Foreword from Dean Joe Dieker

Foreword from Dean R. Joseph Dieker:

Welcome to Cornell College's 21st 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 76 students, working with 37 faculty members across 28 different departments and programs. There will be 26 oral presentations and 33 printed poster presentations. The following pages present the schedule for the 2017 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. Psychology is paired with Economics and Business. History presents with Environmental Studies. And technology is brought to the forefront of student work in the area of digital humanities. 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 with our inaugural Symposium lunch in Smith Dining Room. President Jonathan Brand and Assistant Professor of Chemistry Jai Shanata will be our 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 Brooke Bergantzel, Greg Cotton, Laura Farmer, Amy Gullen, Jennifer Haigh, Jessica Johanningmeier, Kristin Reimann, Jennifer Rouse, Ellen Wrede, 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

SCHEDULE

Session Two
10:45 - 12:00

DURHAM:
Creating Waves

HEDGES:
Libraries from Rome to America

RUSSELL:
Observing Revolution and Avoiding War

AM Poster Session
10:00 - 11:30
Orange Carpet

Session One
9:00 - 10:15

DURHAM:
Healthcare in Administration and Practice

HEDGES:
Strong Women Throughout History and Legend

RUSSELL:
Oral History, Discourse, and Activisim

OVERVIEW

Lunch Session
Noon

SMITH DINING ROOM:
Remarks by President Jonathan Brand

Talk by Assistant Professor of Chemistry Jai Shanata '05

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

Session Three
1:30 - 2:45

DURHAM:
Understanding Cultures and Places

HEDGES:
Intercultural Perspectives on Historical Figures and Conflicts

RUSSELL:
Uncertainty, Fast Fashion, and Wellbeing

Oral Symposium Sessions

Session One 9:00am - 10:15am

Healthcare in Administration and Practice
Durham Room | Moderated by Benjamin Greenstein

- ☐ **Reflections from Catalysis: Lean Methodology in Healthcare**
  Biochemistry & Molecular Biology
  Author: Kayla Septer
  Sponsor: Barbara Christie-Pope
- ☐ **Operation Walk: The Story of the Honduran People**
  Biochemistry & Molecular Biology and Dimensions
  Authors: Christy Ralston, Joseph Herrera
  Sponsor: Craig Tepper
- ☐ **Cardiac Risk among Eating Disorder Patients**
  Psychology
  Authors: Abby Herrick, Linden Miles, Mariah Ravet, Elisabeth Sage
  Sponsor: Melinda Green

Strong Women Throughout History and Legend
Hedges Conference Room | Moderated by Christina Morris Penn-Goetsch

- ☐ **Artemisia as Exemplar for French Queen Regents: Medici Patronage and a Few Fontainebleau Tapestries**
  Art & Art History
  Author: Kelsey Roberts
  Sponsor: Christina Morris Penn-Goetsch
- ☐ **Fascist Archaeology: An Exposé of the Temple of Vesta**
  Art History & Archaeology
  Author: Hayley Uzpen
  Sponsor: Christina Morris Penn-Goetsch
- ☐ ***The Chronicle of Swashbuckling Rubbish***
  Digital Humanities
  Authors: Andrea Davidson, David DeMoss, Emily Strawn
  Sponsor: Helen Rubinstein

Oral Symposium Sessions

Session One 9:00am - 10:15am

Oral History, Discourse, and Activism

Russell Room | Moderated by Misha Quill

A Stroll Through Time: The History of Cornell's Campus
History
Authors: Hannah Robertson, Brad Kane
Sponsor: Catherine Stewart

Do African Women Need Saving? The New Western(ized) Woman's Burden
Gender, Sexuality, & Women's Studies
Author: Glory-Lieb Tetuh
Sponsor: Aparna Thomas

Environmental Activism and Perception of Nature: Oral Histories and the Iowan Outdoors
Environmental Studies
Author: Carly Pierson
Sponsor: Misha Quill

Oral Symposium Sessions

Session Two 10:45am - Noon

Creating Waves

Durham Room | Moderated by Jama Stilwell

- ☐ **Spirits Must Rise: A Textual and Musicological Analysis of Adès and Oakes' *The Tempest***
  Music & English
  Author: Emily Wenzel
  Sponsor: Jama Stilwell
- ☐ **The Readers and Writers of Creative Nonfiction**
  English & Creative Writing
  Author: Lily Cott
  Sponsors: Michelle Mouton, Shannon Reed
- ☐ **Audio Beams: Electronically Steering Directed Acoustic Waves**
  Physics & Engineering
  Author: Simon Fink
  Sponsor: Derin Sherman

Oral Symposium Sessions

Session Two 10:45am - Noon

Libraries from Rome to America

Hedges Conference Room | Moderated by John Gruber-Miller

The Library of Hadrian: A Beacon for Athenian Intellect ☐
Classical Studies
Author: Caitlin Conlon
Sponsor: John Gruber-Miller

American Librarian: Thomas Jefferson and the Classics ☐
Classical Studies
Author: Johnathon Hilliard
Sponsor: John Gruber-Miller

The Library and Literary Endeavors of T. Pomponius Atticus ☐
Classical Studies
Author: John Kintz
Sponsor: John Gruber-Miller

Observing Revolution and Avoiding War

Russell Room | Moderated by Meghan Yamanishi

Deconstructing the Dichotomy: John Adams and Thomas Jefferson and Their Views on the French Revolution ☐
History
Author: Aubrey Kohl
Sponsor: David Yamanishi

Appeasement ☐
History
Author: Suleiman Ibrahim Shehu
Sponsor: Robert Givens

Oral Symposium Sessions

Session Three 1:30pm - 2:45pm

Understanding Cultures and Places
Durham Room | Moderated by David Yamanishi

- ☐ **The Intersection of Religion and Culture in Predominantly Muslim States**
  Politics
  Author: Cairo Eubanks
  Sponsor: David Yamanishi
- ☐ **Dark Tourism and the Complexities of Remembrance**
  International Relations
  Author: Mara McLaughlin
  Sponsor: David Yamanishi
- ☐ **Wartime Sexual Violence**
  International Relations
  Author: Glory-Lieb Tetuh
  Sponsor: David Yamanishi

Intercultural Perspectives on Historical Figures and Conflicts
Hedges Conference Room | Moderated by Lynne Ikach

- ☐ **Panfilov's Twenty-Eight in the Twenty-First Century**
  Russian
  Author: Yiyari De La Garza
  Sponsor: Lynne Ikach
- ☐ **Not Just a Background Character: Chukovskaya in the Spotlight**
  Russian
  Author: Linden Miles
  Sponsor: Lynne Ikach
- ☐ **¡Si Se Puede!: Mujeres Mexicanas que Lucharon Contra el Patriarcado y Cambiaron la Historia de México**
  Spanish
  Author: Arturo Castillo
  Sponsor: Michael Mosier

Oral Symposium Sessions

Session Three 1:30pm - 2:45pm

Uncertainty, Fast Fashion, and Wellbeing

Russell Room | Moderated by Greg Cotton

QPOC's Development of Social Capital and Wellbeing
Sociology & Anthropology
Author: Vanessa Lylyan Iraheta
Sponsor: Tori Barnes-Brus

The Relationship Between Causal Uncertainty and Rumination
Psychology
Author: Jessica Freeman
Sponsor: Suzette Astley

Regenerate Fashion
Economics & Business
Author: Nicole Pereira Plaza
Sponsor: Huan Cai

Poster Symposium Sessions

Morning Session 10:00am - 11:30am

1a Modeling Forest Fires with Cellular Automata
Mathematics & Statistics
Author: Samuel Cieszynski
Sponsor: Tyler Skorczewski

2a Coastal Western Australia Paleoclimate over the Last Five Glacial Cycles Using Stalagmite Carbon Isotope Values from Cape Range, Western Australia
Geology
Author: James Garrett
Sponsor: Rhawn Denniston

3a Structural Studies of Ebola Viral Homolog Encoded by Microbats
Biochemistry & Molecular Biology
Author: Garret Ginell
Sponsor: Craig Tepper

4a The Abortion Debate in Russia: An 'Unattainable Compromise'
Russian
Author: Leena Kaye
Sponsor: Lynne Ikach

5a Sedimentary Properties and Metal Concentrations of St. Croix
Geology
Author: Jeannie Kort
Sponsor: Kelsey Feser

6a Systematic Characterization of Resveratrol in Planar Lipid Bilayers by Single-Molecule Studies
Chemistry
Authors: Aidan Litt, MariKate Murphy
Sponsor: Jai Shanata

7a Analysis of De Novo Missense A-alpha Mutations Associated with Intellectual Disabilities in the PP2A Holoenzyme
Biochemistry & Molecular Biology
Author: Clint McDaniel
Sponsor: Barbara Christie-Pope

8a Euler's *Tonnetz* and Mary's Goat: Algorithmic Music Composition
Mathematics & Statistics
Author: Collin Smith
Sponsor: Stephen Bean

OVERVIEW Poster Symposium Sessions

Morning Session 10:00am - 11:30am

In Vivo Tracking of Dendritic Cell Exosomes Nasally Delivered to Brain **9a**
Biochemistry & Molecular Biology
Author: Shashanna Moll
Sponsor: Barbara Christie-Pope

Mollusks as Indicators of Environmental Change around St. Croix, US Virgin Islands **10a**
Geology
Author: Nina Morris
Sponsor: Kelsey Feser

From Prairie to Monarch: The Search of Life **11a**
Biology
Authors: Belou Quimby, Marin Dettweiler, Baley Good, Camden Grundeman
Sponsor: Tammy Mildenstein

Understanding Under-Film Water Transportation Rates: Dependency on Molecular Weight, Solvent Selection, and Ion Content **12a**
Chemistry
Author: Andres Rosas
Sponsor: Jai Shanata

Helping Fire Coral "Beat the Heat" **13a**
Biology
Authors: Glorisette Santiago-Rivera, Jasmine Li, Winfield Miller
Sponsor: Craig Tepper

ASB on Pine Ridge Reservation with Re-Member **14a**
Ethnic Studies
Authors: Jillian Schulte, Arturo Castillo, Ujessa Dhanak, Octavia Martinez, Jessica Meis, Julian Smith, Sydney Strunk, Cullen Yuska
Sponsor: Marcela Ochoa-Shivapour

Assessing Southern Hemisphere Behavior of the Indo-Pacific Tropical Rain Belt during the Late Holocene through Stable Isotope and U-Th Analyses of a Tropical Western Australian Stalagmite **15a**
Geology
Author: Elena T. Skosey-LaLonde
Sponsor: Rhawn Denniston

Discovering Patterns of Diversity in Peru **16a**
Biology
Author: Julia Thome
Sponsor: Marty Condon

Poster Symposium Sessions

Afternoon Session 1:00pm - 2:30pm

1b Characterization of the Effect of Ethanol, 1-Octanol, and Octanoic Acid on Model Gramicidin Ion Channels
Chemistry
Author: Jennifer Aguayo
Sponsor: Jai Shanata

2b The Sonnenschein Collection of Master Drawings: New Insights
Art & Art History
Authors: Steven Coburn, Jessica Meis
Sponsor: Christina Morris Penn-Goetsch

3b Synthesis of Brooker's Merocyanine and Derivatives: Study of Chromism, and Determination of pK_as
Biochemistry & Molecular Biology
Author: Andrea Corbet
Sponsor: Charles Liberko

4b Computing in Cellular Automata: Smashing Gliders for Fun and Computation
Mathematics & Statistics
Author: Nate Dwyer
Sponsor: James Freeman

5b Growth, Survival, and Habitat Use by Hatchling and Juvenile Ornate Box Turtles
Biology
Authors: Julia Eastham, Kelly Mickael
Sponsor: Andrew McCollum

6b Maximizing Energy Storage in Activated Carbon Supercapacitors
Physics & Engineering
Author: Noah Foster-Frau
Sponsor: Derin Sherman

7b Privacy Interfaces for Remote Telepresence Robots
Computer Science
Authors: Jeffrey Klow, Jordan Proby
Sponsor: Ross Sowell

8b Site Comparisons of Earthquake Destructions in Roman Corinth
Archaeology
Author: Jeannie Kort
Sponsor: John Gruber-Miller

9b Design and Construction of an Open Return Wind Tunnel
Physics & Engineering
Author: Joshua Lee
Sponsor: Derin Sherman

OVERVIEW
Poster Symposium Sessions

Afternoon Session 1:00pm - 2:30pm

On the Duration of Time-Averaging in St. Croix *Chione* **10b**
Geology
Author: John Lewis
Sponsor: Kelsey Feser

Gas Separations by Mixed-Matrix Membrane and High Surface Area Carbons **11b**
Chemistry
Author: Zoe Mann
Sponsor: Craig Teague

A Systematic Evaluation of Memantine and Donepezil's Active Conformations, Affinities, and Location of Binding on an NMDA Receptor **12b**
Chemistry
Author: Victor Martinez
Sponsor: Jai Shanata

Reviving Winifred Mayne Van Etten's Works **13b**
English & Creative Writing
Author: Sydney Pratt
Sponsor: Leslie Hankins

