

Foreword from Dean R. Joseph Dieker:

Welcome to Cornell College's 23rd Annual Student Symposium!

The Student Symposium serves as a venue for some of our most engaged and accomplished students to share their work with the broader campus community and others. It demonstrates the remarkable range of interests pursued in and beyond the classroom at Cornell. This year features 52 students, working with 22 faculty members across 16 different departments and programs. There will be 27 oral presentations and 19 poster presentations. The following pages present the schedule for the 2019 Student Symposium at Cornell College, along with the abstracts of the oral and poster presentations to be featured on this day.

In addition to recognizing student research, the organization of the Student Symposium also celebrates the liberal arts. Oral and poster presentations will cover a wide range of subjects, from Geology to Art History. At Cornell College, students draw meaning and gain a richer sense of knowledge through the connections made across disciplines and subjects. We are looking forward to celebrating this breadth of knowledge today by joining together for a Symposium lunch in Smith Dining Room. I will be joined by Professor of Art History Christina Penn-Goetsch as this year's featured speakers.

This year's Student Symposium was coordinated by the Cole Library Center for Teaching and Learning. The logistics and technical aspects of the symposium were handled by Greg Cotton, Laura Farmer, Jennifer Ferrell, Amy Gullen, Jessica Johanningmeier, Kristin Reimann, Jen Rouse, Meghan Yamanishi, and Matt Zhorne. I offer my heartfelt thanks to them, and to the faculty members serving as session moderators, for their contributions to this project.

I invite you to participate in what promises to be a thought-provoking, exhilarating, and reflective day in our intellectual, creative, and community life.

R. Joseph Dieker, Dean of the College



Morning Oral Sessions 10:00 - 11:15

Morning Poster Session 10:30 - Noon Orange Carpet

Lunch Session Noon Smith Dining Room

Remarks by Dean R. Joseph Dieker

Talk by Professor of Art History Christina Penn-Goetsch



Afternoon Poster Session 1:00 - 2:30 Orange Carpet

Afternoon Oral Sessions 1:30 - 2:45



Morning Session 10:00am - 11:15am

Hall-Perrine West

Moderated by Craig Teague

 What Do You Do with Perfectionism? A Psychological Perspective Psychology

 Author: Madison Politte-Corn
 Sponsor: Melinda Green

 Cardiac Biomarkers of Eating Disorders

 Psychology
 Authors: Emma Hartman, Yumeng Tao, Gabby Carlson, John Bogucki

Sponsor: Melinda Green

 Working with Kids from Hard Places: TBRI at a Summer Camp

 Psychology

Author: Madison Politte-Corn Sponsor: Melinda Green

Durham Room

Moderated by Jai Shanata

Data and Policy: Pulling Back the Curtain

Biochemistry & Molecular Biology Author: MaryJo Schmidt Sponsor: Jai Shanata

□ Systematic Characterization of Octanoic Acid and Resveratrol in Planar Lipid Bilayers by Single-Molecule Studies

Chemistry Authors: Lorin Brokaw, Allison Eikenberry Sponsor: Jai Shanata

Oral Sessions

Morning Session 10:00am - 11:15am

Hedges Conference Room

Moderated by Christina Penn-Goetsch

Deconstructing Camouflage: A Message Against Violence and the Patriarchy Through the Art of Jessica Lagunas Art & Art History

Author: Jessica Meis Sponsor: Christina Penn-Goetsch

Iconography, Power, and Madame de Pompadour's Bellevue

Art & Art History Author: Darby Dowd Sponsor: Christina Penn-Goetsch

Navajo Art in Response to Uranium Mining and Nuclear Pollution \square

Art & Art History Author: Ylana Padgett Sponsor: Christina Penn-Goetsch

Russell Room

Moderated by Greg Cotton

Stripped by the Male Gaze: Virginia Woolf's 'The Looking-Glass' \Box

English & Creative Writing Author: Megan Hanson Sponsor: Leslie Hankins

"Sympathy Is so Close to Pity:" Complicating Female Disability in Anthony Trollope's

Barchester Towers

English & Creative Writing Author: Caitlin Tobin Sponsor: Michelle Mouton



Afternoon Session 1:30pm - 2:45pm

Hall-Perrine West

Moderated by Charles Liberko

 Organic Proxies in Speleothems: Analytical Method and First Data from Cave KNI-51 Geology
 Author: Huong Quynh Anh Nguyen
 Sponsor: Rhawn Denniston

 Effects of Diagenesis on Boron Isotopic Ratios in a Well-Preserved Pliocene Coral Geology
 Author: Kira Fish
 Sponsor: Rhawn Denniston

 Modeling Cosmic Ray Muon Detection *Physics & Engineering* Author: Kean Johansen Sponsor: Derin Sherman

Hall-Perrine East

Moderated by Anna Butz

Operation Walk: Cuba 2019

Dimensions Authors: David Berger, Zoe Randall Sponsor: Mark Kendall

 Aoyama Gakuin Cultural Experience International & Off-Campus Studies Authors: Brena Levy, Alli Charlier, Samantha Frese Sponsor: Anna Butz

 Post-Soviet Decline in Care for Orphaned and Abandoned Russian Children Russian Studies
 Author: Kimberly Gordon
 Sponsor: Lynne Ikach

Oral Sessions

Afternoon Session 1:30pm - 2:45pm

Durham Room

Moderated by James Martin

Putting Thomas Mann's *Doctor Faustus* in Context *Music* Author: Samantha Frese Sponsor: James Martin

The Bomb, Oppenheimer, and God: *Dr. Atomic* and the *Bhagavad Gita Music* Author: Maura Quinn Sponsor: James Martin





Afternoon Session 1:30pm - 2:45pm

Hedges Conference Room

Moderated by Michelle Mouton

Feminist Messages in Postwar Japanese Cinema: A Comparison of Women of the Night and Ugetsu **English & Creative Writing** Author: Eleanor Drummond Sponsor: Michelle Mouton First Impressions and Movie Introductions: An Analysis of Title Sequences in Japanese Film English & Creative Writing Author: Beilin Brower Sponsor: Michelle Mouton □ The Prophetic Nature of Astro-Meteorology in Mary Shelley's *The Last Man* (1826) English & Creative Writing Author: Emma Krombholz Sponsor: Michelle Mouton **Russell Room** Moderated by Cynthia Strong Effects of Mowing on Monarch Butterfly Production Environmental Studies Author: Marin Dettweiler Sponsor: Tammy Mildenstein Egg Laying Habits of Monarch Butterflies Environmental Studies

Author: Stephanie Voller Sponsor: Tammy Mildenstein

 Mineral Content of Fruit Likely Consumed by Pteropus mariannus Chemistry
 Author: Belou Quimby
 Sponsors: Cynthia Strong, Tammy Mildenstein

Oral Sessions

Afternoon Session 1:30pm - 2:45pm

Martin Luther King Jr Room

Moderated by David Yamanishi

Twin Views of Death in Seneca's *Troades*, Act 1 and 2 *Classical Studies* Author: Rachel Renaud Sponsor: John Gruber-Miller

The Role of Women and Education in Critiques of Epicurus *Classical Studies* Author: John Kinne Sponsor: John Gruber-Miller

How Cultural Mimicry Exacerbates Poor Economic Development in Africa International Relations Author: Suleiman Shehu Sponsor: David Yamanishi





Morning Session 10:30am - Noon

1a Global Health, Gender, and Development in India

International Relations Author: Taylor Alishouse Sponsor: Aparna Thomas

2a Species Identification of Burmese Flying Foxes Using Non-Invasive Molecular Techniques

Biology Author: David Castro Sponsors: Tammy Mildenstein, Craig Tepper

- **3a** Putting Thomas Mann's *Doctor Faustus* in Context *Music* Author: Samantha Frese Sponsor: James Martin
- **4a Tropical Australian Cave Flooding Events of the Last 4000 Years Reconstructed from Stalagmites** *Geology*

Authors: Chloe Martin, Paige Klug Sponsor: Rhawn Denniston

5a Sensitivity of the Australian Monsoon Response to Different Volcanic Eruptions in the Last Millennium *Geology*

Author: Cali Pfleger Sponsor: Rhawn Denniston

6a Characterization of Bilayer Properties with the Systematic Addition of Cholesterol

Chemistry Author: Zoe Randall Sponsor: Jai Shanata

7a Imagining Ancient Corinth and the "Interactive Digital Latin Reader"

Classical Studies Author: Rachel Renaud Sponsor: John Gruber-Miller

8a Vibrational Spectroscopy Study of Ionic Liquids

Chemistry Author: Samantha Slaymaker Sponsor: Craig Teague

9a Making Healthcare Safe and Affordable One Network Member at a Time: An Internship at Catalysis *Dimensions*

Authors: Chase Sonnemaker, LaNice Baker Sponsor: Mark Kendall

10a Oxazolone Colitis: Studying Cytokine Signaling in Intestinal Inflammation

Biochemistry and Molecular Biology Author: Margaret Turner Sponsor: Craig Tepper

Poster Sessions

Afternoon Session 1:00pm - 2:30pm

Subcloning: N-Methyl-D-Aspartate Receptor Subunits 1b

Chemistry Author: Ulisses Arroyo Sponsor: Jai Shanata

Comparing Delayed Onset Muscle Soreness in Eccentric and Concentric Contractions 2b

