers students a sufficiently interactive means of practicing and understanding better some of the most challenging concepts of Spanish grammar. To this end we developed five tutorials in the VoiceThread platform as well as a concept map to accompany each of the grammar concepts: uses of the preterit and imperfect tenses; indirect and direct object pronouns; the subjunctive in adverbial clauses; uses of the passive voice; and uses of the verbs *ser* and *estar*. Tutorials were implemented in advanced-level Spanish courses in Fall 2012 and Spring 2013. Feedback suggests that the tutorials succeed in providing an interactive space for reviewing difficult grammar concepts, but the practice exercises in the tutorials don't allow enough immediate feedback for users to know whether they are improving their understanding. The tutorials would function best in the context of a class where instructors could monitor students' use of the VoiceThread exercises and provide feedback. One significant benefit of the VoiceThread platform is that it requires users to evaluate their own responses (orally or in writing) before submission, an important skill for language learners. Participants in this session will have an opportunity to use the tutorials firsthand.

Faculty sponsor: David Thompson

ASHLEY WRIGHT '13
The Nonprofit and the Theatre: An In-depth Examination of the Des Moines Community Playhouse

This presentation is based on research done around a current nonprofit theatre entity, the Des Moines Community Playhouse. Research includes interviewing executive directors and board members, financial research, and historical evaluations. The study explores why the Des

Moines Community Playhouse is successful and concludes that it has an ideal structure for nonprofit theatres, with regard to the key components of nonprofits: mission, resources, acquisition, consistency, leadership, complex, and performance management.

Faculty sponsor: Lisa Lantz

AARON ZAUNER '14
Student Curators in the Classroom: The Barbizon School—An Invented France

In 2011, Alexander Platt generously donated a substantial collection of prints to Luther College. These 150 prints originate from mid-19th-century France and consist primarily of Barbizon School prints. Dr. Kate Elliott's 19th-Century Art History class was tasked with creating a thesis-driven exhibition of these Barbizon School prints. This semester-long process included many scholastic, professional, and practical questions that needed to be considered before staging an exhibition. Every step—deciding upon a thesis, culling prints, and laying out the exhibition in the Wigley-Fleming Gallery—was the result of much collaborative deliberation. The resulting exhibition, *The Barbizon School: An Invented France*, is the consequence of a semester's work in the 19th-Century Art History class. It is the class's hope that this presentation can highlight the challenges, and ultimately the rewards, of working together to plan a professional-quality exhibition of Luther's newly acquired prints.

Faculty sponsor: Kate Elliot

JESSICA ZENCHAK '13
Public Health Implications of Drinking-Water Pollutants in Brittany, France

Pollution of drinking water is a major problem in Europe (Michael Carney, *Drinking Water Standards*). In fact, as of 1991, no member of the European Union had met all of the standards set by the European Union law in terms of drinking water pollution. Diseases such as Alzheimer's disease, and other public health issues, have been linked to pollutants in drinking water worldwide (Carney). This project explores the public health implications of water pollution and a potential link between rates of Alzheimer's disease and high concentrations of aluminum in drinking water in Brittany, France. In Brittany, maintaining standards set by the European Union can be difficult due to the nature of the soil, and even the water treatment itself. A recent study in Brittany, an area prone to high aluminum concentrations

in soil, has shown amounts of aluminum that are significantly higher than drinking water standards allow (UFC, *Eau secours*). Another study has shown that western Brittany has a higher rate of Alzheimer's than France on average (Jouanny). Research includes analysis of data and current literature on the pollution of drinking water (specifically aluminum) as well as interviews conducted with local officials, and suggests that a balance between expensive water purification and awareness of public health concerns could potentially reduce the frequency of Alzheimer's disease in Brittany, France.

Faculty sponsor: Anne-Marine Feat

SAMUEL ZOOK '14

ELLEN BEHRENS '13

Effects of North Atlantic Oscillation on Precipitation and *Quercus Cerris* (Turkey Oak) Growth near Frontale, Italy

As global warming increases and climate change continues, climatic systems and the life dependent on these systems are going to change. It is hypothesized that in the future, the North Atlantic oscillation (NAO) will intensify, causing more intense drought and floods in affected areas. For this study, ring growth of local trees and the precipitation record in the region of Frontale, Italy, were analyzed in an attempt to determine a presence or absence of NAO effects on local vegetation. Bandpasses of five to eight years were used to compare NAO, precipitation, and tree-ring growth. Correlation was found between all three variables, implying that changes in the NAO will correlate to changes in the growth of vegetation of the area and, in turn, changes in the carbon cycle.

Faculty sponsor: Laura Peterson

OPERA PERFORMANCE

Orpheus in the Underworld

Students from our Music program will present Jacques Offenbach's *Orpheus in the Underworld*, a hilarious sendup of the classic Greek myth of Orpheus, a musician who played with such skill that he could charm all of nature. When his beloved Eurydice was fatally bitten by a snake on the day of their wedding, Orpheus set out on

a journey to the underworld to retrieve her. His music softened the heart of Hades, and he was allowed to bring Eurydice back to the land of the living, so long as he would not look back at her as they exit the underworld. In his anxiety, Orpheus forgot this stipulation, and when he looked back at his beloved, she was taken from him forever. In Offenbach's version, Orpheus is still a musician and married to Eurydice, but the couple is anything but happy; in fact, they are both having affairs. When Eurydice's lover turns out to be Pluto, the god of the underworld, in disguise, she happily surrenders herself to his subterranean lair, leaving Orpheus alone (and elated!). Meanwhile, on Mt. Olympus the gods and goddesses are bored out of their minds. So, when news of Eurydice's abduction reaches Jupiter, the king of the gods, the residents of Olympus embark on a field trip to Hell to save Eurydice. Be prepared for anything, since nothing is sacred in this comedy!

THEATRE PERFORMANCE

Arcadia

Presented by students from our visual and performing arts program. Thought by many to be one of the best plays of the 20th century, Tom Stoppard's *Arcadia* premiered in 1993. Set in Sidley Park, a fictional country estate, the play moves back and forth between 1809 and the present. The residents of Sidley Park in 1809 include 13-year-old Thomasina, her tutor Septimus, her commanding mother Lady Croom, and an assortment of other residents and visitors, including "mad, bad, and dangerous to know" Lord Byron. In alternating scenes, the present-day descendants of the 19th-century family entertain two rival researchers who are visiting Sidley Park to piece together the puzzles of the past. Tom Stoppard is said to have been inspired to write the play after reading the best-selling *Chaos* by James Gleick, and the play swirls with references to Newtonian physics, mathematics, and the 2nd Law of Thermodynamics (did a 13 year-old country girl discover it first?) But *Arcadia* also delves into landscape architecture, Romantic poetry, life, death, and the nature of time, all with Stoppard's signature wit, humor, and intelligence.