

# SYMPOSIUM 24<sup>th</sup> ANNUAL UNDERGRADUATE

## 2018

For more information,  
please visit the  
Assumption Portal.

Monday, April 23

**La Maison Salon & Hall**

9:00am - 10:45am

11:00am - 12:30pm

1:00pm - 2:30pm

**Presentation Sessions**

Monday & Tuesday

Morning & Afternoon

Tuesday, April 24

**La Maison Salon & Hall**

8:30 - 10:00am

10:30am - 12:00pm

12:30pm - 2:15pm

**Poster Session**

Tuesday, April 24

**Testa Atrium 2:00pm - 4:00pm**





## ASSUMPTION COLLEGE

### Office of the Provost and Vice President for Academic Affairs

Welcome to the *24<sup>th</sup> Annual Undergraduate Symposium*. The *Symposium* highlights the research and scholarly achievements of Assumption students working in collaboration with dedicated faculty mentors. These collaborations represent a model for integrating teaching, original research, and the beneficial effects of peer review in promoting intellectual development and professional growth. The *Symposium* provides the campus community with the opportunity to gain a greater appreciation of the individual and collective accomplishments of our faculty and students, as well as to applaud those achievements.

I hope that you enjoy and profit from viewing the posters, hearing the papers, and speaking with the authors of these impressive works.

Sincerely,

Louise Carroll Keeley  
Provost and Vice President for Academic Affairs



# Undergraduate Symposium Program Schedule

Monday, April 23, 2018

Time	Event	Location
9:00 AM—10:45 AM	Presentation Session 1	La Maison Salon
11:00 AM—12:30 PM	Presentation Session 2	La Maison Salon
1:00 PM—2:15 PM	Presentation Session 3	La Maison Salon

Tuesday, April 24, 2018

Time	Event	Location
8:30 AM—10:00 AM	Presentation Session 4A	La Maison Salon
	Presentation Session 4B	La Maison Hall
10:30 AM—12:00 PM	Presentation Session 5A	La Maison Salon
	Presentation Session 5B	La Maison Hall
12:30 PM—2:15 PM	Presentation Session 6A	La Maison Salon
	Presentation Session 6B	La Maison Hall
2:00 PM—4:00 PM	Poster Session	Testa Atrium

**Presentation Session 1**  
**Monday, April 23**  
**9:00 AM—10:45 AM La Maison Salon**

Time	Presenter(s)	Discipline	Title
9:00 AM	Shannon McMillan	SOC & CRM	<i>Child Maltreatment and Teen Dating Violence: Protective Factors and Revictimization</i>
9:15 AM	Tyshawn Thompson	PSY	<i>The Association among Mindfulness, Emotional Responding, Stress, and Academic Performance</i>
9:30 AM	Julie Dunn	PSY	<i>The Impact Community Service Can Have on Classroom Learning</i>
9:45 AM	Thea Hickey	HRS	<i>Effects of Foster Care on the Social Skill Development of Youth</i>
10:00 AM	Levi Fancher	HRS	<i>The Optimal Training Program to Maximize Football Player Performance</i>
10:15 AM	Jenna Snyder	HRS	<i>Dancing with Down Syndrome: A Look at the Effects and Benefits of Dance Movement Therapy on the Emotional Well-Being and Overall Quality of Life for Individuals with Down Syndrome</i>
10:30 AM	Mariah Peck	PSY	<i>Fiction and Affect</i>

**Presentation Session 2**  
**Monday, April 23**  
**11:00 AM—12:30 PM La Maison Salon**

Time	Presenter(s)	Discipline	Title
11:00 AM	Sean Sullivan	THE	<i>Amore Ex Machina</i>
11:15 AM	Kimberly Sweeney	THE	<i>The Eucharistic Sacrament: The Culmination of Baptismal Initiation</i>
11:30 AM	Thomas Barringer	NAS	<i>Determining the Mode of Cell Growth during the Cell Cycle of Fission Yeast Schizosaccharomyces pombe</i>
11:45 AM	Rafael Hamawi	NAS	<i>Diversity of UV Resistance in Halophilic Archaea</i>
12:00 PM	Christian Wesolowski	NAS	<i>Characterization of the Role of Pigments in Photoreactivation in Halophilic Archaea</i>
12:15 PM	Susanna Klicka	NAS	<i>The Scientific Analysis of Artificial Reefs in Volusia County, Florida</i>

**Presentation Session 3**  
**Monday, April 23**  
**1:00 PM—2:15 PM La Maison Salon**

Time	Presenter(s)	Discipline	Title
1:00 PM	Kellie Duquette	ENG	<i>A Biblical Allegory to Represent Science as Corruption in “Rappaccini’s Daughter”</i>
1:15 PM	Jessica Ferronetti	MCL	<i>Un estudio de la ética y los métodos de traducción con una traducción de Instrucciones para salvar el mundo por Rosa Montero</i>
1:30 PM	Shant Eghian	POL	<i>The Meridian House Speech and U.S. Foreign Policy in the Middle East Post-Cold War</i>
1:45 PM	David Cifarelli	ENG	<i>Study Abroad and Your Academic Career</i>
2:00 PM	Olivia Corfey, Alaina Kendrick, Stephanie McGovern, Timothy Power, & Lauren Salerno	ENG	<i>Rome as a Classroom</i>

**Presentation Session 4A**  
**Tuesday, April 24**  
**8:30 AM—10:00 AM La Maison Salon**

Time	Presenter(s)	Discipline	Title
8:30 AM	Kasey Blodgett	HIS	<i>Keeping Women’s History Alive: Kate Toomey, Worcester City Councilor</i>
8:45 AM	Joshua Corrigan & Zachary DiCarlo	HIS	<i>The Life of Nancy Avila: An Oral History</i>
9:00 AM	Jeremiah Edwards & Megan Merna	HIS	<i>Serving the Worcester Community: An Oral History about Public Service</i>
9:15 AM	Feldano Francoise & Andrew Moccia	HIS	<i>An Oral History Interview with Ann Marie Shea</i>
9:30 AM	Raymond Furgal & George Lorin	HIS	<i>A Life in the Library: Marie Mueller’s Oral History Interview</i>
9:45 AM	James Watson	HIS	<i>Doctors Without Orders: An Analysis of the 1918 Influenza Pandemic in America</i>

**Presentation Session 4B**  
**Tuesday, April 24**  
**8:30 AM—10:00 AM La Maison Hall**

Time	Presenter(s)	Discipline	Title
8:30 AM	Josie Assad	SOC & CRM	<i>Judicial Decision Making</i>
8:45 AM	Joseph Bretta	SOC & CRM	<i>Levels of Administrative and Organizational Stress among State Police</i>
9:00 AM	Tyis Boykin	SOC & CRM	<i>Primary Education: Technology Takeover</i>
9:15 AM	Alison Carr	SOC & CRM	<i>Measuring At-Risk Population's Knowledge of Sexual Violence</i>
9:30 AM	Alexander Cerbo	SOC & CRM	<i>Characteristics of Pedestrian Fatalities during Motor Vehicle Accidents in Regard to Increased Distracted Driving and Walking</i>
9:45 AM	Nicholas Crespo	SOC & CRM	<i>Navigating the Court System without Representation</i>

**Presentation Session 5A**  
**Tuesday, April 24**  
**10:30 AM—12:00 PM La Maison Salon**

Time	Presenter(s)	Discipline	Title
10:30 AM	Sara Amato	MCS	<i>Schubert Polynomial Multiplication</i>
10:45 AM	Sean McGrath	NAS	<i>Efficiency of Energy Transfer in Rayleigh-Benard Convection</i>
11:00 AM	Emily Tomanelli	NAS	<i>Novel Approaches to Tackling Antibiotic Resistance</i>
11:15 AM	Alexis Levine	NAS	<i>Correlations of Head Circumference, and Epilepsy Severity in Infants with Tuberous Sclerosis Complex</i>
11:30 AM	Noor Kawmi	NAS	<i>The Interaction between Macrophages and Adipose Stromal Cells in Pregnancy Related Breast Cancer during Lactation Increases Inflammatory Cytokines Production</i>
11:45 AM	Christina Forrest	NAS	<i>Mammary Stromal Cells Present During Lactation Cause an Increase in Cellular Proliferation</i>

**Presentation Session 5B**  
**Tuesday, April 24**  
**10:30 AM—12:00 PM La Maison Hall**

Time	Presenter(s)	Discipline	Title
10:30 AM	Ryan Dalli	SOC & CRM	<i>The Role Case Managers Play in Their Clients' Lives: An Analysis of Case Managers' Viewpoints of Their Jobs and Their Clients</i>
10:45 AM	Angela Gentile	SOC & CRM	<i>Factors That Contribute to a Parent's Inability to Comply with Their Child Support Orders</i>
11:00 AM	Raysa Guerrero	SOC & CRM	<i>What Information or Behaviors do Prosecutors Want from Survivors of Domestic Violence and Sexual Assault?</i>
11:15 AM	Cynthia Henderson	SOC & CRM	<i>Court Cases: Getting In and Out</i>
11:30 AM	Connor Henry	SOC & CRM	<i>Police Officer Attitudes about the Policing of Opioid Use</i>
11:45 AM	Samantha Konan	SOC & CRM	<i>How Does Parental Education Affect Children?</i>

**Presentation Session 6A**  
**Tuesday, April 24**  
**12:30 PM—2:15 PM La Maison Salon**

Time	Presenter(s)	Discipline	Title
12:30 PM	ZhiChao Chen	EGS	<i>Worcester Multi-Family House Market Price</i>
12:45 PM	Jonathan Bisceglia	HIS	<i>Doing History: What I Learned as a Guest Curator for a Digital Humanities Project</i>
1:00 PM	Mary Bohane	HIS	<i>Using Newspaper Advertisement to Examine Education in Colonial America</i>
1:15 PM	Kurt Falter	HIS	<i>Coffee and The Colonies</i>
1:30 PM	Zachary Karpowich	HIS	<i>Advertising an Influential Pamphlet: Politics and Print Culture in Early America</i>
1:45 PM	Anna MacLean	HIS	<i>Eighteenth-Century American Newspapers and an Assortment of Advertisements</i>
2:00 PM	Sean Sullivan	HIS	<i>Europe Transposed: German Settlers in Colonial America</i>