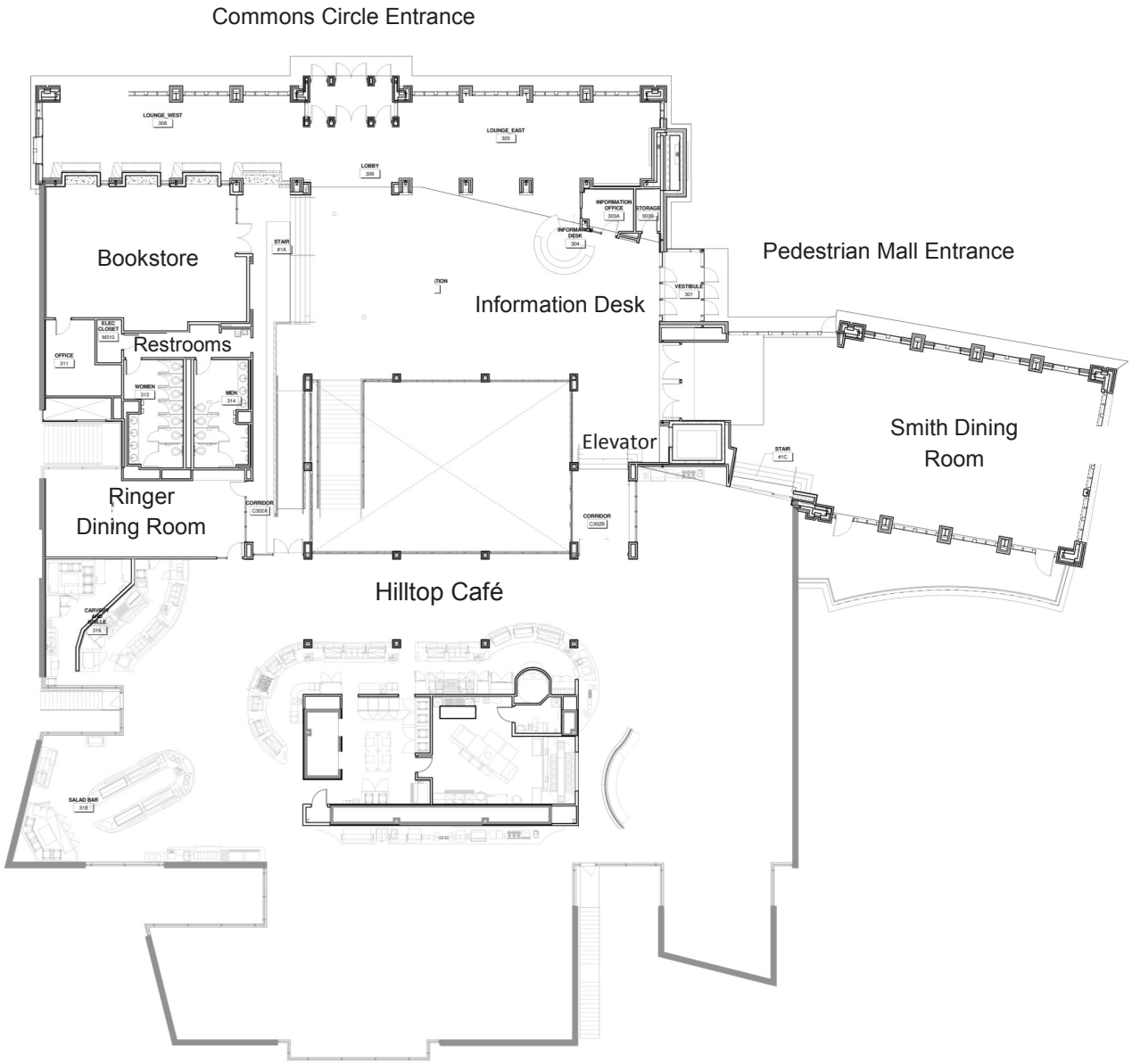
Evaluation of pXRF Technology in the Context of Geology **14b**
Geology
Author: Michael Sanders
Sponsor: Emily Walsh

Language Learning through Digital Games **15b**
French & Digital Humanities
Author: Kat Sayrs
Sponsor: Devan Baty

Maceral and Mineral Characterization of Modern Deposition in an Evaporate Pond: A Multivariable Analysis of Unconsolidated Material from the Triangle Pond Inlet, San Salvador, The Bahamas **16b**
Geology
Author: Elena T. Skosey-LaLonde
Sponsor: Kelsey Feser

Simulating Quantum Systems for the Traveling Salesman Problem **17b**
Computer Science
Author: Simon Fink
Sponsor: Ross Sowell

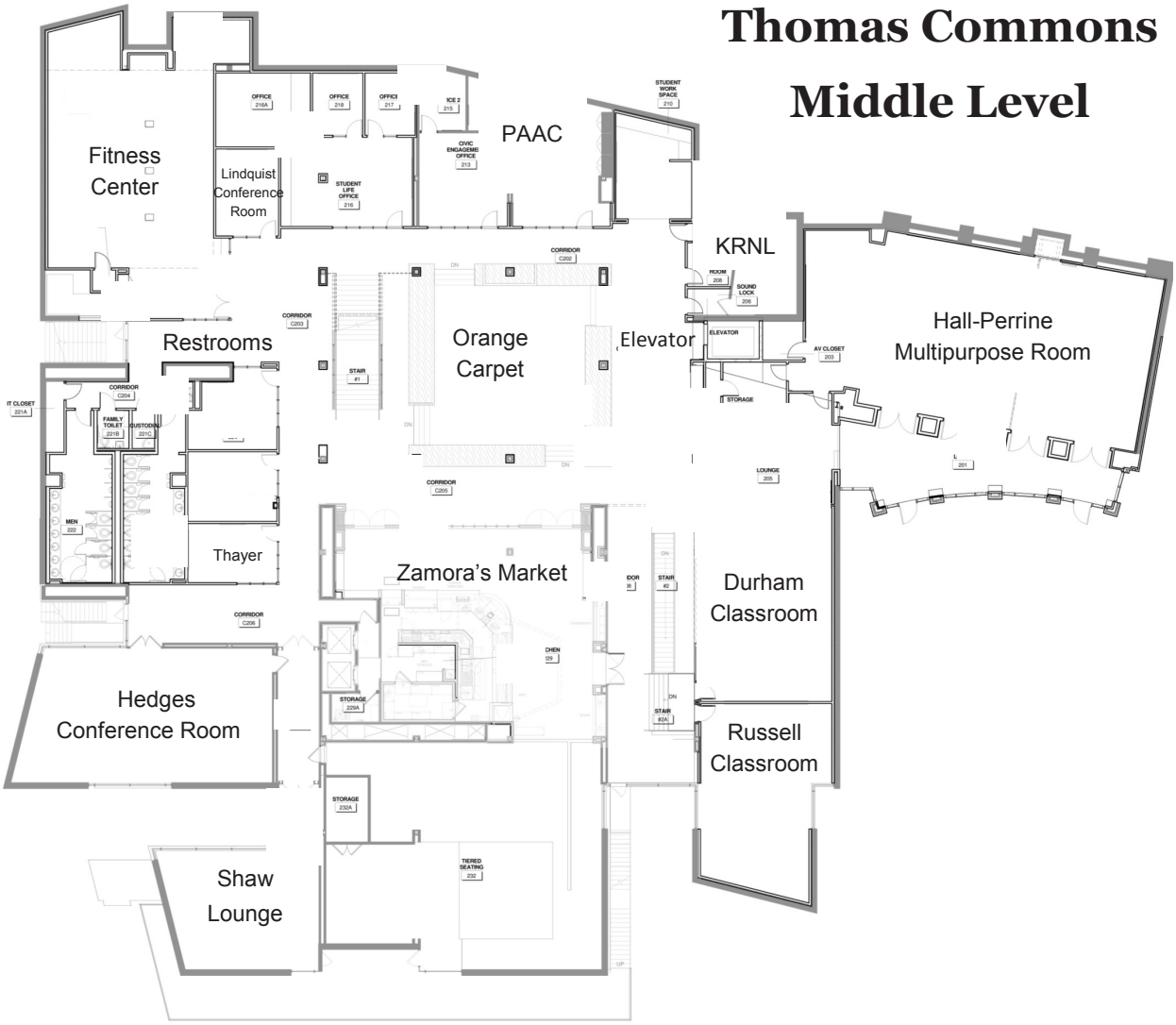
Thomas Commons
Upper Level



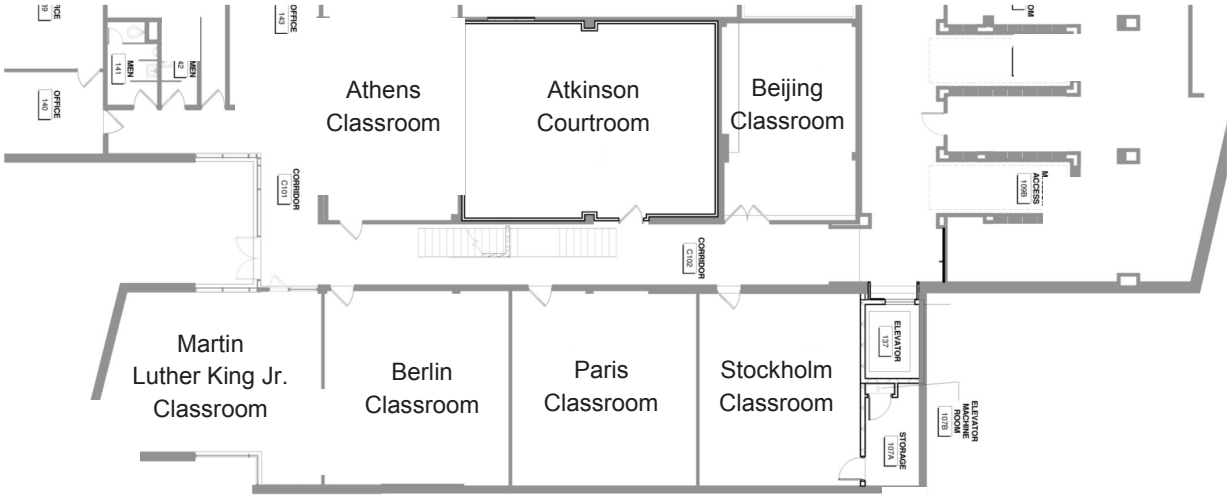
Cornell College

The Thomas Commons

Thomas Commons Middle Level



Thomas Commons Lower Level



ABSTRACTS

Jennifer Aguayo, '18
Chemistry

Chicago, IL
Jai Shanata

Characterization of the Effect of Ethanol, 1-Octanol, and Octanoic Acid on Model Gramicidin Ion Channels

An estimated 1.1 to 10.64 million Americans have Essential Tremor (ET). However, many people are misdiagnosed or simply go undiagnosed because they do not seek medical treatment. This neurological movement disorder causes shaking of the hands, head, voice, and occasionally legs and trunk, sometimes leading to a dramatic decrease in quality of life. Previous studies have found that ethanol, 1-octanol, and its primary metabolite have the potential to become therapeutic agents for people with ET. Nonetheless, ethanol, a two-carbon chain alcohol that is extensively used in alcoholic beverages and fragrances, can make patients more susceptible to misuse of alcohol and overdose during self-medication. In response to these concerns regarding the use of ethanol for the relief of ET symptoms, other molecules became the subject of study. In pilot studies, 1-octanol greatly decreased tremor intensity over longer periods of time in comparison to ethanol. Despite 1-octanol's success, researchers are unclear if 1-octanol or its primary metabolite, octanoic acid, is responsible for the therapeutic effects. Moreover, in most, if not all, current research, the mechanism by which these molecules reduce tremor intensity and amplitude is very poorly understood.

Partition coefficients suggest that both ethanol and 1-octanol will integrate into cell membranes, thereby altering the lipid composition. Through the use of electrophysiology experiments, this research qualitatively and quantitatively determines the impact of ethanol, 1-octanol, and octanoic acid on lipid bilayer physical properties. This data was obtained by measuring the lifetime of gramicidin A in planar lipid bilayers in the presence and absence of these compounds. These measured effects on model cell membranes may indicate a mechanism behind the tremor-reducing properties of potential ET therapeutics.

Arturo Castillo, '17
Spanish

Albuquerque, NM
Michael Mosier

¡Si Se Puede!: Mujeres Mexicanas que Lucharon Contra el Patriarcado y Cambiaron la Historia de México

Throughout time, individuals have been presented with histories of different countries that have heavily lacked the feminine perspective. This has resulted in an overall skewed interpretation of history that has supported and perpetuated patriarchal standards and norms that have consistently impacted both men and women in negative and diverse ways. Therefore, in order to shed light onto this distortion of history, this presentation will attempt to portray the much-needed feminine perspective that has been left out in the history books. The presentation will be centered on the country of Mexico and, more specifically, on the participation and perspective of four major feminine figures that aided in shaping the history of the country. The purpose of this presentation is comprised of two sections. The first section will provide an assessment of how each of the four diverse Mexican women combated the patriarchy by using unique methods, which opposed certain "norms" that were forced on these women during their respective time frames in Mexican society. The second section will provide explanations as to how the four women managed to leave critical marks in Mexican history that would later benefit, serve, and better the situation for all women in Mexico. This presentation is relevant to the public because it not only begins and continues conversations about marginalized individuals, such as Mexican women and other women of color, being consistently erased from mainstream history, it also sheds light that can allow individuals to see a side of a Mexican history that has not been presented to the general public. This presentation allows the audience to identify how important feminine figures have been in the shaping of Mexican history and it also sparks thoughts about feminine participation in the histories of other countries. The audience will be engaged with questions that will require audience participation and they will also be engaged with a visual presentation that will include images and/or videos of certain aspects relevant to the topic of the presentation.

Samuel Cieszynski, '19 **Menomonie, WI**
Mathematics & Statistics *Tyler Skorczewski*

Modeling Forest Fires with Cellular Automata

Forest fires are always dangerous, but certain factors have a strong influence on forest fire severity. In order to develop an effective method of forest fire prevention, we must understand how these factors influence a forest fire. We therefore consider two variables: the amount of biofuel available and the speed at which the fire spreads, or the probability that the fire will spread. This is why campfires are often prohibited in forested areas when there has been too little rain. To analyze how these factors influence forest fires, we created a model in which a fire is started at one location on a grid with a random distribution of burnable biomass and is allowed to spread with a certain probability. We then analyze how the amount of biomass in each cell and the probability that the fire spreads affects the shape of the fire.

