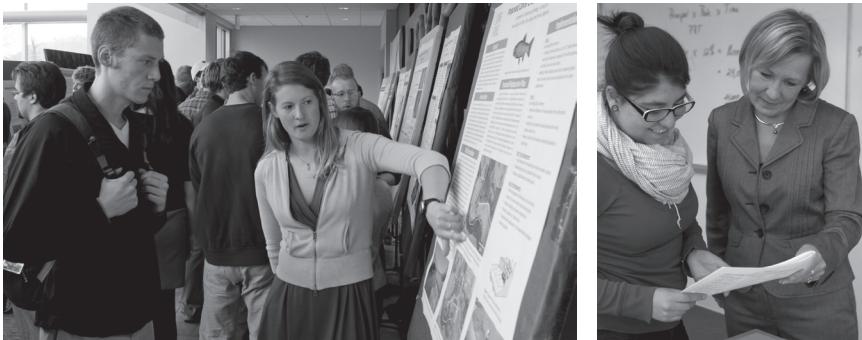


Student Research Symposium

Friday, May 9, 2014



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 where we will welcome Luther College President-elect Paula J. Carlson. Her presence gives us an opportunity to introduce her to the vibrant intellectual life of our college and to the students whose achievements we celebrate today. The community will also gather over a picnic lunch on Bentdahl Commons in the center of campus to extend this welcome to Dr. Carlson and her husband, the Rev. Dr. Thomas Schattauer. (Students have planned a special celebration, beginning around 12:15 pm.)

Following the opening plenary session, the day will unfold with 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: two one-act operas by Giacomo Puccini, *Sister Angelica* and *Gianni Schicchi*, performed by students in our music program's opera workshop; and a contemporary dance performance titled *Highway 57*, presented by students in our program in the visual and performing arts.

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 DAY-AT-A-GLANCE

SESSION I: 9:00–9:45 A.M. OPENING EVENT: CELEBRATION AND KEYNOTE ADDRESSES

Center for Faith and Life Main Hall

- Welcome: President David Tiede and Paul Esker '14

- Address: President-elect Dr. Paula J. Carlson

- Research Reflections: Cate Anderson '14, David Pfotenhauer '15

- Music: Aurora and Norsemen (Jennaya Robison and Andrew Last, conductors)

SESSION II: 10:00 A.M.–11:00 A.M.

Dahl Centennial Union, Mort-Borlaug	Center for Faith and Life Recital Hall	Vallders 206	Olin 101	Olin 102	Olin 107	Preus Library, Hovde Lounge	Jenson-Noble Recital Hall	Valders classrooms
Snips and Snails (and Tallgrass Prairies)	Social Societies	Identity and Diversity	Going Upstream	Behind the Scenes at Luther	Chronicle of a Death Foretold	Something Old, Something New	Power and Politics	Paideia 112 Research (see separate brochure)

SESSION III: 11:15–12:15 P.M.

Dahl Centennial Union, Mort-Borlaug	Center for Faith and Life Recital Hall	Vallders 206	Olin 101	Olin 102	Olin 107	Preus Library, Hovde Lounge	Jenson-Noble Recital Hall	Valders classrooms
Beetles, Butterflies, and Buckthorn	Anthropology and Public Health	Bridging Theologies	Super/Models: Math and Medicine	Leveling the (Media) Playing Field	Loss and Wonder	A Matter of Perspective	Stigma and Progress	Paideia 112 Research (see separate brochure)

COMMUNITY LUNCH: (12:15–1:00 PM)

Bentdal Commons, Central Campus

Celebration with President-elect Dr. Paula J. Carlson and her husband, the Rev. Dr. Thomas Schattauer

SESSION IV: 1:00–2:00 PM					
Dahl Centennial Union, Mott-Borlang	Center for Faith and Life Recital Hall	Valders 206	Olin 101	Olin 102	Olin 107 Dahl Centennial Union Gallery Center for the Arts, Studio II
Bazinga (Physics is Cool)	Ancient Perspectives	Getting the Gospel I	App Happy: Polling and Pros	Contested Spaces	The Play's the Thing 7 is Yellow Bodies in Motion (see separate brochure)

SESSION V: 2:15–3:15 PM					
Dahl Centennial Union, Mott-Borlang	Center for Faith and Life Recital Hall	Valders 206	Olin 101	Olin 102	Olin 107 Preus Library, Hovde Lounge Jenson-Noble Recital Hall
Genes, Proteins, and Sugar Buckets	Class Acts	Getting the Gospel II	App Happy: Not Rocket Science	Rhetoric and Reality	Who's the Real Monster? Life, Death, and Loss Soundings Boards (see separate brochure)

SESSION VI: 3:30–5:00 P.M.					
Poster Session in Sampson Hoffland Laboratories Carlson Atrium/Valders Hall of Science Concourse (with refreshments and chamber music)					

EVENING EVENTS: 7:30 P.M.					
Opera Workshop Performance: Two one act operas, Sister Angelica and Gianni Schicchi (Center for Faith and Life Main Hall) Dance Performance: Highway 57 (Center for the Arts Jewell Theatre)					

SYMPOSIUM SCHEDULE

9:00–9:45 A.M.
SESSION I

- Center for Faith and Life Main Hall*
- Opening Convocation: Celebration and Keynote Address**
- **Welcome:** President David Tiede and Paul Esker '14
 - **Address:** President-elect Paula Carlson
 - **Research Reflections:** Cate Anderson '14, David Pfotenhauer '15
 - **Music:** Aurora and Norsemen (Jennaya Robison and Andrew Last, conductors)
-

10:00–11:00 A.M.
SESSION II

- Dahl Centennial Union, Mott-Borlaug
Snips and Snails (and Tallgrass Prairies)*
- Faculty Moderator: Andy Hageman*

- Kimberly Howell**
Diversity and Effect of Endophytic Fungi on Iowa Prairie Grasses
- Maddy Kofoed**
The Impact of Mid-Holocene Climate on Fire Regimes of the Northern Wisconsin Sand Plain
- Travis Houle**
Riddles in the Dark: The Dispersal of Invasive Aquatic Gastropods in Relation to Cave Environments

Center for Faith and Life Recital Hall

Social Societies

Faculty Moderator: Brian Caton

- Samuel Wettach**
The Civilian Conservation Corps' (CCC's) Role in American Environmental History: New Deal Politics, the CCC in Winnebago County, and Its Environmental Legacy
- Genevieve Becker**
Social Policy and the U.S. Tax System: An Analysis of the Effectiveness of the Earned-Income Credit, Child Credit, and Child and Dependent Care Credit

- Rebecca Rudquist**
Taking On Calvinism: Children and Religion in Meindert DeJong's Literature

Valders 206

Identity and Diversity

Faculty Moderator: Destiny Crider

- Ashley Urspringer**
From Pilgrimage to Fest-Noz: The Changing Manifestations of the Breton Identity
- Jess Landgraf**
Organized Atheism Creating Community
- Ruonan Zheng**
A Step Toward Diversity: Third Culture Kids' Liberation

Olin 101

Going Upstream

Faculty Moderator: Laura Peterson

- Rebecca Dugdale**
Would Divestment from the Fossil Fuel Industry be a Pathway to a Clean Energy Future?
- Anna Gudjonsdottir**
Prevalence of Multi-Drug Resistant Bacteria in Northeast Iowa Streams
- Callie Mabry**
Local Foods in Food Pantries: Current Successes, Barriers to Increasing Procurement by Pantry Clients, and Possible Solutions

Olin 102

Behind the Scenes at Luther

Faculty Moderator: Hongmei Yu

- Emily Tope, Jordan Kuchera**
Behind the Scenes: Director's Cut
- Neal Abbott, Chelsea Hall**
Dis/ordered: An Examination of Mental Health on Luther's Campus
- Bailey Mulholland**
Professor Profiles: A Film Exploration of Life Outside the Classroom

Olin 107

Chronicle of a Death Foretold

Faculty Moderator: David Thompson

- Joseph Novak, Steven Abdo, Karin Hecht, Katelynn Pankratz**
Inept Catholicism: Religious Deficiency in *Crónica de una muerte anunciada*
- Katelynn Pankratz**
The Various Functions of Foreshadowing in *Crónica de una muerte anunciada*

Karin Hecht

Lacking a Trustworthy Narrator:
Why Readers Cannot Discover Truth
in *Crónica de una muerte anunciada*

Steven Abdo

The Sorrow of Memory: An Investigation
into the Inventions and Regret of an Assassin
in *Crónica de una muerte anunciada*

*Preus Library, Hovde Lounge***Something Old, Something New**

Faculty Moderator: Alfredo Alonso Estenoz

Andrew Ruud

Examining Trade Relations and Networks in
16th-Century New Spain

Emma Lofthus

Staging the French Identity: The Sun-King as
Executive Artistic Director on the Stage
of French Court Society

Sandra Cardenas

Forgiveness and Mental Health: The Old
Order Amish Way

*Jenson-Noble Recital Hall***Power and Politics**

Faculty Moderator: Gokhan Savas

Jordy Barry, Clara Lind

Skirts and Sex Politics: A Theoretical
Analysis of Hillary Clinton's Success
with the Big Boys

Cate Anderson

Deconstructing Discourses of the Migrant
in South African History from Apartheid
to the Present

Brita Moore

Their Finest Hours: How Henry V and
Churchill Won British Hearts
by Understanding Them

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

11:15 A.M.–12:15 P.M.

SESSION III**Dahl Centennial Union, Mott-Borlaug
Beetles, Butterflies, and Buckthorn**

Faculty Moderator: Kirk Larsen

Austin Bauer

Impact of Prescribed Fire on Plant and Insect
Communities in a Roadside Prairie Planting

Marissa Schuh

The Effect of European Buckthorn (*Rhamnus cathartica*) on Ground-Dwelling Insects,
including Ants (*Hymneoptera: Formicidae*)
and Ground Beetles (*Coleoptera: Carabidae*),
in Northeast Iowa Forests

Nicole Powers

Ottoes, Baltimores, and Rattlers, Oh My!

*Center for Faith and Life Recital Hall***Anthropology and Public Health**

Faculty Moderator: Maryna Bazylevych

Sophia Ristau

Sleep Deprivation at Luther College:
Perceptual Effects of Sleepiness for Luther
College Students

Ashley Brown

An Anthropological Study of Alcohol,
Stimulants, and Tobacco Products on Luther
College Campus

**Hannah Kelly, Mariana Corpus, Breanne
Rosonke**

Sadness at Luther College

Melissa Lockwood

Violence, Abusive Relationships, and Safety

*Valders 206***Bridging Theologies**

Faculty Moderator: Sean Burke

Jamison Stallman

The Buddhist-Christian Conversation
about Environmental Ethics

Maggie Pierson

What is Common Ground?

Michael Peterson

Babylon is Christian Too: The Experience
of Power in Liberation Theology

*Olin 101***Super/Models: Math and Medicine**

Faculty Moderator: Michael Johnson

Jenny Rustad

Dynamics of Negatively Refracted Light
in Tilings

Megan Gelsinger, Scott Mittman

B-Cell Chronic Lymphocytic Leukemia: A
Model with Immune Response of Genetically
Modified Anti-CD19 CAR T-Cells

Emily Rauch, Gretchen Peterson

Maleficence in Medicine: The Importance
of Intraprofessional Integrity for Upholding
Ethical Standards of Care

Olin 102

Leveling the (Media) Playing Field

Faculty Moderator: Pedro dos Santos

Nathan Converse

Social Media and the Decline of Civic America

Ian Carstens

Who's Playin Who: An Artistic Dialogue on Sports, Race, and the Media

Olin 107

Loss and Wonder

Faculty Moderator: Michael O'Brien

Elizabeth Campbell

The Indianist Compositions of the Wa-Wan Press: Early Attempts to Create an American Musical Identity

Nathan Schmidt

"Broken Dolls": A Short Story of Loss and Wonder

Marin Nycklemoe

Hidden within the Land of the Rising Sun: The Development of the *Kakure Kirishitans* and the Evolution of Religion

Preus Library, Hovde Lounge

A Matter of Perspective

Faculty Moderator: Holly Moore

Katherine Mathis

"What a Piece of Junk": An Examination of the Work of John Chamberlain and the Aesthetic, Ethic, and Environmental Value of "Junk Art"

Carly Ellefsen

Cultural Perception of Landownership in Earth Art: Andy Goldsworthy's *Cracked Rock Spiral* and Robert Smithson's *Spiral Jetty*

Hans Becklin

Art as Theological Propaganda: Herbjørn Gausta's *Good Shepherd*

Jenson-Noble Recital Hall

Stigma and Progress

Faculty Moderator: Ginger Meyette

Catherine Gehlsen

Women's Health, Family Planning, and Literacy Rates in Togo, West Africa

Yang Thao

Addressing Homophobia on College Campuses

Matthew Holcomb

Modelling Value Creation: A New Interpretive Framework for *Thus Spoke Zarathustra*

Valders Classrooms

Paideia 112 Research (see separate brochure)

12:15–1:00 P.M.

Bentdahl Commons, Central Campus

Community Lunch

Celebration with President-elect Dr. Paula Carlson and her husband, the Rev. Dr. Thomas Schattauer

1:00–2:00 P.M.

SESSION IV

Dahl Centennial Union, Mott-Borlaug

Bazinga (Physics is Cool)

Faculty Moderator: Robert Shedinger

Joseph Novak

Finding and Modeling Short Transient Events in the Field of Open Cluster M23

Gian Andreone

Investigating Single Electron Capture between Molecules and Highly Charged Ions

Steven Sorenson

Microscopes and Micromachines: Using Friction to Modify Nanoscale Properties of Aluminum Oxide Surfaces

Center for Faith and Life Recital Hall

Ancient Perspectives

Faculty Moderator: Ruth Caldwell

Daniel Faas

Persepolis in Piraeus: A Study of Persian Cultural Influence on Classical Athens

Sarah Hulberg

Who is Asherah?

Regina Preston

Birds-Eye View

Valders 206

Getting the Gospel I

Faculty Moderator: James Barker

Makayla Marinack

Searching for Sacraments in the Gospel of John

Samuel Berglund
The Birth of the Nativity Stories

Alexandra Klug
To Harmonize or Not To Harmonize the Gospels?

Olin 101
App Happy (Polling and Pros)
Faculty Moderator: Brad Miller

Isaac Dontje Lindell, Sarah McRoberts,
Erik Tingelstad
TapVote

Zachary Aschim, Alain Alcime, Louis Antonio Alcindor, Joseph Lane, Rahul Patle, Nicholas Vondrashek
Prostatys (www.prostatys.com)

Olin 102
Contested Spaces
Faculty Moderator: Kim Powell

Eric Anderson
War, Politics, and Morality Within Children's Media: An Analysis of *Avatar: The Last Airbender*

Philip Mortens
Religion within *Dune*: A Rhetorical Approach to Learning from Literature

Emily Betts
Fighting for Custody: An Ideological Analysis of the Native-American Mascot Debate in Sports

Tyler Rinken
Baseball in 140 Characters or Less:
#SpringTraining

Adelmo Ciucci
The "Good Coach": An Analysis of Communication and Coaching

Olin 107
The Play's the Thing
Faculty Moderator: Nancy Simpson-Younger

Brita Moore
A Method to His Madness: Hamlet and the "Fishmonger"

Tim Komatsu
Directing Mojo

Dahl Centennial Union Gallery
7 is Yellow
Faculty Moderator: Stephanie Travers

Micayla Irmiter
7 is Yellow: Synesthesia and an Art Classroom

Center for the Arts, Studio II

Bodies in Motion
Faculty Moderator: Jane Hawley

Jennifer Schmidt
A Kinesthetic Tradition: Embodying Existing Research as Dance History Pedagogy

Holly Williams
Movement Fundamentals' Four Phases

Valders Classrooms
Paideia 112 Research (see separate brochure)

2:15–3:15 P.M.
SESSION V

Dahl Centennial Union, Mott-Borlaug Genes, Proteins, and Sugar Buckets
Faculty Moderator: Olga Rinco

Shibo (Hylia) Gao
Optimal Placement of Protein Side-Chains Using a Many Body Potential: New Beginning of Dead-End Elimination

Timothy Bumpus
Determining Host-Guest Interaction of Common Environmental Pollutants via Fluorescence Spectroscopy

Alexander Greiner
Controlling a Gene Promoter by Placement in a DNA Loop

Center for Faith and Life Recital Hall
Class Acts
Faculty Moderator: Jeannette Pillsbury

Laura Christensen
Brain-Compatible Interdisciplinary Instruction: Music in the Mathematics Classroom

Ryan Goos
Feedback in Beginning-Level College Language Courses

Jenna Darsee, Claire Baur, Nicole Billips, Robin Hengesteg, Katie Mathis
Empowering Preservice Elementary Teachers to Develop A Critical Eye in the Era of the iPad and Pinterest

Valders 206

Getting the Gospel II

Faculty Moderator: James Barker

Coriann Dorgay

Did Luke Read John's Gospel?

Martin Eyres

The Implications of John's Use of the
Synoptics

Nicholas McGrory

When Were the Gospels Written?

Olin 101

App Happy (Not Rocket Science)

Faculty Moderator: Brad Miller

**Dylan Essing, Alex Dallman, Sam Hedrick,
Noah Lange, Chad Levenhagen, Minh
Nguyen, Ted Ortega, Chris Wagner**
CampusCurb: An Online College Classifieds
System

Gavin Markee, Aaron Mertzenich,

Jacqueline Ott

Ensemble of One: Because It Shouldn't
Take Rocket Science to Make the Next Hit
YouTube Video

Olin 102

Rhetoric and Reality

Faculty Moderator: Kim Powell

Jenna Hoge

The Rhetoric of Sexual Responsibility:
An Examination of Oral Contraceptives
in the United States

Melinda McMahon

A Great and Terrible Beauty: A Study of the
Visual Rhetoric of The People's Gallery

Lora Arens

Divorce: Effects on Communication Patterns
Between Child and Divorced Parents

Chelsea Hall

Handicap Accessibility on Luther College
Campus

Olin 107

Who's the Real Monster?