**Presentation Session 6B**  
**Tuesday, April 24**  
**12:30 PM—2:15 PM La Maison Hall**

<b>Time</b>	<b>Presenter(s)</b>	<b>Discipline</b>	<b>Title</b>
12:30 PM	Korlu Jallah	SOC & CRM	<i>Technology in Policing</i>
12:45 PM	Alexander Lorusso	SOC & CRM	<i>How Has Intelligence and Case Management Software Influenced Perceptions of Police Work?</i>
1:00 PM	Shannon McMillan	SOC & CRM	<i>Internship Satisfaction: Internships for Choice Compared to Internships Required by Class</i>
1:15 PM	Jamie Mickiewicz	SOC & CRM	<i>Stress Training in Police Academies</i>
1:30 PM	Aidan Murphy	SOC & CRM	<i>Differences in Self-Representation by Client Gender</i>
1:45 PM	Patrick Ward	SOC & CRM	<i>The Opioid Crisis: Drug Offenders and Recidivism Patterns</i>
2:00 PM	Matthew Yanczewski	SOC & CRM	<i>Juvenile Delinquency and Rehabilitation in the Criminal Justice System</i>



**Poster Session**  
**Tuesday, April 24**  
**2:00 PM—4:00 PM Testa Atrium**

Time	Presenter(s)	Discipline	Title
<b>2:00 PM - 4:00 PM</b>	Michela Lavin	ENG	<i>Holmes and House: On Friendship and Addiction</i>
	Joselyne Alvarez	NAS	<i>Understanding Brain Development through Worms</i>
	Marissa Gifford	NAS	<i>Optimization of 5-Hydroxytryptophol</i>
	Brittany Goncalves	NAS	<i>Characterization of a Protective Angiogenic Mechanism Triggered by the Heart Pathogen Trypanosoma cruzi</i>
	Brittany Goncalves & Alysha McGovern	NAS	<i>Identification of a Bacillus Species Isolated from a Doorknob Using Staining Techniques, Growth Characteristics, Genetics, and Respiration and Metabolic Assays</i>
	Susanna Jacobsen & Alexandra Olah	NAS	<i>Observing Interspecific Competition and Habitat Preference of Fern Species at Assumption College</i>
	Noor Kawmi	NAS	<i>New Approach on Analyzing Efficiency and Size Trends in Evolving Computer Architecture</i>
	Alyssa Masciarelli & Alora Piela	NAS	<i>Investigating the Immune Response of RAW 264.7 Macrophage Cells to Serratia marcescens Infection</i>
	Eva Mlynarski	NAS	<i>Genetic Screening of Bacillus thuringiensis Crystal Protein Cry14A for Resistance in Free Living Nematode C. elegans</i>
	Dominique Shepard	NAS	<i>Investigating the Biodiversity of Isolated Soil Algae from a Range of Southern New Hampshire Peaks</i>
	Jocelyn Tamayo	NAS	<i>Path Formation in a Complex System</i>
	Melissa Taylor	NAS	<i>A Novel Cryptic Species of Green Algae from the California Desert</i>
	Emily Tomanelli	NAS	<i>The Ecophysiology of Soil Algae</i>
	Nick Villani	NAS	<i>Understanding the Role of Integrin Ligands in Spine-like Projection (SLP) Development</i>
	Lindsay Gomes	PSY	<i>Exploring the Relationships between Social, Motor, Emotional, and Sensory Development in Childhood</i>
	Julia Merchant	PSY	<i>Cyberbullying as a Form of Dehumanization</i>
Holly Olson	PSY	<i>Emotional Expressiveness in Families at Risk for Postpartum Depression</i>	

## ABSTRACTS

### **Presentation Session 1 Monday, April 23 9:00 AM - 10:45 AM La Maison Salon**

#### ***Child Maltreatment and Teen Dating Violence: Protective Factors and Revictimization***

Shannon McMillan '18

Sociology and Criminology

Child maltreatment and teen dating violence victimization are known to be interconnected. However, not all children that are maltreated go on to be victims of further violence in later life. Protective factors are thought to mediate this relationship. Three protective factors, studied individually, have been shown to have influence on this relationship, but once studied together they should have a greater influence for mediating the connection between child maltreatment and teen dating violence victimization. This presentation summarizes an original capstone project that fulfills the final requirement of the Honors Program.

*Faculty Mentor: Dr. Angela Kaufman-Parks*

#### ***The Association among Mindfulness, Emotional Responding, Stress, and Academic Performance***

Tyshawn Thompson '18

Psychology

In this research project, we are investigating the impact of mindfulness on emotional responding, as well as the interactions between mindfulness ability, stress, and academic performance. We will recruit a sample of Assumption undergraduates who will complete a computerized training in two components of mindfulness (awareness and acceptance) as well as answer a series of self-reported questionnaires. Our aim is to answer two questions: 1) Can brief training in mindfulness improve one's emotional state? and 2) Will participants who exhibit better state and trait levels of mindfulness also report better academic success and lower levels of stress? We hope to replicate our previous work demonstrating that our mindfulness training does indeed improve one's emotional state. We further hypothesize that participants whose state of mindfulness improves after the brief training will report lower levels of stress and higher levels of academic performance. Answering these research questions could open avenues for higher education to offer students tools from mindfulness in order to better both their academic performance and emotional well-being.

*Faculty Mentor: Dr. Sarah Cavanagh*

#### ***The Impact Community Service Can Have on Classroom Learning***

Julie Dunn '18

Human Services and Rehabilitation Studies

Community service has been linked to different psychological benefits, such as increased self-esteem. The purpose of the present study was to expand this research by examining other psychological benefits to those who participate in community service. In addition to examining self-esteem, we explored how participating in community service impacts how a person flourishes (the way a person can succeed), their gratitude (the way people feel about themselves, others, and the world around them), and their serenity experiences (feeling a sense of trust, acceptance, and peace in the world around them). We examined this relationship when community service is a requirement for a class. We compared Community Service Learning (CSL) students with non-CSL students of the same course. Participants completed questionnaires that assessed flourishing, self-esteem, serenity, gratitude, and their views about community service at the beginning (before completing community service) and at the end the semester. Contrary to our hypothesis, there was no major difference between CSL and non-CSL students at the end of the semester. Although effects were not significant, means were in the predicted direction for some comparisons (flourishing and views on community service). Psychological benefits did not increase for CSL students possibly because the community service was limited in time. Findings are discussed in

relation to self-determination theory. This presentation summarizes an original capstone project that fulfills the final requirement of the Honors Program.

*Faculty Mentor: Dr. Maria Parmley*

### ***Effects of Foster Care on the Social Skill Development of Youth***

Thea Hickey '18

Human Services and Rehabilitation Studies

This presentation begins with an overview of research conducted on the impact that being in foster care can have on the social-emotional well-being of a child. There is abundant published research that suggests children in foster care are a special population that needs individualized care to support their social skill development. Those findings will then be compared with the statistics and demographics of the student's caseload while she interned at the Department of Children and Families in Worcester, Massachusetts.

*Faculty Mentor: Dr. Christian Scannell*

### ***The Optimal Training Program to Maximize Football Player Performance***

Levi Fancher '18

Human Services and Rehabilitation Studies

A relatively recent shift has taken place in the field of Strength and Conditioning in order to help athletes reach their maximal potential. This shift went from focusing on pure strength alone to focusing on a multimodal approach that includes improving strength, agility, balance, explosiveness, and preventing injury. The role of the Strength and Conditioning Coach is thus more vital than ever before as they are responsible for guiding athletes in their physical preparation for their specific sport. This presentation will review different aspects of the role of a Strength and Conditioning Coach based upon my experience as a Strength and Conditioning Football Intern at The College of the Holy Cross. The presentation will also review strategies to optimize a training program for football players that will lead to increased strength and injury prevention. Those strategies include: functionally specific movements, balance postures and holds, development of "body armor" (increased muscle and strength), and periodization. Special attention will be given to the main movements to be included in optimal training programs as well as the quantity and type of movements recommended. Periodization of the amount of weight needed along with the proper progression of each exercise will be reviewed in order to maximize the athlete's performance on the field.

*Faculty Mentor: Dr. Robert Caron*

### ***Dancing with Down Syndrome: A Look at the Effects and Benefits of Dance Movement Therapy on the Emotional Well-Being and Overall Quality of Life for Individuals with Down Syndrome***

Jenna Snyder '18

Human Services and Rehabilitation Studies

This capstone project examines how combining the creativity of dance with the functionality of physical therapy can allow individuals with Down syndrome to not only be stimulated physically and cognitively, but also to help them to continue to lead very fulfilling and productive lives. Given the positive effects dance has on individuals with Down syndrome, it is expected that the expressive art form of dance movement therapy would be an optimal approach to increase and improve the emotional well-being and overall quality of life for this population. The literature review consists of an analysis of existing literature and personal interviews with professionals in the area of dance and dance movement therapy. The goal of the project is to raise awareness of the health risks associated with individuals who have Down syndrome and how dance movement therapy can alleviate those problems. An additional aim of the project is to encourage dance instructors and physical therapists to incorporate dance movement therapy into their own lesson plans. This presentation summarizes an original capstone project that fulfills the final requirement of the Honors Program.

*Faculty Mentor: Dr. Robert Caron*

### ***Fiction and Affect***

Mariah Peck '18

Psychology

While reading fiction, readers experience simulated social and emotional environments that may introduce emotions, distract from everyday stressors, and/or introduce new learning. Previous research points to these factors (emotional exposure, escapism, and education) as three possible motivations for interest in reading fiction and for choice of book, but the impact of current mood and genre of fiction on these motivations and choices is unclear. We used validated sets of pictures to induce negative, positive, and neutral moods and presented participants with book descriptions of varying genres of fiction (popular, speculative, and literary). Participants rated their interest in reading each book and the degree to which their motivation was related to the desire for exposure to emotional content, escaping into a fictional realm, and educating themselves. We will explore how interest in reading and genre preferences vary by induced mood. This presentation summarizes an original Capstone project that fulfills the final requirement of the Honors Program.

*Faculty Mentor: Dr. Sarah Cavanagh*

### **Presentation Session 2**

**Monday, April 23**

**11:00 AM - 12:30 PM La Maison Salon**

### ***Amore Ex Machina***

Sean Sullivan '18

Theology

For many years, science fiction has pondered the reality of man's future relationships with intelligent machines. Possible scenarios have wandered from the idyllic to the apocalyptic and have covered everything in between. One possible reality which has come into the fore in recent years and which is certainly going to be an issue in a few decades is that of our sexual relationship to intelligence of our own construction. Recent developments in technology as well as artificial intelligence are bringing us ever closer to a point where the widespread use of human-like androids for sexual purposes may become a reality. This naturally poses serious challenges to the way that the human person, be they Christian or not, think of themselves as sexual beings and of their relationships to each other as well as to these new entities of steel and silicon. This presentation will discuss antecedents to the current surge in digital outlets for sexuality in the modern world, the means currently available and in development, and what the Catholic Church must do to get ahead of this trend before it once more finds itself on the defensive regarding the place of sexuality in the modern world.