Steven Coburn, '18 **Naples, FL**
Jessica Meis, '18 **Marion, IA**
Art & Art History *Christina Morris Penn-Goetsch*

The Sonnenschein Collection of Master Drawings: New Insights

The Sonnenschein Collection of 58 old master drawings was gifted to Cornell College in the early 1950s by Mr. Robert Sonnenschein II, whose father, Chicago lawyer Edward Sonnenschein (1881-1935), amassed a vast and diverse art collection in the early 20th century. As a gesture of his friendship with Cornell College President Russell D. Cole, Robert Sonnenschein II donated part of his father's drawing collection to Cornell. At the time of the donation, the drawings were unframed and unaccompanied by any documentation, apart from some artist attributions on the mats and supports of the drawings. The collection was exhibited at Cornell in 1966, 1972, and 1977 accompanied only by tentative artist attributions and without any proper study having been conducted. In the 1990s, the drawings were professionally appraised by a Chicago art appraisal company for insurance purposes. After a temporary loan to Davidson College in 1997, the collection was largely forgotten until the summer of 2016, when, as part of Cornell's Summer Research Institute, students Jessica Meis '19 and Steven Coburn '18, under the direction of Christina Penn-Goetsch, Ph.D., Professor of Art History, undertook a project to study the drawings and ultimately create a physical and online exhibition of the collection. The virtual exhibition was mounted with the goal of providing greater accessibility to the collection.

The students' research quickly revealed a conspicuous lack of accurate and thorough documentation and study of the drawings. Some results of the research portion of the project included: proper and complete documentation through high-resolution photographs of each drawing including versos (back of the drawing) and watermarks, determining provenance, identifying subjects, and reattributing drawings to specific artists. From March 26 to April 22, 2017, the Sonnenschein collection will be exhibited in Cornell's Peter Paul Luce Gallery with a closing reception, and an online exhibition will be launched to showcase the collection in light of the many exciting discoveries made.

Caitlin Conlon, '17
Classical Studies

Newton, KS
John Gruber-Miller

The Library of Hadrian - A Beacon for Athenian Intellect

The Library of Hadrian is located in Athens, Greece and lies beyond the Roman Agora. An immense structure, the Library was funded by Emperor Hadrian in 132 CE. The incredible size of the structure paired with the amount of materials that were imported for its decoration – Phrygian marble from Asia Minor, alabaster from Egypt, just to name a couple – show us just how important this building was to both the Romans and the Athenians. Behind the Phrygian marble-covered front façade was a large peristyle enclosed within a large central courtyard that contained a garden and a pool, as well as the library chamber, two lecture halls for public speaking, and four reading rooms that were situated against the east wall. The library chamber was a large room which contained an apse against the back wall as well as 66 niches that were spread throughout the supposed 3 levels. These niches were used to store the scrolls, and I have calculated an estimate as to how many scrolls the Library of Hadrian was able to hold. All of these aspects of the library – the style and design of the complex, the materials used, the number of scrolls it held – all help uncover just how important intellectual development was to the ancient Athenians. By analyzing the relationship between the Romans and Athenians during the era the library was built, along with the ways in which the space within the library complex was used, we can prove that the Library of Hadrian was a symbol for Athenian and Roman cooperation in the ancient world.

Andrea Corbet, '17
Biochemistry & Molecular Biology

Albuquerque, NM
Charles Liberko

Synthesis of Brooker's Merocyanine and Derivatives: Study of Chromism, and Determination of pK_as

Over the summer of 2016, we developed and optimized procedures to synthesize a series of solvatochromatic dyes: MOED, MOEL, MeO-MOED, and MeO-MOEL. These dyes have vibrant colors that change depending on solvent, pH, and temperature. A series of different experiments were developed that demonstrated the various unique color-changing properties of each dye. The results are a series of procedures and tests that can be repeated by college-level students in an organic chemistry laboratory class. The tests are simple and fairly quick in order to be completed in one lab day. These experiments are meant to help the students determine things such as how basic or how acidic the dye is and even predict the identities of unknown substances using what they know about how the dyes change in different solvents and pH ranges. These experiments were tested out earlier this year in the organic lab class at Cornell College with success. We believe that these experiments will be enjoyable for the students since they are very vibrant and fun to conduct and watch, and the procedures are fairly simple.

Lily Cott, '18
English & Creative Writing
Michelle Mouton, Shannon Reed

The Readers and Writers of Creative Nonfiction

With respect to today's memoir craze, readers seem to expect factual truth and are generally unforgiving of truth-bending and artistic liberty. However, with respect to the broader genre of Creative Nonfiction, expectations have yet to be agreed upon. Specifics such as how ethical stretching the truth is, how much liberty a writer is "allowed" to take with the truth, and even how the truth is defined are at the core of this literary debate. The authors that I call *liberals* believe in the authentic story over an accurate one while the authors I call *purists* believe that Creative Nonfiction should be factually accurate and only use creative tactics when it comes to *how* the truth is told. I studied Peter Rabinowitz's theory of audiences and James Phelan's theory of author reliability/unreliability, both originally written to discuss works of fiction. I applied these narrative theories to three works of Creative Nonfiction that approach the reader-writer contract in three different ways. What I found is that the way an author framed their work ultimately determined the author's success or failure; my study suggests that authors who introduce their work as Nonfiction and take artistic liberties had more success with their readers than authors who also took artistic liberties but admitted it outright.

Andrea Davidson, '17 — **Phoenix, AZ**
Emily Strawn, '17
David Demoss, '19 — **Holland, MI**
Digital Humanities
Helen Rubinstein

The Chronicle of Swashbuckling Rubbish

The Chronicle of Swashbuckling Rubbish is a fantasy/adventure visual novel about a kidnapped feather and the lengths her friends go to to rescue her. The game will feature a full story with a number of dialogue options and multiple endings, a dictionary with unlockable entries of terms particular to the universe, an original score, and a blend of watercolor and pencil sketch art for the backgrounds and characters. The game will be programmed using Ren'Py, a visual novel engine. Though this is still a work in progress, we project that the game will be completed in the next few months.

The story starts when Edna, a feather animate, or object come to life, gets kidnapped by a pirate crew to which she and Hamish, her human friend who lives in a dumpster, used to belong. Hamish, while usually lazy, tries to rescue her. He enlists the help of others like Pocket, a sky cab driver, and Brellerum, a journalist and animate rights activist, as he gears up to intercept the pirate crew in the one place he knows they'll show up, thanks to intel from an old friend. Through the adventures of Hamish and his ragtag team, the player learns more about this unique universe, such as the struggles that animates face in a human-dominated world, as the characters develop and learn about themselves.

Our group's project was presented at The Undergraduate Network for Research in the Humanities 2017 conference. The conference aims to allow students to engage in an innovative approach to the humanities--to be part of a forward-thinking conversation that empowers students to think beyond the traditional curriculum--and we're excited to be able to bring that conversation back to Cornell.

Yiyari De La Garza, '17 **Houston, TX**
Russian *Lynne Ikach*

Panfilov's Twenty-Eight in the Twenty-First Century

The 28 guardsmen of the Red Army's 316th Rifle Division, led by Major General Ivan Panfilov, presumably died battling German tanks on the outskirts of Moscow in the freezing winter of 1941-1942. The myth of Panfilov's 28 Guardsmen, perpetuated by high-ranking government officials, serves to exemplify Soviet Russia's supposed superiority and satisfies the Russian Federation's need to allude to the halcyon days of the Great Patriotic War. With the opening of archives in countries of the former Soviet Union, all-union as well as republic myths, are in peril. It is critical to understand why this myth, as opposed to other more probable stories of valiant and tenacious Red Army fighters, survives.

In the summer of 2015, Director of the State Archives of the Russian Federation Sergei Mironenko debunked the "Panfilov's 28 Guardsmen" myth. After a public rapprochement by the Minister of Culture Vladimir Medinsky, Mironenko was forced to comply with Minister Medinsky's directive "to not give his own assessment on archival documents" or his position could be changed in order to more adequately reflect his preferences.

This lecture examines the archival administration system in the Russian Federation as it is expressed through this conflict. Through the use of historical and administrative elements, the Ministry of Culture's direct exercising of its jurisdiction over the archival system (specifically over the State Archives of the Russian Federation) is investigated. The professional and personal characteristics of State Archival Director Sergei Mironenko and Minister of Culture Vladimir Medinsky are examined individually, followed by an explanation of the conflict between them over the veracity and publication of the highly contested "Panfilov's 28 Guardsmen" myth.

Nate Dwyer, '18 **Lexington, MA**
Mathematics & Statistics *James Freeman*

Computing in Cellular Automata: Smashing Gliders for Fun and Computation

A cellular automata is a set of simple rules on a grid that, given time, will exhibit complex behavior. These are used for a number of purposes, including modeling real-world behavior like simulating a forest fire or a computer. At every timestep, each cell in the grid is updated according to the rules of the cellular automata. These rules give rise to patterns; for example, a glider is a pattern that translates across the grid while oscillating. Gliders and other patterns can interact with each other by colliding, and these collisions can be used to simulate computation.

Unfortunately, simulating computation with gliders makes for a complicated image. We simplify this by defining a new cellular automata that abstracts away complex patterns into single cells. We then show how to use this automata to model logic gates and discuss how this could be used to compute.

Julia Eastham, '19 **Milwaukee, WI**
Kelly Mickael, '18 **Burlington, IA**
Biology *Andrew McCollum*

Growth, Survival, and Habitat Use by Hatchling and Juvenile Ornate Box Turtles

The eastern ornate box turtle (*Terrapene ornata ornata*) is listed as a threatened species in Iowa. Understanding basic information, such as growth rate, range, habitat, and survival rate, is important to help protect this species. Students and faculty from Cornell College and Mt. Mercy University have conducted a 23-year study of ornate box turtles in Johnson Co., Iowa. We used radio telemetry to monitor movements, growth, and mortality of hatchling and juvenile turtles over multiple years. From these data, we estimated survival, compared growth of known individuals to trends inferred from the relationship between size and number of growth rings for the entire population, and analyzed changes in home range with age and body size. Although growth rings and size appear to accurately age juvenile turtles, the same does not apply to mature turtles. Home range increases with age and size. This adds to our basic understanding of juvenile turtles' growth and behavior, which can help inform conservation efforts of the eastern ornate box turtle.

Cairo Eubanks, '17 **Silver Spring, MD**
Politics *David Yamanishi*

The Intersection of Religion and Culture in Predominantly Muslim States

I committed to spending my spring break in Baku, Azerbaijan in order to conduct research into the impact of religion in Azerbaijan society. Azerbaijan, located in Eastern Europe by Turkey, is predominantly Muslim. This presentation will be a comparative analysis on Azerbaijan, Morocco, and Senegal--and how Islam is represented in each country. I wanted to combine my study abroad program last semester with my experience in Azerbaijan to look at the different representations of Islam in these predominantly Islamic nations.

I conducted interviews and made connections with affiliates of the Sumgayit State University, located in Baku, as well as Azerbaijani locals. Through personal interaction with locals and observation, I combined interviews from Azerbaijani students and citizens, as well as made note of similarities and differences in how religion is displayed in Morocco, Senegal, and Azerbaijan. This Symposium presentation will provide a brief introduction to Islam, as well as similarities that Islam shares with other Abrahamic faiths in order to draw parallels and show the relationship between Islam, Judaism, and Christianity. Other methods include photographs in country and anecdotal evidence.

Islam is depicted in diverse areas, depending on how relatively conservative that particular state is. There are a lot of misconceptions and misrepresentations of the religion, due to media portrayals of Muslim practitioners and states being extremist and unwilling to assimilate to our Western definitions of "modern." The objective of this presentation is that my anecdotes about being in these countries, as well as visual representations and personal observations, will illustrate a more nuanced perspective on predominantly Muslim states.

Simon Fink, '17
Physics & Engineering

Brookfield, VT
Derin Sherman

Audio Beams: Electronically Steering Directed Acoustic Waves

The directivity of a loudspeaker is gated by the frequencies of the waves it is required to emit. Tones audible to the human ear have relatively long wavelengths, and as directivity is proportional to the ratio of the size of the speaker to the length of the wave, a practical loudspeaker will emit sound essentially omnidirectionally. One novel solution to this problem is through the utilization of ultrasonic speakers, emitting frequencies inaudible to the human ear. Audible frequencies can piggyback on the ultrasound passed to the speakers, attached in much the same fashion as an AM radio transmitter. Due to the nature of nonlinear acoustics, audible sound is emitted from the ultrasound itself, allowing for highly directed beams of audio.

Achieving a sharply directed beam begs a further question: how can the direction of the beam be changed? If a listener using an ultrasound-to-sound speaker moves from the audio beam, the speaker must be manually rotated to allow for uninterrupted listening. This problem may be solved through the use of an ultrasound-to-sound phased array, which allows for electronic steering of the audio beam. Phased arrays consist of elements that emit with a calculated phase difference between each other, resulting in a directed beam along the phase-aligned angle. This phase difference may be produced in a number of ways, many of which were investigated and compared over the course of the research process.

The research presented here poses a tapped analog delay scheme as a potential implementation for phased ultrasound-to-sound speakers.

Simon Fink, '17
Computer Science

Brookfield, VT
Ross Sowell

Simulating Quantum Systems for the Traveling Salesman Problem

The Traveling Salesman Problem (TSP) is one of the more famous optimization problems in computer science. Its formulation is as follows: given a set of points ("cities"), what is shortest path that will visit each point once, returning to the first point after having done so? This can be easily compared to a salesman tasked with finding the shortest route between a number of cities, hence the moniker.