Faculty Moderator: Amy Weldon

Aubrey McElmeel

Fire and Ice, Rationality and Passion
in *Jane Eyre*

Katherine Mohr

The Others: Monsters in *Frankenstein* and
Native Son

Mary Maiden Mueller

Social Upstarts and the Tenuous Future of
England: Matthew Arnold and Anthony
Trollope

Preus Library, Hovde Lounge

Life, Death, and Loss

Faculty Moderator: Kate Elliott

Hans Becklin, Aaron Zauner

Gerhard Marcks: Woodcuts from the Luther
College Fine Arts Collection

Jenson-Noble Recital Hall

Sounding Boards

Faculty Moderator: Laurie Zaring

Alexandra Robinson

Talking Trees: Musical Ecocriticism in a
Nostalgic Register

Calla Olson

Teaching Tonewoods and Transforming
Values: How We Can Ensure Music as We
Know It Is Sustainable

Elizabeth Campbell

Musical Notation of the Renaissance: Old
and New German Keyboard Tablature

Valders Classrooms

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

3:30–5:00 P.M.

SESSION VI

Sampson Hoffland Laboratories Carlson Atrium/
Valders Hall of Science Concourse

Poster Session

Posters, with refreshments
and chamber music

Faculty Moderator: Kirk Larsen

Grant Barnes

Finding the Catalan Numbers
in the One-dimensional Sandpile Model

Ellen Behrens

Testing for Presence of Tick-borne Disease
and Coinfection

Timothy Bumpus, Matthew Holcomb, Kolin Walker

Lactones Derived from Fatty Acids: New
Monomers for the Production of Bioplastics

Anna Burke

Vascular Plant Diversity in Woodland Seeps
of Winneshiek County

Becca Chapin

Hair and Makeup Renderings
for *A Midsummer Night's Dream*

Lindsey Colyer

A Role for Spirituality in the Nursing Home
Setting: Potential Efficacy in Decreasing
Depression amongst Older Adults

Gabe Dorn, Anuradha Anantharaman, Logan Kochendorfer, Michelle Strafelda

"Restore: The Journey Toward Self-
Forgiveness": A Psycho-Spiritual Educational
Approach to Effectively Promoting Self-
Forgiveness in Cancer Patients

Brian Eachus

Effects of Management on *Pastinaca sativa*
(Wild Parsnip) in a Low-Diversity Grassland

Hannah Fisher

The Environmental Effects of War
in Vietnam

Kristen Flick

Mirror Self-Recognition in Blue Jays

Sarah Floden, Julia Mandsager, Kelsi Swanson

Investigating Elective Macroautophagic
Ald6p Degradation in *Saccharomyces cerevisiae*

Dan Gibson, Karen Davison, Brian Eachus, Devin Gilbertson

Understory Community Structure Response
to Mechanical Thinning and Fire Regime in
an Oak Woodland Restoration

Alexander Greiner

The Development of a Solid-Support
for a Bioplastic Catalyst

Robbie Helgason, Taylor Baloga

Cyclostratigraphy of Monte dei Corvi Beach

Logan Kochendorfer, Bailey Kampa

Moral Foundations Predict Mating
Preferences in Men and Women

Brian Kurtz

Moss and Liverwort Communities Differ
among Four Tree Species at Malanaphy
Springs State Preserve

Kurayi Mahachi, Rob Manges, Melene Thompson, Sam Weinberg

The Effect of a CalR Mutation on *Vibrio
parahaemolyticus* Gene Expression under
Varying Calcium and Iron Conditions

Lauren Maze

Metabolic Recovery Following Submaximal
Exercise Is Not Dependent upon Training
Status or Gender

Megan McClure, Sam Stokes Cerkvenik

The impact of methyladenosine on mRNA
regulation by miRNA-RISC

Victoria Muller Ewald, Allison Bird, Kristin Housholder

Forgiveness and Stress Levels

Joshua Nelson

Ticks and Prevalence of the Lyme Disease-
causing Spirochete *Borrelia burgdorferi*
in Deer Ticks (*Ixodes scapularis*)
in Decorah, Iowa

Jonathan Nerdig, Allison Bird, Kyrie Dailey, Rachel Rem

Modified Two-choice Hidden Food Task
with Blue Jays using Human Gesture and
Gaze Information

Hieu Nguyen

Laws and Regulations of the U.S. Stock
Market: A Study of U.S.-Listed Chinese
Companies and Conflicts of Interest Between
China and the United States

Katrina Okerstrom

Morality Foundation Differences Among
Atheists, Agnostics, and Theists

Maria Streyle

Family Involvement in Implementation
of Music Therapy to Support Infants
in Acute Care Settings

Abbey Syme

Digital Rendering Study on *The Importance of
Being Earnest*

Dylan Winston

Spin Torque of Carriers through Domain Walls

**Sam Zook, Lindsey Bohr, Claire Dembsky,
Taylor Nelson**

Investigating Water Quality in the Dry Run Creek Watershed over Seasons with Varying Precipitation

Additional poster displays presented by students from the following classes:

Biology 253: Invertebrate Zoology

Biology 354: Evolutionary Biology

Environmental Studies 175: Intro to GIS

Nursing 473: Community Centered Care

Nursing 490: Senior Project

Physics 114: Physics of Sound and Musical Acoustics

Psychology 352: Cognitive Processes

7:30 p.m.

OPERA PERFORMANCE

Center for Faith and Life, Main Hall

Two one-act operas, *Sister Angelica and Gianni Schicchi*

See synopsis, page 44

7:30 p.m.

DANCE PERFORMANCE

Center for the Arts, Jewell Theatre

Highway 57

See Synopsis, page 44

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)

NEAL ABBOTT '15

CHELSEA HALL '14

Dis/ordered: An Examination of Mental Health on Luther's Campus

There is no question that there is a stigma surrounding mental health in the world today. Through the documentary that we created in the spring of last year, we were able to explore mental health issues on college campuses in depth. By telling the story of filmmaker and current Luther student Neal Abbott '15, we were able to detail his struggles with obsessive-compulsive disorder and anxiety. After living without treatment for more than 10 years and faced with increasing stresses at college, Neal finally built up the courage to seek help. We argue that, in an age in which it is difficult to discuss and be open about such disorders, stories such as this should be told not only to those who also suffer with mental health issues, but to everyone, so that awareness and respect can be built for individuals experiencing mental illness. The film has already touched the lives of numerous students and faculty as a result of its screening on campus and through the Internet, and it is our hope that the impact of this film will continue to spread.

Faculty sponsor: Thomas Johnson

STEVEN ABDO '16

The Sorrow of Memory: An Investigation into the Inventions and Regret of an Assassin in *Crónica de una muerte anunciada*

In the novel *Crónica de una muerte anunciada* (*Chronicle of a Death Foretold*), Colombian author Gabriel García Márquez weaves an intriguing tale of the events surrounding the murder of a young man named Santiago Nasar. However, this account is not a typical mystery story; rather than leading the reader on a hunt to discover the names and motives of the assassins, Márquez shocks us by describing the details of the murder and introducing the culprits by the second chapter. Instead, the real mystery of the *Crónica* is the identity of the narrator. While some may think the narrator to be an insignificant character, I believe that Márquez's intentional lack of strong involvement in the story on the part of the narrator signifies a much deeper connection to the events of the murder than readers are initially

led to believe. Drawing on very specific occasions in the novel that I point to as subliminal confessions, my research speculates that Márquez creates a false identity for the narrator, aiming to confuse any reader whose attention the purpose of the narrator escapes. I will analyze the characters most closely associated with the victim in the book and show how their roles in the story from the narrator's point of view serve to unveil the mystery of the murder.

Faculty sponsor: David Thompson

CATE ANDERSON '14

Deconstructing Discourses of the Migrant in South African History from Apartheid to the Present

Migration is not new to southern Africa. Since the beginnings of recorded history, groups have moved throughout what constitutes South Africa, Zimbabwe, Namibia, Lesotho, and Botswana. However, more recently, these movements have not been met peacefully. In 2008, riots echoed throughout South Africa as numbers of South Africans physically attacked immigrants in their areas, leading to numerous injuries and deaths. Using South Africa as a case study, this paper examines discourse surrounding immigration in southern Africa. Focusing on public governmental discourse using Michel Foucault's *History of Sexuality* as theoretical framework, this paper examines shifts in the ways that migrants have been discussed and how these changes could contribute to the imagined realities which precipitated violence. My research focus has been a qualitative analysis of primary documents, specifically apartheid-era laws and ANC documents, post-apartheid state-of-the-nation speeches, public statements from the Department of Home Affairs, the Immigration Law of 2002, and official responses to the 2008 riots. This study demonstrates the slow and subtle changes in discourse that have interacted peacefully and violently with the projected South African identity. These findings add a purely discourse-centered historical study to an area of study largely dominated by political science, sociology, and geography literature.

Faculty sponsor: Richard Mtisi

ERIC ANDERSON '14

War, Politics, and Morality Within Children's Media: An Analysis of *Avatar: The last Airbender*

As of late, children's media have begun to include important themes and implications that are relevant to children and adults alike. In addition, certain texts within this genre have become intricate narrative vessels with complex universes and firm senses of morality. A prominent example of this trend is *Avatar: The Last Airbender*, which places its protagonists into a war-torn world packed with sociopolitical notions. Generally, the show adopts an antiviolent, peaceful, and spiritually driven stance on war. The project asks the following question: how does *Avatar* convey its antiwar themes, and how are these themes applicable to nonfictional history? By using a qualitative semiological analysis of the particularly war-related episodes of the series (backed by support from prior research within the realm of science fiction studies and semiotics), it is evident that the series uses the narrative, character arcs, and combat imagery to convey these morals. As a children's show, *Avatar* is effective in introducing children to highly adult concepts that they will undoubtedly face in the future, while also entertaining adults due to its narrative complexity and compelling universe.

Faculty sponsor: Derek Sweet

GIAN ANDREONE '14

Investigating Single Electron Capture between Molecules and Highly Charged Ions

In 1996, astrophysicists pointed a radio telescope toward comets passing near the sun and were astonished to see the comet was emitting X-rays. Physicists speculated that the emissions were actually the result of collisions between relatively slow-moving ions emitted from the sun (called the solar wind) and molecules, such as water and methane, in the vapor surrounding the comet. These ions would then capture the outermost electrons from the cometary molecules into high atomic energy levels. When the electrons relax to a lower energy they emit the x-ray photons. In this study we attempt to improve upon current simulations of collisions between the solar wind ions and water molecules. Using a classical trajectory Monte Carlo method to simulate the collision, we determine which energy states the captured electrons initially populate. The findings from this project will be valuable to researchers attempting to use these cometary X-rays as a way

to study the solar wind ions from low Earth orbit or even from the surface of Earth itself.

Faculty sponsor: James Perez

LORA ARENS '14

Divorce: Effects on Communication Patterns Between Child and Divorced Parents

This paper is an autoethnography that incorporates my personal experience with the divorce of my parents while intertwining research on communication patterns between children and their divorced parents. More specifically, it focuses on a divorce with one partner committing adultery and the effect that it had on the relationship with that parent and the child as a young adult. This study explores different stages of relationships with the parent who had an affair, and shows an evolution in the relationship over time. This paper focuses primarily on the level of communication between the child and the parent. The intention of this study is to utilize an intriguing personal story to extend sociological understanding and gain an understanding of a situation that may be uncommon to many young adults.

Faculty sponsor: Kim Powell

ZACHARY ASCHIM '14

**ALAIN ALCIME '15, LOUIS ANTONIO ALCINDOR '14, JOSEPH LANE '14, RAHUL PATLE '14, NICHOLAS VONDRAŠHEK '13
Prostatys (www.prostatys.com)**

For our senior project in computer science, we wanted to develop a more effective method of obtaining relevant information from social media, news, and economic trends. The result is Prostatys (www.prostatys.com). Fundamental to achieving our goal was strategically limiting ourselves to the producers of the most salient information: subject matter experts. For this project we needed to first define an expert, find and identify said experts, and categorize experts via fields and sub fields. Once identified, the app would allow users to follow experts on Twitter, RSS feeds, and other sources. Users identify subject matter areas and follow and cross reference them, which enables the user to identify a subject that may be impacting multiple disciplines. Our presentation will showcase this app and describe the process we used to create it.

Faculty sponsor: Brad Miller

GRANT BARNES '16

**Finding the Catalan Numbers
in the One-Dimensional Sandpile Model**

The study of avalanches in the one-dimensional Bak, Tang, Wiesenfeld (BTW) sandpile model is deeply connected with number theory. The BTW model characterizes the repeated process of adding a grain of sand randomly to the sandpile. Avalanches occur in this model when the slope of the sandpile becomes too large. Using a Markov chain approach, we can describe how a stable sandpile transitions from one state to another via avalanches, and we show the distribution of various stable states. We found the distribution of recurrent stable states, which are stable sandpile configurations with a nonzero probability of occurring over time, for small values of "n". Analysis of the number of recurrent states for a sandpile reveals interesting applications to number theory. One such result is that the number of recurrent stable states for a sandpile can be described by the Catalan numbers, an important numerical sequence that appears in many different branches of mathematics. We provide an alternate proof to this result of Chhabra, Feigenbaum, Kadanoff, Kolan, and Procaccia.

Faculty sponsor: Mike Johnson

JORDY BARRY '15

CLARA LIND '14

Skirts and Sex Politics: A Theoretical Analysis of Hillary Clinton's Success with the Big Boys
In the United States, women comprise 51 percent of our population; however, they make up only 20 percent of the Senate and 17.93 percent of the House of Representatives. In a nation that prides itself on equality, liberty, and justice for all its people, these numbers do not reflect the visions upon which our country was founded. They also suggest that in the United States, women are not receiving the descriptive representation they need in order to represent effectively the other half of the population. This research focuses on media framing of women politicians, and how that negatively impacts political participation. First, we will focus on politicians who have garnered much of the media's attention (*i.e.*, Michelle Bachmann, Sarah Palin, and, in the state of Iowa, congressional candidate Anesa Kajtazovic) and how they have been portrayed to the American constituency. Second, we will discuss the socio-political implications of viewing these candidates through a lens that is irrelevant to the campaign at hand. Finally, we will contrast the way Hillary

Clinton has distinguished herself from other women politicians, and discuss whether her strategy will be beneficial or detrimental during her probable presidential candidacy in 2016.

Faculty sponsor: Pedro dos Santos

AUSTIN BAUER '14

Impact of Prescribed Fire on Plant and Insect Communities in a Roadside Prairie Planting

Four years after seeding the U.S. Highway 52 roadside to native prairie north of Decorah, Iowa, there has not been successful establishment of native grasses and forbs. The successful establishment of native tallgrass prairie species along Highway 52 would likely lead to increased abundance and species richness of native butterflies and ground beetles by providing suitable host plants for plant-insect interactions. In the spring of 2013, a late-spring prescribed burn was used to control *Bromus inermis* and *Phalaris arundinacea*, which are the primary invasive grass species present. Five 200-meter-long plots, each paired with an unburned control plot, were burned in an attempt to increase native plant and insect diversity. Species richness and diversity (H^1) of plants were not significantly different between burned and unburned plots. Species richness for butterflies and ground beetles were also not significantly different between plots. Principle components analysis data, however, indicate there are differences among plants, butterflies, and ground beetles in the burned and unburned communities. Repeated use of prescribed fire may be necessary to control the invasive grasses and stimulate native species growth.

Faculty sponsor: Kirk Larsen

GENEVIEVE BECKER '14

Social Policy and the U.S. Tax System: An Analysis of the Effectiveness of the Earned Income Credit, Child Credit, and Child and Dependent Care Credit

Since its inception, the United States tax system has evolved in response to changes in our society and economy, and the needs of the population. Specifically, social policy has influenced many changes in the U.S. tax system, especially in regard to tax credits. This study analyzes the impact of social factors that led to the creation of the earned-income credit, child credit, and child and dependent care credit. It will discuss how effective these tax credits have been in achieving social policy goals. By examining the history, implementation, and application of each tax

credit, this study evaluates the social impact and assesses the effectiveness of the tax credits noted.
Faculty sponsor: Mona Nelson

HANS BECKLIN '14

Art as Theological Propaganda: Herbjørn Gausta's Good Shepherd

Herbjørn Gausta's *Good Shepherd* altarpiece, produced for Decorah's First Lutheran Church in 1895, represents far more than a simple reproduction of a devotional image by the German artist Bernhard Plockhorst. Rather, when placed in the context of the late 19th-century Lutheranism's anti-Missourian controversy, this pastoral work is understood as a pointed theological statement. A majority of Norwegian Lutherans had left the Norwegian Synod (the denomination that founded Luther College and First Lutheran) because of a dispute about God's activity in the process of the election of the saved. Through artwork, the "cathedral of the Norwegian Synod" was making a strong statement against those who had fled the church, calling for reunification on their terms. Using an interdisciplinary approach combining history, art, and religion, this presentation will explain the controversy and this work's appropriation of a common devotional image as propaganda.

Faculty sponsor: Kate Elliott

HANS BECKLIN '14

AARON ZAUNER '14

Gerhard Marcks: Woodcuts from the Luther College Fine Arts Collection

Gerhard Marcks' woodcuts, although infrequently on view, are a highlight of Luther's Fine Arts Collection. Many present different understandings of the relationship between life, death, and loss. This relationship was palpable throughout Marcks' life as he dealt with the loss of his son during World War II and the devastation of Germany once the war had ended. Yet Marcks' fascination with these universal concerns continued into the 1960s and '70s, showing the continued mark made by this experience upon his artistic production. This presentation, given as a gallery talk on the main floor of Preus Library, will present a more nuanced understanding of the works than is attainable with concise text panels.

Faculty sponsor: Kate Elliott

ELLEN BEHRENS '14

Testing for Presence of Tick-Borne Disease and Coinfection

This study focused on detecting the presence of tick-borne pathogens in deer ticks, *Ixodes scapularis*, in order to determine disease prevalence for the area and discern whether or not coinfections (in which one tick might be carrying multiple pathogens) are occurring. These ticks were collected from natural lands on Luther College campus and surrounding areas in Decorah during the summer and fall of 2013. PCR assays for two tick-borne diseases (Lyme disease and human granulocytic anaplasmosis) were optimized. Twenty-five percent of the collected ticks tested positive for Lyme disease, but none of the ticks tested positive for anaplasmosis. Work on the test for a third disease, babesiosis, continues.