*Faculty Mentor: Dr. Christopher Klofft*

### ***The Eucharistic Sacrament: The Culmination of Baptismal Initiation***

Kimberly Sweeney '21

Theology

The debate of the reordering of the sacraments can seem conflicting to many Catholics when learning about some changes that are currently introduced in this country. One of the major questions is whether babies and young children should receive Eucharist at the time of Baptism followed by Confirmation at an age much younger than the teenage years. Traditionally Holy Communion is begun when children are seven or eight years of age and Confirmation is for teens in high school. Despite this usual practice, the Church has begun a new plan in certain areas of the United States.

The study of the Seven Sacraments of the Catholic Church is a consideration of "seven mysteries" as the *Catechism of the Catholic Church* terms them. The usual practice as most American Catholics know it has been very different in earlier times. In this presentation, I will investigate the theology of the sacraments and review exactly where the reordering of the sacraments has occurred in this country ... and why. In studying this new plan to reorder the sacraments, we realize it can be upsetting to change a process practiced for many years, but it is important to understand the reasons.

**Determining the Mode of Cell Growth during the Cell Cycle of Fission Yeast *Schizosaccharomyces pombe***

Thomas Barringer '19

Natural Sciences

Malignant cells are often a different size than normal cells. Studying cell size can help scientists better understand cancer cells and what causes their malignancy. Fission yeast cells have two growth stages: G1 and G2. G2 is followed by mitosis, which is the division of the one mother cell into two equally sized daughter cells. The transition from G2 to mitosis is regulated by cyclin dependent kinases (CDK). Research has shown that Cdc13 and Cdc25 directly activate CDK activity and therefore allow a cell to end G2 and start mitosis. To begin to understand how the cell regulates Cdc13 and Cdc25 at the G2/M transition, the mechanism by which fission yeast *S. pombe* grow must be understood. There are two potential growth mechanisms for cells. The first possible mechanism is that the cells undergo bilinear growth. The second possible mechanism is the cell undergoing an exponential growth pattern. Since wild type cells only double in size, the distinction between the two mechanisms is hard to make. Using a mutant strain of *S. pombe* that causes the cells to more than double in size, the cell growth during a single cell cycle may allow us to determine whether the growth pattern is exponential or bilinear. To study and hopefully discern the mechanism of growth, we took time-lapse movies of individual cells and plotted the length of cells over the course of a single cell cycle. At this time, no conclusion about the growth pattern can be reported.

Faculty Mentor: Dr. Mary Pickering

**Diversity of UV Resistance in Halophilic Archaea**

Rafael Hamawi '18

Natural Sciences

Members of halophilic archaea, like *Halobacterium*, are remarkably resistant to ultraviolet light (UV). However, it is unclear to what extent other halophilic archaea share this phenotype, despite the common generalization that halophilic archaea are UV resistant. Species of halophilic archaea found in salt flats at high altitude, where the atmosphere is of a lesser density than at sea level, experience an increased intensity of UV. It was hypothesized that strains of halophilic archaea that reside at a high altitude in the Salar de Uyuni in the Andes Mountain would be more UV resistant than strains isolated at sea level. Diverse genera, including *Haloterrigena* and *Natrinema* from the Andes Mountains, *Haloferax* from the Dead Sea, and *Halobacterium*, were cultured to logarithmic phase, irradiated with increasing doses of UV-C light, diluted, and plated on solid media. Spotted plates were exposed to fluorescent light or kept wrapped in foil to test the effect of photoreactivation, a light-dependent DNA repair process. We observed that (1) there was no photoreactivation in non-pigmented strains, (2) a strain of *Natrinema* was notably sensitive to UV, and (3) *Halobacterium* was the most resistant to UV. I will discuss the diversity of resistance to UV among halophilic archaea and possible cellular mechanisms associated with UV resistance.

Faculty Mentor: Dr. David Crowley

**Characterization of the Role of Pigments in Photoreactivation in Halophilic Archaea**

Christian Wesolowski '19

Natural Sciences

Halophilic archaea are relatively resistant to the DNA damaging ultraviolet rays (UV) that shine down heavily on their natural habitats which include shallow salt pools and evaporation ponds. One general characteristic that most of these halophiles share is their bright orange or pink pigmentation due to the presence of bacterioruberins in their membranes. Previous studies have revealed that most halophilic archaea perform a light dependent DNA repair process known as photoreactivation. We are characterizing a novel halophilic archaea, *Natrinema* 5-4, that was isolated from the Salar de Uyuni in Bolivia and which forms unpigmented colonies on solid media. *Natrinema* 5-4 cultures, when exposed to UV and then incubated in photoreactivation-promoting white light, are unable to photoreactivate as effectively as other halophiles. To see if there is a direct connection between the absence of pigments in 5-4 and their inability to promote effective photoreactivation, we

tested the efficiency of photoreactivation in a pigment-deficient mutant of the well-characterized archaea *Haloferax volcanii*. Unlike 9-4, these pigment-deficient *Haloferax* cells performed photoreactivation essentially as well as their pigmented wildtype cells. We speculate that *Natrinema* 5-4 may be a photolyase-deficient isolate and we are planning degenerate PCR and/or whole genome sequencing studies to investigate this possibility further. It is interesting to note that exposing *Natrinema* 5-4 cultures to white light is detrimental to their growth, indicating that pigments protect the cells from harmful effects of excessive light exposure and/or serve to harvest light energy for growth.

*Faculty Mentor: Dr. David Crowley*

### ***The Scientific Analysis of Artificial Reefs in Volusia County, Florida***

Susanna Jacobsen '18

Natural Sciences

The purpose of this project is to analyze decades (1990-2010) of diver surveys conducted by the Volusia County Reef Research Dive Team. Monitoring of Volusia County's artificial reefs is very important to measure the effectiveness of reef locations, materials used, and reef design. By calculating the relative abundance, species diversity, and species composition of specific deposits within reef sites, subsequent analysis should provide information that can be used to further achieve Artificial Reef Program goals. A secondary goal of this project is to increase the involvement of citizen scientists that provide valuable information on the biotic and abiotic performances of the artificial reef deployments. With all of the work and information provided in the past, it is the hope that this project will enlighten current and future stakeholders to the performance and benefits of the Artificial Reef Program and the importance of citizen science to its future. This specific study analyzed data obtained from three sites off the coast of Ponce Inlet, FL. Each site had similar reef composition, but showed slight differences in structure. From the surveys taken species density, frequency, and diversity were calculated and compared to other artificial reef sites of the coast of Ponce Inlet, FL.

*Faculty Mentor: Dr. James Hauri*

### **Presentation Session 3**

**Monday, April 23**

**1:00 PM - 2:15 PM La Maison Salon**

### ***A Biblical Allegory to Represent Science as Corruption in "Rappaccini's Daughter"***

Kellie Duquette '18

English

This analysis of Nathaniel Hawthorne's "Rappaccini's Daughter" explores the question of Hawthorne's commentary on science and religion. It first works to deconstruct other arguments pertaining to possible readings of the story. A reading of the story as a biblical allegory implying incest does not seem satisfying for the reader and this essay offers an alternate interpretation. This original analysis and interpretation instead explains the text's plot as a parallel to the story of the Garden of Eden, implying Hawthorne's intentional biblical allegory created by character and plot similarities. Creating these connections in the text seems to conclude that science, and consequently the pursuit of it, represents sin and ungodliness. In this reading, Hawthorne's allegory perhaps implies that science is human corruption, a danger to the natural world, and a danger to the state of humankind as a whole.

*Faculty Mentor: Dr. Becky DiBiasio*

***Un estudio de la ética y los métodos de traducción con una traducción de  
Instrucciones para salvar el mundo por Rosa Montero***

Jessica Ferronetti '18

Modern and Classical Languages and Cultures

Without translation, our world would not be as interconnected. The wonderful thing about a translated text is that it facilitates mental access to different places, people, cultures, authors, and times via words on a page, creating a less segregated and isolated world. The focus of this thesis project, written mainly in Spanish, is on the methods and ethics of translation in literature. The study examined three different types of translation – dynamic equivalence, functionalism, and formal equivalence – along with debate in the field on the ethics of straying away from a literal word-for-word translation towards a more cultural and contextually based translation. The second part of the project transferred this knowledge to complete a translation from Spanish to English of one-third of the novel *Instrucciones para salvar el mundo* (2008) (*Instructions to Save the World*), written by Spanish author Rosa Montero. The translation combined multiple different types of translation in order to create a text that was true to the original Spanish version, but made the intricate story available for English readers. This presentation summarizes an original capstone project that fulfills the final requirement of the Honors Program.

*Faculty Mentor: Dr. Maryanne Leone*

***The Meridian House Speech and U.S. Foreign Policy in the Middle East Post-Cold War***

Shant Eghian '18

Political Science

This presentation will examine United States foreign policy in the Middle East Post Cold War through the lens of the Meridian House Speech, an influential speech given in 1992 that has shaped the United States' foreign policy framework for the past twenty-five years. It will examine the work of Edward Said and John Esposito, two influential academics whose work heavily influenced the content of the speech. Finally, this presentation will give a critical analysis of the speech and the implications it has had for our foreign policy in the Middle East. This presentation summarizes an original capstone project that fulfills the final requirement of the Honors Program.

*Faculty Mentor: Dr. Bernard Dobski*

***Study Abroad and Your Academic Career***

David Cifarelli '19

English

*The Grand Tour* is a new course designed for students at Assumption's Rome Campus. The course was intended for students to reflect and share their European excursions through documentation. Over the course of the Fall 2017 semester, I documented over ten excursions as part of a project for *The Grand Tour*. The project, known as the "Common Place Book," allowed me to incorporate what I learned about the world from travel with the knowledge I gained from the classroom. Over the semester I applied the Coliseum's architectural style to Rome's social structure. I learned how the nation's media provided unity across the country's language barriers while visiting different regions of Italy. I saw how the inexpensiveness of travel birthed the cross-culturalization of European cultures. *The Grand Tour's* aim, along with the skills students learned through the "Common Place Book," can be applied to a number of different academic disciplines and allow students to relate study abroad experiences to their potential careers.

*Faculty Mentor: Dr. Becky DiBiasio*

***Rome as a Classroom***

Olivia Corfey '19, Alaina Kendrick '19, Stephanie McGovern '19,

Timothy Power '20, and Lauren Salerno '20

English

We attended Assumption's Rome Program for the Fall 2017 semester. For our final projects in the *Grand Tour* course, small groups of students created something unique to show others back home what daily living and learning in Rome is all about. The project that our group created is a short video depicting "Rome as a Classroom."