It is a relatively simple problem, but is classified under NP-hard, a category of problems which currently have no solution calculable in an efficient amount of time. This means that large TSPs must be solved using high performance computing, and beyond a certain number of points, they are not practically solvable at all. Despite this, an approximate solution may often be found using algorithms called heuristics; these yield solutions that can come very close to the optimal shortest path. There are many categories of TSP heuristics, all of which fall into the broad categories of "deterministic" and "probabilistic." Deterministic algorithms, those with predictable behavior given any input, are better understood, and can consistently achieve approximate solutions within one percent of the optimal tour length; probabilistic algorithms show some potential, however, and yield competitive approximations in many circumstances.

Many probabilistic algorithms are based from natural, physical models; one heuristic, for example, approaches the distribution of cities as an ant colony might, while another uses models of the path taken by an amoeba toward a food source. The basis of the heuristic studied in this project is a model of physical process called *annealing,* a technique performed in metallurgy via rapid cooling of materials to enhance desired properties and reduce the prominence of defects. A classical algorithm simulating this process is compared with one empowered with quantum mechanics, introduced to simulate quantum tunneling to better solutions.

In this presentation, a leading deterministic TSP heuristic is quantitatively compared with two probabilistic algorithms: one classically modeling annealing and one empowered with quantum mechanics, introduced to simulate quantum tunneling to better solutions.

Noah Foster-Frau, '17 **Galesburg, IL**
Physics & Engineering *Derin Sherman*

Maximizing Energy Storage in Activated Carbon Supercapacitors

In modern times, energy storage is an everyday obstacle. Keeping your phone, kindle, laptop, and even your car charged is a constant reminder of the way storing electrical charges efficiently and speedily is essential to our way of life. Activated carbon supercapacitors have been the middle ground between rechargeable batteries and electrolytic capacitors since their invention in the mid twentieth century. At their most basic, they consist of a metal plate known as a base with one side covered in activated carbon mixed with polyurethane (a glue-like material). A thin layer of electrolyte is then placed on top and another base with carbon is sandwiched to the other side. Their advantages lie in the way they store charge in the electric field, unlike batteries, which store charge in chemical reactions within the battery. Because of this difference, they can be charged very rapidly and do not wear out as chemical batteries do.

In this experiment, activated carbon supercapacitors were created from scratch using polyurethane, activated carbon phosphoric acid, and a few types of metal. The goal was to optimize energy storage within the supercapacitors and find which fabrication methods were best at storing charge. To that effect, several generations of capacitors were created using copper, brass, and aluminum bases, as well as different electrolyte acids within the capacitor. Ranging from totally unworkable prototypes to a whole farad of capacitance, each generation of capacitors worked better than the last.

The final generation of capacitors were constructed in order to test a hypothesis about the activated carbon layer. Five were made, with two having a higher concentration of activated carbon and three having a lower concentration; after being made, one of the higher and one of the lower concentration were sprinkled with larger grain carbon to increase surface area and contact with the electrolyte. The capacitor with higher concentration of activated carbon and sprinkles was found to have the highest capacitance.

This finding allows us to make more efficient energy storage methods that could be used to replace batteries in the future. It also demonstrates that we can replace harmful components of electrical systems with readily available and ecologically friendly components and cause less destruction of the earth.

Jessica Freeman, '17
Psychology

Zimmerman, MN
Suzette Astley

The Relationship Between Causal Uncertainty and Rumination

Causal uncertainty is the degree to which an individual believes they understand why social events occur. When people feel causally uncertain, they become motivated to reduce their uncertainty, and past research has shown that individuals high in causal uncertainty (i.e. frequently feel uncertain about the causality of social events) will engage in more thoughtful and effortful social information processing and other behaviors which they believe will reduce their causal uncertainty. However, causal uncertainty has also been found to be associated with negative affect and depressive symptomatology. This seems paradoxical; despite individuals being motivated to reduce their uncertainty and the accompanying negative affect, research has shown that their subsequent behavior does not improve their causal judgmental accuracy and so does not lead to reduced negative affect. These individuals do not seem to learn that these behaviors are not helpful in reducing their uncertainty, so they continue to engage in them whenever they feel uncertain.

Other research has shown that individuals engage in rumination when they encounter situations that make them feel uncertain. It has been suggested that rumination moderates the relationship between intolerance of uncertainty and depressive symptomatology. However, research looking specifically at causal uncertainty and rumination, and rumination's potential role in causal uncertainty's relationship with depressive symptomatology and negative affect, has yet to be completed. The purpose of the present study is to extend research on causal uncertainty and rumination, specifically examining if rumination is the mechanism behind the relationship between causal uncertainty and negative affect.

Participants were recruited using the Amazon recruiting platform Mechanical Turk. All participants completed scales designed to assess causal uncertainty, causal importance, self-esteem, self-efficacy, and their current mood. Participants then read four scenarios designed to induce causal uncertainty and were asked to list possible causes of each scenario. They were split into three conditions which determined how long they were able to think about the scenarios: unlimited time, 3 minutes, or 5 minutes. Then their mood was assessed again, and they completed a scale designed to assess rumination.

James Garrett, '17
Geology

Fountain, CO
Rhawn Denniston

Coastal Western Australia Paleoclimate over the Last Five Glacial Cycles Using Stalagmite Carbon Isotope Values from Cape Range, Western Australia

Climate proxies are any biological or geological record that preserves temperature or precipitation fluctuations prior to human records. This project's climate proxy is stalagmites, which are cave formations created from drip water on a cave floor. In particular, this study focuses on carbon isotopes, which record vegetation and moisture changes, spanning parts of the last 500,000 years from Cape Range, Western Australia. Cape Range is located approximately halfway up the western coast of Australia and sits on the boundary between tropical monsoon rains coming from the northern tropics and middle latitude rainfall moving up from the south. The majority of summer rainfall comes from tropical cyclones while winter precipitation comes from southern rainfall. The percentage of annual rainfall derived from these weather systems varies substantially from year to year. Little is understood of rainfall variability at Cape Range during the ice ages. A recent study by Cheng et al. (2016) produced a continuous 640,000-year record of monsoonal variability using oxygen isotopes in stalagmites from southern China. Although the Cape Range stalagmite record is highly discontinuous, comparison of the Chinese record with carbon isotopes in Cape Range stalagmites suggests an interconnectedness of precipitation over the past 500,000 years. In-phase changes are seen between the two systems (simultaneous wetter or drier intervals), a finding that is surprising given their location in different hemispheres. It is still unclear why this relationship exists, but a possible explanation is an expansion and contraction of monsoon rains over past millennia. Analysis of additional stalagmites is needed to develop a more continuous record from Cape Range and better test this hypothesis.

Garrett Ginell, '18
Biochemistry & Molecular Biology

Naperville, IL
Craig Tepper

Structural Studies of Ebola Viral Homolog Encoded by Microbats

High case fatality rates are observed during sporadic Ebola virus outbreaks. Currently, elusive or not available is the Ebola reservoir host or any safe efficacious treatments. Bats, given their unique features, have been identified as one potential reservoir host, but why Ebola is highly virulent in some mammals and not in others is not well understood. In an effort to address this gap in our knowledge, we have initiated a study to test the role of filoviral genes that are preserved in some mammalian genomes, including those of bats. Filoviral genomes encode seven structural proteins, one of which is viral protein 35 (VP35), a multifunctional protein that both enhances viral propagation in Ebola and inhibits the immune response in its host. Contrastingly, VP35 protein in bats (batVP35) has been conserved over millions of years, and is thought to be a key component aiding in protection from Ebola infection. As a part of the efforts to better understand if VP35 confers resistance to the virus in bats, structural studies of the bat VP35 have been undertaken. Surmounting significant challenges posed while solving the protein crystal structure yielded: a few single crystals suitable for diffraction experiments and a single native data set collected at the IMCA-CAT insertion device beamline at the Advanced Photon Source. The three-dimensional atomic structure of bat viral protein VP35 was solved by molecular replacement using a model of only 33% homology. The structure has been refined to 2.50 Å resolution. Comparison of the structure of this batVP35 protein with that of the Ebola VP35 protein reveals structural similarity to the viral VP35. However, batVP35 also shows unusual biophysical properties as well as dsRNA binding and IFN inhibition, which collectively show significant functional differences that may contribute to its role in bat cells. We will discuss major differences and potential implications to viral replication and host responses as well as potential new targets for therapeutic development.

Abby Herrick, '17 — **St. Paul, MN**
Linden Miles, '17
Mariah Ravet, '17 — **Marinette, WI**
Elisabeth Sage, '17 — **Marion, IA**
Psychology — *Melinda Green*

Cardiac Risk among Eating Disorder Patients

Problem or Purpose: Eating disorders have the highest mortality rate of all psychiatric diagnoses and affect approximately 10% of adolescent girls and young women. The disorders are associated with serious medical complications and premature death from a myriad of causes; a high percentage of these premature deaths are linked to adverse cardiac events. Identifying reliable biomarkers of cardiac risk in this population is essential to improve health outcomes. The present study examines differences in cardiac risk indicators through electrocardiography (ECG) among asymptomatic women compared to women with subclinical and clinical eating disorder symptoms. Specifically, ECG waves examined across the three groups were: mean T wave amplitude, mean R wave amplitude, mean Tpeak-to-Tend, QT interval length, and QRS interval duration. We predicted women in the subclinical and clinical groups would show decreased T wave amplitude, decreased mean R wave amplitude, and increased QRS interval, QT interval, and Tpeak-Tend interval compared to asymptomatic patients.

Procedure: We collected 5 minutes and 30 seconds of cardiac data via 3-lead ECG in a community sample of women with clinical and subclinical symptoms across a 4-year recruitment period as part of an ongoing study of cardiac function in women with eating disorders (N=141). Eating disorder symptoms, body mass index, and biomarkers of cardiac risk were examined. We predicted a statistically significant effect of condition in the one-way MANOVA results.

Results: As predicted, results indicated a statistically significant effect of condition, Pillai's Trace = .59, $F(12, 268) = 9.40$, $p < .001$. Follow-up tests showed mean R wave amplitude was significantly decreased among women with subclinical and clinical symptoms, indicating decreased force of ventricular contraction. Results further indicated T wave amplitude was significantly lower in women with subclinical and clinical symptoms, indicating blunted electrical signaling during repolarization. QT interval prolongation, increased QRS interval duration, and prolonged Tpeak-to-Tend intervals further displayed aberrant depolarization and repolarization processes in women with subclinical and clinical symptoms compared to asymptomatic women.

Conclusions and Implications: Women with clinical and subclinical eating disorder symptoms display aberrant cardiac biomarkers which distinguish them from women without symptoms. Mean R wave amplitude, T wave amplitude, QT interval prolongation, QRS interval duration, and Tpeak-to-Tend intervals are important cardiac biomarkers to assess in eating disorder patients, especially given that several of these markers have been linked previously to risk for sudden cardiac death within eating disorder populations and beyond.

Johnathon Hilliard, '18 **Montgomery, IL**
Classical Studies *John Gruber-Miller*

American Librarian: Thomas Jefferson and the Classics

"I cannot live without books." To Thomas Jefferson, reading was more than a hobby; it was his investment to the future, one of his loves in life. He enjoyed the classical epics and poems as well as reading the new mathematical and scientific happenings and the philosophies of ancient and modern thinkers. The Virginia native lived in a world of literature, one in which he laid a great deal of importance upon the thousands of volumes that he collected over the years. Jefferson recorded that in 1815, he held over 6,700 volumes, close to twice the size of other notable Founding Fathers' libraries.

Within this vast library, he included numerous books on most subjects available to him, including the works of classical authors from the ancient Mediterranean. Thomas Jefferson's library was exceptional, largely due to its all-encompassing nature. In many ways, his collection was beyond anything that would have been found in a single library, contemporary or ancient, and even beyond numerous collections combined. By looking into this collection, we can see evidence of his commitment to classical texts, his ongoing education, his own personal beliefs and ideals, and his organization of knowledge, physically on the shelves as well as in his written catalog.

Suleiman Ibrahim Shehu, '19 **Abuja, Nigeria**
History *Robert Givens*

Appeasement

Appeasement was the policy of conceding to Hitler's aggression, giving him what he wanted in order to keep peace in Europe. After the number of casualties in World War 1, Britain was not interested in starting another war so they adopted the policy of appeasement. What were the Pros and Cons of appeasement? Why do some Historians believe appeasement was the right policy, while other Historians don't? Finally, was appeasement was the right policy or not, and how did people view appeasement after World War 2?

Vanessa Lylyan Iraheta, '17 **Boston, MA**
Sociology & Anthropology *Tori Barnes-Brus*

QPOC's Development of Social Capital and Wellbeing

Using the Social Justice Sexuality Survey from 2015, the relationship between queer social capital and ethnic/racial social capital is investigated, along with its effects on wellbeing or importance of identity. I analyzed these relationships in an attempt to study the positive effects of social capital and how they applied specifically to queer people of color (QPOC). I hypothesized that those with greater social capital will have better wellbeing and those with high queer or ethnic/racial social capital will hold the respective identity as important. Rural residence was introduced as a control to investigate whether the lack of resources found in rural communities would impact individuals' ability to gain social capital. Gender identity was introduced to see if those with differing gender identities would lack the ability to gain certain social capital. Analysis shows that the relationship between social capital and wellbeing is stronger than the relationship between social capital and identity, though both were positive.