Faculty sponsor: Eric Baack

SAMUEL BERGLUND '16

The Birth of the Nativity Stories

There are three main stories of Jesus' birth in early Christian gospels, one each in the canonical Gospels of Matthew and Luke as well as the extracanonical Protevangelium of James. This paper investigates the interrelations among all three versions of the nativity. Each story evinces similarities and differences with both others, and previous studies have debated whether one or more of the gospels served as a written source for the other gospel(s). My research goes beyond previous studies by exploring an interfluential model, that is, whether these gospels could have influenced each other even while they were in the process of being written. In other words, the interrelations of these gospels may be more complicated than scholars currently presume. This research project can provide new ways of understanding the composition of the gospels and the intentions of their authors.

Faculty sponsor: James Barker

EMILY BETTS '15

Fighting for Custody: An Ideological Analysis of the Native American Mascot Debate in Sports

The debate as to whether or not sports institutions should be allowed to use Native American Indian mascots has been ongoing for nearly 30 years. While many fans assert that these images are used in respectful ways, and have become symbols of personal identity, many could

argue against such assertions. The purpose of this paper is to show that the use of these images serves to naturalize Native American Indians as symbolic products of a giant entertainment industry. By conducting an ideological rhetorical analysis using both critical race theory and cultural theory, I ultimately claim that the use of Native American Indian mascots and the rhetoric used with these particular images does in fact marginalize/dishonor Native American peoples.

Faculty sponsor: Thomas Johnson

ASHLEY BROWN '14

An Anthropological Study of Alcohol, Stimulants, and Tobacco Products on Luther College Campus

Alcohol, tobacco, and other drugs are often associated with societal problems, especially in college settings. Our study sought to explain certain findings from the 2012 survey by the American College Health Association (ACHA). Our objectives were to a) figure out why, according to the survey, men tend to have more impulsive drinking behaviors than women; b) determine why fewer students reported drinking and driving at Luther College than the national average; c) find out why there is much more perceived tobacco use than reported use; and (d) explore the reason reported stimulant use at Luther College was significantly lower than the national average. Interviews of 29 selected individuals of varying ages, majors, and genders, with questions on each individual topic, were used to answer the proposed questions. The respondents believed men experienced less judgment for drinking, leading to many of the impulsive behaviors, such as competitive drinking. Explanations for the drinking and driving number disparity were often no need for a car (72.4 percent), having a designated driver whenever they drink (48.3 percent), and knowing someone on campus to call for a ride (27.6 percent). The tobacco use and stimulant statistics were most often explained by under-reporting for stimulants and overestimation for tobacco.

Faculty sponsor: Angela Kueny

TIMOTHY BUMPUS '15

Determining Host-Guest Interactions of Common Environmental Pollutants via Fluorescence Spectroscopy

The presence of environmental pollutants in our water and soil systems is a great nuisance in many ways to both humans and the ecosystem.

Scientists are interested in both understanding to what level environmental pollutants are present in our world (and finding ways of detecting these molecules) as well as finding ways to remove these pollutants from our ecosystem. The ability of several persistent environmental pollutants to form supramolecular complexes with three different host systems (α -cyclodextrin, β -cyclodextrin, and sodium dodecyl sulfate micelles) was investigated using steady-state fluorescence and $^1\text{H-NMR}$. This chemical study aimed to identify pollutants in water samples at very low concentrations, and also add insight into how these chemicals interact with larger, stable structures, called supramolecular systems. The pollutants used for this study were from three broad classes: 1) furans, 2) aromatic hydrocarbons and 3) polychlorinated biphenyls. The formation of host guest complexes was studied with fluorescence and was confirmed using $^1\text{H-NMR}$. The results indicate that fluorescence could be used as an inexpensive means by which to identify these pollutants, especially the furans and aromatic hydrocarbons. Strong interactions were found between the aromatic hydrocarbons and all three supramolecular hosts, while the furans interacted with β -cyclodextrin and micelles.

Faculty sponsor: Olga Rinco

TIMOTHY BUMPUS '15

MATTHEW HOLCOMB '15, KOLIN WALKER '15

Lactones Derived from Fatty Acids: New Monomers for the Production of Bioplastics

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. Nonetheless, despite its promise, PLA may presently displace only a limited range of petroleum-based products. For example, PLA softens at a relatively low temperature, making it unsuitable for applications such as hot-beverage cups and microwave-safe food containers. Several strategies have been employed to modify the

physical properties of PLA (such as the softening temperature). One strategy replaces some or even all of the methyl substituents on the polymer chain with bulkier groups. Herein we report the preparation of analogs of D,L-lactide from palmitic and stearic acid. The new analogs replace the methyl groups of D,L-lactide with large aliphatic chains, and the comb polymers that result from polymerization of these analogs are expected to have an expanded range of physical properties.

Faculty sponsor: Brad Chamberlain

ANNA BURKE '15

Vascular Plant Diversity in Woodland Seeps of Winneshiek County

Small wetlands occur where groundwater slowly emerges from hillsides creating areas of moist, organic-rich soil. While previous studies have documented high plant diversity in seeps and fens of northeast Iowa, small seeps within forested areas have not been described in this region and their ecological importance is largely unknown. The objective of this study was to document plant diversity and to measure water quality in six forested seeps near Decorah. I identified vascular plant species and determined their relative abundance at each location. All seeps used in this study had high vascular plant diversity. Several notable species were *Symplocarpus foetidus*, *Liparis loeselii*, and *Acorus americanus*. I measured nitrate levels, conductivity, and pH of the water at different locations in each seep three times during the summer. Results of water tests showed that seeps with a high diversity of rare wetland plants had nitrate levels averaging 0.68 ± 0.37 parts per million, pH levels of 7.54 ± 0.26 , and average conductivity of $500.3 \pm 66.59 \mu\text{S}/\text{cm}$. These nitrate and conductivity levels are low compared to the surface water in streams in the area. The information obtained by this study is important for preserving these diverse habitats from destruction due to livestock or development.

Faculty sponsor: Beth Lynch

ELIZABETH CAMPBELL '14

Musical Notation of the Renaissance: Old and New German Keyboard Tablature

The musical notation that we use today is the most recent step in hundreds of years of constantly changing form and style. This presentation will take you back to the Renaissance and Baroque eras when there were multiple forms of notation that differed by instrument and region. We will examine two forms of German keyboard

tablature that were used primarily to notate organ and harpsichord music. Old German keyboard tablature first appeared in the 14th century before the shift to New German keyboard tablature in the second half of the 16th century. J.S. Bach used keyboard tablature for some sections of his *Orgelbüchlein*. However, by the end of the Baroque Era, keyboard tablature was replaced by newer styles of notation. Through visual aids and an informative lecture, this presentation will give the audience the opportunity to learn some aspects of keyboard tablature. The audience will be introduced to the challenges of transcription to modern notation through musical examples from *das Buxheimer Orgelbuch*, Bernhard Schmid's *Tabulatur Buch*, and *Klavierbuch der Jungfrau Regina Clara Im Hoff*.

Faculty sponsor: Jim Griesheimer

ELIZABETH CAMPBELL '14

The Indianist Compositions of the Wa-Wan Press: Early Attempts to Create an American Musical Identity

In 1901 Arthur Farwell founded the Wa-Wan Press to counter what he saw as the overwhelming influence of the German musical tradition in the United States. Arthur Farwell and the Indianist composers of the Wa-Wan Press sought to use Native American themes to create a national American musical identity. He wished to establish a unique American sound through the use of Native American song in the same way that European composers had crafted national identities through the use of their folk music. In their attempt to establish Indianist music as a national American music, the composers of the Wa-Wan Press used musical exoticism and claims to authenticity to establish their music as truly American. I argue that it was this drive toward authenticity and exoticism that caused the movement to fail. Authentic Native American music could never produce genuine American music because Native Americans were seen as too exotic and not truly American. The Indianist movement failed because they were unable to break with European traditions and establish themselves as authentically American.

Faculty sponsor: Michael O'Brien

SANDRA CARDENAS '16

Forgiveness and Mental Health: The Old Order Amish Way

Previous research shows that forgiveness is linked with lowering stress, alleviating anger and frustration, and improving mental health.

Forgiveness is an essential pillar to the Amish community. Although there has been research focused on the presence of forgiveness in the Amish community, the direct link to mental health within this community needs further exploration. This presentation focuses on how the Amish community describes the link between forgiveness and mental health, based on a focused analysis from an ethnographic study about how forgiveness is taught within the Amish community. Data from the original study were qualitatively analyzed through the use of codes and themes. Once these codes were developed, connections between forgiveness and mental health began to lace together to provide the findings for this presentation. Participants provided experiences and stories showing that forgiveness increases serenity and decreases stress while helping avert health problems such as drug use or depression. Amish community members attend specific activities to promote mental health, such as Emotional Anonymous, to discuss some of their forgiving practices. Through the Amish model of forgiveness, we are able to observe a connection between forgiveness and mental health, which can contribute to future nursing interventions to improve mental health from a holistic approach.

Faculty sponsor: Angela Kueny

IAN CARSTENS '14

Who's Playin Who: An Artistic Dialogue on Sports, Race, and the Media

Who's Playin Who, an art exhibition, was a senior honors project done in collaboration with Luther College's Black History Month's Symposium on Sports, Race, and the Media. The project involved preliminary research, a curated art exhibition, production of a catalog, and a post-exhibition video documentary. Featuring the perspectives of Luther artists Brian Nnaoji, LeRoy Smith, Jenna McGee, and Decorah artist Tom Sheppard, it explored how national, racial, class, and individual identities have been and continue to be shaped by the media as we fumble, dunk, and race each other. Who's Playin Who examined through artistic media how sports, race, and the media impact understandings of embodiment, personhood, representation, exploitation, institutional structure, and "spectacularization." The project explored how racial and class characteristics such as "blackness" have been defined, appraised, and then sold for material gain. For example: exotic icons made sacred, such as Air Jordan shoes, are consumed and sacrificed

for corporate benefit and spectator enjoyment. Yet sports remains one of the most approachable communal human activities across economic and cultural disparities. Who's Playin Who provides an intimate depiction of the relation of sports, race, and the media as inseparable from human identity and the human community.

Faculty sponsor: David Kamm

BECCA CHAPIN '15

Hair and Makeup Renderings for A Midsummer Night's Dream

For my final project this fall in Theatre Design II, I created hair and makeup renderings for a modern, a period, and a fantasy play. My primary research asks the question: How do I create an effective fantasy character through makeup and hair design? For this presentation, I focus on fantasy techniques for the characters King Oberon and Queen Titania of the fairies for the stage play *A Midsummer Night's Dream* by William Shakespeare. The process involved researching rendering techniques and designs; researching makeup techniques, including highlight and shadow and how to apply those techniques to the face; and researching images to inspire my designs. To document my project, I created a research portfolio, photographed models for each character, and sketched hair and makeup designs with models' features using techniques learned in my research. The final step was to apply my hair and makeup designs to the models to see what the characters would look like on stage in a production of *A Midsummer Night's Dream*.

Faculty sponsor: Lisa Lantz

LAURA CHRISTENSEN '14

Brain-Compatible Interdisciplinary Instruction: Music in the Mathematics Classroom

This project aims to create independent, teachable lessons that use music to help middle-school students connect with mathematics in the context of their current math classes. These lessons will help students build a mathematical foundation that connects with the natural structure and function of the adolescent and pre-adolescent brain, setting them up for better learning both within and beyond the traditional math classroom setting. The research phase of this project established a demonstrated need for pedagogical changes in the mathematics classroom, including interdisciplinary teaching. It also explored connections between math and

music that can be used in practical classroom instruction. Based on this research, I created lesson plans that allow teachers to use music as a teaching tool early in a unit to help introduce new mathematical concepts and keep students engaged while making the conceptual leaps from concrete numbers to abstraction. I am gathering feedback from experienced teachers and their students, helping me to revise my lesson plans based on this data to create a tested and effective set of teachable lessons.

Faculty sponsor: Jeannette Pillsbury

ADELMO CIUCCI '14

The “Good Coach”: An Analysis of Communication and Coaching

One facet of communication that has grown widely popular in the last few years is coaching of sport. Coaches' tactics are becoming more visible in the public eye, and the importance of their impact on athletes has become more widely accepted. This study addresses the tactics coaches use with athletes under specific circumstances to make their athletes successful in performance, and overall as a people. Focusing on testimonials, it asks specifically: when faced with difficult situations, what is the most effective method to generate the highest performance and level of self-esteem from an athlete? Through a series of interviews and qualitative analysis of these testimonials, this study explores what qualities coaches themselves believe necessary to be considered a “good coach.” These findings indicate a large array of answers, ranging from coaches feeling that aggression is almost never necessary for success, to coaches finding that sometimes one needs to do the hard thing to end up with the best result.

Faculty sponsor: Thomas Johnson

LINDSEY COLYER '15

A Role for Spirituality in the Nursing Home Setting: Potential Efficacy in Decreasing Depression amongst Older Adults

Over 1.5 million people in the United States reside in nursing homes, and that number is expected to increase substantially in the coming years. Most of the residents of nursing homes are over 65 years of age, and within that group, one of the major health problems is depression. Depression affects up to 19 percent of individuals 65 years of age and older, and up to 50 percent of those residing in nursing homes. Depressed individuals do not suffer only psychologically: depression is directly related to a number of

health complications, including high blood pressure, chronic pain, and cancer. Working with residents of the Aase Haugen Home in Decorah, we examined the relationship between depression and factors such as daily spiritual experiences, social connectedness, loneliness, and chronic illness. Not surprisingly, we found that depression was related to loneliness. Of interest is our finding that, for residents who felt lonely, an increase in daily spiritual experiences was related to a decrease in depression. These results suggest that introducing spirituality-enhancing interventions that focus on decreasing loneliness may play a major role in decreasing the depression rates of older adults who reside in nursing homes.

Faculty sponsor: Stephanie Travers

NATHAN CONVERSE '14

Social Media and the Decline of Civic America

In On Democracy, French political thinker

Alexis de Tocqueville argues that the culture of “public associations” promotes civic values that contribute to the effectiveness and cohesiveness of American democracy, emphasizing the role newspapers play distributing information and enabling widespread communication. Today, social media and other online technologies enable citizens to interact on a scale that de Tocqueville never could have imagined. The usage of social media in the United States shares much in common with newspapers of de Tocqueville's time: both promote the flow of information for individual citizens and collective public associations, allowing them to actively participate in American community life. This paper will explore whether the rise of social media technologies have contributed to the fabric of American democracy in a positive way, or to a decline in the quality of social interaction and nature of civic values in American society. Examining the social media trends of Luther College students, this study attempts to measure how usage affects civic attitudes of a small group of college students. The data collected suggests that while collaborative usage of digital technologies among college students at Luther is high, respondents do not feel that these relationships are as strong or as meaningful as offline interactions.

Faculty sponsor: John Moeller

JENNA DARSEE '15

CLAIRE BAUR '15, NICOLE BILLIPS '14,
ROBIN HENGESTEG '16, KATIE
MATHIS '15

**Empowering Preservice Elementary Teachers
to Develop A Critical Eye in the Era of the
iPad and Pinterest**

With an abundance of lessons available on the Internet and projects revealed on Pinterest for every occasion, now more than ever there is call for preservice teachers to read these images and curricular ideas with a critical eye. During the course of the semester, the current Elementary Art Methods Course at Luther College challenges preservice classroom teachers to examine their notions of meaningful art integration through readings on current art educational theory and practice, an understanding of contemporary art, studio projects, and critiques of elementary art lessons found on the Internet. Students walk away empowered to develop contemporary curriculum integrating art into their classrooms inspired by contemporary artists, visual culture, social justice issues, and technology. Two current art education students will reveal their research of art lessons on Pinterest, establishing an argument for critical pedagogy, and two aspiring elementary education teachers will present their original lesson plans written at the culmination of the course inspired by contemporary artists, iPad apps, elements of art, and principles of design. This presentation was featured at both AEI (Art Educators of Iowa) and NAEA (National Art Education Association) conferences this year.

Faculty sponsor: Lea Lovelace

ISAAC DONTJE LINDELL '14

SARAH McROBERTS '14, ERIK
TINGELSTAD '14

TapVote

The computer science senior project, TapVote, is a service designed to make polling a group of people quick and painless. TapVote allows a user to quickly create a questionnaire and poll a group of people, with results available in real time. The focus of development is on ease-of-use, versatility, and immediate results. TapVote works on smartphones, tablets, and laptops. The original inspiration for this app was to replace the single-purpose "clickers" that professors hand out to students to take in-class surveys. TapVote's flexible interface makes it appropriate for many situations, from classroom polls to deciding what to have for lunch. Our presentation will showcase

this app and discuss the process we used in its development.

Faculty sponsor: Brad Miller

CORIANN DORGAY '16

Did Luke Read John's Gospel?

The Gospel of John's relationship to the Synoptics (Matthew, Mark, and Luke) continues to be debated. This paper investigates the material common to the Gospels of Luke and John. Specifically it tests the hypothesis of F. Lamar Cribbs (and Mark Matson) that Luke was using John rather than the reverse. According to Cribbs, at times Luke appears to know that Mark and John have given conflicting reports; examples include the location of Jesus' ministry as well as his call of the disciples and his trial before the Jewish council. D. Moody Smith has recently suggested further testing of Cribbs's thesis, and this paper makes an initial attempt to do so.

Faculty sponsor: James Barker

GABE DORN '15

ANURADHA ANANTHARAMAN '15,
LOGAN KOCHENDORFER '15, MICHELLE
STRAFELDA '14

**"Restore: The Journey Toward
Self-Forgiveness": A Psycho-Spiritual
Educational Approach to Effectively
Promoting Self-Forgiveness in Cancer Patients**

The purpose of the present study was to design and test Restore: The Journey Toward Self-Forgiveness, a brief psycho-spiritual curriculum for encouraging appropriate and responsible self-forgiveness. This was a randomized, wait-list controlled trial including 83 cancer patients and caregivers who were randomly assigned to either complete the Restore curriculum or be part of a waiting-list group that enjoyed light reading and/or conversation. A workbook was the tool used to implement the curriculum. Measures of self-forgiveness, acceptance, benefit-finding, and optimism/pessimism were collected before and after participation. Using analysis of covariance to control initial levels, post-session levels showed that Restore participants scored higher than wait-list controls on self-forgiveness ($F(1,78) = 9.85$, $p < .001$), acceptance ($F(1,77) = 4.84$, $p < .05$), and benefit-finding ($F(1,79) = 5.28$, $p < .05$) and lower than wait-list controls on pessimism ($F(1,77) = 5.01$, $p < .05$). Furthermore, changes in acceptance, benefit-finding, and pessimism explain a statistically significant proportion, though not all, of the Restore effect on self-

forgiveness (Beta = -.08, p < .05). The present investigation provides what we believe is the first brief, evidence-based program for facilitating self-forgiveness and provides empirical support for its efficacy in individuals known to struggle with forgiveness issues.