Kinesiology Author: Nicole Ciari Sponsor: Kristin Meyer

Lignin Isolation and Metal Ion Extraction 3b *Chemistry* Author: Benjamin Hewson

Sponsor: Charles Liberko

The Role of Sport Psychology in Division III Small Colleges 4b *Kinesiology* Author: Sophia Hollingsworth Sponsor: Christina Johnson

Biomechanical Analysis of an Offensive Lineman Kick-Set 5b

Kinesiology Author: Robert Madole Sponsor: Kristin Meyer

Photosynthesis: Possible in Snails? 6b

Biochemistry and Molecular Biology Author: Mitchell McAndrew Sponsor: Craig Tepper

The Effects of a High Sucrose Diet on Adolescent Rats' Cognitive Functions Between Sexes: A Pilot Study 7b Psychology Authors: Peyton Ort, Valerie Sukolowsky, Jamie Rhoads, David Berger

Authors: Peyton Ort, Valerie Sukolowsky, Jamie Rhoads, David Berger Sponsor: Steven Neese

Coral Symbiosis: Overcoming the Heat 8b

Biology Author: Jocelyn Torres Sponsor: Craig Tepper

Computational Exploration of CO₂ Capture with Functionalized Graphene 9b

Chemistry Author: Oliver Lawrence Trousdale Sponsor: Craig Teague **The Thomas Commons**

Thomas Commons Upper Level

Commons Circle Entrance





The Thomas Commons





Global Health, Gender, and Development in India

The Comprehensive Rural Health Project (CRHP), or Jamkhed, is a nonprofit health organization that works with the rural poor and marginalized in various districts in the state of Maharashtra, India. Founded in 1970 by Drs. Raj and Mabelle Arole, they have been working for and with the underprivileged and poorest of the poor for the past 49 years. CRHP is attempting to change how health and empowerment are taught in India with a variety of programs: 1) Women's Self Help Groups that discuss village issues, learn about community health topics, and take part in microcredit; 2) a Mobile Health Team that operates in many capacities including preventive health services, social work, and development projects; and 3) Adolescent Programs that cover topics like mental and physical health, the environment, and social issues. These programs use a community-based approach, known as the Jamkhed Model, to bring education, health, and empowerment to communities all over the state of Maharashtra. This organization's work is an example of the kind of impact that can be made when nongovernmental organizations (NGOs) work from the grassroots up, and work to help the people who need it most in their community. I spent 8 weeks working at CRHP as a Global Health Intern through the Cornell Fellowship program. I watched first-hand as communities learned and laughed together, and saw the impact that a community-based approach can have on health. The purpose of this presentation is to raise awareness about community health, gender, and development issues in India, and to recognize the contribution that CRHP has made.

Ulisses Arroyo, '20 Chemistry **Chicago, IL** Jai Shanata

Subcloning: N-Methyl-D-Aspartate Receptor Subunits

My project was an attempt to subclone genes for the human NMDA receptor protein into E. coli cells in order to produce working quantities of the protein. Working from small stocks of two different purified genes, I managed to get one of them successfully produced in larger quantity. This project explored the methods to produce both genes. These methods were the transformation of plasmids into E. coli, cell growth on LB agar plates, plasmid purification, and gel electrophoresis to analyze the success of each step. One goal is to process these genes with in vitro transcription and translation kits in order to express the receptor protein subunits. This process involves separating the genes from live cells, and placing them in the presence of specific building block chemicals to create the protein in a more controlled environment. A further goal is to separate the subunits from the media they were produced in, and figure out how to build a fully functioning NMDA receptor from the subunits produced. This receptor will then be incorporated into planar lipid bilayers to characterize the indirect impact of bilayer physical properties on the function of these receptors.

David Berger, '19 Zoe Randall, '20 Dimensions Ebermannstadt, Germany St. Paul, MN Mark Kendall

Operation Walk: Cuba 2019

Operation Walk is a non-profit organization that was founded in 1994 by Dr. Lawrence Dorr, a Cornell College graduate of 1963. Operation Walk has provided free knee and hip surgeries to over 10,000 patients in 20+ countries on more than 100 trips. Orthopedic surgeons, physical therapists, nurses, and volunteers together to make up the Operation Walk team. The team works to provide joint replacemnt preoperative, surgical, and postoperative care for people suffering from arthritis, polio, or other knee and hip complications. This past April, we traveled to Havana, Cuba as part of the Operation Walk team. During our mission, patients from all over Cuba received 58 total joint replacements for no cost and shared their stories and culture. We had the opportunity to help with patient care, shadow surgeries, assist with physical therapy, and meet patients and their families. We left Cuba with a better understanding of the various roles within a healthcare team and how this team works together efficiently. This trip gave us new insights into Cuban culture and the challenges people can face to receive adequate healthcare. We both took away a renewed excitement for pursuing careers in the healthcare field and feel more prepared to serve a diverse population of patients as future physicians.

Lorin Brokaw, '20
Allison Eikenberry, '21
Chemistry

Solon, IA Neola, IA *fai Shanata*

Systematic Characterization of Octanoic Acid and Resveratrol in Planar Lipid Bilayers by Single-Molecule Studies

Octanoic acid and resveratrol are amphiphilic molecules that are commonly found in human diets. Foods that naturally contain octanoic acid are palm and coconut oil and milk from humans and cows. Octanoic acid is currently being researched as a treatment for essential tremors. Propranolol is the most widely used molecule to treat essential tremors, but the effectiveness is limited, which introduces the need for better treatment options. Resveratrol is found in foods such as grapes, wine, peanuts, chocolate, and berries, and it has been found to have various health benefits, including protection against cancer, inflammation, and cardiovascular problems. Both octanoic acid and resveratrol, along with many other molecules found in the foods we eat and drugs we take, are soluble in cell membranes due to the molecules' polar and nonpolar regions. Although most drugs produce their effects by binding to proteins in cell membranes and altering their properties, which in turn alters the function of the proteins within the membrane. To test this hypothesis, we use electrophysiology to measure the durations of gramicidin A (gA) ion channel openings in planar lipid bilayers. Previous studies have shown that resveratrol alters the function of gA channels within planar lipid bilayers at very high concentrations, but our research aims to determine the effect of using resveratrol concentrations that would actually be found in a human body after consuming food containing resveratrol.

First Impressions and Movie Introductions: An Analysis of Title Sequences in Japanese Film

A title sequence is the beginning sequence right before a movie where the title of the film is introduced along with key production and cast members. The best title sequences are the ones that stand out and make memorable impressions on the audience, capturing their attention as soon as possible. This is done through various techniques, from catchy tunes to flashing text to stunning graphics, all to set the tone for the film that follows.

Despite title sequences being made in various countries and languages, they all seem to have two main functions: opening credits for legalities and transitioning audiences from the real world into the world of the film. Opening credits usually follow a standard pattern, such as introducing important cast members, the logos of the companies involved, and the actual title of the movie. As a result, much individualization in that area is through specific font types, order, and color designs.

It is the transition from the real world to the film's world that is often unique, depending heavily on the overall genre of the following film. Some focus on an art or music style, some hint to important objects or sets that might come up later, and some even include snippets of the actual film that follows. It is a highly varied and creative aspect; therefore, it is difficult to compartmentalize and analyze.

The following Japanese films I have selected all have title sequences that illustrate very different methods of transitioning audiences from the real world into the world of the film. I will be analyzing how their title sequences, through the use of audience immersion, or lack thereof, into the fictional world, can both consciously and subconsciously prime audiences to view the following films in a certain way.

David Castro, '19 Biology Austin, TX Tammy Mildenstein and Craig Tepper

Species Identification of Burmese Flying Foxes Using Non-Invasive Molecular Techniques

Additional Author: Rebecca Ritter

Flying foxes (Pteropodidae spp. with forearm >110mm) are important for forest maintenance and regeneration because they are considered "keystone" pollinators and seed dispersers. It is generally known that flying foxes are threatened by habitat loss, overhunting, and other anthropogenic stressors. However, in many places, simple baseline information about flying fox populations remains largely unknown. The use of molecular techniques is invaluable to conservation biologists, providing insights into population connectivity, genetic diversity, and roosting ecology. Fecal collection is a favorable method of sampling for genetic material, bypassing the need to capture and handle threatened flying foxes. We used this non-invasive method at four flying fox roosting sites in Myanmar to collect 96 unique samples inexpensively (supplies cost < \$50 USD) and with very little effort (<3 person-hours). We successfully extracted, amplified, cloned, and sequenced mitochondrial DNA (mtDNA) from the samples in the mtDNA cytochrome b (cytb) region. Our results confirm the identity of an isolated population of flying foxes to be *Pteropus hypomelanus* (486 bp; 97% match to reference). Our results also provide unexpected insights into other bat species present in this colony, such as *Cynopterus sphinx* (99% match to reference). Non-invasive genetic sampling is an inexpensive and effective technique which holds promise for studying species present, roosting ecology, and genetic diversity among fruit bat populations in lesser studied regions of their distribution.