Leena Kaye, '17
Russian

Denver, CO
Lynne Ikach

The Abortion Debate in Russia: An 'Unattainable Compromise'

The debate on abortions is often thought of as a contrast between religion and science. However, this contrast is not two-dimensional. Specific to Russia, the debate on abortion is longstanding and complex. In order to understand the abortion debate, it is important to first explore the history of abortion, starting with the Soviet Union and ending with modern day Russia. Russia was the first country to legalize abortion in 1917, but recently has been a leading country in tightening abortion laws in Eastern Europe. An examination of the history of the abortion debate in Russia also requires an investigation into the main actors involved: the Russian Government including Russian President Vladimir Putin and the Duma, the Russian Orthodox Church, World Congress of Families, non-governmental organizations, pro-choice activists, and St. Petersburg women's clinics. This investigation will not only help to explain the gap between perspectives and arguments for or against regulating abortion, but it will also help to explain how abortion is perceived within aspects of Russian culture. Thus, discussing this gap will illuminate the 'unattainable compromise' that exists between the anti-choice movement and the pro-choice movement. As Russia continues to influence its surrounding countries in Eastern Europe, explaining and understanding this 'unattainable compromise' is a key component to understanding the abortion debate in Russia.

John Kintz, '18
Classical Studies

Hastings, MN
John Gruber-Miller

The Library and Literary Endeavors of T. Pomponius Atticus

Titus Pomponius Atticus was a wealthy Roman citizen of the late Republic period who is now best remembered as a close friend of the orator Cicero. However, he is notable in his own right for a substantial personal impact on the literate sphere of the ancient world. He was a writer himself, as well as a collector of manuscripts, a patron of other writers' efforts, and a publisher with a considerable number of slaves trained as scribes who hand-copied texts for him. He additionally amassed an extensive personal library. None of his works survive, nor does any catalogue of his library, but references to his activities with books survive embedded in the records of Cicero's correspondence with him in the *Letters to Atticus*, a published series of letters which Atticus himself preserved. By examining these letters and the scattered literary references within them, it is possible to ascertain an approximation of the contents of Atticus's library, thanks to the wide range of texts which are named and the patterns between them in subject, authorship, and time and place of origin. Together, these form an image of the distribution of literature among prominent elite Romans of the time period, and shed some light on the history of book-collecting culture. Furthermore, it is possible to develop an image of Atticus's activities in the acquisition, storage, and production of these texts. This will form a composite picture of the literary landscape of a figure with a disproportionate impact on this area in his own in his time and place.

Jeffrey Klow, '17
Jordan Proby, '19
Computer Science

Omaha, NE
Ross Sowell

Privacy Interfaces for Remote Telepresence Robots

As teleoperated robot technology improves, remotely-operated telepresence robots will certainly become more prevalent in homes and businesses, allowing guests and business partners to visit without being physically present. That said, privacy remains a subject of concern. An Internet-connected telepresence robot has the ability to, unbeknownst to the robot's owner, spy on its local area. Whether by the remote operator or by a third party with access to the video data, telepresence robots represent a unique vulnerability to our privacy.

Existing solutions to this problem rely on various algorithms to detect objects, identify them as private or not, and apply protections accordingly. While this approach has merit, it requires a high-quality camera and sufficient computing resources to run the algorithms in real-time. Further, if the algorithms fail to identify or properly protect an otherwise-private object, even for a single frame, a person with access to a recording of the video would still be able to breach privacy.

As a possible solution for these concerns, we decided to apply protections to the whole video feed. In addition to the robustness of this approach, rendering the latter concern moot, we found that these image manipulations could still run quickly on a rather weak computer. Three such video filters were created, making use of the Kinect present on our remotely-operated Turtlebots.

We conducted a user study to examine the effects of applying these whole-image filters on robot usability and privacy protection. We also looked at the effects of cognitive load and robot operation, as it is possible that the operator is simply too distracted to breach privacy in the first place, though this would obviously have no effect on a third-party with a video recording.

We found that applying such filters protected privacy without significantly affecting the robot's usability and that the video feed from the depth camera was the most effective privacy protector. We also found that the cognitive load of driving the robot has a slight privacy-protecting effect.

Aubrey Kohl, '17
History

Davenport, IA
David Yamanishi

Deconstructing the Dichotomy: John Adams and Thomas Jefferson and Their Views on the French Revolution

John Adams and Thomas Jefferson are most notable for their contributions to the American revolutionary cause. Both of them worked to advance the Revolution. What is not as widely discussed is their influence in the discussion on the French Revolution in the United States of America. If the topic is discussed, it is narrowly defined by historians by the political party identities the two men would form - John Adams as a Federalist and Thomas Jefferson as a Democratic Republican. In this narrative, these two opposing political identities, logically, leads to opposing views on the French Revolution. However, there is much more to the story than that.

The letters and works written by John Adams and Thomas Jefferson illustrate a more nuanced view of the discussion surrounding the French Revolution in the United States of America. In particular, writings from the early years of the revolution are highly instructive in gaining insight into their perspective of what was occurring across the Atlantic. Neither of the two men fully lost their zeal of revolution. The ideals of freedom and liberty were no less powerful to them when looking toward France than they were when the colonies revolted against Great Britain. They also both recognized that violence was an unfortunate but inevitable part of revolution. Contrary to what may be assumed based upon political ideology, the only question that the two men truly differed on is how the French Revolution should end.

Jeannie Kort, '17 **Red Oak, IA**
Archaeology *John Gruber-Miller*

Site Comparisons of Earthquake Destructions in Roman Corinth

Corinth has been subject to much seismic activity throughout the years. Due to Corinth's placement near tectonically active plates, it is expected that there would have been many earthquakes throughout its history. Romans occupied Corinth from 44 BCE to the 12th century CE. During this time, several Roman phases occurred. Several ancient literary sources (Suetonius, Cassius, and Marcellinus) have identified earthquakes during Roman occupation of Corinth; however, it cannot be known from these sources if Corinth itself was affected.

This paper has identified five archaeological criteria to tell if an earthquake has occurred. Earthquakes can be shown through 1. Fallen walls, 2. Block imprints on the floors, 3. The force with which objects hit the ground, 4. Signs of reconstruction, and 5. Other nearby sites that show similar destruction. Though not a specific criteria on its own, buttresses can also be used as a sign of the area being prone to having earthquakes. These would be built during the reconstruction of a building to help stabilize it.

In applying these criteria, I verify the literary sources and show that there were in fact five destructive earthquakes between 44 BCE and 375 CE, effectively ending four of the Roman phases in Corinth. In order to assess these criteria, I have researched the excavation reports of two different sites in Roman Corinth: East of the Theater and the Sanctuary of Demeter and Kore. At both of these sites, multiple buildings were studied for signs of earthquakes.

Jeannie Kort, '17 **Red Oak, IA**
Geology *Kelsey Feser*

Sedimentary Properties and Metal Concentrations of St. Croix

Sedimentary properties can affect many aspects within the marine environment. It can affect everything from the way benthic organisms live to the pollutants causing changes to the environment. Some organisms prefer to live in more carbonate sediments while others prefer siliciclastic. The properties of sediments can be used to test the metal concentrations of the area. I have tested the sedimentary properties from seven localities around St. Croix and determined if these properties are causing certain metals to bind to the sediments. I have determined where there is a higher concentration of metal in the offshore sediments. This can be compared to the terrestrial elements to determine the sources of the metal in the offshore samples. This can help us in figuring out if the metals are anthropogenically derived or from another source. If the metals are from anthropogenic sources, steps can then be made to preserve and protect the offshore area and target the sources producing particularly harmful metals to stop pollutants. Grain sizes affect which metals may be binding to the sediments. Several sedimentary properties were identified from seven areas around the island of St. Croix. The sedimentary properties were determined by the following tests: a grain size analysis, a constituent analysis, a loss on ignition (LOI) test, quantification of the siliciclastic:carbonate percentages, and identification the siliciclastics in the sample. Using sedimentary properties, I have determined which of the seven areas are similar and which are different. Based on the results, the areas most affected by metals are locations with a lot of human contact. This leads to the conclusion that the offshore metals are likely a result of anthropogenic influences.

Joshua Lee, '17 **Sahuarita, AZ**
Physics & Engineering *Derin Sherman*

Design and Construction of an Open Return Wind Tunnel

The physics behind various wind tunnels were examined, and the most viable design was chosen. In terms of viability, the wind tunnel had to be designed so that it could be reasonable in size and could be built with materials that were reasonable in price. The open return wind tunnel is a type of tunnel where the air is pulled through the tunnel by a fan, rather than blown through it. There are four different sections to the wind tunnel: the inlet section, the contraction cone, the test area, and the fan section. The way to design the various sections of the wind tunnel were first researched, then altered so that they were of a viable size, and finally, actually built. When looking at different wing tips of a missile or a plane, the aerodynamics are very important for allowing it to fly farther, faster, and more efficiently. Using a wind tunnel allows the different designs of wing tips to be tested, giving the ability to the testers to determine the most efficient design, and thus a reliable wind tunnel is required.

John Lewis, '17 **Palos Verdes Estates, CA**
Geology *Kelsey Feser*

On the Duration of Time-Averaging in St. Croix *Chione*

One of the most compelling modern applications of paleoecological research focuses on utilizing subfossil assemblages to determine the impact of human activity on shallow marine environments. The extent of anthropogenically-mediated changes, however, cannot be determined without a pre-disturbance ecological baseline against which the altered state may be compared. To overcome this limitation, paleoecologists rely on subfossil assemblages of shelly fauna that accumulate in shallow marine environments to characterize the pre-disturbance community composition and establish a timeline of community change. However, through processes including low sedimentation rates, mixing, and differential taphonomic destruction, most shallow marine subfossil assemblages are time-averaged, meaning that specimens within the same stratigraphic horizon may differ in age by as many as several thousand years. As such, without a high-resolution temporal framework, narrowing down precisely when anthropogenic effects began to manifest in shallow marine environments becomes difficult or impossible. In order to use the subfossil record as an accurate measure of St. Croix's pre-disturbance baseline, this project made use of amino acid racemization (AAR) dating (coupled with radiocarbon calibration) as an effective means to establish the age distribution of the *Chione* bivalve subfossils therein. Age distributions gleaned from these analyses indicate downward, but not upward mixing, with both recent and older shells being present in the deepest samples and older shells being absent from the shallower horizons. Absolute ages determined through radiocarbon analysis show clusters of ages primarily around the 1960s and the 500s CE (~1500 years old). By expanding our preliminary dataset to include additional age data, we hope to determine: a) the extent of time-averaging in seagrass beds, b) whether deeper intervals are likely to represent more accurate pre-disturbance baselines, and c) how these environments might have changed through the examined interval.

Aidan Litt, '19
MariKate Murphy, '18 **Noblesville, IN**
Chemistry *Jai Shanata*

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

Resveratrol, a polyphenol found commonly in red wine, is linked to a number of health benefits including the prevention of cardiovascular disease, suppression of cancer, and stimulation of genes associated with longer lifespans. Although many of these properties have been investigated, the exact mechanism by which resveratrol causes these effects within the body is not yet understood. The relatively quick metabolism of resveratrol makes the understanding of these processes even more difficult, as some of the observed effects of resveratrol may be due to its metabolites and derivatives. One hypothesized mechanism for resveratrol's health benefits is its ability to integrate directly into cell membranes, thereby changing the membrane composition and cellular activity. Resveratrol metabolites and derivatives may act in a similar way. We performed electrophysiology on planar lipid bilayers to determine the impact of nanomolar concentrations of resveratrol and the resveratrol derivatives dihydroresveratrol and trimethyl resveratrol on a model cell membrane structure, as measured by changes in the lifetimes of gramicidin A channel dimers. Resveratrol and trimethyl resveratrol were found to increase the flexibility of the membrane, suggesting that both molecules can be incorporated directly into the membrane and change its properties. The ability of these molecules to integrate into the cell membrane may modulate some of their beneficial effects within the human body.

Zoe Mann, '17 **Urbana, IL**
Chemistry *Craig Teague*

Gas Separations by Mixed-Matrix Membrane and High Surface Area Carbons

Mixed-matrix membranes and high surface area carbons (HSACs) are promising methods for cost-effective gas separation, which is important for reducing the emission of greenhouse gases into the atmosphere. We tested the pressure dependence of permeability and selectivity for a triblock copolymer membrane loaded with 0, 5, 10, 20, or 30 wt.-% hollow carbon spheres. We found that the permeability of the membrane increased with pressure, while the selectivity of the membranes remained fairly constant. We used a scanning electron microscope to evaluate the membranes before and after the permeability/selectivity testing, which revealed some changes in the appearance of the membranes. We synthesized our HSACs by hydrothermally carbonizing samples of three carbonated beverages, Mello Yello®, Mtn Dew®, and Push® Orange Soda, at 200 ºC, and then further heat treating the resultant carbon powder at 1000 ºC in a tube furnace. These powders had surface areas between 300 and 820 m^2/g. Gravimetric adsorption tests showed CO_2 uptake between 10 and 13 mass-% and selectivity values around 10. Elemental analysis showed our samples to be ≥90% carbon, with trace amounts of heteroatoms such as oxygen or sulfur. We investigated the properties of carbon powders prepared with an artificial sweetener by adding Splenda® to samples of Diet Pepsi®, Diet Mtn Dew®, and water, which we then carbonized and analyzed by a similar method. We were able to show that these powders had some properties that were advantageous for CO_2 adsorption. We have shown through our research that there can be many approaches to gas separations including the use of mixed-matrix membranes and the use of high surface area carbon powders.