Faculty sponsor: Loren Toussaint

**REBECCA DUGDALE '14
Would Divestment from the Fossil Fuel Industry be a Pathway to a Clean Energy Future?**

In a world where an energy crisis is a pressing issue, there needs to be movement toward a clean energy future. The fossil fuel divestment campaign is growing, hoping to stimulate changes. This paper compares the divestment from South African companies during the 1980s with the current call for divestment from the fossil fuel industry as a catalyst for social change. I will specifically ask: can divestment from the fossil fuel industry be a pathway to a clean energy future, or do the financial implications and tensions outweigh the positive effects of making a social statement? To dig further into this complex issue, I used the analysis of various articles as well as interviews with college presidents and consulting firm members. This paper concludes that although there are similarities between the two campaigns, the biggest benefit from the fossil fuel divestment movement is the awareness it brings to the issue of climate change. This movement can lead to other types of change, such as impact investing, that may have an effect on reducing, and possibly reversing, climate change.

Faculty sponsor: Mona Nelson

**BRIAN EACHUS '15
Effects of Management on *Pastinaca sativa* (Wild Parsnip) in a Low-Diversity Grassland**

Pastinaca sativa (wild parsnip) is a nonnative biennial managed because of its impacts on human and other animal skin through phytophotodermatitis. We used three different treatments to control *P. sativa* adults prior to setting seed: scything flowering stems above-ground, root-cutting plants several centimeters below-ground, herbicide application on target plants, and control plots. All treatments were replicated (x7) in a burned and unburned plot design. After two years of targeted control and three consecutive years of prescribed fire, the number of reproductive *P. sativa* was one half to one third less abundant in burn than no-burn

plots. In burn and no-burn plots, the number of *P. sativa* adults was greatest in the scythe treatment, and generally similar among the other treatments. This pilot study indicates that multiple, annual, late spring burns may provide significant reduction of *P. sativa*, possibly resulting from mortality of adults, rosettes, and/or seed bank. In contrast, the greater number of *P. sativa* in scythe treatments, an effect similar to mowing, may create favorable growth conditions for *P. sativa*. These results suggest that management methods can greatly differ in their effectiveness, ranging from population reduction to growth of *P. sativa*.

Faculty sponsor: Molly McNicoll

**CARLY ELLEFSEN '15
Cultural Perception of Land Ownership in Earth Art: Andy Goldsworthy's Cracked Rock Spiral and Robert Smithson's Spiral Jetty**

This paper considers the cultural differences in the understanding of land ownership in Earth Art artists Robert Smithson and Andy Goldsworthy, and how that understanding translates into the formal qualities of their work. British artist Goldsworthy and American artist Smithson define the meaning of land and land ownership in different ways respective to their cultures, which leads to formal differences of size and shape, as well as differences in time sensitivity. The traditional British perception of land is not as material to be exclusively owned, as it is unnatural, while the American perception of land can be traced to the concept Manifest Destiny. This difference in the concept of land ownership is manifested in each artist's oeuvre. Goldsworthy's *Cracked Rock Spiral* is small, while *Spiral Jetty* is colossal, expanding 1,500 feet off the shore of the Great Salt Lake of Utah. Goldsworthy's piece is destroyed over time by nature, while Smithson's work permanently changed the landscape. Goldsworthy's spiral shape is aesthetically organic, while Smithson's is unnatural looking. Through this comparison, the American and British cultural understandings of land are directly understood.

Faculty sponsor: Kate Elliott

DYLAN ESSING '14

ALEX DALLMAN '14, SAM HEDRICK '14,
NOAH LANGE '14, CHAD LEVENHAGEN
'14, MINH NGUYEN '14, TED ORTEGA '13,
CHRIS WAGNER '14

CampusCurb: An Online College Classifieds System

For most college students, decorating their dorm room is a key part of the college experience. As part of this process, most want to buy used items to save a little bit of precious cash. Craigslist is a great resource for this effort at large universities in densely populated areas, but Decorah's distance from the nearest city on the website makes it difficult for Luther students to fully utilize its services. For our senior project in computer science, our team created CampusCurb to remedy this problem by creating an online classifieds system targeted toward college campuses in the United States where each college is given its own listing. Users are able to upload into three distinct categories: textbooks, goods, and rooming/housing. The textbook and goods classified listings let users post books, furniture, or whatever else they want to sell, while rooming/housing can assist users in finding a roommate to help with the rent or fill that last space in the cluster. Available on three different platforms (website, Android, and iOS), CampusCurb helps students connect and sell with convenience and confidence. Our presentation will showcase this system and will include a discussion about the process of development we follow to create it.

Faculty sponsor: Brad Miller

MARTIN EYRES '16

The Implications of John's Use of the Synoptics

Scholars have debated the Gospel of John's relation to the Synoptic Gospels (Matthew, Mark, and Luke) for the last century. Most have concluded that John was independent, but that position is being challenged more and more. Without presuming to settle this question, this paper uncovers the implications of whether John was familiar with the Synoptics. By examining the handful of stories occurring in all four canonical gospels (for example, Jesus' interaction with John the Baptist, the Feeding of the 5,000, and the Passion Narrative), I ask whether John more likely intended to supplement, reinterpret, or replace the previous Gospels.

Faculty sponsor: James Barker

DANIEL FAAS '14

Persepolis in Piraeus: A Study of Persian Cultural Influence on Classical Athens

The nature of the relationship between Classical Athens and the Persian Empire has recently come into question. Scholars have begun to ask whether significant cultural interaction took place between these two powerful civilizations. Dan Davis, assistant professor of classics, and I set out to determine, first, whether cultural interaction was likely to have occurred between Persia and Athens. If so, did that influence extend to the architecture of one of Athens' greatest engineering projects, the shipsheds of the Piraeus, the vast array of roofed ramps built to protect the warships of the Athenian navy when in port? To address the question, we analyzed reconstructions of Athenian public buildings and those of the capitals of the Persian empire and investigated both Greek and Persian contemporary sources to determine the level of cultural exchange. We conclude that a high degree of cultural exchange did take place, and that it is probable that Athens' shipsheds were built as a potent political symbol much in the same fashion as the royal architecture of the Persian court. These findings point to a much more reciprocal relationship than was previously thought and shine new light on the nature of the Athenian Empire.

Faculty sponsor: Dan Davis

HANNAH FISHER '14

The Environmental Effects of War in Vietnam

Can you imagine walking around town and suddenly being surrounded by a choking fog? What if all of your trees or all of the plants in your garden started dying and you had no idea why? This is what the Vietnamese people were confronted with by the Vietnam War in the 1960s. Much of the immediate effect of the war was seen in the defoliation of the forests. The primary question that drove my research was whether the war in Vietnam had any lasting effects on the environment. I used firsthand reports of what happened during the war as well as reports of the amounts of various chemicals that were used. I also looked at studies that were done more recently to determine any lasting effects. I found that the main immediate effects of this war were very similar to most wars: people were killed and injured, and land was destroyed. But there were long-term effects on the environment

as well. Soil continues to be contaminated by herbicides, and the forests and mangroves have not recovered. Because the soil is contaminated by chemicals, so is the food that is grown there. My presentation will discuss some of the ongoing effects of this contamination on the Vietnamese people.

Faculty sponsor: Jim Martin-Schramm

KRISTEN FLICK '15

Mirror Self-Recognition in Blue Jays

Previous research has shown that three species of Corvid birds are able to show mark-directed behavior in front of a mirror. We wanted to see if blue jays would also demonstrate this behavior. Because two other species have not been able to pass the mark test, it was not a given that blue jays would pass. Our methods for testing this involved exposing birds to different conditions, including having a mirror or a nonreflective plate present. We then looked to see whether or not the birds reacted to a small, colored, circular sticker located on the neck region, or to one that was clear and that presumably blended into the feathers. In our experiment we had two birds that had statistically significant mark-directed behavior during the experimental conditions with a colored sticker in front of a mirror compared to all other control conditions. Finding that two of the eight birds tested passed the mark-directed test puts blue jays in the same category as other birds that also passed in the Corvid family. This result suggests that these birds have the capacity of self-awareness and self-recognition.

Faculty sponsor: Kristy Gould

SARAH FLODEN '15

JULIA MANDSAGER '15,

KELSI SWANSON '14

Investigating Elective Macroautophagic Ald6p Degradation in *Saccharomyces cerevisiae*

When cells lack necessary nutrients autophagy is initiated, which digests unessential cellular components to be recycled for vital functions. The neural death associated with disease states like Alzheimer's is caused by the neurons' inability to remove protein aggregates. It is also known that autophagy is broken in these diseases. Curiously, these protein aggregates are completely covered with a protein coat of ubiquitin. This discovery has led to two hypothesis: 1) the ubiquitin coats are a protective mechanism in response to the protein aggregates; or 2) ubiquitin is used to initiate autophagy but only "seen" when

autophagy is halted. The purpose of this study was to develop a model system to distinguish between these two possibilities; Ald6p, an aldehyde dehydrogenase, has been found by other studies to be both ubiquitinated and sent through the autophagic pathway. An epitope-tagged version of Ald6p was used in Western blot analysis to test for degradation in response to starvation. We hypothesized that if Ald6p was degraded by autophagy, then a loss of signal could be detected. We also tagged Ald6p with green fluorescent protein (GFP) to explore its movement in vivo. We hypothesized that Ald6p-GFP would be seen moving to the vacuole (the digestive organelle), indicating the active degradation of Ald6p.

Faculty sponsor: Brookhart Shields

SHIBO (HYLIA) GAO '14

Optimal Placement of Protein Side-Chains Using a Many Body Potential: New Beginning of Dead-End Elimination

As one of the major biological components, proteins have a fundamental role in every organism. Understanding the crystallographic structures of proteins can be quite essential for gene therapy, drug design, and related medical applications. Unfortunately, many proteins implicated in pathogenesis have not yet been crystallized. Therefore computational optimization prediction of protein structures becomes important. Protein side-chains are often very flexible with respect to backbones, thus prediction of side-chain position can be exceptionally difficult. Global optimization of protein side-chains using discrete rotamer libraries is a challenging problem due to the large number of permutations that exist. To reduce the search space, rigorous inequalities called Dead-End Elimination have been described to eliminate high-energy rotamers, rotamer pairs, and so on. However, important biomolecular driving forces, including the hydrophobic effect and electronic polarization, are neglected in the original algorithm. Here we present new rotamer elimination criteria with consideration of higher order energy terms such as three-body and four-body energies. This opens the door to the rigorous use of protein simulations and computational protein structure design.

Faculty sponsor: Marian Kaehler

CATHERINE GEHLSEN '14

Women's Health, Family Planning, and Literacy Rates in Togo, West Africa

It seems generally acknowledged that the more educated women are, the fewer children they will have and, conversely, the less educated they are, the fewer opportunities they will have for adequate family planning. However, some countries with relative women's independence and higher literacy rates show high fertility rates, suggesting that there may be other factors involved. For instance, the fertility rate of women in Togo is 4.58 children born per woman in 2013 (*CIA World Factbook*), placing it 28th in the world. Women's literacy is 46.9 percent, compared to neighboring Benin and Burkina Faso with lower literacy rates and comparably higher fertility rates. This paper questions the assumption that low literacy goes hand in hand with lower fertility rates. Analysis of multiple articles on women's health in West Africa, statistics on women's health, and my field research in Togo this past summer show that there are numerous other factors that affect fertility rates, such as access to and availability of birth control, women's economic independence, and urban or rural location. My research suggests that family-planning campaigns need to take into consideration sociocultural context and that Togo would benefit from using existing women's organizations to educate women about family planning and women's health in general.

Faculty sponsor: Anne-Marine Feat

MEGAN GELSINGER '15

SCOTT MITTMAN '14

B-Cell Chronic Lymphocytic Leukemia: A Model with Immune Response of Genetically Modified Anti-CD19 CAR T-Cells

B-cell chronic lymphocytic leukemia (B-CLL) is characterized by the gradual accumulation of malignant mature white blood cells, originating in the bone marrow and spreading to other parts of the body. While currently no cure exists, several therapy methods are in use to try to stabilize the disease and/or put the patient into remission, a gamut which recently includes the modification of autologous T-cells as a means of targeting and fighting the cancer internally. In an attempt to understand the dynamics between the anti-CD19 CAR T-cells and B-CLL cells in the body, we present a mathematical model in terms of ordinary differential equations for the immune response. With the support of data obtained from recent medical trials, we analyze the relationship

between the anti-CD19 CAR T-cells and B-CLL cells, studying the sensitivity of parameter and initial condition values and their effect on the overall "successfulness" of the immunotherapy method. With this model, we hope to shed light on future research using anti-CD19 CAR T-cells, offering areas of concentration for new trials using our insights in the sensitivity of certain parameters.

Faculty sponsor: Kyle Fey

DAN GIBSON '15

KAREN DAVISON '14, BRIAN EACHUS '15,

DEVIN GILBERTSON '14

Understory Community Structure Response to Mechanical Thinning and Fire Regime in an Oak Woodland Restoration

Response of the understory plant community to an oak woodland restoration may vary based on canopy openness and fire frequency. In this pilot study, the canopy was thinned of junipers, *Juniperus virginiana*, and black walnuts, *Juglans nigra*, to leave mature oak trees, *Quercus macrocarpa*, significantly increasing canopy openness. After thinning, plots (1/3 acre) were assigned one of three treatments (burn annually, burn biannually, and no-burn). After four years of treatments, understory species richness was greatest in the thinned, no-burn plot and lowest in the annually burned and control plots. Among burn regimes, the difference in species richness was primarily due to the presence of woody saplings, vines, and shrubs in the no-burn and biannual burn plots but not the annual burn plots. Abundance of herbaceous species was greatest in the annually burned plot. Herbaceous species present were common to degraded woodlands in the region and likely reflect the history of the woodland and the young age of the restoration. In this restoration, mechanical thinning increased woody species richness in the understory, but annual burns offset this effect. A combination of thinning and burns is likely needed to maintain an open herbaceous-dominated understory that is characteristic of open oak woodlands

Faculty sponsor: Molly McNicoll

RYAN GOOS '16

Feedback in Beginning-Level College Language Courses

Feedback is an essential ingredient in learning a second language, as it helps to reinforce unfamiliar grammar and language rules. Feedback shows learners where they are in the process itself, letting them know what they already

understand well and what they still need to work on. However, it can be confusing to know which type of feedback will be the most effective in a certain situation: is it better to correct what the learner said without signaling errors, or is it more beneficial to highlight the error as well as the correction? This study sought to answer three main questions: 1) How does feedback contribute to the language learning process? 2) What constitutes high-quality feedback? and 3) How effective is feedback received through computer-based language exercises? A survey of 20 scholarly articles and experiments suggests that the most useful forms of feedback for beginning-level language students are more explicit than implicit and have more focus on producing output than receiving input. This presentation will define key terms and discuss research findings on the most effective forms of feedback in second-language learning.

Faculty sponsor: David Thompson

**ALEXANDER GREINER '14
Controlling a Gene Promoter by Placement
in a DNA Loop**

The *E. coli lac* operon contains the first genetic switch to be discovered. Yet, fundamental questions regarding the regulation of gene expression remain. Studies have shown that *lac* repressor is capable of looping DNA. These DNA loops have regulatory roles, because RNA polymerase is excluded from DNA by direct competition between RNA polymerase and repressor binding sites. What happens if RNA polymerase and repressor binding sites do not physically overlap? To address this question we have designed a set of spacing constructs in *E. coli* to examine the accessibility of a promoter at different positions within a DNA loop. The promoter was incrementally altered such that the RNA polymerase binding surface faces the inside or outside of the loop. Expression of the reporter gene *lacZ* was measured in the absence and presence of the lactose analogue IPTG to determine if the promoter was active or repressed, depending on its position within the DNA loop. This allowed comparison of *lacZ* activity when DNA was looped (absence of IPTG) and non-looped (presence of IPTG). Data suggests RNA polymerase can bind promoters facing the outside of a DNA loop, but is excluded from promoters facing the inside of the loop.

Faculty sponsor: Brad Chamberlain

**ALEXANDER GREINER '14
The Development of a Solid-Support
for a Bioplastic Catalyst**

The world's use of bioplastics has increased at an alarming rate over the past 20 years. Recent statistics from the Environmental Protection Agency show that nearly 32 million tons of plastic waste was generated in 2012. Only nine percent of this plastic was recovered for recycling. The necessity for plastics derived from renewable resources, such as corn and soy, has never been greater. Efforts are underway across the world to develop plastics that have a decreased environmental footprint. The Chamberlain laboratory has previously identified a catalyst that is capable of developing these bioplastics. This catalyst, while powerful, is extremely difficult to recover and reuse after it has completed its catalytic activity. We aim to develop a recoverable and reusable bioplastic catalyst through the development of a polymeric scaffold. This scaffold binds to the catalyst, which prevents its loss. This project investigates whether development of this catalyst is possible and offers advantages over current methodologies.

Faculty sponsor: Brad Chamberlain

**ANNA GUDJONSDOTTIR '15
MATTHEW ROSENE '15, REBEKAH
SCHULZ '14
Prevalence of Multi-Drug Resistant Bacteria
in Northeast Iowa Streams**

Over 70 percent of antibiotics purchased in the United States are used for healthy livestock, and as a result, concentrated animal feeding operations (CAFOs) are being investigated as potential breeding sites for antibiotic resistance in bacteria. To further investigate this, water samples collected from both streams near CAFOs and streams that did not have CAFO land upstream were filtered through a membrane which was then placed on media containing tetracycline. Bacteria that grew were then cultured on media containing either ampicillin, bacitracin, methicillin, or streptomycin to test for multidrug resistance, characterized by resistance to four or more antibiotics. The majority of colonies that were tetracycline resistant showed resistance to at least four other antibiotics with an average fraction of 0.306 multidrug resistant to tetracycline at non-CAFO sites and 0.334 at CAFO sites. With the Upper Iowa River being such a popular destination for recreational activities, many individuals are likely being regularly exposed to multi-drug resistant bacteria.