Comparing Delayed Onset Muscle Soreness in Eccentric and Concentric Contractions

This presentation offers a comparison of delayed onset muscle soreness in eccentric and concentric contraction during resistance training. By performing these separate contractions during resistance training, one can predict which contraction elicits the most muscular discomfort due to delayed onset muscle soreness. Delayed onset muscle soreness will be measured in three ways. The first is through a Perceived Muscle Soreness scale. The following two measurements are muscle function tests. In this experiment, sit and reach and a broad jump measurement will be used to test muscle function post exercise. By using the data collected by these three measurements, I will determine which type of contraction results in a greater amount of delayed onset muscle soreness post exercise. It is predicted that eccentric contraction will elicit a greater amount of delayed onset muscle soreness compared to concentric contraction.

Marin Dettweiler, '19

Environmental Studies

North Branch, MN Tammy Mildenstein

Effects of Mowing on Monarch Butterfly Production

Monarch butterflies (Danaus plexippus) are a well-known icon of summer across the Midwest. This species of butterfly travels thousands of miles from Mexico to Canada, stopping in the Midwest prairies in the United States to lay their eggs on certain species of milkweed found in prairies, gardens, parks, and along roadways. Monarch populations are falling fast, however, each winter fewer and fewer Monarchs make their way back to the Mexican forest grounds (Pleasants and Oberhauser 2013). The United States Fish and Wildlife Service is currently considering monarch butterflies as a candidate for protection under the Endangered Species Act because of this. It is still unknown why the monarch populations are declining. However, there are studies that show that pesticides, parasitism, and road traffic mortality all contribute to it (Pleasants and Oberhauser 2013, Altizer and Oberhauser 1999, Zangerl and McKenna 2001). The major reason for dangerously low monarch populations is prairie or habitat loss. Iowa was once covered in prairies for a total of 80% of the pre-settlement land cover (Smith 1998). Only less than 0.01% still stand today, making Iowa one of the most ecologically decimated states in the country (Smith 1992). This loss of prairie land affects milkweed, which acts as the habitat for monarch eggs and caterpillars, therefore providing less habitat for the butterflies as well as many other species. This study focuses on one prairie that was mowed once per year during two summers of data collection and the effects the mowing had on the monarch butterfly's production rates. My hope is if prairie managers can have a better idea of how mowing, which is one of the main types of prairie restoration, affects the monarch's production rates, the prairie managers can follow different regulations for prairies hosting milkweed in them.

Iconography, Power, and Madame de Pompadour's Bellevue

Madame de Pompadour was the official mistress to King Louis the XV of France and has been extensively studied over the years. Scholars have gone in depth examining her life and specifically her art patronage. Within her art patronage, she was most well known for her active role in decorating houses; fifteen homes were completed during her time as mistress. Out of all of these homes, Bellevue was the only home to be built from the ground up and during a time of transition. This significance has been briefly acknowledged by other scholars, but this scenario has not been as fleshed out as it should be. Katie Scott provides a valuable reconstruction of the house, but stays focused on identifying where the major artworks in the house were placed and not on any of the themes or relationships between the rooms. Other scholars such as Colin Jones and Perrin Stein both focus on specific paintings and their general significance, but they also neglect to relate the themes of each room to one other. This lack of close observation and connection has allowed the viewers to miss how Madame de Pompadour used the decor of specific rooms to establish her place with the king.

This official mistress used the subject matter in three linked rooms to communicate her position with the king: her bedroom, the toilet, and the king's bedroom. Additionally, she used the iconography to celebrate her own engagement with the theatre and her evolving relationship with Louis XV. When one looks closely at the decoration, one can see how she used art to negotiate a tumultuous time in their relationship. She used the art to convey power and solidify her new position with the king.

Eleanor Drummond, '21 English & Creative Writing

Highlands Ranch, CO Michelle Mouton

Feminist Messages in Postwar Japanese Cinema: A Comparison of Women of the Night and Ugetsu

Acclaimed Japanese film director Mizoguchi Kenji made over 80 films from 1923 to 1956, many of them about women. He became known for his work in "women's genre" films, films made to appeal to women, and was considered a feminist. However, that does not mean that Mizoguchi would be considered a feminist today; according to the film critic Richie, the word "feminist" in Japan simply meant "interested in women." In fact, Mizoguchi would probably be considered sexist by today's standards, as he said that women should not become film producers.

This presentation will look at two of his films: the grittily realistic film *Women of the Night* (1948), telling the story of prostitutes in postwar Japan, and the eerie historical ghost story *Ugetsu* (1953), which tells the story of two men in war-torn feudal Japan. Richie considered Mizoguchi's films to be feminist according to the Japanese definition of the term. By comparing *Ugetsu* to *Women of the Night*, I will argue that at least some of his films could also be considered feminist in a modern sense. Ultimately, while both films prominently feature women, *Women of the Night* is more likely to be considered feminist according to the modern use of the word. I will examine the reasons why and the ways in which both films portray women.

Effects of Diagenesis on Boron Isotopic Ratios in a Well-Preserved Pliocene Coral

Reconstructions of pre-Quaternary surface ocean pH have generally focused on boron isotopes in planktonic, tiny organisms called foraminifera. While often preserved with high fidelity, foraminifera lack the temporal resolution that other proxies, such as coral, are able to provide. At a small number of sites, suites of extremely well-preserved corals are composed of largely unaltered primary material and thus provide the opportunity to apply the boron isotope method ($\delta^{11}B$) to these materials to examine paleo pH. However, corals are highly susceptible to different types of alteration, all of which make the corals unusable for pH reconstructions. Characterizing the nature of such diagenesis and its impact on coral boron isotopic signatures is an important step in understanding the utility of these proxies.

We investigated the δ^{11} B values in a well-preserved aragonite coral (*Sideastrea radians*) from the Pliocene Limón formation in eastern Costa Rica. The degree of diagenetic alteration was assessed using a variety of analytical tools including X-radiography, scanning electron microscopy, and thin section petrography. Intervals of secondary cements and recrystallization are apparent within a skeleton that also contains unaltered material. We measured boron isotopic ratios in both well preserved and clearly altered sections of this coral using secondary ion mass spectrometry. Preliminary results show significant differences in both δ^{11} B values and B concentrations between altered and unaltered material. This demonstrates the importance of accurately accounting for all types of diagenetic alteration in samples before analysis, as even minimal inclusions of secondary material can drastically alter paleoclimate reconstructions.

This initial study highlights the need to carefully constrain diagenetic alteration in fossil corals before conducting boron isotopic analysis. As calibrations for the δ^{11} B-pH proxy are further developed, fossilized corals could prove to be a valuable resource in understanding ancient surface ocean pH variations with high temporal resolution.

Samantha Frese, '20 *Music* **St. Louis, MO** James Martin

Putting Thomas Mann's Doctor Faustus in Context

Shaped by the great thinkers of his time, Thomas Mann wrote *Doctor Faustus* as a nuanced response to Nazism. Thomas Mann uses the quintessential German myth to express his multifaceted views about Germany and how the country he had previously loved became ripe for the rule of the Third Reich. I believe that the novel, written after WWII and set during the Third Reich, can be better understood by putting it in context of the original myth and Thomas Mann's intellectual world. I seek to do this by exploring the origins of the Faust myth and Germany's experience of the Reformation, giving a broad historical cultural context for the novel. I will use Thomas Mann's *Reflections of a Nonpolitical Man* to illuminate how Thomas Mann struggles to reconcile his art and the pressure he felt as an intellectual, along with the newly formed political attitudes toward his German homeland. Using Thomas Mann's speeches and *Doctor Faustus* itself, I seek to explain how Thomas Mann was able to both love and abhor German ideals. These ideals, in the hands of evil, were contaminated, and the beauty in them was tragically lost, much as his Faust character, Leverkühn, is lost to the devil and the darkness within his own mind.

Putting Thomas Mann's Doctor Faustus in Context

In 1943, Thomas Mann, a German intellectual living in exile from Nazi Germany in California, starting writing a new novel. Not to be completed and published until nearly two years after the war, *Doctor Faustus*, set during the Third Reich in Germany, uses the quintessential German myth to express his multifaceted views about Germany. Previously a bit of a German Nationalist, Thomas Mann saw the country he loved and called home turn into something terrible as the Third Reich rose to power. Seeing parallels between Germany at the time and the Reformation, Thomas Mann uses this idea to write about his main character Leverkühn, beloved yet disturbed, who comes to represent everything both beautiful and dark that Thomas Mann saw hidden in German Kultur.

Kimberly Gordon, '19 *Russian Studies* Phillipsburg, KS Lynne Ikach

Post-Soviet Decline in Care for Orphaned and Abandoned Russian Children

Since the fall of the Soviet Union in 1991, the living conditions for children who are homeless, orphaned, or abandoned have declined. My study focused on three major aspects affecting the well-being of these children: attitudes towards disabled individuals within Russian society; the existence and effectiveness of legislation dealing with homeless, orphaned, or abandoned children; and the consumption and abuse of alcohol nationwide. The degrees to which these three elements impact the living conditions of abandoned Russian children have varied in their severity throughout the years. Each element has had negative effects on the situation of these children, but not all of the elements have consistently affected the situation in a negative way. For instance, Russian society and legislation have at times aided the plight of these neglected children. However, most of the successes analyzed during this study are attributed to the Soviet Union, and unfortunately my research shows that, since then, failings have been much more frequent. My study concludes that out of the three elements I analyzed, the epidemic of widespread alcoholism within Russia is both the greatest contributor to the state of wellness of Russian children and the most harmful.