Victor Martinez, '18 **Chicago, IL**
Chemistry *Jai Shanata*

A Systematic Evaluation of Memantine and Donepezil's Active Conformations, Affinities, and Location of Binding on an NMDA Receptor

As of 2015, 46.8 million individuals worldwide are estimated to have dementia, and it is thought to double every 20 years, eventually reaching 74.7 million in 2030 and 131.5 million in 2050. Dementia is defined as a mental disorder caused by brain disease or injury to the brain, which can result in memory disorders, personality changes, and impaired reasoning. In the United States, Alzheimer's disease (AD) has been reported as the 6th leading cause of death, but is the 5th leading cause of death for individuals who are 65+ years of age and is responsible for 60-80% of cases pertaining to patients with dementia. New estimates by the *World Alzheimer's Report of 2015* have shown a 12-13% increase of individuals diagnosed with AD when compared to the estimates made by the same report in 2009, meaning that individuals are being diagnosed with AD at greater rates than predicted in 2009. An estimated $200 billion have been reported for the treatment of patients with AD in 2012. Memantine hydrochloride (HCl), an N-methyl-D-aspartate receptor antagonist (NMDA), and donepezil HCl, an acetylcholinesterase inhibitor, are oral pharmaceuticals used to treat Alzheimer's disease. The price of Namenda® (memantine HCl) is reported to be an average of $382.13 for 30 capsules, and an average of $163.64 for 30 capsules of Aricept® (donepezil). Docking can be defined as a computational simulation used to observe whether a ligand can bind to a receptor site and how well a ligand can bind based on different conformations. By using Autodock tools and Vina (docking software), memantine and donepezil were docked onto an NMDA receptor for the purpose of understanding which ligand has a greater affinity to the NMDA receptor by systematically evaluating their active conformations, affinities, and location of binding. When comparing the highest affinities generated between donepezil and memantine HCl when docked onto the NMDA receptor, donepezil (-9.0 kCal/mol) had a higher affinity to the NMDA receptor than memantine (-6.4 kCal/mol). From this data, we can state that the oral pharmaceutical (memantine HCl) made to bind onto this protein's receptor does not have a greater affinity than the one that was not made for this purpose (donepezil).

Clint McDaniel, '17 **Aledo, IL**
Biochemistry & Molecular Biology *Barbara Christie-Pope*

Analysis of De Novo Missense A-alpha Mutations Associated with Intellectual Disabilities in the PP2A Holoenzyme

Intellectual disability (ID) is a genetic disorder characterized by limitations in intellectual capabilities, such as below-average cognitive functioning and deficiencies in social and practical skills, which affects 1-2% of the world population (Hu et al., 2015). A recent study by Houge et al. presented information on cases of ID that identified de novo missense mutations in two subunits of protein phosphatase 2A (PP2A), a heterotrimeric enzyme consisting of a catalytic subunit (C), a regulatory subunit (B, B', B", and B'"), and a scaffolding subunit (A) that regulates a variety of cellular functions. The mutations were found in the PPP2R5D gene that encodes for the B subunit and the PPP2R1A gene that encodes for the Aα subunit. Patients with the Aα mutations (P179L, R182W, and R258H) displayed phenotypic characteristics such as hypotonia, absence of speech, and inability to walk unsupported. The study proposed the three Aα PPP2R1A mutations cause a dominant-negative function associated with lost or diminished A-C subunit binding affinity and loss of A-B subunit binding affinity of multiple regulatory subunits, with the notable exception of B'δ (Houge et al., 2015). Binding assays of the three Aα mutations with Cα and Bβ2 and B'β showed evidence to support that the de novo mutations have a negative effect on the binding affinity of the PP2A holoenzyme. This data supports previous claims about the effects of these mutations on PP2A.

Mara McLaughlin, '18
International Relations

Crested Butte, CO
David Yamanishi

Dark Tourism and the Complexities of Remembrance

In many post-modern societies, post-conflict societies, and other societies that have very academic and sophisticated labels, the study of memory is essential to the identity of the society. The manner in which the past is understood and remembered has a great effect on the impact history has on the current society. In exploring this, as well as the motivations people have for trying to remember their past, various trends can be seen among so-called consumers of history.

Tourism, being one of the greatest economic sources in today's world, is also one of the largest channels people take to connect with history. Within tourism, however, there are different strands of tourists and their destination types. One of the most fascinating and probably the most convoluted areas of tourism is called dark tourism. There are several different definitions for this phenomenon; however, the most widely accepted definition is from Lennon & Foley in their novel, *Dark Tourism*. They assert that dark tourism is "…the act of travel to sites associated with death, suffering, and the seemingly macabre" (Biran, Poria, & Oren, 821). There is an immense amount of self-reflection that takes place when one is contemplating tragedy. Dark tourism "…provides the opportunity to step into the role of makers of historical knowledge…" (Reynolds, 349-350). Memories are made and re-made, and remembrance takes place collectively.

Dark tourism is a social phenomenon that is taking a large role in the way events such as the Holocaust are remembered and understood as the events themselves recede further and further in the past. This paper is an analysis of various academic work on dark tourism that is coupled with specific examples from personal experiences at dark tourism sites to explore the general theory of dark tourism and its relevance. The discovery through this discussion is that dark tourism and the debate surrounding it reveal moral and ethical dilemmas that relate directly to a view of humanity itself. Want to know why humans act the way they do? Look at how they react to the worst parts of humanity, the worst parts of themselves. Watch their faces in the mirrors of the most terrifying reflection they could have pictured and see what they do with it.

Linden Miles, '17 **Wellsville, NY**
Russian *Lynne Ikach*

Not Just a Background Character: Chukovskaya in the Spotlight

Lydia Chukovskaya was an incredible woman who is most remembered for her supportive role towards other writers, painters, and poets in twentieth century Soviet Russia. "For Chukovskaya this notion of service [to a greater moral cause] truly governs the writing and reception of her work and tends to obscure her achievements as an artist" (Holmgren, "Chukovskaia, Lidiia Korneeva" 136). Typically, when Chukovskaya is written about, she is overshadowed by the other famous people in her life: her father, the beloved editor and children's author Kornei Chukovsky and her friend, the world-renowned poetess Anna Akhmatova. Chukovskaya herself preferred to support literature and the arts in the background, but her place in literature goes beyond this and deserves to be acknowledged and in the spotlight. Her supportive role should not be diminished, but rather enhanced by the fact that, in her own right, she overcame many physical, mental, and emotional challenges in her life. While her skills as a writer may not equal those of Akhmatova, her literary works also deserve recognition. From novellas to her poetry to her journals on Akhmatova, each of her works preserves the truths of her time despite the great danger to herself for writing them. Chukovskaya's deceptively simplistic writing style can lead to an underestimation of her literary skills. However, each of her works was intricately created to concisely convey very complex emotions and themes. Her style is reminiscent to the tradition of oral storytelling, providing a voice that represents not a single experience, but the experiences of many people. Overall, Chukovskaya should not be relegated to the background, overshadowed by the lives of others. Her life and her literary works—her service and her defiance—deserve being in the spotlight.

Shashanna Moll, '17 **Belfast, ME**
Biochemistry & Molecular Biology *Barbara Christie-Pope*

In Vivo Tracking of Dendritic Cell Exosomes Nasally Delivered to Brain

Prior work in the Kraig lab demonstrated that naïve animals have increased central nervous system myelination after nasal delivery of stimulated dendritic cell exosomes (SDC-Exos) (Pusic et al., 2014a). Exosomes are small, 30- to 120-nm-diameter membrane vesicles that are secreted by many cell types, and are involved in a multitude of functions, both physiological and pathological (Pusic et al., 2014a). SDC-Exos can potentially be remarkably effective neurotherapeutics when administered nasally to the brain. Pilot work shows that nasal treatment with SDC-Exos reduces the degree of demyelination using a chemical model of multiple sclerosis (MS) (Pusic, unpublished observations). Accordingly, the general goal of this study was to determine the degree and extent of SDC-Exo entry into the brain after nasal delivery. This study produced preliminary data that non-biological inert fluorescent nanovesicles were able to enter the brain and reach the spinal cord within six hours of nasal administration. This demonstrates that nasally-administered nanovesicles and likely SDC-Exos can quickly reach the spinal cord and, therefore, may have potential as a neurotherapeutic for MS.

Nina Morris, '17
Geology

Maxwell, IA
Kelsey Feser

Mollusks as Indicators of Environmental Change around St. Croix, US Virgin Islands

Around the island of St. Croix, US Virgin Islands, it is very likely that both natural and anthropogenic environmental changes are having effects on communities of marine organisms living in offshore seagrass beds. Mollusks are some of the most abundant invertebrates in seagrass beds, and some species have specific tolerances for environmental variables such as water clarity, substrate type, and environmental energy. These so-called indicator species are organisms that act as sentinels indicating changing environmental conditions and are therefore useful as biomonitoring tools. They also serve as powerful modern analogues, in that if we find them in abundance in ancient sediments, we can use them to reconstruct the environments in which they lived. To that end, the purpose of this study was to 1) identify key indicator species at a number of localities around St. Croix and 2) conduct a detailed literature review of each indicator species' ecology and physiochemical tolerances, in order to 3) interpret changing environmental and compositional changes in communities through time. Each of the seven seagrass-covered localities around the island yielded an assemblage of mollusks with a distinct community structure. At Smuggler's Cove on the north coast, for instance, the indicator species represented a wide variety of trophic levels, while at Molasses Pier, on the south coast, most indicator species belonged to the same trophic group. The ultimate goal of the continuing study will be to determine whether these types of signals are indicative of naturally- or anthropogenically-induced change.

Nicole Pereira Plaza, '17
Economics & Business

La Paz, Bolivia
Huan Cai

Regenerate Fashion

The fast fashion industry is easily overlooked and dismissed as a topic of vanity or non-priority. However, it is one of the driving forces to the world's economy and has a massive environmental impact, as much as the oil industry. I discuss the impact the fast fashion industry has on the United States, such as the rapid increase of apparel waste, the apparel trade deficit, and the impact on standard apparel companies. The purpose is to create awareness to the individual of their economic and environmental investment when purchasing articles of clothing.

I show the changes standard apparel companies have undergone in order to not be driven out of the market by the fast fashion industry, in addition to the development of the fashion brand Virid that can be environmentally conscious and assist in the stimulation of the U.S. economy successfully by using the asset valuation model Eval to project the company values.

Carly Pierson, '17
Environmental Studies

Durango, CO
Misha Quill

Environmental Activism and Perception of Nature: Oral Histories of the Iowan Outdoors

What causes some people to be more environmentally concerned and aware than others? Using oral histories, an anthropological interview method, I am trying to find an answer. The question of focus is: Is there a common perspective that connects the lives of environmentally concerned people who work towards sustainable environmentalism in Iowa? By learning what this thread of commonalities could be, then using design intervention, may be possible to stimulate a similar ethos in Iowans. The need for this question to be answered and a solution to be found is clear. Iowa's natural environment has undergone great changes—evident in the state's extensive agriculture—and these processes continue, many times to its detriment. In short, Iowa's waterways, fertile lands, native ecosystems, and biodiversity are at risk for being overburdened and even lost to pollution, overuse, and exploitation. At the same time, rural areas are shrinking as more people move to cities, adults and children are spending more time inside, and the way of life that once involved being very in tune with the natural world is far from our mainstream culture. Iowa also has a history of environmentalism, which has continued today. People have formed coalitions to protect areas of land and rivers, to study nature, and to grow fresh produce. It is from this history of Iowan environmental activism that I draw my sample of environmentalists to find the inspiration behind their action. Interviewees are Iowans who are known to be environmentally aware, are involved in environmental organizations and programs, or who farm using sustainable methods. Research is not complete at the time of this writing, thus conclusions are yet to be known.

Sydney Pratt, '19
English & Creative Writing

Mount Vernon, IA
Leslie Hankins

Reviving Winifred Mayne Van Etten's Works

People who know of Winifred Mayne Van Etten most often think of her 40 years of exemplary teaching at Cornell College. However, much of the Cornell community has forgotten that Van Etten was also a talented and modernist writer. It's time to bring Van Etten's incredible works out of the past and into the hands of today's readers. Republishing the short story *The Cheerful Idiot* is the first step in reviving Van Etten's numerous and beautifully written works. Putting *The Cheerful Idiot* into a modern book format, I have highlighted the musical gifts of the main character Roger, who suffers from isolation and discrimination due to his intellectual disabilities. The story also highlights the power of music to capture the world, connect to the human soul, and express emotions and thoughts.

Belou Quimby, '19 — **San José del Cabo, Baja California Sur, Mexico**
Marin Dettweiler, '19
Baley Good, '18 — **Los Alamos, NM**
Camden Grundeman, '19 — **Naples, FL**
Biology — *Tammy Mildenstein*

From Prairie to Monarch: The Search of Life

The United States Fish and Wildlife Service is currently considering a petition to list monarch butterflies (*Danaus plexippus*) as a candidate for protection under the Endangered Species Act. Reasons cited for the decrease in monarch population sizes revolve around habitat loss and degradation in the Midwest prairie region. This habitat loss affects milkweeds, which are the primary plants used by monarchs at the egg and larval stages. Current restoration efforts are in place to bring back prairies and milkweeds. However, it is unknown how many milkweeds are needed to recover the monarch population.

In the summer of 2016, we studied milkweed plants and monarch butterflies in five tall-grass prairies in Iowa which included Cornell Prairie, Mink Run, Waterworks Prairie, Goose Pond, and Wikiup Prairie. We measured the milkweed population density at each prairie. Twice a week, we recorded the number and life stage of monarchs found on milkweeds within two 200 ft by 6 ft transects at each prairie. For the 275 milkweed plants we tracked, we also recorded the height and number of leaves to see if monarchs were selective. Survival rates among stages were low for monarchs. All of the monarch individuals disappeared within a few days of being found, suggesting predation was high. None of the eggs or larvae made it to the chrysalis stage. There was no correlation between the features of the plant that the egg was laid on and the survival rate of juvenile monarchs.

Christy Ralston, '19 **Savanna, IL**
Joseph Herrera, '17 **Oakland, TN**
Biochemistry & Molecular Biology & Dimensions *Craig Tepper*

Operation Walk: The Story of the Honduran People

Operation Walk is a non-profit organization that was founded in 1994 by Dr. Lawrence Dorr, a Cornell College graduate of 1963. Operation Walk provides free knee and hip surgeries to patients around the world. Operation Walk is comprised of 15 teams, has completed 100 trips in 20 different countries, and has served nearly 10,000 patients.