Faculty sponsor: Eric Baack

CHELSEA HALL '14

Handicap Accessibility on Luther College Campus

Handicap accessibility on college campuses is one aspect of college life that many people don't consider. However, for people with physical disabilities, easy access to entrances and other building accommodations are often the deciding factor in choosing a school. This project addresses the question: how can we change the buildings on Luther's campus to be more accessible and wheelchair friendly? This public relations project includes developing a brochure and slideshow presentation that address the weak areas on campus where improvements could be made, and considers solutions to how buildings and entrances can be altered to better serve the needs of all students, not just the able ones. The goal of this project is to draw attention to these weaknesses and explore possible architectural solutions.

Faculty sponsor: Mark Johns

KARIN HECHT '16

**Lacking a Trustworthy Narrator:
Why Readers Cannot Discover Truth
in *Crónica de una muerte anunciada***

The novel *Crónica de una muerte anunciada* (*Chronicle of a Death Foretold*), by Colombian author Gabriel García Márquez, is a piece of literature read and pondered by many, as its plot appears shrouded in mystery. This mystery has tempted countless readers to extract from its pages the truth about the murder of Santiago Nasar, around which the facts seem endlessly twisted. As the narrator goes on his quest to discover the truth, readers are introduced to various perspectives of the fateful day that Santiago died, and the inconsistencies between them. A central issue of this novel is how these differing perspectives might change how readers interpret the story, and the crime that took place. Through reading and analysis of *Crónica de una muerte anunciada*, I have concluded that the information given to readers regarding the death of Santiago is overall not trustworthy; therefore, readers cannot discover the truth about what happened, regardless of how in-depth one may read. This research adds one more theory to the numerous perspectives that already exist, each of which affects how this intricate and multifaceted novel may be interpreted.

Faculty sponsor: David Thompson

ROBBIE HELGASON '15

TAYLOR BALOGA '15

Cyclostratigraphy of Monte dei Corvi Beach

Monte dei Corvi, a mountain near Ancona on the east cost of Italy, is composed of limestone, shale, and marly limestone outcrops dating back to the Serravallian (13.65 Ma). The section's varying sedimentary beds are hypothesized to be indicative of Milankovitch cycles and therefore of the environmental conditions of eight million years ago. The purpose of this study was to identify correspondence between lithological fluctuations and the climatic changes of the Milankovitch cycles. Samples were collected from 26 meters of the Monte dei Corvi Beach section. Data analysis focused on three specific intervals of the outcrops. A variety of proxy analyses were performed on samples from these intervals. The data were interpreted in Matlab and then correlated with the Laskar model of Milankovich cycles through the use of Adobe Illustrator. Magnetic susceptibility proved to be an inaccurate proxy for correlating lithology to Milankovitch cycles. Calcium carbonate data from the SAR outcrop demonstrate precessional cycles within the black shale layers. A strong obliquity signal, with a wavelength twice that of the precessional cycle, was shown to control a lithologic modulation between black shales and evaporitic calcite layers.

Faculty sponsor: Laura Peterson

JENNA HOGE '14

**The Rhetoric of Sexual Responsibility:
An Examination of Oral Contraceptives in the
United States**

In United States society and culture, the division between gender roles, rules, and norms is visible in a plethora of ways, but particularly through sexual expectation. Perhaps the most visible and accessible of these expectations is the female virgin/whore dichotomy. More complex and relevant, however, is the related debate over sexual responsibility manifested in contraceptives, especially oral birth control. In our day of advanced technology and medicine, why does sexual responsibility remain largely with women? Why is the availability of sexual responsibility a topic of such intense contention? This feminist rhetorical criticism first analyzes United States contraceptive history from 1960 until present, including available methods, technologic progress, legal rulings, and social perceptions and receptiveness. The analysis then turns to a close textual analysis of the modern

day political contraceptive debate and its social implications. Evidence for this analysis is gathered primarily from advertisements and recent news reports on debates. The resulting analysis reveals that hegemonic masculinity, medicalization/surveillance medicine, and technosociality have dominated social discourse, reducing women's agency.

Faculty sponsor: Kim Powell

MATTHEW HOLCOMB '15

Modelling Value Creation: A New Interpretive Framework for *Thus Spoke Zarathustra*

Friedrich Nietzsche was a late 19th-century philosopher whose works are often challenging to read both because of his aphoristic style and because of his forceful critique of society. Among a difficult body of work, *Thus Spoke Zarathustra* is in many ways one of most challenging. It combines the vagueness of Nietzsche's aphorisms with the personal challenges presented by his approach to his subject in a narrative format. Therefore, understanding the messages of this work requires formalization of the significance of its narrative structure. To accomplish this task, the approaches of other authors are analyzed, with the criteria in mind that a successful statement of the purpose of *Thus Spoke Zarathustra* should both explain its form and agree with statements made about the work by Nietzsche. Traditional philosophical approaches are found to fail the first criterion. A comparative literature approach ultimately informs an interpretive framework which emphasizes Zarathustra's journey as a positive model for how value creation is possible in a world after the death of God. This new framework leads to a new understanding of the most esoteric section of the work, the fourth part, as a warning against exoteric philosophizing.

Faculty sponsor: Matt Simpson

TRAVIS HOULE '15

Riddles in the Dark: The Dispersal of Invasive Aquatic Gastropods in Relation to Cave Environments

The New Zealand Mud Snail, *Potamopyrgus antipodarum*, is an invasive aquatic gastropod seen throughout Europe, Australia, Japan, and North America. *P. antipodarum* has been found along the Sentino River in Italy, which flows through the Frasassi Gorge, a large incised limestone complex containing a karstic cave system that is home to unique extremophile ecosystems. This study was conducted to identify

the distribution of *P. antipodarum* along the Sentino River within the Frasassi Gorge, and to compare environmental characteristics of sites along the river with sites within and akin to the cave environment. At each of our 24 sites we measured the number of individuals and collected water samples for chemical analysis in the lab. We found no individuals at sites similar to the cave environment, or at the cave environment itself. However, upon placing individuals within a mesocosm that replicated the cave ecosystem, *P. antipodarum* was able to survive past several weeks. This result suggests that although *P. antipodarum* does not prefer to occupy this habitat, it may be able to adapt and survive in this unique cave ecosystem. Our findings also shed light onto the potential evolutionary origins of the endemic gastropod species, *Islamia* sp., found within the Frassasi caves.

Faculty sponsor: Laura Peterson

KIMBERLY HOWELL '15

Diversity and Effect of Endophytic Fungi on Iowa Prairie Grasses

Tallgrass prairies are an important ecosystem of the Midwest, but the fungal symbionts, which live inside prairie grasses and often confer benefits to their hosts such as drought tolerance, have received little study. We isolated endophytes from native and restored prairies in northeast Iowa, to compare the difference of the species of endophytes isolated from the native grasses in each prairie. We also set up a greenhouse experiment in which Indian Grass seedlings were inoculated with no endophytes, with one of two endophyte strains, or with both endophytes after being heat treated to remove any pre-existing endophytes. Some of the fungi isolated from the field have yet to be classified. In the greenhouse experiment, the effects of fungi on their hosts varied depending on the species, with one species appearing to increase plant growth and another appearing to decrease plant growth. Fundamental biological questions remain unanswered for this important symbiont of a keystone prairie species.

Faculty sponsor: Eric Baack

SARAH HULBERG '14

Who is Asherah?

In 1929, the Late Bronze Age city of Ugarit was discovered on the Mediterranean coast of Syria. At that site numerous mythological texts were discovered that portrayed the Canaanite pantheon, including a goddess named Athirat

(the biblical Asherah). Since the discovery, scholars have debated the characteristics of this goddess, including her presence in biblical texts and in early Judahite religion. Asherah has been attributed to different figures and figurines by scholars, and she has even been linked to other goddesses such as the Ugaritic goddess Astarte and the Greek goddess Aphrodite. In my presentation, I will examine the scholarship related to the figure of Asherah through a comparison of characteristics attributed to this deity and other similar deities from the eastern Mediterranean during the Late Bronze Age and Early Iron Age. This comparison will demonstrate that representations of Asherah from the southern Levant are in continuity with representations of other similar goddesses from the eastern Mediterranean.

Faculty sponsor: Kristin Swanson

MICAYLA IRMITER '14

7 is Yellow: Synesthesia and an Art Classroom

As a student with synesthesia, a neurological condition in which sensory experiences are involuntarily associated and organized, sensory integration has been a fundamental part of my learning language. Using my experiences and research as a guide, I have integrated sensory information as an experiential tool to add depth in learning in an art classroom. I explored Gardner's multiple intelligences, studied artists such as Joan Mitchell, David Hockney, and Wassily Kandinsky, and read relevant works by art critics, such as Charles Baudelaire. My research has shown that incorporating associations and diverse sensory information into a classroom setting can potentially enhance learning experiences. These findings have resulted in a unit of lesson plans that illustrate this awareness and use sensory integration as a tool to facilitate meaningful learning experiences in an art classroom. This presentation will be given as a gallery talk.

Faculty sponsor: Kate Elliott

HANNAH KELLY DEC. '14

MARIANA CORPUS '15, BREANNE
ROSONKE '15

Sadness at Luther College

This project analyzes the mental health of students attending Luther College using the American College Health Association's survey as a benchmark, specifically focusing on levels of sadness. The root of sadness, defined by feelings

of despair, helplessness, and being unhappy, was examined more deeply through interviews with 23 individuals over the course of January Term. Research questions included: Why have 66.8 percent of men and women at Luther College felt very sad in the last 12 months? What are the possible reasons for the differences of sadness between genders reported at Luther, with women at 71.4 percent and men at 57.4 percent? Why do Luther College males have a higher rate of "seriously considering suicide" as compared to Luther females? (ACHA, 2012a). Our group's results showed that men and women had the same causes of sadness, but their coping mechanisms differed. Men internalized their sadness, resulting in a greater percentage of males who seriously considered suicide. The results demonstrated that males are less likely to seek external help from their peers or treatment from health care professionals, instead turning to unhealthy coping mechanisms. This information can help to identify at-risk populations and resources needed to prevent sadness and potential suicide at Luther College.

Faculty sponsor: Angela Kueny

ALEXANDRA KLUG '16

To Harmonize or Not To Harmonize the Gospels?

This paper examines ways the ELCA harmonizes the canonical Gospels, particularly when teaching the Christmas and Easter stories. It will examine ELCA publications and place these interpretations in the context of other notable attempts to combine multiple gospels into a single narrative; examples include Tatian's *Diatessaron* (second century), Augustine's treatise *On the Harmony of the Gospels* (late fourth/early fifth century), and the work of Protestant Reformers Martin Luther and John Calvin (16th century). The guiding research question concerns what is gained and what is lost theologically by harmonizing the gospels. In other words, what are the advantages or disadvantages of reading the gospels together as one rather than in isolation from, or in conflict with, one another?

Faculty sponsor: James Barker

LOGAN KOCHENDORFER '15

BAILEY KAMPA '15

Moral Foundations Predict Mating Preferences in Men and Women

Buss and Schmitt (1993) proposed evolutionary-based differences in male/female mating

preferences, and past research suggests that those sex differences are moderated by religiosity. The present research extends this line of research to examine the relationship between mating desire variables in men and women and the five moral foundations proposed by Haidt and Graham (2007; care, fairness, in-group loyalty, authority, and purity). Results from 165 subjects indicated that, consistent with past research, men reported wanting more sexual partners and being willing to have intercourse sooner than did women. Women also had higher care and purity foundation scores than did men. Finally, results revealed that purity scores were negatively related to women's desire for sexual partners in the long term and the short term, as well as for willingness to have intercourse in the long-term. For men, however, purity was negatively related only to willingness to have intercourse in the long term. These results suggest that not only are there differences between men and women in moral foundations, but that there are sex differences in how at least one of those foundations relates to mating desires.

Faculty sponsor: David Njus

MADDY KOFOED '14
**The Impact of Mid-Holocene Climate
on Fire Regimes of the Northern Wisconsin
Sand Plain**

A region's wildfire regime is just as much a part of its ecosystem as its vegetation or climate. Paleoecologists can study sediment from lake bottoms to reconstruct wildfire history from hundreds and thousands of years ago. In this project, I studied the wildfire history of a jack pine ecosystem in the Northern Wisconsin Sand Plain using lake sediment. Microscopic charcoal from a core taken from Metzger Lake was quantified to reconstruct the fire regime 4,000–6,000 years ago during the Mid-Holocene Warm Period (MHWP). The main focus of this project was to determine how the warmer climate of the MHWP affected fire regime in the Sand Plain. Was fire more frequent, of higher intensity, or neither? I analyzed total charcoal abundance and frequency of peaks in the charcoal record that relate to fire events, and compared these parameters to Metzger Lake charcoal records from 4,000 years ago to present. It seems likely that MHWP fire frequency indicated by the charcoal record will be significantly higher than that of the later, cooler Holocene. Understanding how fire regime responded to the warmer climate of the MHWP may help land managers better predict and manage for potential fire regime changes

during the climate warming projected for the next 50–100 years in northern Wisconsin.

Faculty sponsor: Beth Lynch

TIM KOMATSU '15

Directing *Mojo*

In 1995, Jez Butterworth's *Mojo* premiered in London. It was met with rave reviews, and was eventually adapted into a movie and revived in 2013. Since its premier, reviews have called it "wickedly funny" as well as "exhilaratingly violent" (Spencer, Coveny). It is a fast paced, often surprisingly funny drama, set in the late 1950s, in a club called "The Atlantic Club" in London. The play contains incredibly dark themes, such as drug addiction, pedophilia, and murder. The characters Sweets and Potts are what drew me to the play: they are younger men who are drawn into the world of The Atlantic, and turn a blind eye to the horrifying things that surround them. This is a chosen ignorance; the two men are unwilling to look at the violence and horrors that surround them because they are so enraptured by the "glamour" of the music and drugs in the club scene. My presentation will focus on my analysis of this play as a striking commentary on modern youth. What does it take to get us to notice that the issues of the world are more serious than we want to believe?

Faculty sponsor: Jeff Dintaman

BRIAN KURTZ '15

**Moss and Liverwort Communities Differ
among Four Tree Species at Malanaphy
Springs State Preserve**

With over 300 vascular plant species in 64 acres, Malanaphy Springs State Preserve (Winneshiek County, Iowa) is an exceptionally diverse preserve. During the 2013 summer I began an inventory of mosses and liverworts (bryophytes) in the hardwood forests on the north-facing slope of the preserve. I also compared the composition of bryophyte communities growing at the bases of red elm, hackberry, sugar maple, and basswood trees. Previous studies demonstrated that bryophyte composition differs among tree taxa due to differences in the texture and pH of bark and light availability. I estimated the percent cover of bryophytes in 10-by-20 cm rectangular plots located at 0, 40, 80, 120, and 160 cm up the trunk of each tree. We identified over 30 bryophyte species in the forest, and found 15 species growing on the trees sampled. The plots at the bases of the trees had the highest percent

cover and the greatest species diversity. Five bryophyte species were found on all four tree species, and an additional five species were found on all species except basswood. *Anomodon minor*, *Amblystegium serpens*, and *Leskeia gracilescens* were most prevalent. Several taxa occurred only on red elm or sugar maple.

Faculty sponsor: Beth Lynch

JESS LANDGRAF '14

Organized Atheism Creating Community

As a college affiliated with the Evangelical Lutheran Church in America (ELCA), Luther College offers many campus-wide activities, traditions, and organizations rooted in Christian tradition. In 2009 a small minority of atheist, agnostic, humanist, and other religiously unaffiliated students organized themselves into the Secular Student Society (SSS), which still meets weekly. Members follow different moral systems and personal interests, but the SSS fosters strong connection among the participants. Over what commonalities do these students build community within the organization? Why do these students value and prioritize SSS meetings? I address these questions by analyzing recorded meetings from October 2013 through February 2014 and in-depth interviews with each SSS participant. Based on preliminary results, I argue that the participants build their community around both a shared experience of religious ostracism, made more intense by the Christian symbolism present across the Luther campus, and opposition to biblical literalism.

Faculty sponsor: Evgenia Fotiou

MELISSA LOCKWOOD '15

Violence, Abusive Relationships, and Safety

Violence, abusive relationships, and safety are public health issues affecting individuals' physical, mental, and emotional well-being. Luther College data about violence, abusive relationships, and safety were examined and compared to national data using the American College Health Association's National Collegiate Health Assessment II (ACHA-NCHA II) statistics. Luther students reported feeling safer on and off campus versus national data. Male students at Luther were more likely to report being stalked and sexually touched compared to the national data. Furthermore, verbal threats were the most reported case of violence both at Luther College and nationally. A total of 21 Luther College students were interviewed to gain

a deeper understanding about these safety issues. Each of the interviews lasted about an hour and addressed the following topics: safety at night; gender differences in stalking and sexual touching without consent; and the prevalence of verbal threats. It was discovered that several factors influenced the differences seen between Luther College and national norms, such as a) the small campus and community size, and b) the excessive alcohol consumption on campus versus national data. After addressing the existing campus safety measures, recommendations to improve safety will be discussed.

Faculty sponsor: Angela Kueny

EMMA LOFTUS '14

Staging the French Identity: The Sun-King as Executive Artistic Director on the Stage of French Court Society

French King Louis XIV (r. 1643–1715), in his attempt to create a new absolute monarchy, was a patron of the arts in order to consolidate his power and bolster his self-idealized *Roi-Soleil* (Sun-King) image. As the aristocracy's power decreased, Louis XIV centralized his power by making the courtiers live at Versailles and attend his courtly entertainments. Was Louis XIV the master puppeteer/artistic director for the entire French court society? Music and dance were his particularly favorite arts, and his favored composer was Italian-born Jean-Baptiste Lully (1632–1687), the founder of French opera. This presentation concentrates on the tension between political agenda and artistic freedom through the study of historical primary sources, Baroque scores, and critical documents found in Parisian libraries, the Cité de la Musique, and several universities. Lully's symbolic operas are historical products of this royal patronage from a time when the government held great control over artistic expression. The "partnership" between composer and "master puppeteer" planted the seeds of a "new" French aristocratic identity and shaped our post-modern understanding of performance as both an artistic and a social construct.