Megan Hanson, '21 English & Creative Writing

Stripped by the Male Gaze: Virginia Woolf's 'The Looking-Glass'

This presentation examines the connection from Virginia Woolf's recurrent metaphor of the 'looking-glass' in her work with Woolf's own life experiences. By examining the past traumas in Woolf's life, I am able to find a deeper meaning and weight to the frequent motif which appears in many of her central works. With this study, I first read through Virginia Woolf's work to find the fiction novels she mentions the 'looking-glass' in (*To the Lighthouse, A Room of One's Own, Jacob's Room, Mrs. Dalloway, Monday or Tuesday, Orlando, The Waves, Three Guineas, The Lady in The Looking Glass: A Reflection*). I then read through Virginia Woolf's recollections of her life. In this presentation, traumatic events Woolf experienced in her rather short life are examined and discussed. Woolf's fear of large Chippendale mirrors comes from their presence during the events of her half-brothers Gerald and George sexually assaulting Woolf, as well as the death of her mother. Mirrors were also a constant reminder that Woolf must participate in the role of a female in a high-class Victorian society. Every day at five p.m., Virginia and her sister had to be completely dressed in gowns and participate in activities like formally pouring their father tea even if the family did not have any guests. All of these events haunted Virginia Woolf up until the last decade of her life, as she notes in *Moments of Being*. In this presentation, I will explore these ideas further.

Emma Hartman, '21 Yumeng Tao, '20 Gabby Carlson, '21 John Bogucki, '20 Psychology Bettendorf, IA China Ackworth, IA Minneapolis, MN Melinda Green

Cardiac Biomarkers of Eating Disorders

The purpose of this study was to identify cardiac biomarkers of disordered eating among women with no ED symptoms, subclinical ED symptoms, anorexia, bulimia, binge eating disorder, or other specified feeding and eating disorders. Results suggest decreased mean R wave amplitude may represent a clinical biomarker of ED symptoms.

Lignin Isolation and Metal Ion Extraction

Potable water is necessary for human survival; yet, clean drinking water is scarce in several parts of the world, especially developing and third world countries. In villages that rely on wells and streams for water, there is risk for metal contamination, which can go undetected and cause numerous health risks. While there are resources that can eliminate metal contaminants, these resources can be costly and difficult to import and distribute. This research project seeks to use inexpensive and locally available materials to eliminate toxic levels of metal ions in water and works to create a method that will be available for use anywhere that has wood. There are two main polymers that together provide the structure of wood: cellulose and lignin. When making paper, lignin is often chemically separated from cellulose and removed as waste. Our process uses treatment of wood components and heat to thermally decompose the cellulose, leaving mostly lignin. The remaining lignin is capable of removing metal ions from water because its unique structure contains numerous phenol groups. These phenol groups likely bind with the metal ions in the water, and can be separated from the solution by gravity filtration, leaving decontaminated water behind. Relying on procedures originally performed by Katie Heidt, this research focuses primarily on optimizing the procedure to remove the most metal ions.

Sophia Hollingsworth, '21 Kinesiology

Portland, OR *Christina Johnson*

The Role of Sport Psychology in Division III Small Colleges

This study examines small colleges in the Midwest and surrounding areas offering sport psychology services to student-athletes. Research has demonstrated that sport psychology services can provide aide to student-athlete wellbeing and performance enhancement (e.g., Danish & Hale, 1981; Greenspan & Feltz, 1989). The National Collegiate Athletic Association recognizes the importance of sport psychologists for supporting student-athletes' performance; however, athletic directors may hesitate to employ mental performance consultants or sport psychologists due to a lack of funding, mistrust or lack of knowledge of the research supporting sport psychology services, and the stigma against mental skills support (Carr & Davidson, NCAA, 2017). The Association for Applied Sport Psychology (AASP) developed the Certified Mental Performance Consultants(CMPC), in part, to offer certification for practitioners who focus on performance enhancement and distinguish the scope of practice from licensed psychologists. This distinction is relatively new and may foster hesitation or confusion among collegiate administrators. As previous research has been based on Division I student-athletes, further research is necessary to examine perception of benefits and the patterns of hiring sport psychology service providers specifically within Division III and small colleges (e.g., Schimmel, et al., 2014; Wrisberg, et al., 2012).

In this study, 56 small colleges from the Midwest area and surronding regions were researched from four athletic conferences and two academic consortia. The websites for colleges included in the study were searched for data indicating the presence of a licensed sport psychologist, CMPC, or other sport psychology service provider. Preliminary results demonstrate that most small colleges in the Midwest region do not offer sport psychology services in any way. Instead, colleges frequently appear to refer counseling needs of student-athletes to counseling centers on campus; however, these professionals may not be trained as sport psychologists and may be unable to help with any performance enhancement needs. The results of this study indicate a need to advocate for the provision of sport psychology services to athletic directors, student services or student affairs administrators, donors, and institutional stake-holders.

Modeling Cosmic Ray Muon Detection

Cosmic ray muons are elementary particles created when cosmic rays collide with particles of the Earth's upper atmosphere. Muons travel at speeds upwards of 99% of the speed of light and have a half life of just microseconds. Simple Newtonian calculations would predict that we should be measuring essentially no muons anywhere near sea level. In fact, we would expect them to travel on average around 650 meters - a small fraction of the roughly 15,000 meters they would need to travel to reach sea level. Yet verifiably they seem to be common here on the surface of the earth - the reason being their relativistic nature. This presentation will detail a mathematical model, derived by combining what is known about muon decay at different energies with ideas of Einstein's relativity, that attempts to predict muons as a function of altitude. However, the model is dependent on the distribution of muon energies when they are created - an unknown distribution in the physics world. Analytically, Laplace transforms can be used to reverse engineer the model using real world data of muon observation as a function of altitude to obtain an estimate and get an idea of a physical yet unrealistic solution. For a more realistic solution, we also attempt to numerically solve to obtain this elusive distribution to compare to future discoveries.

John Kinne, '19

Classical Studies

Skokie, IL John Gruber-Miller

The Role of Women and Education in Critiques of Epicurus

This project contains the research and analysis I conducted during my Classical Studies capstone, concerning the rhetorical strategies and criticisms of 5th century B.C.E. Stoic philosophers (founded in the early 3rd century by Zeno of Citium, whose philosophy emphasized controlling one's emotion in reaction to outside stimuli) concerning the philosopher Epicurus and the larger school Epicureanism (founded by Epicurus around 307 B.C.E., which focused on the means to achieve freedom from physical and spiritual suffering). Due to these radically different outlooks, the Stoics and Epicureans often clashed, resulting in somewhat of a rivalry. With regard to these well-documented arguments, I analyzed the misogynistic language and emphasis on Epicurus' supposed lack of formal education and how these rhetorical strategies hide the frailty of the Stoics' criticisms by leaning heavily on dominant social norms concerning women at the time, particularly women called *hetairai*, who are often categorized as sex workers. Many of the criticisms leveled at Epicurus and his larger philosophical school revolve around his admittance of women into the school, and his companionship with one of his students at the time, a woman named Leontion. She is characterized as one of the *hetairai* and her relationship with Epicurus is the subject of innuendo and invective by his Stoic opponents; their friendship is heavily sexualized without basis, and it is insinuated that Leontion has cuckolded Epicurus by sleeping with the other members of his school. Through this relationship, Epicurus and his philosophical tradition is portrayed as effeminate, stupid, and weak.

This work is important because these kinds of rhetorical strategies have not disappeared. In large part, they mirror their ancient counterparts in their blatant misogyny. However, as public opinion changes and decries the more blatant of these techniques, the people who use these strategies develop ways of hiding the overt misogyny in their ideology. It is my hope that by analyzing these criticisms at a basic level, we can identify underlying similarities between these arguments and expose the bigotry they depend on.

The Prophetic Nature of Astro-Meteorology in Mary Shelley's *The Last Man* (1826)

In the British Romantic era, scientists, poets, and novelists alike sought to uncover the longstanding mysteries of the Earth's atmosphere, leading to such influential inventions as Francis Beaufort's wind-scale system and Luke Howard's taxonomy of clouds. One focus of research during this period was astro-meteorology, arguing that the position of celestial bodies, including the Sun and Moon, affects the atmosphere. This essay explores the meteorological significance of clouds in the Romantic period, the reputation of meteorology and the rise of astro-meteorology, and explicates pertinent sections from Mary Shelley's apocalyptic novel, *The Last Man*. I argue that aspects of Shelley's novel that have long puzzled critics can be better understood by understanding the Romantics' assumed connections between elements of the Earth's atmosphere and aspects of human behavior.