The purpose of the video we created was to portray what our day-to-day learning experiences in Rome were like, as they were quite different than what we were used to in Worcester. Rome is full of significant culture, history, and religion. Through our weekly site visits, we witnessed some of the greatest works of Roman artists, visited some of the world's most famous churches, and improved our Italian by going out into the city and speaking with the locals. Bringing the classroom "outside" and applying what we learned in class to the real world is one of the best ways to truly become knowledgeable. We will also be reading passages from our common books from our *Grand Tour* course, including hold reflections on our many travels while studying abroad.

*Faculty Mentor: Dr. Becky DiBiasio*

**Presentation Session 4A**  
**Tuesday, April 24**  
**8:30 AM - 10:00 AM La Maison Salon**

***Keeping Women's History Alive: Kate Toomey, Worcester City Councilor***

Kasey Blodgett '21

History

This presentation provides an overview of an oral history interview featuring Kate Toomey, a project conducted in collaboration with the Worcester Women's Oral History Project. Toomey was born in Worcester in 1958. She attended Regis College in Weston, Massachusetts. She studied Public Administration, developing the belief that it was her job to give back to her community. She married Steve Toomey and had three children; the family settled in the southeast part of Worcester. Toomey is currently serving her sixth term as a City Councilor, making contributions as an educator and a mentor as well as a legislator for the city's people. She runs town meetings and hosts several charity events. In her interview, Toomey discusses the struggles and joys of her experience as a City Councilor. In addition, she touches upon the challenges she faced overcoming an attention deficit disorder that made her feel less smart and incapable of achieving specific goals. She gained confidence in her strengths, especially mentoring others. She elaborates in detail about her position as a City Councilor and the connections she has made with the Worcester Women's History Project. She emphasizes her goals for greater diversity (especially in education), public safety, and affordable housing.

*Faculty Mentor: Dr. Carl Robert Keyes*

***The Life of Nancy Avila: An Oral History***

Josh Corrigan '21 and Zachary DiCarlo '21

History

This presentation examines the life experiences of Nancy Avila, an employee of the Worcester Women's History Project. She is also an organist who has shared her talents with the congregation at a church in Hubbardston, Massachusetts. Throughout her interview she emphasized the importance of working with others and learning from them. As she summed it up, "You learn by saying 'yes.'" This project was conducted in collaboration with the Worcester Women's Oral History Project.

*Faculty Mentor: Dr. Carl Robert Keyes*

***Serving the Worcester Community: An Oral History about Public Service***

Jeremiah Edwards '21 and Megan Merna '21

History

This presentation examines the experiences of Jill Dagilis, the executive director of the Worcester Community Action Council since 2006. Before taking that position, she worked for the City of Worcester in a management position at City Hall. Dagilis has had many accomplishments in the city Worcester, including being the first female Commissioner of Code Enforcement as well as the first female Commissioner of Health and Human Services. She has also been a part of many projects, including the construction of the \$90 million Worcester Technical High School. As Contracting Officer for the City of Worcester, she oversaw the team that



completed this project. During her interview she discussed the challenges she faced in building a successful career with the constant threats and backlash she received in a male-dominated field. She also made several recommendations to women in the workplace: speak up and do not allow yourself to get pushed around. She emphasized being brave, smart, and thoughtful as well as always giving others a helping hand because not everyone has the same opportunities.

*Faculty Mentor: Dr. Carl Robert Keyes*

***An Oral History Interview with Ann Marie Shea***

Feldano Francois '20 and Andrew Moccia '21

History

This presentation highlights the life experiences and insights of Ann Marie Shea, a Worcester native born in 1939. Growing up a Catholic Irish American, Shea is the daughter of Irish immigrants. She attended Worcester Public Schools and majored in English at Anna Maria College before furthering her educational and career pursuits at Catholic University of America in Washington, DC, where she studied theatre. Several years after earning an M.A. in Drama, she earned a Ph.D. in Educational Theatre from New York University. With a passion for the art of theatre, Shea devoted much of her life to volunteering and working in this field. In her oral history interview, Shea discusses the changes in Worcester and some of the city's history. She also discusses her many jobs, including publishing, writing and performing. As an educated, informed, and contributing member of society, Shea represents the strides made by American women in the second half of the twentieth century and the early twenty-first century.

*Faculty Mentor: Dr. Carl Robert Keyes*

***A Life in the Library: Marie Mueller's Oral History Interview***

Raymond Furgal '21 and George Lorin '21

History

This presentation draws from an oral history interview with Marie Mueller, the director of the Bigelow Free Public Library in Clinton, Massachusetts. In the interview Mueller focused on her work life including the daily routines and procedures for being successful in her field. She stressed that many have a misinformed judgment of libraries and wanted people to realize that the working in a library is not the boring field most people believe. Mueller also discussed her education; she obtained graduate degrees in Publishing and Library and Information Science. Both helped get her where she is now. She stated that it is essential for women to follow their dreams. The interview concluded with Mueller providing advice for women interested in pursuing a career that involves serving others through working at libraries or otherwise helping people locate the information they need in their personal and professional lives.

*Faculty Mentor: Dr. Carl Robert Keyes*

***Doctors Without Orders: An Analysis of the 1918 Influenza Pandemic in America***

James Watson '18

History

This project focuses on the influenza pandemic of 1918-1919 in specific reference to America and the chief organizations that responded to the pandemic. In this paper, two organizations are discussed in great detail: the American Red Cross and the United States Military. The purpose of this paper is to explain how American organizations responded to the pandemic as well as illuminating how their relationship was altered by war and previous interactions. By discussing how these two groups reacted to the pandemic, and ultimately each other, this paper sheds light on how America as a whole survived the pandemic as well as discussing the problems that were encountered along the way. In doing so, the nuanced connections between the military and the American Red Cross can become known. This was accomplished by first explaining the pandemic as a biological entity and the major effects that it had on human civilization. Once this was done, both organizations were described with particular emphasis on structure and importance in America during this specific moment in history. Each is given attention as to their stance on the pandemic and their actions in reference to its containment and eradication. Finally, the two are linked by means of political interplay and the finer points of their relationship. This

presentation summarizes an original capstone project that fulfills the final requirement of the Honors Program.

*Faculty Mentor: Dr. Winston Black*

**Presentation Session 4B**  
**Tuesday, April 24**  
**8:30 AM - 10:00 AM La Maison Hall**

***Judicial Decision Making***

Josie Assad '18

Sociology and Criminology

This study examines which social influences affect a judge's decision in deciding an offender's outcome within the court system. The research attempts to find whether or not factors like race, socioeconomic status, occupation, environmental reasons, or other substantial factors have determinable effects on the kind of sentence an offender might receive. The purpose of this research is to provide significant evidence that there is some kind of pattern involved in sentencing. If so, then perhaps judges and government officials need to regulate their decisions better so we can have a fair and just court system. To perform this research I will be combining participant observation along with short interviews with at least one judge, court officials, and probation officers.

*Faculty Mentor: Dr. Alison Cares*

***Levels of Administrative and Organizational Stress among State Police***

Joseph Bretta '18

Sociology and Criminology

There has been research regarding my research topic of the levels of administrative and organizational stress among state police. This was done through the Police Stress Survey (Spielberger, Westberry, Grier, & Greenfield, 1981). The purpose of the study that I am conducting is to see how stress affects police officers at the next level, more specifically the state police. The sampling will be done on members of the state police and the dispatchers that work there. They are all males consisting of twenty one to 65 years old. The research will be conducted through the means of an online survey distributed to the members of the barracks. I plan to analyze the data using the original Police Stress Survey as a guideline. While using this as a guideline I will be able to see what was normal or not for a police officer employed by a town.

*Faculty Mentor: Dr. Alison Cares*

***Primary Education: Technology Takeover***

Tyis Boykin '18

Sociology and Criminology

This study intends to examine the effects of technology integration in primary education. By conducting between seven and ten open response based interviews with teachers and teachers' aids, I hope to identify potential ways to improve these integrations. Through these interviews, we could find out different kinds of concerns that teachers have. Then we can address those concerns and began improving integration of technology in the elementary school classroom. In turn, that can benefit teachers and more importantly lead to the betterment of the students that they teach.

*Faculty Mentor: Dr. Alison Cares*

***Measuring At-Risk Population's Knowledge of Sexual Violence***

Alison Carr '18

Sociology and Criminology

College aged students (18-24) are the most at risk population to be sexually victimized, ranging from

sexual harassment to sexual assault. Understanding this, and motivated by prior research on the subject, I designed an anonymous survey to measure the population's knowledge of reporting avenues available to them by using a mixture of qualitative and quantitative questions. The survey was released to a small liberal arts college in Massachusetts and available for completion by members of all class years. Having personal experience of victimization was not a requirement for the survey. There were over 70 participants for this survey, ranging from ages 18-22 from five different races and encompassing multiple sexual orientations. Findings of the survey revealed personalized information from a student's perspective of the institutional support available to them and their interpretation of the accessibility both on and off campus. The study could be furthered with more research that is more generalizable to the greater population so that institutions, rape crisis centers, police, and hospitals may gain a greater understanding of what is and is not working for those most at risk for sexual assault.

*Faculty Mentor: Dr. Alison Cares*

***Characteristics of Pedestrian Fatalities during Motor Vehicle Accidents  
in Regard to Increased Distracted Driving and Walking***

Alexander Cerbo '18

Sociology and Criminology

Much research has been conducted in recent years regarding distracted walking and distracted driving accidents. An increasing public safety issue facing the United States, legislative efforts have taken place in many states to improve safety conditions on the road for both drivers and street walkers. This study seeks to explore the characteristics of pedestrian fatalities during motor vehicle accidents in regard to increased distracted driving and walking. This research is important as the use of smartphones, as well as the increase in both walking and the use of motor vehicles as forms of transportation, have caused pedestrian fatalities at an alarming rate. In this study, statistical data will be compiled and analyzed from official legal emails, reports, and police department reports to garner quantifiable information regarding how many accidents occur within the Worcester area, what types of accidents are occurring, what are the causes, and other pertinent information relating to the cause of the accident.

*Faculty Mentor: Dr. Alison Cares*

***Navigating the Court System without Representation***

Nicholas Crespo '18

Sociology and Criminology

For my research project I will be looking into the issues litigants face when trying to navigate the court system without legal representation through participant observation. I will be looking at how people's emotion can lead to or prevent individuals from successfully navigating the court system. I will also be looking at the issues litigants face when using pro bono legal services.