This past October, we embarked on a journey to San Pedro Sula, Honduras. The Operation Walk team is composed of passionate volunteers that include students, orthopedic surgeons, physical therapists, nurses, and many other healthcare professionals who work together to provide preoperative care, surgeries, and postoperative care for people suffering from arthritis, polio, or other knee and hip complications. During our mission, 33 patients were operated on and 46 joints were replaced at no cost to the patients.

As students, we had many "hands-on" experiences including helping with patient transport, aiding with physical therapy exercises, scrubbing in to observe a surgery, helping nurses with bandages or medications, and performing numerous other tasks that required our assistance. We worked side-by-side with many skilled physicians and had the opportunity to interact with many amazing patients and their families. This was a transformative experience for us, but to see what the patients get from this experience is the most rewarding feeling of all. In the words of Dr. Dorr, "You don't get many opportunities in life to give something to someone that gives them a whole new life." This experience was life-changing and has reinforced our motivation to pursue healthcare.

Kelsey Roberts, '17 **Braidwood, IL**
Art & Art History *Christina Penn-Goetsch*

Artemisia as Exemplar for French Queen Regents: Medici Patronage and a Few Fontainebleau Tapestries

Catherine de' Medici and Marie de' Medici were two powerful French queen regents and art patrons during the early modern era. Throughout their respective reigns, each woman faced related, but different, difficulties that caused them to respond by issuing strong political statements through visual rhetoric. Catherine was the driving force behind the creation of a series of cartoons for expensive tapestries between 1562 and 1565 that illustrated her position and control over the royal family through the guise of the Classical figure of the Artemisia II of Caria. These cartoons were planned under Catherine's direction, but Marie did not translate them into textiles until 1611-1627. Three different Fontainebleau artists, Antoine Caron, Henri Lerambert, and Laurent Guyot, created the designs; however, the tapestries became known under a single title--*The Story of Artemisia Series*.

A few of the cartoons for *The Story of Artemisia Series* have been investigated through a gendered lens by Sheila ffolliott. One specifically, *The Lesson in Horsemanship*, was translated into a tapestry for Marie de' Medici which later came to be known as *The Riding Lesson*. By comparing the similarities and differences between the cartoon and tapestry, I will demonstrate how Catherine and Marie employed the subject of Artemisia differently to promote their role as regents responsible for a country.

Hannah Robertson, '18 **Durango, CO**
Brad Kane, '18 **Naperville, IL**
History *Catherine Stewart*

A Stroll Through Time: The History of Cornell's Campus

In 1852, the Rev. George Bowman decided the small town of Mount Vernon, Iowa, was to be the site of his new seminary, located on the top of the nearby hill. With the assistance of the townsfolk and the first students, a seminary building was constructed. As the seminary grew into a college, it gradually spread out across the hilltop. Each building has a unique story just waiting to be heard, waiting to be discovered.

In 2014, the Mount Vernon Historic Preservation Commission (MVHPC) received a grant to create a cell-phone audio tour for three historic districts around Mount Vernon, including Cornell's campus. With the Mount Vernon-Lisbon Community Development Group (MVLCDG) and Dee Ann Rexroat, Cornell's part of the project launched last summer. As members of the Cornell Summer Research Institute, Brad Kane '18 and I dove into the archives, discovering stories of former students and faculty, photos of historical groups or classrooms that are no longer present, and hidden facts about buildings' origins. We compiled our notes into short written histories of the buildings and selected some of our favorite photos to present on a website for the historical districts of Mount Vernon.

This project was an opportunity for Kane and myself to make a real contribution to historic preservation, through the documentation of the significance of Cornell's historic buildings and getting an older generation of Cornell community members on tape, like Professor Emeritus Reverend Thomas. Under the direction of Professor Catherine Stewart, and with the help of Instructional Technology Librarian Brooke Bergantzel, Kane and I learned how to do archival research and share that knowledge with others. We also gained valuable experience working with representatives from the MVHPC, the MVLCDG, and the Marketing and Communications department of the College. The website and audio-visual tour increases the visibility of Cornell and its unique historic campus, drawing in visitors from anywhere in the world, and engaging prospective, current, and former members of the Cornell community. Through our research, Kane and I were able to bring to light some of the hidden histories of campus buildings, telling their stories to the greater Cornell community.

Andres Rosas, '17
Chemistry

Chicago, IL
Jai Shanata

Understanding Under-Film Water Transportation Rates: Dependency on Molecular Weight, Solvent Selection, and Ion Content

Refined metals are valuable sources of structural materials but are thermodynamically unfavorable, allowing metals to become corroded over time. Protective coatings minimize ingress of water and oxygen to the metal-polymer interfaces, decreasing corrosion. This research focused on quantifying water transportation rates through corrosion initiation/propagation under films by comparing polymeric materials as protective layers. Films were cast using resin solutions in solvent blends of ethyl 3-ethoxypropionate (EEP) or methyl ethyl ketone /1-methoxy 2-propanol (MEK/PGME; 75/25 blend), and polyepoxide pellets from the PK phenoxy series of either PKHA or PKHH. Fluorescein was added so that fluorescence may be performed later to track the location of the water. A pH-sensitive probe, Rhodamine B, was blended with the polymer solutions prior to film formation to utilize the fluorescence's effect to track water transport and corrosion events. The films were then tested in several conditions: DI water, 3.5% NaCl, and 5% NaCl, each with and without 75mg/L $SrCrO_4$. The pure DI water acted as a control group for comparing the transportation rate. These transportation rates were recorded with fluorescence plate reading after 0, 24, 48, 72, and 240 hours of exposure to the solution.

Fluorescence, adhesion, and water uptake data indicate that solutions with higher NaCl concentrations are more corrosive and allow a greater transportation rate. MEK/PGME based films resulted in more corrosion when compared to EEP. The lower molecular weight polyepoxide, PKHA, resulted in greater corrosion protection. Additionally, it was determined that the presence of $SrCrO_4$ retards corrosion progress when immersed in the solution, acting as a corrosion inhibitor. Thus, it is determined that the PK phenoxy series with a lower molecular weight offer more protection as well as EEP as a solvent than the other variables used.

Michael Sanders, '17
Geology

Quetzaltenango, Guatemala
Emily Walsh

Evaluation of pXRF Technology in the Context of Geology

X-Ray Fluorescence (XRF) technology is used to find information of the elemental percentages found in many objects. Handheld XRFs use energy dispersive technology that works through hitting a sample with an electron beam and converting the spectrum of x-rays produced into proportional electric energies which register the different peaks for each element. This process takes 60 seconds and gives a readout of most of the major elements. Elemental information is a very useful tool for an igneous petrologist because it can tell you more about the tectonic past and can allow you to classify rocks. Using trace element information, you can use specific ratios to determine the tectonic signature of rock, telling you where it formed. However, a problem with this is that most handheld XRFs only give out information on major minerals, ones lighter than those used for determining tectonic signature. There have been advancements in technology that have allowed the development of handheld XRFs. Handheld XRFs are mostly used in the commercial sector, but, more recently, scientists have begun to use them. However, research on their efficacy has been limited and is a relatively unstudied field.

This project involves the evaluation of the Niton XL3t Pro GOLDD handheld XRF. This device was used on two different rock suites from Iceland and the St. Francois mountain area of Missouri. The Icelandic rocks are mafic, high in Mg and Fe, while the St. Francois Mtns rocks are felsic, high in silica, Al, K, and Na, lighter elements than those found prominently in mafic rocks. The data received from the device was then compared to the elemental data of the same kinds of rocks, found in the literature. The data received using the pXRF did not resemble that from the literature. The data received from the pXRF had many useless points, outliers, and no content reads. Many readings came out as unreadable, meaning that there was not enough content into the rock to produce a reading, even though other rocks that were very similar in other elements produced readings. The data showed a much higher abundance of Fe in the Iceland rocks than those in the St. Francois suite, with an average Fe content of 60,000 ppm in the Iceland suite and an Fe content of about 20,000 in the St Francis suite. The K content in the St. Francis suite also was noticeably high, with an average K content of 48,000 ppm. This shows that the pXRF has its uses and can make good generalizations about rocks, but is less useful when trying to find out more sophisticated things like tectonic past, as the pXRF does not read many lighter elements or heavier ones. This provides evidence that pXRF technology available to Cornell students may not be the best tool for providing accurate elemental percentages in the field of igneous petrology.

Glorisette Santiago-Rivera, '17 — **Ponce, Puerto Rico**
Jasmine Li — **(Kennedy High School) Cedar Rapids, IA**
Winfield Miller, '17 — **Washington, DC**
Biology — *Craig Tepper*

Helping Fire Coral "Beat the Heat"

As the effects of global warming intensify, one of the most biologically diverse ecosystems of the ocean, coral reefs, are increasingly affected by rising water temperatures and increased solar radiation. The key to the survival for this temperature-sensitive ecosystem may be found in a photosynthetic algal symbiont that lives within coral cells. This endosymbiotic organism is known as *Symbiodinium* (dinoflagellate). *Symbiodinium* are classified into nine clades (A-I), each with multiple subclades. The genetic diversity of these symbionts are responsible for providing its host with different physiological benefits, including the ability to cope with thermal stress. The bleaching of corals is caused by the expulsion of these symbionts during thermal stress conditions.

We examined the relationship between the different *Symbiodinium* clades present in one of the major reef-building hydrocorals known as *Millepora* (fire coral). This hydrocoral, in spite of being a major framework for many reefs, has been poorly studied and ignored. In this study, we explore the symbiosis between these two organisms at two thermally different locations (San Salvador, The Bahamas and South Water Caye, Belize) in order for us to understand the diversity of *Symbiodinium* in *Millepora* at two temperatures. Our preliminary results indicate that certain *Symbiodinium* clades may be more efficient at different ocean water temperatures. *Symbiodinium* Clade B was dominant in all of the Bahamas samples (N= 60). While *Symbiodinium* Clade A was dominant in 74% of the Belize samples (N= 26); the rest showing Clade B dominance (N= 9). The dominance of these clades at different latitudes may explain how millepores cope with higher ocean temperatures in Belize.

Kat Sayrs, '17 — **Athens, OH**
French & Digital Humanities — *Devan Baty*

Language Learning through Digital Games

It is challenging for students to make gains in their foreign language proficiency when they are not currently in a language course, particularly when they have limited contact with the target language and with communities who speak the language. This can lead not only to delayed progress in the language, but also language attrition.

Pedagogical games have a lot of potential to aid foreign language learners with these problems in so far as they provide motivation -- motivation to play, to continue, and to return to the games. No matter the genre or purpose of a game, players inherently learn game mechanics, characters, and story elements with no conscious effort. Therefore, a game can be a great teaching tool when designed in such a way that the pedagogical material is well-integrated into its mechanics. They can be even more effective when used alongside readings and exercises.

During Cornell Summer Research Institute 2016, I developed the framework for a website hosting interactive games, exercises, and authentic texts in French designed for both students and teachers that could be well-integrated into a blended-learning program or used independently. I researched a variety of game formats and created a working demo of a choose-your-own-adventure-style game based on a medieval French romance by Chrétien de Troyes. The quest tale of a French knight was adapted to a game format intended for intermediate- to advanced-level students of French. The initial demo was well-received by students regardless of prior experience with games, and they expressed interest in seeing more.

Jillian Schulte, '19 — **Naperville, IL**
Arturo Castillo, '17 — **Albuquerque, NM**
Ujjesa Dhanak, '19 — **Long Beach, CA**
Octavia Martinez, '19 — **Fruita, CO**
Jessica Meis, '19 — **Marion, IA**
Julian Smith, '20 — **Denver, CO**
Sydney Strunk, '17 — **Ottumwa, IA**
Cullen Yuska, '20 — **Buzzards Bay, MA**
Ethnic Studies — *Marcela Ochoa-Shivapour*

ASB on Pine Ridge Reservation with Re-Member

For Alternative Spring Break, Cornell College's annual, sponsored event, our group collaborated with Re-Member, a non-profit organization located on Pine Ridge Reservation, SD. Re-Member aims to improve the quality of reservation life for the Oglala Lakota people by creating relationships, sharing resources, and providing volunteer services. While at Re-Member, we were immersed in Lakota reservation life, expanding our knowledge of Native American culture and history while also gaining a greater understanding of the poor living conditions on the Rez today. As a group, we chopped/delivered firewood, built/delivered bunk beds, and skirted trailers across the reservation. We participated in several cultural exchange activities and listened to natives speak on the topics of politics, diversity, history, and Lakota culture. Our reflective presentation will document both what we learned through our spring break as well as highlight how our perspectives changed throughout the experience. Prior to the trip, our goal was to merely provide service, but, through this presentation, we hope to raise awareness to the difficulties one faces as a Native American living on a reservation.

In short, we aim to better life on the reservation and educate ourselves. For more information, visit our website, *http://www.re-member.org.*

Kayla Septer, '17 — **Lockridge, IA**
Biochemistry & Molecular Biology — *Barbara Christie-Pope*

Reflections from Catalysis: Lean Methodology in Healthcare

Catalysis, formerly ThedaCare Center for Healthcare Value, is a not-for-profit educational institute dedicated to lowering healthcare costs, improving patient outcomes, and increasing transparency. Catalysis teams with hundreds of healthcare systems to teach leaders in healthcare how to improve their structure and organization through lean methodology. Lean methodology, adapted from the Toyota Production System, focuses on reducing waste and making healthcare more reliable by creating a management system from the bottom all the way up to top administration. Ultimately, Catalysis enables leaders to dramatically improve their healthcare systems, change organizational behaviors, and enhance delivery of patient care, all while lowering its cost.