Brena Levy, '21 Alli Charlier, '21 Samantha Frese, '20 International & Off-Campus Studies

Aoyama Gakuin Cultural Experience

Japan and the United States are both highly industrialized societies. They may seem very similar on the surface, but the deeper cultural differences shape American and Japanese individual experiences and social patterns in unique ways.

We went to Tokyo in the fall of 2018 as part of the long-standing Aoyama Gakuin student ambassador program. During this experience, we lived in the dorms with students as well as participated in their daily routines of day-today dorm and college life. We attended class, participated in co-curricular activities, and shared, through informal conversations and formal presentations, our experience of life in America and Japan. During our time in Japan we explored many different parts of the Tokyo area, including Edo Tokyo Wonderland, Harajuku, Shinjuku, Akihabara, and the Scramble Crossing in Shibuya.

From this experience, we learned a lot about Japanese culture and its impact on everyday life. Japanese tend to focus on respect between others and interpersonal relationships as opposed to an emphasis on the self. This difference and the structure and patterns of day-to-day life both impact and reveal that Japanese feel responsible not just for themselves but also the people around them. In addition, cultural patterns impact Japanese people's sense of self and personal space. For example, the structure and history of bathing and bathhouses in Japan has an impact on body image and comfort. These differences were highlighted even further as we returned to America and the frantic pace and constant chaos left us jarred.

Kansas City, KS

St. Louis, MO Anna Butz

Biomechanical Analysis of an Offensive Lineman Kick-Set

The sport of football has become increasingly pass-heavy at all levels. This requires an offensive lineman to take an increased number of pass sets during a season. The purpose of this study was to create a discussion of the forces involved with a kick set, a movement unique to offensive lineman, and the possible consequences from those forces as they relate to Femoroacetabular Impingement (FAI). An NCAA Division III offensive lineman was video recorded and photographed from three different sides in non-game like conditions. The kick set was broken down into three phases and then analyzed separately. Angular measurements of the hips, knees, ankles, and lumbar were made during each phase of movement using software. The video was used to generate an estimation of linear forces involved, while angular measurements aided in discussing body positions throughout all three phases. FAI is often characterized by poor passive hip flexibility. Multiple studies have found that many football players fall into this category, but offensive linemen often show even worse passive hip flexibility than their counterparts. A possible reason behind this could come from basic positioning of the lineman during play. Offensive lineman must maintain their awkward position while taking on the forces of their own movement and the collision forces from their opponents. It is possible that dealing with these forces, while also maintaining the ideal position, coupled with the large volume of plays during a season could have a large impact in understanding FAI and other lower body injuries that occur in offensive lineman. Previous studies, have looked at forces experienced by football players during movement, when broken down by position group, but does not discuss unique body positions and movements of those position groups. In those studies, they have compared across position groups using basic athletic movements experienced by all position groups. Further discussion of injuries during these studies, is often disappointing as no strong conclusions can be drawn by comparing across position groups. For meaningful discussion of injuries, future studies will have to account for the different demands experienced by the various position groups.

Chloe Martin, '21 Paige Klug, '21 Geology Blair, NE St. Cloud, MN Rhawn Denniston

Tropical Australian Cave Flooding Events of the Last 4000 Years Reconstructed from Stalagmites

Flooding events can be catastrophic to communities, both economically and through the lives that can be lost in these events. The central Australian tropics regularly experience extreme rainfall events associated with the summer monsoon and/or tropical cyclones. In this study, we examined flood layers in stalagmites collected from cave KNI-51 in the Kimberley region of north-central Australia to better understand temporal changes in the frequency of extreme rainfall. Mud layers within the KNI-51 stalagmites are formed when flood waters deposit sediment on stalagmite caps, and these layers are entombed within the stalagmites when flood waters recede and stalagmite growth resumes. Flood layers were identified, measured relative to the base of the stalagmite, and assigned an age using growth models derived from previously obtained radiometric dates. The mud layer data, which span the last 4,000 years, were smoothed using a 21-year running average. Coeval stalagmites were measured by each of the authors, and the results, which agree well, were averaged into a single time series. This time series reveals a high degree of variance in extreme rainfall activity over time. Most notably, cave flooding activity/extreme rainfall events peak during the Medieval Climate Anomaly (AD 800-1200), possibly due to an elevated number of tropical cyclones as identified in other regional records.

Mitchell McAndrew, '19

Biochemistry & Molecular Biology

Photosynthesis: Possible in Snails?

Symbiodinium is a beneficial photosynthetic algae, represented by nine clades (types), that has been found to live symbiotically within tissues of numerous marine invertebrates. Most research is focused on corals because of the effects of global warming and bleaching. Interestingly, these photosynthetic symbionts have been found in mollusks. For example, the exposed mantle tissue of giant clams which, like coral, is exposed to sunlight, have *Symbiodinium* that perform photosynthesis. Surprisingly, recent studies have shown the presence of *Symbiodinium* within queen conch, a shelled gastropod (snail). The relationship is thought to be beneficial during the veliger (larvae) stage of development when the gastropod is translucent and the algae is able to photosynthesize and supply nutrients to the veliger. However, the symbionts are retained throughout life and are present in the adult shelled snail. The question addressed by the investigators is whether the symbionts are photosynthetic in the adult or have become heterotrophic or parasitic?

We are examining nerites, a photonegative snail, that are abundant in the intertidal zone throughout the Caribbean. The nerites are represented by three species: *Nerita versicolor* (four tooth), *N. peloranta* (bleeding tooth), and *N. tessallata* (checkered), all of which we have shown to contain *Symbiodinium* clade B (N=38). We are investigating whether the relationship between *Symbiodinium* and adult nerites, is symbiotic. In order to explore this question, we are attempting to determine if *Symbiodinium* are expressing photosynthetic-specific genes.

Preliminary data indicates that *Symbiodinium* may be expressing genes necessary to carry out photosynthesis. The genes we tested code for two proteins - one in photosystem I and the other in photosystem II. These photosystems are responsible for light absorption. The gene coding for the protein in photosystem II was expressed in five of the eleven samples examined, while we were unable to detect any expression from the other gene. The next step in the research project is to increase our sample size and begin examining other *Symbiodinium* photosynthetic-specific genes. In order to determine if the symbiotic relationship is beneficial to adult nerites, like it is for coral, we also plan to measure photosynthetic output.

Deconstructing Camouflage: A Message Against Violence and the Patriarchy Through the Art of Jessica Lagunas

Jessica Lagunas's work is overtly political and is based in the contemporary context of the United States and Guatemala. Having grown up in Guatemala during *La Violencia* and relocating to New York City in 2001, Lagunas has had a variety of contact with a design that has infiltrated both of these cultures: camouflage. In three of her works, entitled, *120 minutos de silencio (120 Minutes of Silence)*, *Untitled (Souveniers from Governor's Island)*, and *Deshilando el miedo (Unraveling the Fear)*, she disassembles camouflage fabric and the fear it has represented for many in Guatemala due to the violent conflict. Lagunas chose to create these works in response to the scar left on her home country and the comparatively flippant nature of the use of camouflage in the U.S. fashion industry. I will argue these camouflage works are a comment on the patriarchal violence that has been brought into our everyday life through the ubiquitous pattern. While in dialogue with the long history of feminist artists, Jessica Lagunas employs two different mediums, performance and textiles, in order to address a greater concept of power and violence that permeates the larger global community.

In this presentation, I will start with a visual analysis of Lagunas's camouflage works. Then, I will explain *La Violencia* in Guatemala, the involvement of the United States government, and the origins of camouflage and its direct association with violent war. I will go on to explain how camouflage fabric was introduced to U.S. civilians through the women's fashion industry and the frivolous way it is used today. This will bring me to a discussion of the importance of textiles and performance within feminist and Latin American art that may have influenced Lagunas' choice of fabric in these pieces. Next, I will highlight other contemporary Latina artists commenting on violence in their home countries using some variation of textiles or performance art. I will conclude with a comparison of Lagunas's camouflage pieces to performances by Yoko Ono, which Lagunas may have been heavily influenced by, to show how the message of Lagunas's work transcends a single culture.

Huong Quynh Anh Nguyen, '19 Geology

Moscow, Russia Rhawn Denniston

Organic Proxies in Speleothems: Analytical Method and First Data from Cave KNI-51

Fire plays a critical role in the ecology of the tropics of western Australia, with ignition generated by human activities and lightning strikes. However, the lack of high-resolution records of prehistoric fire activity that extends over multiple centuries impedes our understanding of fire dynamics prior to the arrival of European settlers. In this work, we measured specific organic markers (polycyclic aromatic hydrocarbons (PAHs)) which are formed during burning of biomass in stalagmites from the tropical Australian cave KNI-51 to reconstruct paleofire activity. I conducted these analyses during summer 2018 at Ca'Foscari University, Venice, Italy, under the guidance of Dr. Elena Argiriadis, an expert on PAH records of fire dynamics. We developed the analytical protocol for high resolution, low contamination PAH detection using gas chromatography-mass spectrometry (GC-MS), and collected preliminary data. This research could lead toward solidifying the usage of stalagmites as a proxy for studying paleofire activity.