*Faculty Mentor: Dr. Alison Cares*

**Presentation Session 5A**  
**Tuesday, April 24**  
**10:30 AM - 12:00 PM La Maison Salon**

***Schubert Polynomial Multiplication***

Sara Amato '19

Mathematics and Computer Science

Schur polynomials are a fundamental object in the field of algebraic combinatorics. The product of two Schur polynomials can be written as a sum of Schur polynomials using non-negative integer coefficients. A simple combinatorial algorithm for generating these coefficients is called the Littlewood-Richardson Rule. Schubert polynomials are generalizations of the Schur polynomials. Schubert polynomials also appear in many contexts, such as in algebraic combinatorics and algebraic geometry. It is known from algebraic geometry that the product of two Schubert polynomials can be written as a sum of Schubert polynomials using non-negative integer coefficients. However, a simple combinatorial algorithm for generating these coefficients is not known in general. Monk's Rule is a known algorithm that can be used in specific cases. This research seeks to identify more algorithms for the multiplication of Schubert polynomials. In this presentation, I will provide a brief overview of Schur polynomials and Schubert polynomials. Also, I will present diagrams called 'pipe-dreams' to illustrate Schubert polynomials and establish a connection to Schur polynomials. Our main result is in Schubert polynomial multiplication where I will present two algorithms for Schubert polynomial multiplication, which generalize Monk's rule in specific cases. This presentation summarizes an original capstone project that fulfills the final requirement of the Honors Program and summarizes collaborative research conducted with a faculty member made possible by an Honors Summer Fellowship.

*Faculty Mentor: Dr. Joseph Alfano*

***Efficiency of Energy Transfer in Rayleigh-Benard Convection***

Sean McGrath '18

Natural Sciences

The study of self-organization of complex systems has been of significant importance to the scientific community for a while now. Self-organization can be defined as a spontaneous formation of an ordered pattern from complete disorder. These patterns are formed in various systems throughout nature. One of the more recognizable patterns is the formation of convection cells, also known as Rayleigh-Benard Convection cells. When a liquid is evenly heated from the bottom and evenly cooled from its surface the liquid tends to self-organize into a pattern of hexagonal cells or a series of rolls with an upward flow of the hotter liquid from the bottom, and a downward flow of the cooler liquid from the top. In our experiments, we use a thermocouple that is attached to a copper plate and an infrared camera that is positioned directly above the plate to measure the temperatures of the hotter and colder fluid. A heater is attached to the bottom of the copper plate and voltages of 10 V – 80 V are introduced to heat the working fluid. The fluid we use is Silicone oil with varying viscosities (5 cst, 10 cst, 150 cst) and varying thicknesses (50 mm – 300 mm). Using ImageJ we analyze the thermal profile of each one of these experiments and calculate the entropy, dissipation of heat, and the work done on the sample during convection, which will give us the action efficiency of the energy transmission through each pattern. The principle of least action leads to a maximum action efficiency. The working hypothesis is that the energy rate density increases with increased action efficiency in the system, up to a limit. The nature of the dependency is the goal of this study. These results are compared to similar findings about this dependency in other physical systems in search for universality.

*Faculty Mentor: Dr. Georgi Georgiev*

## ***Novel Approaches to Tackling Antibiotic Resistance***

Emily Tomanelli '18

Natural Sciences

Bacterially caused diseases have plagued humanity for centuries. The recognition of the causative agents of these ailments (microorganisms) was the first breakthrough on the road to understanding and treating such diseases. The discovery of antibiotics in the early 20th century yielded the first curative treatment for bacterially caused illnesses. Antibiotics were seen as the “holy grail” of medicine. Today, with the increasing prevalence of antibiotic resistant bacteria and such infections, it is time to search elsewhere for treatment for drug resistant bacteria such as methicillin resistant *Staphylococcus aureus* (MRSA). Bacteria utilize many mechanisms to help circumvent the effects of antibiotics, leaving humanity with a dangerous scientific race to win. New ways to circumvent antibiotic resistance such as antimicrobial peptides, metal oxide nanoparticles, and quorum sensing approaches are techniques that show promise for effective treatment in the face of antibiotic resistance.

*Faculty Mentor: Dr. Soraya Betancourt-Calle*

## ***Correlations of Head Circumference, and Epilepsy Severity in Infants with Tuberous Sclerosis Complex***

Alexis Levine '18

Natural Sciences

This study tested if a correlation between head circumference and epilepsy in Tuberous Sclerosis Complex (TSC) could be confirmed. TSC is a rare genetic disorder, characterized by the occurrence of seizures and tubers (benign cellular abnormality that appears mass like on brain imaging). Epilepsy is often diagnosed in TSC positive children during the first year of life. We hypothesized that head circumference would correlate with epilepsy severity in infants with TSC. We examined clinical data from 121 infants diagnosed with TSC who were enrolled in a multi-site, prospective study. We calculated each infant's mean head circumference z-score across all study visits by comparing collected values with those reported by the World Health's Organization normal growth curve from 0 to 5 years. The overall mean head circumference z-score was 0.97 with no significant sex differences. The number of seizure types correlated with head circumference z-score. For example, infants with no seizures had a mean z-score of 0.57, those with 1 seizure type had a mean z-score of 0.88, and those with 2 or 3 seizure types had a mean z-score of 1.2. Thus, our hypothesis was supported. This data provides promise that a larger head circumference may serve as a biomarker for severe epilepsy, enabling earlier treatment for seizures, leading to improved neurodevelopment. This presentation summarizes an original capstone project that fulfills the final requirement of the Honors Program.

*Faculty Mentor: Dr. Michele Lemons*

## ***The Interaction between Macrophages and Adipose Stromal Cells in Pregnancy Related Breast Cancer during Lactation Increases Inflammatory Cytokines Production***

Noor Kawmi '18

Natural Science

Pregnancy associated breast cancers (PABC) are those that occur during pregnancy, lactation, or one year after giving birth. These cancers are more aggressive and have a poorer prognosis compared to non-PABC. Many changes happen to mammary gland cells during pregnancy and lactation. The milk producing epithelial cells expand, differentiate, and secrete milk. The stromal cells, which include adipocytes and immune cells, secrete proteins that aid in this process. In breast cancer, macrophages induce an immune response against the tumor cells by secreting proteins called cytokines that trigger inflammation. However, the crosstalk between immune cells and breast stromal cells is not well understood, especially during the lactating stage. It is also not well understood how this cross talk might affect the development or progression of PABC. In this research, we focus on the interaction between macrophages and adipose stromal cells isolated during lactation (ASC-L) since adipocytes have also been shown to secrete cytokines during times of stress. We hypothesize that the aggressiveness of PABC may be related to the interaction between ASC-Ls and macrophages. To test this hypothesis, we extracted RNA from three different sets of cells: macrophages cultured in isolation, ASC-Ls cultured in isolation, and macrophages co-cultured in the same plate as ASC-Ls. We performed RT-qPCR in order to assess the RNA levels of certain cytokines such as IL-6, CXCL1, CXCL5 as well as the matrix metalloproteinase MMP-9. Our results indicate

that RNA levels in all genes tested are significantly higher in samples isolated from co-cultured cells. Cytokines and MMPs contribute to faster proliferation, metastasis, invasion, and angiogenesis. Therefore, the elevation of their levels could ultimately explain the aggressiveness of PABC cancers.

*Faculty Mentor: Dr. Jessica McCready*

***Mammary Stromal Cells Present During Lactation Cause an Increase in Cellular Proliferation***

Christina Forrest '19

Natural Sciences

Pregnancy Associated Breast Cancers (PABC), or breast cancers diagnosed during pregnancy, lactation, and one year postpartum, have shown to be more aggressive than breast cancer diagnosed at any other stage of life. During pregnancy and lactation, epithelial cells are responsible for milk production. Stromal cells, such as adipocytes and immune cells undergo changes in order to support the growing nutritional and metabolic needs of the epithelium. The changes within the microenvironment during lactation may be related to this increase in tumor aggressiveness. Previous data from our lab indicates that co-culture of macrophages and adipose stromal cells present during lactation (ASC-Ls) causes an increase in secretion of inflammatory cytokines. These cytokines have been shown to cause normal cells to behave like cells found in the tumor microenvironment. We hypothesized that interactions between the macrophages and ASC-Ls cause an increase in the release of inflammatory cytokines, causing an increase in cellular proliferation and aggressiveness of PABC. To test our hypothesis, we performed proliferation assays in which Comma D cells were exposed to conditioned media isolated from ASC-Ls cultured in isolation, macrophages cultured in isolation, or a co-culture of ASC-Ls and macrophages. Our data indicate that proliferation of Comma D cells increases when they are treated with conditioned media from ASC-Ls and macrophages grown in isolation. There was no significant increase in proliferation however when Comma D cells were treated with conditioned media from co-cultured cells. Future experiments include different functional assays such as migration or invasion assays to investigate if co-culture conditioned media contributes to aggressiveness of PABC.

*Faculty Mentor: Dr. Jessica McCready*

**Presentation Session 5B**

**Tuesday, April 24**

**10:30 AM - 12:00 PM La Maison Hall**

***The Role Case Managers Play in Their Clients' Lives:***

***An Analysis of Case Managers' Viewpoints of Their Jobs and Their Clients***

Ryan Dalli '18

Sociology and Criminology

The research project looks at the role case managers play in their clients' lives, and analyzes case managers' viewpoints of their jobs and their clients. The research project is being conducted in a sheriff's office in the state of Massachusetts where a focus of responsibility, cognitive behavioral therapy, and in classroom environments help look to change a client's decision making and lifestyle. Prior research has explored the idea of punitive systems more than rehabilitative, and has not been able to decide which practice allows for better results for the clients. In-depth qualitative semi-structured interviews were conducted where case managers, supervisors, and sheriff office staff members were interviewed on the teachings of sheriff's office, a client's decision making, and a client's struggles and issues, and how these members of the sheriff's office work with clients. A total of eight interviews are expected to be conducted and after transcribing these interviews, the data should show how much of influence case managers have on their clients through rehabilitative programs.