Faculty sponsor: Anne-Marine Feat

CALLIE MABRY '14

Local Foods in Food Pantries: Current Successes, Barriers to Increasing Procurement by Pantry Clients, and Possible Solutions

There are many benefits at the individual, community, and ecosystem level to building more community-oriented local food systems, including

reduced energy inputs for transportation, processing, and packaging, and increased familiarity with the grower. However, locally grown foods are often unavailable for lower-income people. This investigation uses Decorah, Iowa, as a case study examining how local foods have been incorporated into food pantries' efforts to meet the needs of food-insecure individuals in the surrounding community. Interviews with directors and volunteer coordinators at the three food pantries in Decorah and surveys of clients at the First Lutheran Church food pantry were conducted. Several successful efforts to provide food pantry clients with local foods were identified, including a program to bring surplus produce from the farmers market to one of the food pantries, donations from local gardeners and church gardens, and donations from local restaurants and meat lockers. However, barriers to increasing local foods in food pantries existed for pantries, donors, and clients. This study examines many possible solutions to increasing local foods procurement for food pantry clients.

Faculty sponsor: Jim Martin-Schramm

KURAYI MAHACHI '15

ROB MANGES '15, MELENE

THOMPSON '14, SAM WEINBERG '15
The Effect of a CalR Mutation on *Vibrio parahaemolyticus* Gene Expression under Varying Calcium and Iron Conditions

In this study we investigated the organism *Vibrio parahaemolyticus*, a ubiquitous marine bacterium and major cause of foodborne illness in humans. We are interested in understanding how this bacterium senses and responds to environmental changes, including those that occur in ocean, estuary, and gastrointestinal habitats. Two elements whose levels vary in these environments are calcium and iron, and prior work in our lab has identified 45 *V. parahaemolyticus* genes, whose activity is influenced by these metals. A protein, CalR (for calcium regulation), has been identified that is involved in regulating a subset of these genes. We hypothesize that CalR operates by suppressing gene activity under particular calcium and iron conditions. To test this idea, we introduced a CalR mutation into *V. parahaemolyticus* strains and examined the effect on gene activity under varying calcium and iron conditions. Results suggest that the CalR protein has a negative effect on activity of some genes under low iron and low calcium conditions. This study is increasing our understanding of how *V. parahaemolyticus* responds to environmental

signals, including those that might be contributing to disease-causing ability.

Faculty sponsor: Jodi Enos-Berlage

MARY MAIDEN MUELLER '14

Social Upstarts and the Tenuous Future of England: Matthew Arnold and Anthony Trollope

One of the prevailing issues in Victorian England was the struggle of the English gentry to maintain their sense of inherent superiority over the lower classes, particularly over the nouveau riche, whom the upper classes often viewed as rude, ignorant, and vulgar. The English gentry worked hard to sustain this sense of superiority throughout the Victorian period through their careful cultivation of elaborate systems of manners, refinement, and general good taste. Their position, however, became increasingly threatened by the increasing financial status of many members of the lower classes. This issue is one that is continuously examined and explained throughout the literature of the period, such as in the works of poet and essayist Matthew Arnold and novelist Anthony Trollope. Through an examination of Arnold's *Culture and Anarchy* as well as Trollope's *The Way We Live Now*, I work to illuminate the shared belief of these two authors that hope for the future of England lies in the hope that the upper classes will learn to share their distinguished taste and culture with those of the lower classes.

Faculty sponsor: Amy Weldon

MAKAYLA MARINACK '16

Searching for Sacraments in the Gospel of John

This paper investigates the seeming absence of Baptism and Eucharist in the Fourth Gospel. Unlike the Synoptic Gospels (Matthew, Mark, and Luke), John the Baptist does not baptize Jesus in the Gospel of John (1:29–35); yet Jesus' disciples perform baptisms (John 4:2). Similarly, Jesus institutes the Eucharist at the Last Supper according to the Synoptics, but John omits these words of institution; nevertheless, Jesus "gives thanks" (Greek: *eucharist*) for the bread in the Feeding of the 5000 (John 6:11), and soon thereafter he speaks about eating his flesh and drinking his blood (John 6:51–56). The question arises whether John presupposes the Synoptics' rituals of Baptism and Eucharist or opposes them in some way. By entertaining this question, this paper contributes to the longstanding debates about whether John's Gospel draws upon oral

tradition or written gospels and—in the case of the latter—whether John attempts to supplement or replace the Synoptics.

Faculty sponsor: James Barker

GAVIN MARKEE '14

AARON MERTZENICH '14, JACQUELINE OTT '14

Ensemble of One: Because It Shouldn't Take Rocket Science to Make the Next Hit YouTube Video

For our senior project in computer science, we created Ensemble of One, a video-editing application created specifically for tablets and the web. The application runs natively on Windows 8.1 devices and makes use of everything Windows has to offer with HTML5, JavaScript, CSS3, and the built-in WinJS library to create a wide variety of video projects. In our presentation, we will explain how the application went from its design phase to its current implementation and will demonstrate the key features that make the application unique.

Faculty sponsor: Brad Miller

KATHERINE MATHIS '15

"What a Piece of Junk": An Examination of the Work of John Chamberlain and the Aesthetic, Ethic, and Environmental Value of "Junk Art"

With the increase in industrial production throughout the 20th century, a number of artists began to use consumer products in their work. Among these artists was American sculptor John Chamberlain, who began reassembling car parts into intricate abstract sculptures in the early 1960s. Although his sculptures are visually interesting due to their sharp angles and bright colors, it is difficult to disassociate the material from their symbolic connection to American consumer culture of the 1950s and '60s. Chamberlain's art leads us to wonder whether creating something aesthetically pleasing out of "junk" can fully free it from the cultural, environmental, and ethical associations that the materials may hold. By considering this question through the academic debate over the aesthetic worth and the ethical value of junk, via Allen Carlson's "Environmental Aesthetics and the Dilemma of Aesthetic Education" and Thomas Leddy's "The Aesthetics of Junkyards and Roadside Clutter," Chamberlain's work can verify the moral and aesthetic value of "junk art." In my presentation, I will describe the social factors that

influenced Chamberlain's sculptures, as well as the positive ethical and environmental implications of recontextualizing and recycling junk into art.

Faculty sponsor: Kate Elliott

LAUREN MAZE '14

Metabolic Recovery Following Submaximal Exercise Is Not Dependent upon Training Status or Gender

The purpose of this study was to determine if gender and training status affects the speed at which individuals recover from submaximal exercise. Four subject groups were studied. Six trained females, six untrained females, six trained males, and six untrained males, all aged 19–22 years, performed cycle exercise during two separate visits. Subjects first completed a VO₂ max test on a stationary bike and a 20-minute ride at 70 percent of their max for the second visit. Following the second ride, subjects sat for one-hour postexercise while heart rate, RER, and VO₂ were recorded. A two-way ANOVA was used for analysis, and significance was set at $p < .05$. Max tests were completed at a significantly higher rate in trained versus untrained subjects and were higher in males than in females. There was also a significant difference in resting VO₂ levels between trained and untrained individuals. There was no significant difference in the time it took to recover to resting levels between males and females or between trained and untrained individuals. In conclusion, training and gender do not influence the time it takes for individuals to return to basal metabolism following submaximal exercise.

Faculty sponsor: Mark Eichinger

MEGAN MCCLURE '15

SAM STOKES CERKVENIK '15

The Impact of Methyladenosine on mRNA Regulation by miRNA-RISC

The use of micro RNA (miRNA) is one method by which organisms regulate gene expression. When bound to protein to form the RNA-induced silencing complex (RISC), miRNA associates with complementary sequences in messenger RNA (mRNA), so that it no longer can be used in translation. We are interested in testing the hypothesis that methylated adenine bases (a chemical modification observed in mRNAs *in vivo*, with no known function assigned) within this complementary region of mRNA might affect its regulation by miRNA. We first transform *E. coli* with plasmids that

contain an artificial minigene; this is used as the template for making target RNA (the manufactured equivalent of mRNA). The conditions for in vitro synthesis of target mRNA are optimized for incorporating m6ATP directly into the target RNA. The target RNA size and concentration are assessed by urea polyacrylamide gel electrophoresis. Once generated, target RNAs containing various levels of m6A can be utilized in an RISC assay to monitor the impact of methylation on the interaction of the miRNA-RISC with the target RNAs.

Faculty sponsor: Marian Kaehler

AUBREY McELMEEL '14
Fire and Ice, Rationality and Passion in Jane Eyre

Charlotte Bronte's *Jane Eyre* is a classic tale of a lower-class governess rising to a higher position thanks to an unlikely romance. But Jane herself is no ordinary woman. Over the course of the novel she must work to conceal the depth of her fiery passion because, in a 19th-century woman, that kind of emotion must be concealed, lest she be thought unruly and unmarriageable. Throughout the book's five acts, we see Jane swing too far in both passion and her attempts at rationality. Both responses get her in trouble, but by the end she is able to find a balance between the two, and ultimately gets her happy ending.

Faculty sponsor: Amy Weldon

NICHOLAS MCGRORY '16
When Were the Gospels Written?

The gospels must have been written after 30 C.E., the approximate date of Jesus' crucifixion, and before 180 C.E., when Irenaeus of Lyons quotes all four of them by name. This paper surveys the dates suggested for the composition of the canonical gospels (Matthew, Mark, Luke, and John) in recent commentaries. Individual commentators claim dates as early as 60 and as late as 110. Such a wide range would revolve around very few historical events, the main ones being Nero's persecution of Christians in Rome in the mid-60's and the Romans' destruction of the Jerusalem temple in 70. The relative dates for the gospels are also complicated by theories of their interrelations. That is, a subsequent gospel could not have been written earlier than one of its source texts, yet disagreements abound regarding which gospel(s) used the other(s). This paper charts these current trends and debates, and it determines and recommends the best practices for

dating the gospels. For example, it is inadvisable to average the range of possible dates, so scholars should not suggest an exact date of 85 C.E. if a gospel might have been written between 70 and 100 C.E.

Faculty sponsor: James Barker

MELINDA MCMAHON '14
A Great and Terrible Beauty: A Study of the Visual Rhetoric of The People's Gallery

The intent of my project is to examine the visual rhetoric produced by The People's Gallery in County Derry, Northern Ireland. Between 1994 and 2008, a group known as The Bogside Artists painted 12 murals along Rossville Street in the Bogside. Intending to tell County Derry's story during a more active time of The Troubles, the murals were painted purposefully onto the sides of buildings along Rossville Street. My research questions for this endeavor are: 1) Is there a political statement being made by the visual rhetoric of The People's Gallery? and 2) How has this visual rhetoric impacted the County Derry community, the Loyalist community, and the Nationalist community? My intent is to focus on the interplay of images in the individual murals and the interplay of the murals themselves. The importance of this research lies in the lack of work done on The Troubles, especially by communities outside of Northern Ireland, as well as contextualizing the imagery of The People's Gallery and, to an extent, The Troubles themselves. This research will also add to the still-emerging field of visual rhetoric study.

Faculty sponsor: Derek Sweet

KATHERINE MOHR '14
The Others: Monsters in Frankenstein and Native Son

Monsters could be physically scary creatures or they could be normal-looking humans who do terrible things. Monster theory points to our characterization of monsters as "other" as a manifestation of societal norms. Authors like Mary Shelley and Richard Wright create their own monsters in *Frankenstein* and *Native Son*, unleash them onto their chosen communities, and write about the consequences. How do *Frankenstein* and *Native Son* embody monster theory, and what does their use of monsters say about each author? I explore monster theory with a close eye on both texts. Combining this with research of the authors' biographies and the circumstances under which they wrote the books,

I conclude that the authors were at a crossroads in their lives when they decided to write *Frankenstein* and *Native Son*, and thus we can gain a better understanding of their intentions as we look at each novel through the lens of monster theory. This research furthers the relatively unknown conversation about monster theory because it explores specific instances of personal and societal commentary and what factors led each author to portray characters as monsters. This is also a dialogue about how characterizing someone as a monster may say more about ourselves and our society than the “monster” itself.

Faculty sponsor: Amy Weldon

BRITA MOORE '14

Their Finest Hours: How Henry V and Churchill Won British Hearts by Understanding Them

I undertook an analysis of three plays from Shakespeare's second tetralogy—*Henry IV*, Parts 1 and 2, and *Henry V*. I address the question of how a public figure can use his or her image to move others, and how it can be good for more than personal gain. In the English Renaissance, public figures were encouraged to put effort into image. Books like Baldassar Castiglione's *The Book of the Courtier* were widely read. Prince Hal/Henry V, the central character of the three plays, reflects some of these Renaissance ideals, as I found by comparing his actions in the texts to the ideas presented in books on the instruction of princes. I concluded that Hal exemplifies the way rulers can use consciousness of public opinion for everyone's good. He creates stability in his kingdom the way his father, Henry IV, did not. Henry V is one of England's most popular kings, and this insight inspired me to write a historical-fiction play about England's most popular contemporary leader, Sir Winston Churchill, who also brought together a nation out of chaos. While both men show signs of selfishness in their use of public image to gain power, ultimately, their success rightfully defines them. I will present both findings from my research and an excerpt from my play.

Faculty sponsor: Kate Narveson

BRITA MOORE '14

A Method to His Madness: Hamlet and the “Fishmonger”

One of Shakespeare's most heavily analyzed plays, *Hamlet*, presents a countless number of human issues, including mental illness. Critics consistently ask, “Is Hamlet actually mad, or is

he feigning it as he claims to be?” In response to this question, I looked into how Claudius and Polonius perceive him versus how he perceives himself. As a litmus test, I compared Hamlet with Ophelia, who is more widely accepted as insane than Hamlet is. I analyzed specific passages in the play while consulting secondary sources. My conclusion was that Hamlet is not inherently mad, but is considered to be by his peers because he withdraws from society and is considered a threat to Claudius's power, after he is not given the space to grieve his father's death. When compared with Ophelia, it is clear that Hamlet retains control over his reason and makes deliberate choices about what to say, even the things that make others believe him mad. The larger point is, we should be more aware of what our criteria for insanity are and look into its relationship with power. Claudius's power causes him to be paranoid and to incite Hamlet's madness, and it is worth looking at power's influence on society.

Faculty sponsor: Amy Weldon

PHILIP MORTENS '14

Religion Within *Dune*: A Rhetorical Approach to Learning from Literature

Regarded as one of the greatest science fiction novels of all time, Frank Herbert's *Dune* is a thrilling masterpiece of fiction. Despite being published in 1965, the issues addressed in *Dune* are still very real and important almost 50 years later. Dealing with the complex interplay between religion, politics, ecology, technology, and human nature, the issues addressed in *Dune* are paralleled by reality. In particular, this paper will focus on the role that religion plays within the *Dune* universe. By applying Kenneth Burke's theory of rhetoric as equipment for living to the role that religion plays in the novel, the hope is to be able to identify lessons and strategies that can be applied to everyday life. After the application of Burke's rhetorical lens to *Dune*, many lessons and strategies emerge that have the potential to help the average reader navigate the tumultuous waters of religious interaction in modern society. The author's hope is that this interpretation of religion within *Dune* will better equip readers to deal with religion in a modern society as well as to help understand the role that religion can play in the lives of others.

Faculty sponsor: Kim Powell

BAILEY MULHOLLAND '15

Professor Profiles: A Film Exploration of Life Outside the Classroom

This project couples field research with the creative medium of film. Six Luther College professors were interviewed about hobbies or activities they engage in outside of the classroom: a chemistry professor involved in community theater, a math professor who plays competitive Scrabble, a religion professor who owns a dog training facility, a German professor who runs and submits his German-language mystery novels to international contests, a health and physical education professor who breeds and trains Schnauzers for show and therapy, and a religion professor who is also an Episcopal priest. The professors add dimension to their identities by describing their nonacademic passion in a two-minute illustrative, student-produced film. The filmmaking process occurred during summer of 2013 and required the development of technological camera use and editing software skills, as well as storytelling artistry.

Faculty sponsor: Thomas Johnson

VICTORIA MULLER EWALD MAY-15

ALLISON BIRD '15, KRISTIN

HOUSHOLDER '15

Forgiveness and Stress Levels

Lack of forgiveness can increase stress levels and be detrimental to a person's psychological and physical well-being. Because of this fact, it is necessary to develop efficient forgiveness interventions. We hypothesized that a concise forgiveness intervention in the form of a seminar that included a written workbook focused on benefit-finding would increase subject forgiveness levels. Subjects were Brazilian college students, ranging from 18 to 62 (N=47) who participated in an hour-long forgiveness seminar and were then given measures of self-forgiveness, depression, life satisfaction, and religiosity. Preliminary results indicate that forgiveness and life-satisfaction levels of subjects in the experimental groups decreased when compared to the control condition. This is possibly due to the order of the forgiveness process, which entails negative emotionality as a possible first step toward self-forgiveness. Furthermore, it was found that only 45 percent of the subjects succeeded in finding benefits, writing on average twice as much about a negative situation than about possible benefits, which can have affected the effectiveness of the forgiveness intervention.

Faculty sponsor: Loren Toussaint

JOSHUA NELSON '15

Ticks and Prevalence of the Lyme Disease-Causing Spirochete *Borrelia burgdorferi* in Deer Ticks (*Ixodes scapularis*) in Decorah, Iowa

The purpose of this study was to survey the distribution and abundance of Ixodid ticks in the area of Decorah, Iowa, and examine the prevalence of the Lyme Disease-causing spirochete *Borrelia burgdorferi* in deer ticks, *Ixodes scapularis*. Sampling at 11 sites around Decorah was done between May 29 and July 30, 2013. Ticks were collected using a tick drag. Overall, 192 deer ticks, and 126 dog ticks, *Dermacentor variabilis*, were collected. Deer tick nymph numbers increased as compared to adults as the summer progressed, and the number of adult dog ticks decreased as the summer progressed. To test for the presence of the Lyme Disease-causing spirochete *B. burgdorferi*, the midgut of 172 deer ticks was placed in Barbour Stoenner Kelly (BSK) media for several weeks. Isolates were examined periodically; 37 revealed spirochetes, yielding a 21 percent rate of infection. Identification of *B. burgdorferi* was confirmed by extracting the total genomic DNA of the organism and replicating target DNA sequences associated with species-specific outer surface proteins. Samples of four tick isolates were sequenced and compared against an international genomic database. We confirmed that the spirochetes present in the Decorah area are indeed the organisms that cause Lyme Disease.