Peyton Ort, '19 Valerie Sukolowsky, '19 Jamie Rhoads, '19 David Berger, '19 Psychology

The Effects of a High Sucrose Diet on Adolescent Rats' Cognitive Functions Between Sexes: A Pilot Study

Childhood obesity has become unfortunately more common in recent decades (CDC), and there has been little research exploring the negative consequences of this disease pertaining to cognitive function (Krakauer et al., 2017). The purpose of this study was to determine the effects of a high-carbohydrate diet during development on several behavioral endpoints in adulthood in rats, including performance on tasks of working memory, repetitive behaviors, and locomotor activity. Twenty-one day-old male and female rats were pair-housed and given either a 20% sucrose (w/v) solution to establish a prediabetic model or given plain water. Cognitive testing began after eight weeks on these diets. Working memory was tested using the novel object recognition task, which is specifically linked to the rats' spontaneous behavior of preferring to explore new objects over familiar ones (Ennaceur & Delacour, 1988; Luine, 2014). Obsessive-compulsive behaviors were tested with a marble burying task, which is a reliable measure of repetitive digging behaviors in rodents (Thomas et al., 2009). Finally, locomotor and emotional behavior of the rat was tested with the open field task (Walsh & Cummins, 1976). Glucose assays were performed at the end of testing, following an overnight fast. Female rats exposed to sucrose showed impaired working memory in the object recognition task compared to water-exposed female rats, an effect not seen in male rats. Conversely, there were no measured differences in behaviors in either the marble-burying task or open field test between the treatment and control groups. This study was an effective pilot study, justifying the further exploration of the effects that highsugar diets have on an adolescent rat's ability to perform various cognitive tasks, specific to the object recognition task. Interestingly, the glucose test did reveal that the use of the 20% sucrose (w/v) may not have been high enough to effectively induce a diabetic model in adolescent rats, and future studies will utilize a higher percentage of sucrose (w/v) in the treatment group to more accurately produce a diabetic rat model.

Ylana Padgett, '19

Art & Art History

Navajo Art in Response to Uranium Mining and Nuclear Pollution

Uranium mining on Navajo land has largely been a silent issue. Research on the effects of uranium mining and nuclear pollution has existed for almost a century although very little, if any, of that information was released until relatively recently. Because of this silence, the recognized art addressing uranium mining on indigenous land is far from prolific; the Hope and Trauma in a Poisoned Land exhibition was a big step in helping Navajo art responding to this issue become recognized in art culture, as well as provided education about the effects of uranium mining. The Museum of Contemporary Native Arts is also planning on showing a similar exhibition in 2020. As a result of helping research art works for this exhibition, I became particularly interested in three Navajo art works which address uranium mining as an intergenerational issue. Navajo art works Yellow Dust Eve, Autoimmune Response 1 and 5, and When They Came Home depict the destruction and devastation that uranium mining has inflicted and continues to inflict on the Navajo Nation. Shonto Begay's Yellow Dust Eve; Will Wilson's Autoimmune Response 1 and 5; and When They Came Home by Ann Futterman, Kim Hahn, Jane Benale, and Malcome Benally have not been examined as a group, as they employ disparate mediums and diverse artistic expressions; however, all three works are able to communicate the impact of uranium mining on the Navajo people by exemplifying the intergenerational effects of such an issue--uranium mining and nuclear pollution as a toxic legacy for the Navajo Nation. Each work employs iconography, references to Navajo traditions, and social history to tell stories about how native life over several generations has been affected by uranium mining. They show how toxicity and poisoning has been passed down through each generation, the home, and the land, and, in doing so, help give voice to a historically silenced social and environmental issue.

Sensitivity of the Australian Monsoon Response to Different Volcanic Eruptions in the Last Millennium

Tropical explosive volcanic eruptions can cause the Pacific ocean to shift into an El Niño-like state which, in turn, can influence rainfall across many parts of the globe. In this presentation, I investigate the link between large volcanic eruptions and Australian monsoon rainfall using the Community Earth Solar Model (CESM) Last Millennium Ensemble (LME), with a particular focus on the large Samalas eruption in 1257 CE. The LME covers the period 850-2005 CE and consists of 13 individual ensemble members that are driven by a variety of forcing factors including volcanic, solar, and land use. I will compare model output to data from tropical stalagmites from cave KNI-51, located in tropical Western Australia, that have been used to reconstruct the strength of Australian summer monsoon rainfall.

Tropical stalagmites can serve as proxies of precipitation through their oxygen-18/oxygen-16 isotope ratios (δ^{18} O), and can be accurately dated using uranium-thorium methods. Rainwater in many tropical areas has δ^{18} O levels that are driven by the "amount effect", in which higher amounts of rainfall are generally lower in δ^{18} O. These oxygen isotope ratios in rainfall are incorporated into stalagmites that grow in these settings.

I aim to better understand how volcanic eruptions influence rainfall in northern Australia by analyzing the moisture transport, sea surface temperature, and precipitation in the years following large volcanic eruptions, specifically looking for El Niño signals and drying of the Australian monsoon season. While the instrumental data suggest that ENSO events have a limited impact on the hydroclimate in the KNI-51 region, stalagmites from this cave have recorded changes in rainfall due to outside forcing events such as volcanic eruptions. The synthesis of KNI-51 stalagmites and the LME thus offers a promising opportunity to diagnose and understand the hydroclimatic response to volcanic eruptions.

Madison Politte-Corn, '20

Psychology

What Do You Do with Perfectionism? A Psychological Perspective

What do you do with perfectionism? Are you highly motivated, or do you worry about making mistakes? Audience members will complete a subset of Frost's Multidimensional Perfectionism Scale which includes statements measuring concern over mistakes, personal standards, parental criticism, parental expectations, doubts about actions, or organization. An important distinction is that of adaptive perfectionism and maladaptive perfectionism. Personality psychologists describe maladaptive perfectionists as people who fail to see the value in their efforts and consistently feel like they should do better; research has consistently demonstrated that these mindsets can lead to depressive tendencies. Conversely, adaptive perfectionists are still able to derive satisfaction from their achievements and are likely to score high on items such as "Organization is very important to me" and "I am very good at focusing my efforts on attaining a goal." The difference between adaptive and maladaptive perfectionism will be discussed with a focus on why maladaptive perfectionism can stimulate depressive thoughts. Common mediating variables explaining the relationship between perfectionism and depression are contingent self-worth, self-esteem, perceived stress, and self-compassion. With these variables in mind, the presentation will explore ideas about how to cope with maladaptive perfectionistic tendencies. Audience members will be encouraged to reflect on the prominence of perfectionism in multiple contexts, including academics, sports, and body image.

Madison Politte-Corn, '20

Fort Worth, TX Melinda Green

Psychology

Working with Kids from Hard Places: TBRI at a Summer Camp

Trust-Based Relational Intervention (TBRI) is an evidence-based intervention model designed for children who have undergone psychological trauma as a result of abuse or neglect during their early childhood. Audience members will progressively create their own drawings of the brain to understand the neuroscience behind this intervention. Specifically, TBRI aims to keep children out of their hindbrain, inhibiting their "fight or flight" response by creating a safe, stable environment. By doing so, children will theoretically tap into the frontal region of their brain, allowing them to exercise skills such as decision-making, problem solving, logic, and emotional regulation. Within the context of camp, a counselor can stimulate a camper's use of their frontal lobe by maintaining a calm, playful tone, offering choices, and ensuring that the child has all of their needs met (i.e., that they are not hungry, thirsty, uncomfortable, etc.). After TBRI is implemented over an extended period of time, the child establishes trust in his or her counselor, making it possible to eventually correct problem behaviors. Although TBRI was contrived specifically for children from "hard places," it can be applied to interactions with all populations of kids, making this a relevant topic for all parents, teachers, pediatric doctors, or anyone who has to interact with children. During my experience as Assistant Day Camp Director at a summer camp, I learned to apply TBRI to my interactions with the campers, especially situations which entailed dealing with a conflict or an upset camper. Throughout the course of this presentation, I will share what I learned about interacting with kids from traumatic backgrounds and how audience members can use TBRI concepts to guide their future interactions with children.

Belou Quimby, '19

Chemistry

San José del Cabo, B.C.S., Mexico

Cynthia Strong and Tammy Mildenstein

Mineral Content of Fruit Likely Consumed by Pteropus mariannus

The Mariana fruit bat (*Pteropus mariannus*) is an endangered species that resides on Guam and the Commonwealth of the Northern Mariana Islands. Threats to *P. mariannus* include poaching, the invasive brown tree snake, natural disasters, and deforestation. The local governments in the Mariana Islands as well as the US Fish and Wildlife Service are dedicated to the recovery of this federally-listed threatened species. One of the main goals of these collaborating agencies is the protection and restoration of the natural forest habitat of fruit bats. Lists of species eaten by the bats exist, but these do not distinguish those diet species that may be of special importance to the bats, e.g. calcium, which is not found in all fruits but is essential for bone development and lactating bats. We conducted a study on the nutritional qualities of species within the bats' diet. Fruits were dried, ashed, dissolved, and run through an Inductively Coupled Plasma Optics Spectrometer to determine the Ca, Na, K, Mg, Fe, Zn, Cu, and Mn content of eight species of fruit collected from Rota. Our data suggest that native fruit species may provide higher nutritional value than agricultural and non-native fruit species. Our work aids in reforestation planning by identifying those tree species that should highlighted if fruit bat habitat restoration is a goal.