*Faculty Mentor: Dr. Alison Cares*

## ***Factors That Contribute to a Parent's Inability to Comply with Their Child Support Orders***

Angela Gentile '18

Sociology and Criminology

A substantial amount of past research has shown that parents, mostly fathers, who failed to comply with child support payments were either unemployed, low income, incarcerated, suffered from a disability or mental disorder/illness, or the child support obligations were simply too high. In a majority of states in the U.S., state guidelines for child support compliance are often higher than fathers' actual income. The goal of this study is to uncover and evaluate why parents, whether custodial, non-custodial, or non-resident, are unable to comply with child support payments. Two methods, qualitative and quantitative, will be used in this study in order to collect data from subjects of this study: interviews and participant observation. Three interviews will be conducted: two with two Department of Revenue employees and one with a family court judge, all whom work with the court. In addition to these interviews, on-site observation will be done where behaviors of people in the court will be recorded, along with interactions between DOR employees and the public. Data collected from these methods will be analyzed using transcription and coding of both the interviews and the on-site jottings of interactions that are observed. Further policy implications should include lower state child support guidelines to accommodate lower-income parents who cannot comply with the currently high guidelines in the U.S.

*Faculty Mentor: Dr. Alison Cares*

## ***What Information or Behaviors do Prosecutors Want from Survivors of Domestic Violence and Sexual Assault?***

Raysa Guerrero '18

Sociology and Criminology

Many victims of sexual assault and domestic violence fear prosecution of their perpetrator, yet victim participation is extremely important for conviction. Prosecutors are important actors in the criminal justice system because they decide whether to charge a defendant and what crime to charge them with. Using open-ended interviews with professionals who work with victims of gender-based violence, this project seeks to gather their perspectives on what information or behaviors prosecutors want from victims in sexual assault and domestic violence cases. Gaining a better understanding of what prosecutors expect from survivors may help inform how victim services works with survivors who are engaged in the criminal justice process.

*Faculty Mentor: Dr. Alison Cares*

## ***Court Cases: Getting In and Out***

Cynthia Henderson '18

Sociology and Criminology

According to the Sixth Amendment, all citizens of the United States are guaranteed a speedy and public trial. While that seems quite simple, seeing that come to life proves otherwise. Each state has its own time standards on which their criminal proceedings must follow; however, very little research has been done on the effectiveness of these time standards and what it means for defendants. In this study, through participation observation and data collection, the length of criminal cases in one Massachusetts court was examined from when defendants have their arraignment date to when they're sent out to trial. During their journey within the criminal justice system, some of these court cases have experienced more court dates than others, but that does not take away from the fact that defendants are left in judicial limbo awaiting trial. While the courts may be moving as fast as they can, there needs to be something done for those who are waiting to be tried in these cases.

*Faculty Mentor: Dr. Alison Cares*

## ***Police Officer Attitudes about the Policing of Opioid Use***

Connor Henry '18

Sociology and Criminology

This research project's main goal is to dive deeper into police opinions about the recent opioid crisis. This opioid epidemic takes millions of lives every year and police are at the forefront of enforcing the problem. As a

country, especially when it comes to opioid addition, we have moved away from a war on drugs to a more rehabilitative state. We have seen decriminalization of marijuana in several states, and the use of Naloxone by many police departments. What have the police observed with this new age policing, and how do they feel about what they are doing? Is there a differences in opinions between officers with more time on the job compared to younger, more progressive officers? In order to look deeper at these opinions, five police officers from each of the two groups, (five or less years and ten or more years) from a municipal police department in Massachusetts were interviewed. The findings should show how this epidemic has been frustrating for police officers but they want to see people get better if they have the chance to, rather than be incarcerated. Seeing a change in policing to a more rehabilitative state, and how younger officers are focused on rehabilitation shows how there have been great strides taken by law enforcement to help an epidemic.

*Faculty Mentor: Dr. Alison Cares*

### ***How Does Parental Education Affect Children?***

Samantha Konan '18

Sociology and Criminology

Using secondary data, I will compare and contrast the effects of children's mental health and educational achievement based off of their parent's educational level. I want to examine whether or not low parental education will affect the child, and if so, in what ways. "Maternal education is linked significantly to children's intellectual outcomes even after controlling for a variety of other SES indicators" (Duncan & Brooks-Gunn, 1997). Low parental education makes for a tough situation within a child's school experiences to begin with, simply because they typically won't be educated enough to help the child with their school work, homework, extra-credit etc. Studies show parental education not only has an effect on the child's education, but their behaviors as well (Dubow, Boxer, & Huesmann, 2009). These behavioral problems may lead to issues with a child's academic and intellectual development, as "they affect young children's opportunities to learn because these youths often are punished for their behavior and might develop conflictual relationships with teachers, thus socioeconomic status (including low parental educational levels" (Dubow et al., 2009). My sample will be juvenile delinquents in the Fitchburg Courthouse, but blinded data will be used.

*Faculty Mentor: Dr. Alison Cares*

### **Presentation Session 6A**

**Tuesday, April 24**

**12:30 PM - 2:15 PM La Maison Salon**

### ***Worcester Multi-Family House Market Price***

ZhiChao Chen '18

Economics and Global Studies

This research examines how the change of 30 years mortgage rate impacts the Multi-Family house market price in Worcester city. In the study, there will be both economic variables and physical variables that will influence market house price. The purpose of this research is to gather all the variables that might impact the House Market Price of Worcester, examine the variable coefficient with sufficient P-Value, and develop a linear regression to predict the future trend of Multi-Family Worcester Housing Market using python machine learning. To perform this research, I will gather all the data from Multiple Listing Service from 2001 to 2017. All the observations will be reflecting the market price, which means a licensed professional has exposed the property to the market. The dataset will not include For Sale by Owners or "in-house" transaction. I also gathered the economic variables through 17 years, based on the sold date of the property to associate the economy variable with all the physical variables. There will also be dummy variable for the zip-code because in the city of Worcester there are different areas and school systems. However, there will be variables that may impact the house prices that I am not able to measure, such as hours to work and school system. The expectation is that using python pandas' library to handle the dataset and using Scikit-learn machine learning to develop a linear regression, we can examine the change in property market price according to the rate change.



***Doing History: What I Learned as a Guest Curator for a Digital Humanities Project***

Jonathan Bisceglia '18

History

The *Adverts 250* Project invites students who have a passion for digital humanities to serve as guest curators. This project features short essays in which students examine advertisements from 250 years ago to see what consumer culture was like eighteenth-century America. However, the project goes far beyond this. Guest curators have to analyze each advertisement not only understand what the advertisement attempted to sell but more broadly how that related to the larger context of social, political, and economic history in the colonies. This project delves deep into working with documents from 250 years ago to decipher the past. Serving as a guest curator provided an outlet for creativity, but it also developed practical insight into what it is like to work as an historian.

Faculty Mentor: Dr. Carl Robert Keyes

***Using Newspaper Advertisement to Examine Education in Colonial America***

Mary Bohane '18

History

The *Adverts 250* Project gives a glimpse into what consumers 250 years ago were buying and what they considered to be the necessities of daily life. As a guest curator for the project, I examined an advertisement for a school teaching “BRANCHES of LITERATURE” as well as “several PARTS of the MATHEMATICKS.” In today’s age, it seems hard to imagine a world without public schools considering that most students attend public schools. However, for much of the colonial period, private institutions run by individuals were the only option for education in many places. These early American institutions provided the foundation for generations of educated men and women. Education began at the home, typically as the responsibility of the mother, and, as the children grew older, became the father’s task; children could often read quite well before receiving any additional tutoring outside the home and Christian values often went hand in hand with their daily lessons.

Faculty Mentor: Dr. Carl Robert Keyes

***Coffee and the Colonies***

Kurt Falter '18

History

It’s no exaggeration to say that Americans today run on coffee. Whether it’s a plain cup of black or some specialty flavor, coffee is something that American society can’t get enough of. In that regard, Americans continue consumption habits that began in the colonial period. Examination of colonial newspapers reveals that coffee was a highly desired commodity. Its production and marketing reveal a broad picture not just of the trade itself, but also how it fit in with other aspects of Britain’s colonial empire. From its dependence on the transatlantic trade to the utilization of slave labor, the coffee industry of the colonial period became closely connected with many economic trends in the transatlantic world.

Faculty Mentor: Dr. Carl Robert Keyes

***Advertising an Influential Pamphlet: Politics and Print Culture in Early America***

Zachary Karpowich '19

History

The *Adverts 250* Project examines American history through the advertisements published in newspapers 250 years ago. By looking at what was running in advertisements we can gain a better understanding of what was happening at the time. This presentation focuses on one advertisement that I selected for the project, a notice in the *Pennsylvania Gazette* for a pamphlet containing the influential “Letters from a Farmer In Pennsylvania.” These “Letters” were a series of essays written by John Dickinson and published in newspapers. He published these essays under the pseudonym of “A Farmer” from 1767 to 1768. In these essays Dickinson makes an impassioned

defense of the colonists and how the Townshend Acts were an abuse of power by the British government. Dickinson acknowledges the authority of Parliament in regulating trade, but he makes a case that the men and women of the colonies were sovereign when it came to internal affairs in the colonies. He denounced the acts of Parliament as unconstitutional. These essays were popular. Some historians consider them the precursors to Thomas Paine's *Common Sense*.

*Faculty Mentor: Dr. Carl Robert Keyes*

### ***Eighteenth-Century American Newspapers and an Assortment of Advertisements***

Anna MacLean '18

History

This presentation features my experiences working on the *Adverts 250 Project* alongside several classmates in the Public History class. A revealing glimpse into the life of early American colonists can be found in the advertisements that appeared in the newspapers published 250 years ago. Colonists used these advertisements in order to fulfill a number of motives. Sellers looking to attract buyers placed many eighteenth-century advertisements. Those notices often highlighted a commodity for sale to the general public, such as tea or alcohol. Another type of advertisement found within eighteenth-century newspapers was dedicated to the buying and selling of slaves. Authors of those advertisements often included the many skills and trades practiced by slaves as means of attracting buyers. The story encoded within each advertisement tells a great deal about American colonists. My commentary and analysis published by the *Adverts 250 Project* helped me better discern what these stories might be. In the same way, I hope my work will help readers gain a greater understanding and appreciation for the advertisements in their historical context.

*Faculty Mentor: Dr. Carl Robert Keyes*

### ***Europe Transposed: German Settlers in Colonial America***

Sean Sullivan '18

History

Many people typically refer to the original thirteen colonies as the "English Colonies." One popular narrative concerns only the mother country and her scions' discontent with their treatment. In that rendition of the story, the entire Revolution is a decidedly English affair. This is, however, an obfuscation of the reality of the composition of the colonies. Englishmen and others from the British Isles were not the only ones settling in England's North American colonies. Dutch, French, and German settlers, among others, were all participants in the early American experience. In studying the early German community in Pennsylvania through its newspapers, we see that this was a vibrant community that made a home among Englishmen and others, contributing experiences and talents to this colony and region and thus shaping what it would become in the years before and following the Revolution. This presentation will concern the early American German community and how it found its place in the world of colonial America.