Faculty sponsor: Kirk Larsen

JONATHAN NERDIG '14

ALLISON BIRD '15, KYRIE DAILEY '15,

RACHEL REM '16

Modified Two-Choice Hidden Food Task with Blue Jays Using Human Gesture and Gaze Information

Past research at Luther College has explored the ability of blue jays to utilize human gesture and gaze information to locate hidden food. In the previous study, difficulties arose with habituating the birds to the presence of the human experimenter. The purpose of this study was to develop a modified procedure that would reduce the blue jays' anxiety around the experimenter and in turn lead to better results. One major modification was the introduction of a companion blue jay that did not participate in the experiment but was placed in the room next to the testing cage. In the experiment, two dishes were presented to a blue jay, one with food underneath it, the other without food. The blue jays would

choose a dish based on the experimenter either touching, pointing at, or gazing at the baited dish. There was also a control trial in which no gesture or gaze information was given. One of the five blue jays tested showed a significantly greater proportion of correct responses for touch, point, and gaze trials when compared to chance. We concluded that the modifications made to the experimental procedure were partially successful in improving the ability of blue jays to use gesture and gaze information.

Faculty sponsor: Kristy Gould

HIEU NGUYEN '14

Laws and Regulations of the U.S. Stock Market: A Study of U.S.-Listed Chinese Companies and Conflicts of Interest Between China and the United States

Currently, United States-listed Chinese companies are not subject to the regulation of the U.S. Securities and Exchange Commission. As a result, these firms pose a high risk of providing misleading financial information to U.S. investors. In fact, the investors have already suffered serious losses from such lack of disclosure. My paper investigates the obstacles for the U.S. government to oversee U.S.-listed Chinese firms. Specifically, my research focuses on whether the U.S. government should allow Chinese firms to be listed on the U.S. stock market without proper and sufficient inspections over audit procedures and financial reports done by Chinese audit firms. Through an analysis of pertinent, significant events and their connection to the topic, economic and political conflicts between China and the U.S., and an analysis of risk and benefits for the U.S., I argue that the U.S. government should de-list listed Chinese companies or create a single-agency oversight with China to ensure a stable stock market trusted by the investors' community to fortify the leading position of the U.S. financial market.

Faculty sponsor: Mona Nelson

JOSEPH NOVAK '14

Finding and Modeling Short Transient Events in the Field of Open Cluster M23

Luther College faculty and students have monitored about 1,600 stars in a single field every clear summer night since 2003. While many stars have a constant signal, our research focuses on finding, verifying, and modeling instances in which a star's signal deviates abruptly over the course of a night. We use statistical methods to

identify such potential short transient events, and then perform tests to determine if the event is genuinely astronomical or if it is the result of some nonastronomical phenomenon. If no terrestrial cause is determined, we develop models of possible causes. Thus far, we have identified 1,217 potential events. Of these, we have determined that 637 are nonastronomical, and are we performing further tests on the remaining 580. The events we might detect could include planet-star collisions, magnetic flares, or gravitational microlensing events. Gravitational microlensing occurs when a dense massive object, such as a black hole, passes between a star and an observer. The curvature of space concentrates light and causes an apparent brightening of the star. I will describe results of efforts to model apparent signal increases as the result of microlensing from a previously unknown population of dense objects between us and the stars being observed.

Faculty sponsor: Jeff Wilkerson

JOSEPH NOVAK '14

STEVEN ABDO '15, KARIN HECHT '15,
KATELYNN PANKRATZ '15

Inept Catholicism: Religious Deficiency in *Crónica de una muerte anunciada*

Gabriel García Márquez's novel *Crónica de una muerte anunciada* (*Chronicle of a Death Foretold*) takes place some 20 years after the murder of Santiago Nasar, a man who is killed by two brothers after allegedly taking the virginity of their sister Angela Vicario. Over the course of the novel, the narrator reveals that while almost the entire town knows of the murder in advance, nobody is able—or perhaps wants—to stop it. Although the novel takes place in an ostensibly Catholic community, one must wonder what role religion actually plays in the lives of the characters in *Crónica*. Analysis of the narration and interactions between characters reveals that in the community where *Crónica* takes place, Catholicism has failed completely as a source of ethical guidance, and the characters live in a moral anarchy. The townspeople hide behind a façade of religion, but given the opportunity to act upon their professed beliefs and stop a murder, they do nothing.

Faculty sponsor: David Thompson

MARIN NYCKLEMOE '14

**Hidden within the Land of the Rising Sun:
The Development of the *Kakure Kirishitans*
and the Evolution of Religion**

Colonialism brought about incidents of creation and destruction. The interactions between the nation of Japan and European colonial powers, specifically Spain and Portugal, produced a unique result. In the end, the colonials found themselves with no access to the country. In the realm of religion, after the Spanish and Portuguese were removed, those whose lives had been changed by Western Christian missionaries were condemned. Japanese converts were persecuted and massacred by the Tokugawa regime, beginning in the late 16th century. After the reopening of Japan in 1868, however, a group of Christians were revealed to have survived the years of isolation and persecution. They were called *Kakure Kirishitan* (Hidden Christians). Today, the *Kakure Kirishitan* tradition has taken the form of a religious practice that has little in common with mainstream Christianities. More than the 200-plus years in isolation, this group created a new form of Christianity through a syncretic process, that is, through incorporating elements from multiple traditions to create something distinctive. With no text and knowledge of only a few practices, the *Kakure Kirishitan* mixed in practices native to Japan to fill in the missing pieces of Christianity. The example of the *Kakure Kirishitan* shows how through syncretic processes, religion is able to change and adapt to its environment.

Faculty sponsor: Jim Martin-Schramm

KATRINA OKERSTROM '14

**Morality Foundation Differences Among
Atheists, Agnostics, and Theists**

A connection between religiosity and morality is supported by a religion-morality stereotype in the United States (Galen, 2012). Recently, Haidt and Graham (2007) expanded the domain of morality with moral foundations theory, identifying five foundations of moral concerns: care, fairness, in-group loyalty, authority, and purity. The present research examines the relationships between religious orientation and the five moral foundations. We studied differences in moral foundations among theists high or low in religiosity, atheists, and agnostics in 455 adults. Results showed differences among all four groups for the purity and authority foundations, with high religiosity theists scoring the highest, followed by low religiosity theists, agnostics, and atheists scoring lowest. Results also showed that

theists—high and low—scored higher than both agnostics and atheists on the in-group foundation. The results suggest that both religiosity and belief in God are related to moral concerns, and that atheism, agnosticism, and high and low religiosity are qualitatively distinct moral orientations.

Faculty sponsor: David Njus

CALLA OLSON '14

**Teaching Tonewoods and Transforming
Values: How We Can Ensure Music
as We Know It Is Sustainable**

Large quantities of woods with specific structural and aesthetic characteristics, designated “tonewoods,” are required to produce high-quality musical instruments. Using data from international, national, and nongovernmental scientific organizations monitoring deforestation, over-harvesting, and other threats, I examine the biological, economic, and acoustic challenges facing the sustainable use of tonewoods. Three important and heavily imperiled species—Brazilian rosewood, African blackwood, and pernambuco—serve as case studies. Ultimately, I conclude that continued harvesting of these woods is not environmentally or economically sustainable, and that to avoid a future shortage of high-quality musical instruments, the music-instrument industry and musicians must begin adapting to alternative materials for instrument construction. Drawing on perspectives from cultural musicology and the history of innovations to musical instruments, I argue that current resistance to such new materials among classical musicians is not inherent in the musical tradition but rather a result of the modern, but antimodernizing, conservatism that currently pervades this field. I end by proposing several means of facilitating a cultural shift among classical musicians and instrument manufacturers, inducing them to explore alternative, more sustainable instrument materials.

Faculty sponsor: Michael O'Brien

KATELYNN PANKRATZ '16

**The Various Functions of Foreshadowing
in *Crónica de una muerte anunciada***

Gabriel García Márquez's novel *Crónica de una muerte anunciada* (*Chronicle of a Death Foretold*) is filled with literary strategies that are used to create a mysterious and fascinating story. One of these utilized strategies is foreshadowing that couples with the unique writing style of Márquez. In a single novel, Márquez is able to manipulate the use of foreshadowing so that it functions

differently for the reader, the protagonist (Santiago), and the townspeople. More specifically, the style of foreshadowing shows readers that the protagonist does not actually know his destiny and that the townspeople are ignorant and purposefully do not intervene to prevent his death. This presentation is based on literary analysis performed in the context of a Spanish writing course. Through these methods of research it was discovered that the foreshadowing in the novel functions in traditional and nontraditional ways and reveals important qualities of the protagonist and other characters. These findings may shed light on the literary style of Márquez.

Faculty sponsor: David Thompson

MICHAEL PETERSON '14

Babylon is Christian Too: The Experience of Power in Liberation Theology

Particularly since the second half of the 20th century, social justice and liberation have become major themes in Christian theology. This development has led many historically marginalized groups to assert unique claims to Christian scripture that emphasize this justice. In modern American culture, the prominent theologies that have arisen out of this movement have been feminist, black liberation, and queer theologies. These theologies have focused on the experience of marginality in order to craft new understandings of Christian scripture and tradition. My research addresses these new ideas through the lens of power, trying to find some way for the experience of power to contribute to these movements. Through research of established thought, liberation theologies, and the reactions to those theologies, this research will show that entrenched ideas on evil and identity are at the heart of what makes these movements so contentious. Movements of liberation have not adequately addressed these concepts, solidifying unspoken notions that have allowed the worldviews of their oppressors to arise. If these concepts are addressed, it is my conclusion that social justice can come through humanization of the “other” and cooperation, rather than cyclical conflict.

Faculty sponsor: Wanda Deifelt

MAGGIE PIERSON '14

What is Common Ground?

Jesus is an extremely contradictory character in both inter- and intrareligious dialogue. Who

was this person, and what significance does he hold for Christians and Muslims today? John Hicks' theology of religious pluralism preaches the importance of finding common ground between Christians and Muslims regarding Jesus. With an intricate look at the writings of contemporary scholars of the Bible and of Islam, it is possible to find similarities in belief. But are these rudimentary similarities really the most effective way to find common ground? Do simplistic statements of cooperation really help to understand the nuanced differences which do exist between these two great traditions? Is common ground really about similarity, or is common ground about mutual acknowledgement of fundamental and experiential difference? I will argue that analysis of Christian and Muslim scholarship on the figure of Jesus Christ does not support John Hicks' claim that the “metaphorical Jesus” provides common ground for interreligious dialogue.

Faculty sponsor: Sean Burke

NICOLE POWERS '14

Ottoe, Baltimores, and Rattlers, Oh My!

In the late 1980s, over 345 butterflies representing 69 species were collected by John Nehnevaj from hill prairies and fens in Allamakee County, Iowa. Nehnevaj's collection includes 14 species listed in Iowa as species of greatest conservation need (SGCN). The goal of this study was to revisit sites surveyed in the 1980s, and several additional sites, to compare the species present in 2013 to the species found by Nehnevaj. Twelve sites were surveyed between June and September 2013 using a modified Pollard walk technique. We found over 2,500 butterflies representing 60 species. Eight were SGCNs, including the hickory hairstreak and Leonard's skipper, species not found in the 1980s, and the ottoe skipper and Baltimore checkerspot. Species richness for the sites ranged from 13 to 32 species, with SGCNs found at 11 of the 12 sites. Changes have occurred to hill prairies in Allamakee County since the 1980s, primarily invasion by red cedars. Invasion has reduced prairie size by an average of 45 percent on 15 Allamakee County sites, possibly contributing to decreased species richness. This information about the current status of butterflies present on northeast Iowa hill prairies can be used to direct future management and conservation efforts.

Faculty sponsor: Kirk Larsen

REGINA PRESTON '14

Birds-Eye View

Birds were extremely important to the culture of the ancient Greeks, playing roles in food, sport, natural phenomena, omens, and augury. They were especially important to the religion and history of the Greeks and often appear in association with the gods, with many having one if not more associated with them. Aphrodite has an extremely strong tie with her three most common avian representations: dove, goose, and swan. Although the avian iconography of Aphrodite is often seen as multivalent, doves stand out as her predominant symbol. The ornithological depiction of Aphrodite is expressed through metaphors and similes in literary sources such as *The Odyssey* and *The Iliad* by Homer. Meanwhile, in material culture sources Aphrodite's connection to doves is expressed more literally, with the goddess being accompanied by her archetypal bird. This discussion may be beneficial to future scholarship in recognizing depiction of Aphrodite where no literary sources have been left in association with the objects.

Faculty sponsor: Dan Davis

EMILY RAUCH '14

GRETCHEN PETERSON '14

Maleficence in Medicine: The Importance of Intraprofessional Integrity for Upholding Ethical Standards of Care

What makes a good nurse? According to Myrtle Aydelotte, former CEO of the American Nursing Association, "Nursing encompasses an art, a humanistic orientation, a feeling for the value of the individual, and an intuitive sense of ethics, and of the appropriateness of action taken." From the outside, Charles Cullen was the epitome of a good nurse. He was always on time, available nights, weekends, and holidays, had six years of intensive-care nursing experience, and was eager to help his fellow colleagues. How could such a "good nurse," working in the world's most trusted profession, maintain his nursing license while intentionally murdering hundreds of patients? How is it that nine hospitals throughout a span of 16 years chose to save their reputation as a business rather than save the lives of Cullen's future patients? The purpose of this presentation will be to analyze the ethical and moral responsibility required by members of the health-care team. By examining Charles Graeber's book, *The Good Nurse*, and other scholarly accounts, we hope to increase awareness of ethical standards for

individual nursing practice and organizations as a whole.

Faculty sponsor: Jayme Nelson

TYLER RINKEN '14

Baseball in 140 Characters or Less:

#SpringTraining

Currently we live in a world that is obsessed with social media. One of the most popular forms of social media is Twitter. Each day millions of users log on to Twitter to tweet, retweet, or even "favorite" other tweets. Twitter allows for individuals to follow closely not only friends and family members, but also singers, organizations, celebrity figures, and professional sports teams. In major league baseball (MLB), spring training is an exciting time for baseball fanatics across the nation. As all major-league teams report to their respective camps, their fans follow their every step on Twitter. During spring training, we see teams post tweets about results, starting lineups, pictures, team video, and even behind-the-scenes content. The content on the Twitter accounts is designed to draw fans more deeply into their interest in baseball. This research looks at the uses and gratifications of Twitter among MLB organizations and their fans. Using cluster analysis and grounded theory, four essential types of spring training tweets are identified, and possible uses and gratifications of each type are suggested.

Faculty sponsor: Mark Johns

SOPHIA RISTAU '15

Sleep Deprivation at Luther College:

Perceptual Effects of Sleepiness for Luther College Students

Sleep deprivation in college students is a public health concern, as it is linked to a decrease in physical health, mental health, and academic performance. The purpose of this study was to determine the nature of the differences between sleeping behaviors and attitudes of Luther students and a national sample based on American College Health Assessment findings. We aimed to explore why Luther students frequently feel tired, why fewer males report feeling tired than females, and why a greater proportion of Luther students report feeling tired as compared to the national average, yet perceive their sleepiness as less of a problem. Throughout January Term, we conducted 28 ethnographic interviews with Luther students. Our findings suggest that Luther students may prioritize academics and other activities above sleep, thus disallowing adequate rest; that females may value

academics more than males; and that males may prioritize sleep above other activities more often than females. Additionally, we found that other concerns, including academics, athletics, and social events, may distract from the perception of lack of sleep as a serious health issue. From our findings, we have developed possible interventions aimed toward Luther students, which could help to reduce health problems related to sleep deprivation.

Faculty sponsor: Angela Kueny

ALEXANDRA ROBINSON '14

Talking Trees: Musical Ecocriticism in a Nostalgic Register

Ecocritics have effectively utilized the visual genres of film and literature; these “greenified” media have presented an interesting pattern of rhetoric, instilling in their audience a sense of apocalyptic urgency coupled with a call to immediate action. Music is, however, especially effective in simultaneously conjuring emotion and reflection, making it successful as ecocritical commentary when oriented toward nostalgia. In this presentation, I will discuss the effectiveness of this approach through a case study featuring the work of Iowa composers Brooke Joyce and Harvey Sollberger. Their sound installation, *Talking Trees*, located at Seed Savers Exchange, was composed of audio recordings of sounds collected from the site itself. I examine the process, cultural space, and reception of the installation by examining not only the sounds themselves, but the assembly, material, and spatial conditions in which the project operated. Additionally, I will draw on ethnographic interviews with the composers to further examine the relationship between the intent and reception of the installation. These factors give way to a discussion of the potential and limits of sound installation as a form of ecocritical commentary.

Faculty sponsor: Michael O'Brien

REBECCA RUDQUIST '14

Taking On Calvinism: Children and Religion in Meindert DeJong's Literature

Despite receiving a Newbery Medal and the internationally renowned Hans Christian Anderson Award, Meindert DeJong (1938–1991) is relatively unknown to modern-day readers and scholars. DeJong has written 27 children's novels—the majority in the 1950s and '60s, including his most famous works, *The Wheel on the School*, *Shadrach*, and *The House of Sixty*

Fathers. Critics have written about DeJong's keen ability to write from the limited perspective of children and animals, which especially appeals to young readers. However, his novels have received little attention to religious undertones and philosophical ideas. My research is centered on a reading of Meindert DeJong's literature in the context of his involvement with the Calvinist Reformed Church throughout most of his life. As I read with this religious perspective, DeJong's simplistic language transforms into a complex conversation that both challenges and confirms his religious background, intertwining traditional selectivity with ideals of an inclusive community.

Faculty sponsor: Lise Kildegaard

JENNY RUSTAD '14

Dynamics of Negatively Refracted Light in Tilings

When light passes from one medium to another, its trajectory is typically refracted in a certain direction. However, physicists have recently created metamaterials that negatively refract light in the opposite direction of natural materials. These materials could have many useful applications, such as creating perfect lenses that can resolve details even smaller than the wavelengths of visible light. However, the behavior of light in scenarios involving metamaterials is unintuitive and has not yet been extensively studied. This past summer, to improve understanding of the behavior of light in metamaterials, my research group and I focused on the predicted behavior in regular tilings of metamaterials. We studied the properties of orbits of light in three families of such tilings: divisions of the plane by a finite number of lines, triangle tilings, and the trihexagonal tiling. Our results deal geometrically with the existence of periodic orbits and unbounded orbits in each family of tilings, as well as the stability of these orbits.