I interned with Catalysis for 10 weeks in Appleton, Wisconsin. The internship with Catalysis was designed for an individual with little experience in the healthcare field to learn how and why healthcare needs to be changed. I will reflect on my time with Catalysis, as well as share what I learned and how I grew from this incredible experience. I will give insight from an outsider's perspective on the work Catalysis is doing and their work toward the ultimate goal of transforming the healthcare industry. I will provide my thoughts on what should be changed in healthcare from the perspective of a student who is pursuing a career as a health professional. Lastly, I will share a few of my favorite stories and memories from my summer with Catalysis.

Elena T. Skosey-LaLonde, '17 **Chicago, IL**
Geology *Rhawn Denniston*

Assessing Southern Hemisphere Behavior of the Indo-Pacific Tropical Rain Belt during the Late Holocene through Stable Isotope and U-Th Analyses of a Tropical Western Australian Stalagmite

Given the strong influence of monsoon systems on (sub)tropical populations, it is crucial that we understand what drives changes in monsoon behavior. Several geological and biological proxies have been used to examine trends in monsoon rainfall occurring prior to historical observation. Because they can grow continuously for thousands of years, be precisely dated, and record chemical signatures of past rainfall variability, stalagmites have become increasingly popular paleomonsoon proxy. Precipitation in the Australian tropics is primarily derived from the Indo-Australian Summer Monsoon (IASM) and tropical cyclones. The seasonal strength of the IASM over northwestern Australia is tied to the position of the intertropical convergence zone (ITCZ), the area of intense convection. The ITCZ migrates seasonally between ~20˚N-20˚S on a seasonal basis, tracking peak heating of the land surface during summer months. The interval between the northern and southern edges of the ITCZ is defined as the tropical rain belt (TRB).

Speleothem-based records of monsoon precipitation in Southeast Asia and the Indo-Pacific have indicated that regional precipitation is controlled by climate variability in the high latitudes of the northern hemisphere, with cooling triggering a southward displacement of the ITCZ and TRB. Such a displacement of the TRB should be observed in southern hemisphere monsoon records by a precipitation dipole (wetter in China and drier in Australia). However, when interhemispheric records are compared, they reveal an interhemispheric symmetry in precipitation (wetter in both China and Australia) suggesting a more poleward positioning of the ITCZ, which triggers an expansion and contraction of the TRB's northern and southern bounds.

Stalagmite KNI-51-16-3 from cave KNI-51 in the Ningbing range of northern Australia was dated using two ^{230}Th dates which indicate that the sample grew from 400-790 BCE. This stalagmite was analyzed for stable isotopes as a means of developing a paleomonsoon record. The isotope record from this sample overlaps well with other stalagmites of similar age from KNI-51 and supports the expansion and contraction model of TRB behavior through observed interhemispheric symmetry in monsoon precipitation in the Holocene.

Elena T. Skosey-LaLonde, '17 **Chicago, IL**
Geology *Kelsey Feser*

Maceral and Mineral Characterization of Modern Deposition in an Evaporate Pond: A Multivariable Analysis of Unconsolidated Material from the Triangle Pond Inlet, San Salvador, The Bahamas

Located on the northwestern side of San Salvador, Triangle Pond represents one of the island's many brackish-hypersaline inland lake systems, with salinities ranging from 50-91 ppt, year round. The Triangle Pond inlet is located at the point's northwestern-most point and serves as the only accessible entrance to the pond at present. While a series of cores have been removed from the southern arm of the pond and analyzed, the top 15-20 cm of material in the analyzed samples was discarded, as the consistency of the gelatinous microbial material made coring at the sediment-water interface difficult. Despite the challenges of identifying the sediment-water interface boundary under the expansive microbial mat, to understand the depositional process of this environment, it is imperative to analyze this layer and its transition into well-defined sedimentary layers.

The role of microbialites along the sediment-water interface is central to the sequence of stratigraphy present in the Triangle Pond inlet. The spatial distribution and vertical expansion of microbial communities not only impact the sedimentation rate of inherited carbonates (tempestites) through the suspension of sediment by weight, it also greatly impacts the allogeneic controls placed on the rate of sedimentation and mineral precipitation. Not only is the composition of inlet sediment, both surficial and in profile, greatly dependent on the chemical alterations of biodissolution and peatification, the rate of carbonate deposition, and density of distribution, they are dominantly controlled by seasonal changes in climate through meteoric deposition. As Triangle Pond is such a specific environment, the slightest changes in the water's salinity concentration, depth, and coastal extent can have devastating impacts on the biota; this places extraneous stress on the bacterial mats by forcing autotrophic microbes into periods of stasis during low-water (dry) and high-productivity in wet periods (post storm deposition). This multi-component dependency on cyclic meteoric conditions indicates that deposition in the Triangle Pond inlet is controlled by meteoric deposition in the forms of seasonal precipitation, hurricanes, overwash, and tropical storms.

Collin Smith, '18 **Palatine, IL**
Mathematics & Statistics *Stephen Bean*

Euler's *Tonnetz* and Mary's Goat: Algorithmic Music Composition

In the late eighteenth century, Mozart wrote a musical dice game. With 272 bars of music and a table of rules, the player could roll the dice to choose specific bars in sequence, creating a new piece of music randomly patched together from the precomposed measures. While this is the most well-known musical dice game, it was not the first. The idea was very popular in the second half of the eighteenth century. These "games" are examples of algorithmic music composition—generating music based on a set of rules. They reduce music composition to a structured process, exploiting the rigid theory behind what makes music pleasing. Many algorithmic composers explore this concept while others prefer to avoid it. John Cage sought to free music of all structure, with pieces like *Music of Changes*, in which every compositional choice was made by chance. As computers have grown in accessibility, the field of algorithmic music has grown in popularity, bringing music together with math and computer science. In my own exploration, I tried to keep both viewpoints (Mozart's and Cage's) in mind, using my knowledge of music theory to write algorithms that compose pleasing pieces while using random elements to ensure that the same sound couldn't have been achieved through traditional composition.

My first program for algorithmic music composition uses a random process in which, given an existing melody, it randomly generates a new song with some of the same characteristics as the original melody. For example, given "Mary Had a Little Lamb," in which all the notes are close in pitch, my program would produce a sequence of notes with the same range restrictions. My other programs rely on the *Tonnetz*, or "tone network," for selecting pitches. The *Tonnetz* is an arrangement of notes first used by mathematician Leonhard Euler to show traditional harmonic relationships. If two notes are adjacent on the *Tonnetz*, they will work well in harmony (sound good when played together). The alternative arrangement to the traditional keyboard, which is derived from music theory, appealed to me as a possible source of pleasing music which is still far removed from what a composer would naturally write. I will explain my algorithms, play some of their compositions, and talk about how I revised the algorithms based on the results I heard. I implemented all my algorithms in Java, using the jMusic programming library and MIDI sound to play the compositions.

Glory-Lieb Tetuh, '17 **Chicago, IL**
Gender, Sexuality, & Women's Studies *Aparna Thomas*

Do African Women Need Saving? The New Western(ized) Woman's Burden

Harmful actions taken as part of the "White man's burden to civilize the world" have not just been limited to the Americas, but also to the African continent, where they have sought to 'save' Africans from themselves and their cultures. Within the past decades, Western nations, backed by feminists, intellectuals, celebrities, etc., have launched an all-out campaign to save the African Woman from a series of different types of operations that are cumulatively referred to as "Female Genital Mutilation" (FGM).

Many feminists and proponents of Women and Gender Studies consider the eradication of FGM as one of the great issues of our time; it is seen as one that is central to the efforts to free women from the chains of socially binding cultures. This presentation seeks to provide a different, underrepresented point of view in the conversations about female genital alterations. It calls feminists and other intellectuals to question the kind of feminism that they practice and whether or not their actions are helpful or hurtful to those whom they seek to help.

This presentation explores the conversations that happen in Western nations in regard to these operations and critiques the basis and validity of the anti-FGM campaign. I examine Western society's history with the practice, the often unintentionally harmful nature of the discourse that has surrounded the topic, and take an in depth, multidimensional look at how the practice has been treated in the West. I also provide information about what is often unsaid in anti-FGM activist spheres and argue that Western and Westernized individuals should seek to abandon the harmful trends of imperial liberalism that color Western discourse about the "Other" woman. Ultimately, I point out the hypocrisy of the global anti-FGM campaign, and suggest alternatives to the hardline approach to these operations that color Western discourse.

Glory-Lieb Tetuh, '17
International Relations

Chicago, IL
David Yamanishi

Wartime Sexual Violence

When we as humans are faced with calamities, it seems that our society is programmed to do one thing first: save the women and the children before all else. However, in times of war, this socially ingrained understanding is ignored, resulting in heinous attacks against women - often of a sexual nature. Women's bodies are often claimed during warfare and even as spoils of war. This results in the age-old tagline of 'rape, loot, and pillage' that has accompanied all wars that have been waged in human history. This phenomenon is so widespread and prevalent that scholars and activists alike have classified wartime sexual violence as a weapon of warfare.

This presentation explores the true nature of sexual violence during warfare and what it entails. I undertake an in-depth exploration of theories that are adapted by scholars and activists in an effort to understand the nature of the beast, as well as how the phenomenon has been interpreted and tried by international and humanitarian law. Lastly, I explore and critique some of the systems that have been adapted in recent history and their efficiency in seeking gender justice and healing for those whose lives have been impacted by wartime sexual violence.

Feminists, proponents of Women and Gender Studies, human rights activists, intellectuals, etc., have identified wartime sexual violence as one of the great gender-based issues of our time that should be eradicated. From an international relations perspective, wartime sexual violence is also important as an issue that requires the collective action of all nations, as well as transnational, multinational, and non-governmental organizations, if the phenomenon is to be properly understood, tried, and hopefully ended. I conclude that that while certain theories better explain the phenomenon than others, none of them should be understood as mutually exclusive, but as complementary to each other, with each theory explaining different narratives. It is by discussing theories in this light that we can truly understand how to bring an end to wartime sexual violence.

Julia Thome, '18
Biology

Crystal Lake, IL
Marty Condon

Discovering Patterns of Diversity in Peru

Flies in the genus *Blepharoneura*, along with their host plants, can be found in Central and South America. Previous findings suggest that these host plants vary in abundance and flowering, depending on what time of year it is. If we wish to find *Gurania spinulosa* (one of the flies' host plant species) in Peru, for example, we can see at which time of year it is most abundant and have the most luck finding it at that time. Knowing that these seasonal patterns exist for the host plants, we were curious to see if seasonal patterns also exist for the flies. One region where we know *Blepharoneura* and its host plants can be found is at the Los Amigos Biological Station in Peru. Four different collection trips were done at this site by Luz Huerto Santillan, a graduate student at the Universidad Nacional Mayor de San Marcos, in September 2006, January 2007, April 2007, and December 2007. The site consists of a one-kilometer-long airstrip, along with its surrounding land, where the collecting was done. Santillan's collection data was brought to Cornell College to make sure all written data was consistent with electronic data. We tested hypotheses about species diversity and distribution, and we looked at differences in Shannon Diversity Indices, host plant and fly-specimen locations, host plant abundances, and generalist species proportions. Our aim was to use these tests to biologically explain our findings that indicated extreme differences in relative species abundance patterns between each trip.

Hayley Uzpen, '17
Art History & Archaeology

Hudson, WI
Christina Penn-Goetsch

Fascist Archaeology: An Exposé of the Temple of Vesta

In 1930's Rome, Mussolini was launching projects and programs which would reshape Rome. Benito Mussolini was striving to create an empire that would rival that of Augustan antiquity. One such project that he appropriated was the excavation of the Temple of Vesta with special emphasis on reconstructing this structure. Mussolini focused on the Temple of Vesta in an effort to both resurrect the pagan religion as well as uncover and display Ancient Rome. The site of the Temple of Vesta today houses a 1930's reconstruction done by Mussolini's team. While there are some original pieces, the majority of the colonnade is a modern work and, as such, aids in Mussolini's propaganda and his mission to relate himself and his Fascist regime to the greatness and power of Ancient Rome. Mussolini's reconstruction failed to do anything with the frieze section of the colonnade. The lead archaeologist on the excavation, Giacomo Boni, noted in his field notebook an ordering for the original frieze pieces, which Mussolini failed to follow. The two original pieces of the frieze have glyphs carved into them that signify what became known as Pontifical instruments, which were used in sacrifices mostly performed by the Vestal Virgins. Had more attention been given to this section, a full, accurate reconstruction of this would have actually aided in furthering Mussolini's agenda and better solidified the resurgence of Ancient Rome.

Emily Wenzel, '17
Music & English

Shaver Lake, CA
Jama Stilwell

Spirits Must Rise: A Textual and Musicological Analysis of Adès and Oakes' *The Tempest*

Ambiguous characters abound on the stage. Whether they be morally gray, androgynous, or some other variation on the theme, characters who don't "pick a side" or who have feet in two different worlds have a long-established history in English-language theater as well as in opera from around the world. Ariel, the bound spirit from *The Tempest*, is a perfect example of such a character who resists placement in any one realm and, specifically, in any one gender. Different directors have taken advantage of openings in the work to interpret the gender of Shakespeare's Ariel in ways that are often tied to the cultural climate of their times, causing the spirit's gender representation to fluctuate from one era to the next. Building on this tradition, adapters of the Bard's work have emphasized certain characteristics of Ariel to force a choice in their own works, influenced by those same cultural forces.

A very recent adaptation of this work, Thomas Adès and Meredith Oakes' *The Tempest* (2004), brings this ambiguous tradition into the world of opera. Their work creates a character whose gender seems to fluctuate, never settling on one definite gender. This indeterminacy is rooted in the disagreement between the gendered pronouns applied to Ariel--the language--and the music written for the part, music that demands a specific body. Therefore, it is only through analyzing Ariel as both a literary character and as an operatic, musical one that we can fully understand the extent to which the spirit pushes beyond the boundaries and expectations of gender in the work and thereby ascends to ultimate, authentic freedom.

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.