*Faculty Mentor: Dr. Carl Robert Keyes*

## **Presentation Session 6B**

**Tuesday, April 24**

**12:30 PM - 2:15 PM La Maison Hall**

### ***Technology in Policing***

Korlu Jallah '18

Sociology and Criminology

Technology has become so essential to our everyday life, that it has become a natural component of our personal and work life. In recent years, the rapid development of technologies has led police departments to adopt new and modern ways of managing crime. The purpose of this research was to look at how the use of technology, specifically surveillance cameras, ShotSpotter, and social media, impact police

practices. Participants in this study were recruited from a municipal police station in Massachusetts. This study used semi-structured in person interviews to explore police officer attitudes towards the use of technology such as surveillance cameras, ShotSpotter, and social media for crime solving and crime prevention. This study this may help to expand our knowledge of how police view technology, which can be used to help inform future decision-making regarding implementation of technology.

*Faculty Mentor: Dr. Alison Cares*

### ***How Has Intelligence and Case Management Software Influenced Perceptions of Police Work?***

Alexander Lorusso '18

Sociology and Criminology

Technology has changed the way police work is done and the way crimes are being solved. Some changes in technology include the use of DNA evidence, fingerprints, cameras, video, and case management systems. Case management systems like ACISS, which is an intelligence and case management system, allow law enforcement to better analyze and make connections of names and other important information more effectively which gives them a better chance at solving cold cases. This process can be long and can take several months and a lot of people, but it contributes to the ability of law enforcement to be better provided with resources that were previously lacking when the original investigation was done. The process for adding information to the database involves reading through paper documents and evidence, analyzing them, and converting them into online files that can be searched by keywords by law enforcement officials. Data will be collected by recruiting participants from a District Attorney's office by means of interviewing. Participants will be recruited based on their roles as supervisors and those who are familiar with the system. They will be interviewed to get their feedback on how they think technology, specifically case management systems like ACISS, has changed their job.

*Faculty Mentor: Dr. Alison Cares*

### ***Internship Satisfaction: Internships for Choice Compared to Internships Required by Class***

Shannon McMillan '18

Sociology and Criminology

Many students engage in internships while they are in college. Some of these students choose to participate in an internship because they want the experience, while other students are required to participate in an internship for their major or minor. Students from four majors/minors will fill out surveys based on whether or not they have participated in an internship, and whether it was required. Based on these questions, the students will also be asked about whether they were satisfied with their internship. I will then evaluate whether the students are more satisfied based on whether they chose their internship or were required to have their internship.

*Faculty Mentor: Dr. Alison Cares*

### ***Stress Training in Police Academies***

Jamie Mickiewicz '18

Sociology and Criminology

The extent of my research is to further examine the self-care curriculums, policy, and stress training required within police academies and for police officers later in their career, as policies change and improve. The purpose of this research is to show whether or not academies are providing proper tools for law enforcement officers to cope and deal with the everyday stresses of working in the line of duty. To perform this research, I will be completing a content analysis of data within a police academies curriculum, from different regions throughout the country. The background suggests that there is a correlation between officers being exposed to a high frequency of highly stressful events on a day to day basis, with developing stress disorders or difficulty coping. It stresses the importance of proper training and safe outlets where these officers can regroup.

*Faculty Mentor: Dr. Alison Cares*

### ***Differences in Self-Representation by Client Gender***

Aidan Murphy '18

Sociology and Criminology

The main goal of this research project is to understand how individuals of different genders present themselves to court support staff members. While working in the Worcester Court Service Center, I have interacted with many different types of people, and have seen them present themselves in numerous ways to the court staff members. A court staff member is a mediator between the litigant and the court. The way in which people interact with court members shows how confident or nervous they are in their case or with their knowledge of the court system. My research is to study the mental and emotional states of those who come to the court service center while also analyzing their physical appearance to gauge their perceptions of the court and their confidence. While performing this research I will also analyze the differences between the male and female genders with how they present themselves. I will keep this research in a confidential notebook and not record any identifying details of the individual for their ambiguity. Understanding how people present themselves in the court system can provide viable feedback as to how the court can adapt and help their litigants have better experiences in the court.

*Faculty Mentor: Dr. Alison Cares*

### ***The Opioid Crisis: Drug Offenders and Recidivism Patterns***

Patrick Ward '18

Sociology and Criminology

The purpose of this study is to collect and analyze data that pertains to recidivism patterns among individuals who have been convicted of a drug offense. As an intern for a police detective unit at the state level, I have been exposed to an extensive amount of information about various criminal activities and the individuals who engage in this type of behavior. Since the subjects of this study have been convicted of some type of drug offense in Worcester County, I will analyze the necessary data and gain a stronger understanding of the recidivism patterns associated with this type of crime. The goal of this research is to determine the commonality of recidivism for drug offenders in Worcester County and then compare it to the national recidivism rates for this type of offense. If we can confirm the significance of this issue through our examination of the data collected, then we will be able to propose alternative methods of punishment and reintegration plans for drug offenders. By introducing these new methods, we hope to proactively diminish high patterns of recidivism among these types of offenders.

*Faculty Mentor: Dr. Alison Cares*

### ***Juvenile Delinquency and Rehabilitation in the Criminal Justice System***

Matthew Yanczewski '18

Sociology and Criminology

Juvenile Delinquency and Rehabilitation in the criminal justice system has been a form of deterrence for future offenses by kids who have been recently "incarcerated". The significance of studying these institutions that help juvenile offenders is important because they are trying to guide and help troubled youth reintegrate into society and stay away from reoffending. Through this research, I will be looking into how employees within the Department of Youth Services view their line of work and if they see it as meaningful and effective. Data will be collected through semi-structured qualitative interviews lasting about 30 minutes in length. Some preliminary findings have shown that there are conflicting views on the effectiveness the Department of Youth Services has on their youthful clients.

*Faculty Mentor: Dr. Alison Cares*

**Poster Session**  
**Tuesday, April 24**  
**2:00 PM - 4:00 PM Testa Atrium**  
**(in order of discipline)**

***Holmes and House: On Friendship and Addiction***

Michela Lavin '18

English

This project looks at Sir Arthur Conan Doyle's character, Sherlock Holmes, and the television character, Gregory House, from *House, M.D.*, a popular program that ran for eight seasons. The latter character is based on Conan Doyle's famous detective. There are several striking similarities and characteristics that connect the two. Both eccentric characters have exceptional talents that are accompanied by quite a few significant flaws. This project, in the form of an anthology of various Sherlock Holmes stories and *House M.D.* episodes, evaluates the psychological motivations behind each character's actions and how their success in their fields of expertise does not come without sacrifices. Specifically, this project looks at how struggles with addiction plague both of these characters and places a significant strain on the few close relationships each character is able to maintain. Holmes and House both seem to only have one true friend, Watson and Wilson, respectively, and addiction causes strife in the one friendship each character has.

*Faculty Mentor: Dr. Becky DiBiasio*

***Understanding Brain Development through Worms***

Joselyne Alvarez '19

Natural Sciences

During normal human brain development, neurons form trillions of synapses, specialized sites of neural communication. These complex, numerous and very small synapses are essential for brain function. Our studies aim to understand the molecules important for proper synapse formation. To do so, we have employed the nematode, *C. elegans*, due to its powerful genetics, limited and defined set of neurons, and transparency; all of which provide a unique opportunity to view synapses in vivo. We have focused our efforts on extracellular ligands of a family of transmembrane receptors called integrins, which are present at synapses in humans and worms. We are currently creating novel *C. elegans* strains that will enable us to view fluorescently tagged synapses in integrin ligand mutant worm strains including cle-1. Therefore, we will analyze the differences between the synapses in the integrin ligand mutant strains from the synapse in wild type strains. Thus, we hope to clarify the role of integrins in the development of neuronal synapses.

*Faculty Mentor: Dr. Michele Lemons*

***Optimization of 5-Hydroxytryptophol***

Marissa Gifford '18

Natural Sciences

The organic molecule 5-Hydroxytryptophol (5-HTOL) is a metabolite of serotonin. Serotonin is a neurotransmitter made in the body that affects many different pathways such as mood stabilization, digestive regulation, sleep, and memory. Serotonin is broken down into the body to form 5-HTOL and can be used as a marker of recent alcohol consumption in urine. The molecule 5-HTOL is expensive to purchase, costing \$225 for 100mg. The goal of the project was to synthesize 5-HTOL in a cost effective manner and attain a high yield during the process, specifically using the Fischer Indole synthesis. This process entailed a series of reactions. The reaction scheme began with Iodophenol and a benzyl group was added to it. The percent yield for this reaction was 44.7%. Next, this molecule was joined to Boc-protected hydrazine using a copper-catalyzed reaction. The percent yield was 38.5%. The Boc group was then removed and replaced with NH<sub>2</sub>. This molecule underwent the Fischer Indole synthesis in order to create a second, 5 membered ring, onto the molecule. This had a percent yield of 71.7%. The last step was to remove the benzyl group that was added in the beginning and replace it with an

alcohol (OH) group. During this process, it was found that a column was the best way to purify the product after most steps. The column purification process caused the Fischer Indole synthesis to have the highest yield, which was a main goal of this research.

Faculty Mentor: Dr. Elizabeth Colby Davie

**Characterization of a Protective Angiogenic Mechanism Triggered by the Heart Pathogen *Trypanosoma cruzi***

Brittany Goncalves '18  
Natural Sciences

Chagas Disease affects mostly the poor in many Latin American countries. The Triatomine bug transmits the parasite *Trypanosoma cruzi* (*T. cruzi*) through its feces. The stages of the disease are: Acute Phase (Peak of Parasitemia), Indeterminate (Symptom free), Chronic Phase (Low Parasitemia). *T. cruzi* has an outer membrane protein called PDNF (Parasite-Derived Neurotrophic Factor), which leads to the activation of survival receptors of the neurotrophin family TrkA and TrkC. *T. cruzi* targeting of the heart leads to structural and functional alterations in acute and chronic infection. About 30% of Chagasic patients develop chronic Chagas cardiomyopathy (CCC), an incurable and lethal condition. Angiopoietin-like 4 (ANGPTL4) is a protein that facilitates keratinocytes migration and wound epithelialization and promotes tissue healing via integrin/JAK/STATs pathways. The production of nitric oxide is upregulated causing angiogenesis leading to accelerated wound healing, important in heart hypoxia and in diabetes. Previous RNA seq analysis of primary cardiac fibroblasts by the Perrin Lab revealed that *T. cruzi* and PDNF significantly changes gene expression of ANGPTL4. The aim of this project is to identify the optimal dose of PDNF that upregulates ANGPTL4 in cardiac fibroblasts using qPCR technology and to determine whether ANGPTL4 is altered in a mouse model of acute Chagas disease. This presentation summarizes collaborative research conducted with a faculty member made possible by the Building Diversity in Biomedical Science program at Tufts University.