Faculty sponsor: Mike Johnson

ANDREW RUUD '14

Examining Trade Relations and Networks in 16th-Century New Spain

Ideas are dangerous. Bound and printed volumes containing many ideas that deviate from the norm are even more dangerous. With the invention of the printing press in early modern Europe, there were efforts in many countries to control the production and dissemination of books. The rigidly Catholic country of Spain was one such country. Famous for its own Inquisition

in the peninsula, Spain, with the “discovery” of the New World, exported its most infamous apparatus of control. In New Spain (modern-day Mexico), book importers, publishers, and sellers were meticulously scrutinized, and their movements, business dealings, and networks were documented. By closely and critically examining logs of ships and their contents that Mexican Inquisition officials created, a history of trade and commerce—legal in many cases, but perhaps even illegal, clandestine activities—in the New World emerges. Results of this study demonstrate that despite legal prohibition of certain books, there was still a lively and quite profitable business in the trading of banned, censored, and prohibited books. Such a history informs modern scholars about popular attitudes and activities in a strict legal atmosphere, further demonstrating the gap between the prescriptive and the descriptive.

Faculty sponsor: Ed Tebbehoff

JENNIFER SCHMIDT '15

A Kinesthetic Tradition: Embodying Existing Research as Dance History Pedagogy
The Judson Dance Theater (JDT), a collective of multidisciplinary individuals who broke away from traditions of modern dance and ballet in the 1960s, initiated the postmodern dance movement. Their intention was to discover all possible choreographic methods. Dance has existed culturally as an “oral tradition” (or perhaps a kinesthetic tradition). It is important to embody research, in order to enrich understanding of dance in the past. Through physically investigating the existing research written on the choreographic methods of JDT, my research asks, “What is possible when employing the body with a textbook as a reference point, rather than employing a textbook with the body as a reference point?” Dancers and I created a 20-minute dance using JDT methodology. Sourcing articles, books, documentaries, and JDT footage, we embodied the choreographic methods. Dancers gained fuller knowledge of JDT than a text alone could provide. This method can shift how dance history is taught to students, preserving the kinesthetic knowledge of historic dance through embodying existing research to inform future dance movements. My presentation will include a dance performance, an explanation of the research, and an invitation for the audience to engage in the JDT choreographic methods.

Faculty sponsor: Jane Hawley

NATHAN SCHMIDT '14

“Broken Dolls”: A Short Story of Loss and Wonder

I wrote my short story, “Broken Dolls,” during a single hour-long session with the Write On writing club. For our prompt, we were given two distinct black-and-white photographs, the first of a doll lying in a heap of junk on a rainy lawn, and the second of a tombstone with the statue of a woman resting on top. All of a sudden, the link between the two became clear to me, and I wrote out my story that night. My presentation will address how I use this story to explore the concept of death, something that frightens me to a degree. I’ve taken some comfort through the Japanese concept of *wabi sabi*, which embodies beauty in the imperfect, and acceptance of impermanence in this life. This philosophy argues that there is a sense of beauty in the twilight, as life slowly moves toward death. I wanted to capture a similar vision of fleeting beauty in the two pictures. As the story progresses, the characters are forced to confront personal losses in their lives. In the end, they find peace by accepting the inevitable change and seeing the inner beauty that shines stronger than the darkness around them.

Faculty sponsor: Amy Weldon

MARISSA SCHUH '14

The Effect of European Buckthorn (*Rhamnus cathartica*) on Ground-dwelling Insects, including Ants (*Hymenoptera: Formicidae*) and Ground Beetles (*Coleoptera: Carabidae*), in Northeast Iowa Forests

European buckthorn, *Rhamnus cathartica*, is an invasive woody species in deciduous forests of the Upper Midwest. To test the effect of buckthorn on ground-dwelling insects in northeast Iowa, pitfall traps were used to sample five forest sites four different times throughout the field season. Each site had three treatments: areas heavily infested with buckthorn; areas where buckthorn has never been established; and areas where buckthorn had been removed within the last 2–10 years. Insects were identified to family and quantified. A total of 11,576 insects from nine orders and 46 families were collected. It was found that areas where buckthorn has not become established had significantly greater insect abundance ($p=0.05$) and taxonomic richness ($p=0.018$) than areas where buckthorn has invaded. Abundance and species richness of ants and ground beetles was lower in areas with buckthorn than in areas with no history of buckthorn. Ground beetle

communities in particular were negatively impacted by the invasion of buckthorn.

Faculty sponsor: Kirk Larsen

STEVEN SORENSEN '15

Microscopes and Micromachines: Using Friction to Modify Nanoscale Properties of Aluminum Oxide Surfaces

To meet the rising demand for smaller and smaller mechanical parts in smart-phones and computers, we need to better understand the frictional behavior of surfaces at an extremely small scale (nanoscale). To help improve this understanding, we examined how the frictional behavior of aluminum oxide surfaces changes when they slide over each other. Using an atomic force microscope, which measures surface heights and friction by using a small probe, we observed that friction between surfaces increased with continual sliding. We determined that this increase in friction varies with the size of probe and strength of applied force between surfaces, and the duration of sliding. Surprisingly, we observed that occasionally after a period of letting the surface rest, the friction of the aluminum oxide surface decreased over time. We hypothesize that the frictional modification occurs due to a chemical reaction with water vapor in the air. The reverse reaction might account for the sporadic healing behavior. While our results reveal that aluminum oxide is not an ideal material for small-scale mechanical devices, we have come to better understand the complicated nature of friction of aluminum oxide, bringing us closer to a general understanding of the fundamentals of small-scale friction.

Faculty sponsor: Erin Flater

JAMISON STALLMAN '14

The Buddhist-Christian Conversation about Environmental Ethics

Christian theologians have looked into the root causes of environmental degradation and have found dualistic thinking as a key source of why humans treat the environment the way they do. Dualisms such as mind/body and nature/culture have endured for much of Western history and allow for a lessened sense of responsibility and an alienation from nature. In an attempt to seek an outside-the-box solution, this project utilizes Paul Knitter's methodology for comparative theology of "passing over" to investigate Buddhist thinkers, and then "passing back" into Christian thought to gain a new perspective on an already

existing, though perhaps underutilized, approach to environmental ethics. My research shows how Buddhist thinker Thich Nhat Hanh's explanation of interbeing, or interconnectedness, may grant a different view on currently existing Christian doctrines, such as Christian ethicist Larry Rasmussen's take on dualisms like nature/culture. I argue that while no one tradition has all the answers, collaboration between Buddhist and Christian thinkers will enable an out-of-the-ordinary perspective to come to fruition.

Faculty sponsor: Todd Green

MARIA STREYLE '14

Family Involvement in Implementation of Music Therapy to Support Infants in Acute Care Settings

Research demonstrates that music therapy can be beneficial to infants by increasing weight gain, increasing feeding ability, and decreasing stress. Additionally, implementing music therapy into the care plans of neonatal patients can also benefit their mothers by decreasing anxiety. The purpose of this research is to examine current literature about music therapy methods for infants, develop recommendations for music therapy use, and describe ways to involve families in this intervention. A literature review of relevant research was conducted to assess the effects of and to make recommendations for music therapy techniques. This research suggests that families can collaborate with music therapists to be involved in their infant's care by singing or making noises that are similar to those infants would have heard in the womb. This practice can greatly enhance the bonding experience and decrease parental anxiety. Music therapy can be incorporated into nursing practice to provide high quality family-centered care for infants in acute-care settings.

Faculty sponsor: Angela Kueny

ABBEY SYME '16

Digital Rendering Study on The Importance of Being Earnest

This project involves using historical research and digital rendering techniques to create historically accurate poster, costume, and set designs for Oscar Wilde's play, *The Importance of Being Earnest*. The costume renderings were hand-drawn based on historical research of the clothing of early-20th-century England, scanned, and then later colored and edited in Photoshop. The poster and two set designs were all made by editing historical and

other appropriate images found online. I created the set to exist on a proscenium stage, and the apartment would be small enough to be built in front of the garden and be removed to reveal the garden house during intermission. I also researched the life of Oscar Wilde and worked to incorporate what we know of his world views into my designs. Since some scholars suggest that the character of Algernon is a reflection of Wilde himself, I incorporate both this concept and Wilde's values in grandeur and extravagance to make them visible in the costume, set, and poster design relating to the character.

Faculty sponsor: Lisa Lantz

YANG THAO '14

Addressing Homophobia on College Campuses

Social work is among the many helping professions and academic fields that have begun to address disparities and injustices associated with homophobia and heterosexism. Homophobia is still a topic on college campuses and an issue that LGB (lesbian, gay, bisexual) college students face in their everyday lives. The purpose of this study is to explore the types of homophobia that participants (out or closeted gay, lesbian, or bisexual student) experience on a college campus and how homophobia affects their college experiences. The participants in this research were sampled from a population of college students on a college campus located in the Midwest. Students were identified as gay, lesbian, bisexual, open, or closeted. Six undergraduates at a Midwest private liberal arts college (three males, three females) participated in this study. Data was collected through qualitative interviews and then transcribed. Three major themes emerged from the data: 1) factors that affected disclosing their sexual orientation; 2) a relationship between outness and positive college experience; and 3) the campus climate is welcoming; however, the campus was not informed about LGB issues. Participants also described ways they minimize or cope with homophobia on a college campus.

Faculty sponsor: Ginger Meyette

EMILY TOPE '15

JORDAN KUCHERA '15

Behind the Scenes: Director's Cut

The ultimate goal of a documentary film is to connect with the hearts and minds of its viewers. Behind that lofty aspiration, however, are hours of preparation and careful decision-making (coupled, of course, with a healthy dose

of creativity). This presentation will unmask the four stages of the production process as learned in Communication Studies 258: Concepts of Media Production, from the initial script and research phase to preproduction, production, and postproduction. We will attempt to lay bare both the difficulties and the delight involved with each stage, from choosing a subject, to filming, and finally to editing the documentary. We will further share how our vision for our film evolved throughout the semester-long process, along with other amusing behind-the-scenes stories. Our presentation will culminate in the showing of our short documentary, *Going Forward* (as seen at the Oneota Film Festival), and a brief discussion of what we hope to do with our film in the future.

Faculty sponsor: Thomas Johnson

ASHLEY URSPRINGER '14

From Pilgrimage to Fest-Noz: The Changing Manifestations of the Breton Identity

Religious pilgrimages and *pardons* have occurred throughout the Brittany region of France for many centuries, with some of the largest and most famous events stretching back more than 1,300 years. Traditionally a deeply pious event, the *pardons* became a major draw for tourists beginning in the 19th century. At that time, outsiders' opinions of Brittany and its people were a contradictory combination of both uneducated savage peasants and bucolic culturally rich countryfolk. The focus of this research project is to examine the transformation of the *pardons* of Brittany in order to gain a better understanding of the overall Breton identity and how it has transformed from a shameful status to a celebrated culture. Using qualitative analysis of both primary sources from the time as well as recent literature on the subject, I will also incorporate some of my own observations from modern Breton cultural manifestations. This study will demonstrate how a group considered to be the "other" went from being ostracized to being sought out as stewards of tradition. These findings can then help us to better appreciate and celebrate the cultures that are being belittled or ostracized in our world today.

Faculty sponsor: Anne-Marine Feat

SAMUEL WETTACH '14

The Civilian Conservation Corps' (CCC's) Role in American Environmental History: New Deal Politics, the CCC in Winneshiek County, and Its Environmental Legacy

In 1933 President Franklin D. Roosevelt was sworn into office along with a sweeping super-majority in Congress. The challenges the new president faced went beyond politics and economics as the boom and bust of previous decades and the demand for raw goods on the industrial scale left the land as depleted as the collapsed economy. One of the most popular programs within the work relief programs of FDR's New Deal was the Civilian Conservation Corps (CCC). The CCC provided work for young, unemployed men, focusing on implementing a general natural resource conservation program that spanned the country. Research into the CCC camp based in Decorah provides a look into the implementation of federal policy on the local level. Historiography within American environmental history most often holds the 1960s as the watershed period for environmental politics; however, the opportunities that arose from the great adversity of the Great Depression make the CCC, the more than three million young men who participated, and the 225 "Boys of the CCC" encamped in Decorah an example of the federal environmental policy, its implementation locally, and the legacy it created.

Faculty sponsor: Brian Caton

HOLLY WILLIAMS '15

Movement Fundamentals' Four Phases

The Four Phases, a practice of movement and reflection used in the movement fundamentals curriculum at Luther College, will educate participants of all ages to experience the body as a primary tool for creative expression. The Four Phases is a resource available to all that allows for creativity in movement through a four-step process of movement and reflection. Ken Robinson, international leader in education and business, states in his 2006 Ted Talk, "Creativity is as important in education now as literacy, and we should treat it with the same status." My research investigates how the Four Phases aids in deconstructing social and cultural norms while experiencing the body as a tool for self-agency and creative expression. My research also investigates how the Four Phases identifies the body as creative source. As a result of this practice participants also enhance creativity in the reflection process through speaking, writing, and

drawing. My presentation will present my findings based on this research and demonstrate the Four Phases practice and reflection process.

Faculty sponsor: Jane Hawley

DYLAN WINSTON '15

Spin Torque of Carriers through Domain Walls

The spin of an electron, like the tiny magnetic needle on a compass, rotates its orientation in response to local magnetic fields. In a region where this magnetic environment is not constant in space, the electron changes its spin as it passes through. Fundamental conservation laws in physics then dictate that the material itself undergo an equal and opposite change, called "spin torque." We use a simple quantum mechanical model for the transport of electrons in one type of these magnetic regions: a domain wall, which can move around a wire in response to this spin torque. We calculate the spin torque for single and coupled domain walls that vary in geometry and material parameters, with an eye toward future devices that involve strings of domain walls on a nanowire "racetrack" to be used for computational memory. We find that the material parameters have a significant effect on the spin torque felt by domain wall systems that can help or hinder the motion of multiple domain walls along the racetrack.

Faculty sponsor: Elizabeth Golovatski

RUONAN ZHENG '15

A Step Toward Diversity: Third Culture Kids' Liberation

A Third Culture Kid (TCK) is a person who has spent a significant part of his or her developmental years outside the parents' culture. The TCK frequently builds relationships to all of the cultures, while not having full ownership in any. Although elements from each culture may be assimilated into the TCK's life experience, the sense of belonging is in relationship to others of similar background. My research is intended to study the advantages and disadvantages of being a TCK, helping these individuals to transcend boundaries between languages and cultural values. I also will offer some strategies to better cope with TCK identity based on my research. Since this study is motivated by my personal experiences as a TCK, my personal views shape the direction of this research. My research includes two methods: I reflect on my own TCK identity, and I apply insights from published scholarly articles about

the TCK phenomenon. This is my liberation as a TCK; hopefully this will be a step toward more diversity.

Faculty sponsor: Scott Hurley

SAM ZOOK '14

LINDSEY BOHR '15, CLAIRE DEMBSKY '15,
TAYLOR NELSON '15

Investigating Water Quality in the Dry Run Creek Watershed over Seasons with Varying Precipitation

During the spring of 2013, precipitation in Iowa significantly surpassed averages, followed by a period of relative drought in the late summer and fall. During this time, we investigated water quality parameters at 10 sites in the Dry Run Creek Watershed in northeast Iowa, including bacteria levels, benthic macroinvertebrates, and field parameters. These data were compared to previous monitoring data obtained from the same sites in 2010 and 2011 to explore the impact of varying precipitation on water quality monitoring. Results suggested precipitation-related effects on several water quality parameters, including turbidity, *E. coli* levels, and macroinvertebrate communities. This work underscores the importance of evaluating water quality data in the context of varying annual precipitation.

Faculty sponsor: Jodi Enos-Berlage

OPERA PERFORMANCE

Sister Angelica and *Gianni Schicchi*

Students from our music program will present two one-act operas by Giacomo Puccini: *Sister Angelica* and *Gianni Schicchi*. Thought by many to be the quintessential Italian opera composer, Puccini displays in these two pieces his penchant for writing beautiful melodies and for breathing musical life into a story.

Sister Angelica takes place in the late 18th century in a convent on the Mediterranean Sea. Amid the daily activities of the nuns, a mysterious story unfolds: no one knows why Sister Angelica, a noblewoman by birth, came to the convent seven years before, nor why she has not heard from her family or friends since she arrived. When Angelica's aunt makes an unexpected visit to the convent, Angelica is confronted with heartbreak news and a terrible dilemma.

Puccini's music soars as Angelica resolves to place her fate in the hands of the Virgin Mary.

The action of *Gianni Schicchi* takes place in Florence in the year 1918. The relatives of Buoso Donati are gathered by his deathbed; yet, rather than mourning his loss, the Donati family desperately wants to inherit a fortune from Buoso's will. When the family learns that Buoso has bequeathed his entire estate to the church, they have no choice but to seek the help of Gianni Schicchi, a crafty and notorious swindler. Together, they hatch a plot to revoke Buoso's will, but Gianni's true motives are not revealed until the lawyer actually arrives. This masterful comedy, which contains one of opera's most beloved arias, never fails to entertain.

The performances will be sung in English, accompanied by the Luther College Chamber Orchestra, conducted by Daniel Baldwin, professor of music.

DANCE/THEATER PERFORMANCE

Highway 57

This original dance/theater work was created by Visual and Performing Arts faculty member, Blake Nellis '07. The cast includes 20 movement artists from a variety of disciplines, four live musicians, and one live DJ. The recorded text is by Luther professor Jim Griesheimer and visiting professor Kristen Underwood, with original music composed by Luther alumni Jon Ailabouni '10, Ted Moore '09, and Justin Nellis '10. *Highway 57* is inspired by Edgar Lee Masters's *Spoon River Anthology*, a book of first-person epitaphs and Midwestern characterizations. It explores the paths that bring us together and the obstacles that create distance from the people and things we love. Through movement, emotion, and human connection, the performers will do more than demonstrate virtuosic dance or narrate stories from the past; they will invite you into their world, beneath the layers that keep us apart. This piece will remind you, inspire you, delight you, and challenge you. Come meet the memory of Lucinda Matlock, George Gray and others. Watch us dance while exploring things we're afraid of: betrayal, loneliness, death, and speeding tickets.

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