Maura Quinn, '21 *Music*

Rome, GA *James Martin*

The Bomb, Oppenheimer, and God: *Dr. Atomic* and the *Bhagavad Gita*

The *Bhagavad Gita* is a several-thousand-year-old Hindu text that discusses questions of the ethics of war and the duties of a soldier. In the millennia since it was written, the *Bhagavad Gita* has been used by an incredibly vast number of people to justify an equally vast number of causes, sometimes directly contradictory to each other. During the nineteenth and twentieth centuries, it had an increased impact on the West. J. Robert Oppenheimer, the mastermind of the atomic bomb, was just one of the many people who found the text compelling.

In his 2005 opera, *Dr. Atomic*, composer John Adams and librettist Peter Sellars use excerpts from the *Bhagavad Gita* along with declassified military documents and other poetry to weave the story of Oppenheimer's conflict in the days before the first test of the gadget. In this paper, I compare the use of the lines of the *Bhagavad Gita* in *Dr. Atomic* to their original context. In doing so, I conclude that the lines serve to parallel Oppenheimer with the god Krishna and the mythological Hindu general Arjuna, and ultimately conflate Oppenheimer with his creation, the atomic bomb.

Characterization of Bilayer Properties with the Systematic Addition of Cholesterol

Cholesterol is a biosynthesized lipid that is known to have a profound effect on cellular membranes. As an essential structural component, cholesterol can increase bilayer stiffness and thickness, along with playing a key role in facilitating membrane organization. The experiments conducted in this research apply electrophysiology to determine the impact of cholesterol on lipid bilayer physical properties through the incorporation of gramicidin A ion channels (gA), in which gA lifetimes were used as a readout. A gA lifetime is the time for which two gA monomers are dimerized to form a channel for ions to flow through. Gramicidin lifetimes were measured in bilayers containing different mole fractions of cholesterol. The findings of this research have the potential to provide insight into the specific effects of cholesterol on protein activity and membrane organization that can be used to enhance the beneficial effects of prescription drugs.

Rachel Renaud, '19

Classical Studies

Ypsilanti, MI John Gruber-Miller

Imagining Ancient Corinth and the "Interactive Digital Latin Reader"

This Cornell Summer Research Institute project was intended to create teaching and learning tools for students of both Ancient Greek and Classical Latin. The *Imagining Ancient Corinth* (IAC) is an online digital textbook for intermediate Ancient Greek students, using the works of Pausanias, a travel writer from AD 110-180, as the main sort of texts. To supplement Pausanias, other stories have been included from Strabo (geographer), Zonaras (theologian), Apollodorus (historian), and the *New Testament* to provide a broader understanding of Greek literature and culture. My project has added several new stories to the website, including the myths of Bellerophon and Medea as well as poetry from Antipater of Sidon. I also organized a timeline of Corinth history from the Archaic Period to its re-founding by Rome. I created several grammar exercises, scaffolded to allow students to learn more about how Greek verbs are constructed and the cultural meanings behind compounds. The largest portion of my time was spent developing videos to explain several challenging grammar topics for non-native Ancient Greek speakers.

The second portion of this summer project is the "Interactive Digital Latin Reader." This project was designed to make readings for beginning Classical Latin students more interesting and engaging. I researched gamification and applications to the classroom to create a tool that would be both fun for the student and provide learning opportunities. The result of this project is the "Hercules Story video game," which takes the student through the 12 Labors of Hercules, almost fully in Latin. While currently the story is a simple point-and-click, text-based adventure (a game where students read a passage and then answer a question to move forward), the goal is to make the game more interactive in the future. The game is designed to increase in difficulty; the passages become harder and the questions eventually switch from English to Latin. Both the Greek grammar videos and the Hercules video game are available to test out during the poster session.

Twin Views of Death in Seneca's Troades, Act 1 and 2

Seneca the Younger wrote his plays in a time of political and social turmoil during the rule of Caligula, Claudius, and Nero. *Troades (The Trojan Women)* was written amid this chaos, telling the story of the Trojan women just after the sack of Troy, and their thoughts and emotions before being separated from each other by the Greek victors. In the first act, Hecuba, wife of Priam, is defiant and the chorus of Trojan women amplify her rebellion by expressing hope that their loved ones will find peace in the afterlife. In Act 2, the Greek men in the play have received word they cannot sail home unless Polyxena, one of Hecuba's daughters, is sacrificed to the ghost of Achilles. At the end of the act, the chorus of Trojan women speak up again and express a second perspective on death, one where the soul and body die together with no thought of the afterlife.

Act 2 is the source of much debate: are the Trojan women on stage, and if so, why does their outlook on death change so drastically? Some researchers have posited that the Trojan women leave the stage during Act 2 or are the mouthpiece for philosophical alternatives. However, through a close reading of the text for cultural markers, gendered power dynamics, and implicit stage directions, I argue that the Trojan women remain on stage and are engaging with both perspectives—a belief in an afterlife and a complete death of body and soul—as a way of expressing their own agency and control in a situation where they have none. This change in mindset is used to provide every Trojan with hope—an afterlife for Hector and the rest of the Trojan and nothing for Polyxena so that she does not have to meet Achilles in the afterlife.

MaryJo Schmidt, '19 Biochemistry & Molecular Biology

St. Michael, MN Jai Shanata

Data and Policy: Pulling Back the Curtain

Policy makers use a variety of information to inform their decisions. Collecting relevant information and presenting it in a way that is useful to policy makers often proves far more difficult. Over the summer of 2018, I was tasked with creating an annual report for policy makers within the Linn County, IA area. These annual reports are used to determine which projects/initiatives will be funded within the next year as well as how they will be funded. The annual report is comprised of three components, the most telling being a report on the current status of the county. The report I created was for the organization Early Childhood Iowa, an entity that provides funding to specific regions within the state. To complete this project, I used a variety of public, as well as private, databases connecting myself with many of the community resources in the area. This project required me to manage, collect, analyze, and communicate data to a wide audience. The final product needed to illustrate the current state of children (0-5 years) within Linn County. I completed a report that included 17 community demographics and 33 condition indicators. These indicators showed a lack of availability to resources by families in need as well as demonstrated the changing demographics of the area. The report I provided included more than double the amount of information compared to previous years. The results of this project were presented to the board of Early Childhood Iowa, where it was then used to determine funding allocations for the following year.

How Cultural Mimicry Exacerbates Poor Economic Development in Africa

The colonization of Africa happened from the late 18th century to mid 20th century. The struggle for hegemony among the Western powers led to the colonization of Africa. European Great Powers of Belgium, France, Britain, and Portugal wanted to achieve hegemony by gaining more resources and expanding their spheres of influence. An examination of the effects of France and Britain's colonization of West Africa reveals that their colonial policies affected not only the institutional fabric of West African societies, but also the psychology of those they colonized: the African people. The British and French colonial governments exploited the West African colonies economically, socially, and psychologically. This exploitation forced many of their subjects to adopt inferiority complexes; by adopting inferiority complexes, the African subjects reinforced the superiority complexes of the British and French colonial policy, the French colonial policy was more detrimental and exploitative as its goal was to strip the Africans of their culture and traditions, forcing them to adopt the 'superior' French culture. I will argue that inferiority complexes compound the problem of economic development. Inferiority complexes today are sustained through cultural mimicry of the colonizer by the native Africans; this cultural mimicry drives African nations like Nigeria and Senegal to economic dependence on other countries, which in turn creates political dependency.

Samantha Slaymaker, '21 Chemistry

Williamsburg, IA Craig Teague

Vibrational Spectroscopy Study of Ionic Liquids

Greenhouse gases are produced in large quantities by human activities and have caused an overall warming of Earth's climate. Ionic liquids are liquid salts at room temperature and have the potential to be used for a number of applications because they are highly tunable, meaning they can be adjusted to have certain properties by changing either the anion or the cation. One of the possible uses of these ionic liquids is in carbon capture and sequestration. Vibrational spectroscopy can be used to determine which combinations of cations and anions are most effective at accomplishing CO_2 capture. Similar to how ionic liquids can be adjusted to increase effectiveness, the spectrometers used in vibrational spectroscopy can also be fine-tuned by using a wide range of accessories and experimental parameters. We describe our efforts at obtaining temperature-dependent infrared spectra, far-infrared spectra, and Raman spectra.

Making Healthcare Safe and Affordable One Network Member at a Time: An Internship at Catalysis

LaNice Baker and Chase Sonnemaker spent their summer working to improve US Healthcare at Catalysis in Appleton, Wisconsin. Catalysis is a non-profit which supports healthcare organizations in improving their patient care by cultivating an attitude and culture of continual improvement commonly known as "Lean." At Catalysis, Chase and LaNice learned about the myriad of issues currently facing the US Healthcare System. These include rising costs, preventable accidents, wasteful levels of unnecessary care, and a fee-per-service payment model, among other issues. They also learned through interviews with staff, reading, and on-site healthcare facility visits that through a hospital-wide culture of improvement, many of these issues could be curbed and even prevented entirely. Creating this culture is difficult and requires the support of the entire hospital network, from the CEOs to each and every doctor and nurse, a fact that makes the work of Catalysis staff members difficult and complex.

In this presentation, LaNice and Chase will discuss the Lean problem solving method, giving a step by step guide to the process, including how to identify problems, how to plan a solution, how to test a solution, how to measure the efficacy of the solution, and how to further improvement and implement further. They will give concrete examples of how they put this method into practice during the internship and how that process benefited their work. They will also discuss what they took away from the internship, what their future plans are, and how they have been incorporating the Lean problem solving method into their current school and personal lives.

Caitlin Tobin, '20

English & Creative Writing

Madison, WI Michelle Mouton

"Sympathy Is so Close to Pity:" Complicating Female Disability in Anthony Trollope's *Barchester Towers*

Disabilities in Victorian Literature regularly signified a character's eccentricity or moral standing; the authors used their deformities either to put them in favor with the reader or to entice the audience to abhor them. Charles Dickens, for example, sometimes used disabled characters to elicit pity from the reader, most popularly seen in the character of Tiny Tim in *A Christmas Carol*. Literary scholars including Martha Stoddard Holmes, Gareth Cordery and George Levine have studied what this call for pity means for disabled people, and disabled women in particular, and their conclusions are generally not positive. But, not all Victorian authors presented disabled characters as desolate objects of pity or monstrous villains.

Anthony Trollope, who, like Dickens, often used social critique in his novels, published *Barchester Towers* in 1857; it included the character Madeline Stanhope, a fabulous and intelligent woman who also happens to be disabled. This paper will argue that while Trollope does adhere to some common tropes used to describe disabled women, he also affords Madeline agency and depth uncommon among novels at the time. Trollope paints her as a complex character and not simply a vehicle for pity or hate.

Coral Symbiosis: Overcoming the Heat

Symbiotic relationships exist within a variety of marine invertebrate hosts, but are most prevalent in corals. The most common symbiont, *Symbiodinium*, is a photosynthetic algae which is found in symbiosomes, which are organelles within coral cells. Rising seawater temperatures, associated with global warming, cause coral to expel their symbionts resulting in coral bleaching. Worldwide beaching events have caused significant loss of corals. It is estimated that live coral coverage worldwide has decreased by 40% since 1970.

We are using *Millepora* (fire coral), an abundant coral on Caribbean reefs, as a model system to investigate susceptibility and resistance to coral bleaching at two thermally different locations, South Water Caye, Belize and San Salvador, The Bahamas. South Water Caye has Sea Surface Temperatures (SSTs) which range between 26° and 30°C whereas SSTs in San Salvador are cooler and range between 22° and 28°C. By examining Millepore-*Symbiodinium* clade (species) diversity from two thermally different reef locations, we are attempting to determine if specific symbiont clades offer *Millepora* resistance to bleaching. Our research premise is based on recent studies that have shown specific *Symbiodinium* clades allow coral to withstand higher SSTs.

Our current results show that fire coral, which is thriving in The Bahamas, is clade B dominant (N=80). In Belize, corals are split; they are either clade A dominant (N=47) or clade B dominant (N=35). Corals that are clade A dominant (with B background clades) appear to be healthy, whereas some clade B dominant corals (with A background clades) are showing signs of bleaching. Our results suggest that corals located in reefs surrounding South Water Caye may be capable of shuffling their symbiont populations in order to cope with thermal stress.

Oliver Lawrence Trousdale, '20 *Chemistry*

Computational Exploration of CO₂ Capture with Functionalized Graphene

Carbon dioxide is responsible for approximately 81% of greenhouse gas emissions. Increased greenhouse gas emissions jeopardize the environment and human health. During the Cornell Summer Research Institute, we used computational chemistry to investigate alternative carbon dioxide capture methods. Current CO_2 capture methods are expensive, energy intensive, and have a multitude of engineering problems. Ionic liquids have been researched in recent years as alternative materials for CO_2 capture. One promising approach is to study the properties of ionic liquids and their interactions with CO_2 first using computational methods to save money and time before experimental research. Previous computational work with a series of ionic liquids showed that there was some tunability for this series of structure when plotting reaction energy versus partial charge on the free anion.

Instead of ionic liquids, this study investigates functionalized graphene-like structures and their interactions with CO_2 . Various graphene-like structures have been shown to have some tunability in the gas capture in both a computational and an experimental setting. We used similar computational and functionalization methods to the previous ionic liquid studies, despite working with a different structure. We used the WebMO interface to run jobs on QChem through the Midwest Undergraduate Computational Chemistry Consortium (MU3C) cluster. After initial studies to replicate prior work and test the cluster for this work, we settled on a computational method including basis set and correlation function.

From our initial computational research, we found a few promising results. Groups functionalized with nitrogen bond better with CO_2 than groups functionalized with oxygen. Groups where the displaced hydrogen is on the same side as the functionalized nitrogen (cis nitrogen groups) have the most negative reaction energies and the strongest bond with CO_2 . We did not expect the hydrogen attached to our graphene-like structure to completely detach and bond with the CO_2 , and this positive and unexpected result yields the strongest bonds of any set. Furthermore, we did find some chemical tunability within each group. Our results point toward the next round of studies in these important materials.

Oxazolone Colitis: Studying Cytokine Signaling in Intestinal Inflammation

Dextran Sodium Sulfate (DSS) and oxazolone are both known to produce an ulcerative colitis-like phenotype in mice, making them ideal models for studying colitis immunopathology. However, these agents induce colitis through different pathways involving the expression of different intercellular signals known as "cytokines." DSS causes injury of the intestinal epithelium, exposing the lamina propria and submucosal compartment to the antigens present in the intestinal lumen. The oxazolone colitis (OC) model relies on the interaction of oxazolone with endogenous proteins to form immunogenic complexes in the lamina propria.

The cytokine IL-18 is known to be produced by hematopoietic cells and endothelial cells under inflammatory conditions. Hematopoietic cells form all blood cellular components, including those that comprise the immune system. Previously, Dr. Nowarski's lab at Harvard Medical School has shown that deletion of hematopoietic/ endothelial IL-18 reduced susceptibility of mice to DSS-induced colitis. This indicated that IL-18 production during DSS-induced colitis drives disease progression. The purpose of this project was to implement the OC model into our lab to allow for future study into the role of IL-18 in OC compared with DSS-colitis. Here we use immunohistochemistry to show successful implementation of the OC model. We also report preliminary experiments suggesting that mice lacking hematopoietic/endothelial IL-18 may be more susceptible to OC.

Stephanie Voller, '19 *Environmental Studies* Marengo, IL Tammy Mildenstein

Egg Laying Habits of Monarch Butterflies

The migratory population of monarch butterflies from eastern North America, *Danaus plexippus*, has declined dramatically in recent decades. Population records show that between the winters of 1996-97 and 2014-15, their population decreased by more than 80%. Since past studies have demonstrated that monarch butterfly populations have decreased, it is important to inquire about typical monarch egg-laying patterns, or oviposition. In my Cornell Summer Research Institute project from 2018, I explored where monarch butterflies typically lay their eggs. It is well known that monarch butterflies only lay their eggs on milkweed plants, so my question analyzed how high up on common milkweed plants monarchs typically lay eggs. We found that monarch eggs were distributed in a bell curve, with the most eggs being laid around 83% of the total height of the plant. We also found that half of all monarch eggs were laid between 70% and 90% of the total plant height. In practical terms, we found that monarch butterflies prefer to lay eggs near the canopy, or the top. From a conservation standpoint, this experiment is helpful, since prairie management can now be informed that preserving the tops of milkweed plants is important and effort should be made to keep milkweed plants upright.

Cornell College Student Symposium

Inaugurated in the spring of 1997, the Cornell College Student Symposium provides an annual opportunity for undergraduate students on the Hilltop to share the fruits of their study in a forum that encourages wide community participation and attendance. Students who have done interesting and accomplished work in the setting of regular term courses or in independent research may be invited to present by faculty members or may themselves seek faculty sponsorship. Over a period of weeks beginning in the late fall, and with the assistance of their faculty sponsors, students indicate their intention to present, prepare a brief abstract of their work for inclusion in the Symposium program, and formulate the presentations themselves. The event, coordinated by the Center for Teaching & Learning, occurs in April each year.

The Symposium features three modes of presentation. One is an oral presentation of 15 minutes summarizing the project and its findings before a seated audience. Another is a poster presentation offering a graphic representation of the project along with explanatory comments made for the benefit of an audience circulating among the various poster displays. A third mode is the performance/lecture, particularly tailored to the fine arts. All of the presentations are made in concurrent sessions, some organized by mode of presentation, others by topical theme.

For presenters, the Symposium offers a prime setting for refining ideas, sharpening skills, and receiving feedback from the campus community, including students and faculty members in and beyond the presenters' major programs. For attendees, the Symposium offers a rich sampling of liberal arts research, represented by the work of dozens of students, in every academic division. For the College, the Symposium offers a memorable enactment of academic community, the contemporary realization of a historic ideal.