Faculty Mentor: Dr. Jessica McCready

**Identification of a *Bacillus* Species Isolated from a Doorknob Using Staining Techniques, Growth Characteristics, Genetics, and Respiration and Metabolic Assays**

Alysha McGovern '19 and Brittany Goncalves '18  
Natural Sciences

The ability to identify bacteria is crucial in numerous fields, such as the healthcare industry and the food industry, because it allows for the determination of a bacterium's pathogenicity and the methods that can be used to control its growth, therefore preventing infections and cross-contamination. The goal of this study was to identify a bacterium isolated from a doorknob in Testa Science Center. The structural and growth characteristics, respiration and metabolism types, and genetic sequencing data of the bacterium were used together to determine the identity. The bacterium was determined to be a species of *Bacillus*, most closely related to *Bacillus megaterium*. The bacterium was discovered to be a gram-positive diplobacilli that prefers warmer aerobic environments, with 37°C to 45°C being the optimal temperature range for growth. The bacterium grew best on nutrient agar with a pH of 6.8. It was found to be able to catabolize glucose, hydrolyze gelatin, decarboxylate ornithine, ferment sucrose, hydrolyze starch, and ferment mannitol.

Faculty Mentor: Dr. Aisling Dugan

**Observing Interspecific Competition and Habitat Preference of Fern Species at Assumption College**

Susanna Jacobsen '18 and Alexandra Olah '18  
Natural Sciences

Ferns are highly abundant in the wetlands of the Northeast - found on riverbanks, roadside ditches, and anywhere with general moisture. This is no exception at Assumption College, where many ferns can be observed near streams and in relative low areas. Based on the findings of fern populations around campus, three transects were selected near a stream between LLC and South Hall (42°17'45.9"N 71°49'53.5"W). Transects consisted of 15 m by 1 m plots with fifteen 1 m x 1 m grids. Fifteen soil samples were taken from the first transect (one from each grid) and dried to a constant mass. The soil samples were measured for percent moisture and total fern and total

species counts were obtained from all three transects. Based on the total fern count, specific data analysis focused on the populations of two fern species along the transects; cinnamon and sensitive ferns. From the study, it was found that as the distance from the stream increase, fern density and percent of soil moisture decreased. It was also found that the number of fronds per cinnamon fern plant decreased as soil moisture decreased. This suggests that ferns need higher concentrations of soil moisture in order to survive. Lastly, the population of sensitive ferns significantly decreased around meter 5 as the population of cinnamon fern significantly increased. This relationship between species suggests that there may be interspecific competition between the two species.

*Faculty Mentor: Dr. Owen Sholes*

### ***New Approach on Analyzing Efficiency and Size Trends in Evolving Computer Architecture***

Noor Kawmi '18

Natural Sciences

We propose a new way of analyzing CPU data in order to study trends in technological evolution. We aim to find the role that the Principle of Least Action plays in increasing efficiency of complex systems such as CPUs. We analyze the existing data using nonlinear regression methods. In our analysis we observed that the data follows two different trends. Such an insight was absent from the empirical analysis in the existing literature. The empirical analysis was carried out by using log-transformed data points on a linear scale. This was done by plotting different, direct and derived, parameters for a wide array of CPU architectures, and looking for trends in the graphs. We found out that points on most of the graphs do not fit into a single fit-line. In fact, those points seemed to change slope around a certain region that corresponds to the introduction of the Pentium generation of the CPU models in the year, 1994. Thus, the nonlinear regression model fits the points with two different allometric fits each having a different slope.

*Faculty Mentor: Dr. Georgi Georgiev*

### ***Investigating the Immune Response of RAW 264.7 Macrophage Cells to Serratia marcescens Infection***

Alyssa Masciarelli '18 and Alora Piela '18

Natural Sciences

*Serratia marcescens* used to be considered a non-pathogenic bacterium, however new antibiotic resistant strains have caused this microbe to cause some hospital-associated infections. *Serratia* is a member of the *Enterobacteriaceae* family, and thus is a mobile, non-endospore forming, gram- negative rod-shaped bacterium. This opportunistic pathogen has a mortality rate of 37% and has been found to cause infections such as pneumonia, bacteremia, osteomyelitis, and endocarditis in adults and blood stream infection, urinary tract infection, and meningitis in neonates. *Serratia* isolates have also been known to interfere with macrophage function or viability. In this study, we use RAW 264.7 cells which are from a mouse macrophage cell line used as models for human macrophages. This in vitro model allows us to investigate mammalian immune response to *S. marcescens*. We investigated the ability of RAW mouse macrophage cells to phagocytose, chemotax, produce cytokines, transduce intracellular signals, and undergo oxidative burst after being challenged with the *S. marcescens*. This study will reveal more about how the immune system responds to *S. marcescens*, which could help gain insight into the pathogenesis of bloodstream, lower respiratory tract, urinary tract, surgical wounds, and soft tissue infection.

*Faculty Mentor: Dr. Aisling Dugan*

### ***Genetic Screening of Bacillus thuringiensis Crystal Protein Cry14A for Resistance in Free Living Nematode C. elegans***

Eva Mlynarski '18

Natural Sciences

Soil-transmitted helminths (STHs), most notably, hookworms, whipworms and *Ascaris*, are nematodes that infect more than 1.5 billion people and are a leading cause of morbidity worldwide. Only one class of deworming drugs (anthelmintic) are commonly used in mass drug administrations. New anthelmintics are urgently needed to overcome emerging resistance and produce higher cure rates.

Current literature reports have demonstrated that crystal (Cry) proteins produced by a gram positive

sporulating soil bacterium *Bacillus thuringiensis* (*Bt*) have great potential for the development of novel and powerful anthelmintics. The free living nematode *C. elegans* has been used to study the mechanisms of action of Cry protein toxicity and how the innate immune system protects against a bacterial toxin attack. The goal of this study was to expose *C. elegans* to *Bt* crystal protein Cry14 to investigate the toxicity and molecular mechanisms of action by which parasites develop resistance to it. This study will illustrate bioactivity of Cry14A on *C. elegans* in terms of lethality, developmental inhibition and production inhibition, along with a forward genetic screening to identify Cry14A resistant *C. elegans* mutants.

*Faculty Mentor: Dr. Soraya Betancourt-Calle*

### ***Investigating the Biodiversity of Isolated Soil Algae from a Range of Southern New Hampshire Peaks***

Dominique Shepard '18

Natural Sciences

Algae are located in a wide range of habitats such as freshwater, saltwater, rocks, and soil. They belong to various evolutionary groups but are generally characterized as photosynthetic organisms that lack stems, leaves, and roots. In comparison to plants, algae are less complex structurally, but still diverse in morphology. The purpose of this independent study is to explore the biodiversity of algae isolated from Southern New Hampshire areas. Individual colonies from different algae strains were isolated and examined microscopically to determine the morphological characteristics.

Based on the microscopic images, the strains were categorized by cell size, color, and cell shape. From this information, distinct strains were selected for PCR amplification, DNA sequencing, and phylogenetic analysis. It was expected that the findings from this experiment would indicate that the morphologically distinct strains belonged to different genera and species of green algae. The data was formatted into a phylogenetic tree in order to further understand the biodiversity of the selected soil algae samples and their corresponding taxonomy.

*Faculty Mentor: Dr. Karolina Fucikova*

### ***Path Formation in a Complex System***

Jocelyne Tamayo '18

Natural Sciences

We propose an agent-based simulation model of non-interacting particles within a closed system. The system thus defined can be thermodynamically described as a canonical ensemble. The statistics of the system, in such a state, when an interacting field is absent, shows a symmetrical distribution of the agent parameters. On introduction of an internal interaction field, the system, which earlier was in a state of disorder was driven to a state of order. A thousand simulations were run in order to quantify the emergence of order in the system. Steady-state statistics of the simulations reveal the appearance of an exponential decaying tail for the agent parameters. This result can be used to understand the evolution of the system, which was initially random and uncorrelated, into an ordered, strongly correlated system. The interplay between a completely random state and an ordered state is used as a metric to quantify the magnitude of complexity of the system.

*Faculty Mentor: Dr. Georgi Georgiev*

### ***A Novel Cryptic Species of Green Algae from the California Desert***

Melissa Taylor '18

Natural Sciences

Green algae are a diverse group of plant life, yet are still vastly understudied compared to land plants. For many years, these algae were characterized through their morphology and life cycles. It has since become apparent that a better understanding of their evolutionary and phylogenetic history can be obtained through phylogenetic and genomic analyses. A desert strain of green algae, referred to as WJT24VFNP31, was isolated from Joshua Tree National Park (JTNP) in southern California as part of a larger biodiversity survey. The alga's organellar genomes were sequenced, annotated, and used for phylogenetic analysis. A morphological analysis of the algae was conducted to determine its phenotypic characteristics such as size, number of chloroplasts, flagellation, and number of nuclei. Although morphologically this strain is consistent with the coccoid genera *Bracteacoccus* and *Pseudomuriella*, phylogenomic analyses demonstrate that it is not closely related to any other



known green algal species. As a result, we propose that WJT24VFNP31 be placed into its own new species and genus in the class Chlorophyceae. By studying cryptic green algae, such as WJT24VFNP31, a better understanding of the biodiversity of JTNP and green algae in general can be obtained. This presentation summarizes an original capstone project that fulfills the final requirement of the Honors Program.

*Faculty Mentor: Dr. Karolina Fucikova*

### ***The Ecophysiology of Soil Algae***

Emily Tomanelli '18

Natural Sciences

Using desert, temperate and arctic strains of *Bracteacoccus bullatus* the stress response to UV radiation, heat, and cold was assessed. The algae were plated on antibacterial/antifungal BBM media with goat manure extract. Each experimental group was subjected to 2 levels of stress: moderate (A) and severe (B). UV exposure variables were 2 (A) and 6 (B) minutes. For heat shock, samples were exposed 30 minutes (A) and 1 hour (B). For cold shock, samples were frozen for 15 (A) and 30 (B) minutes. After a two-week growth period, cells were assessed for size and pigment production via microscopy and TLC. It was hypothesized that the desert and arctic strains would be least affected by stress conditions because their native environment consists of varying levels of UV light and drastic temperature changes. Preliminary assessment suggests in terms of all three stresses, the desert strain of *B. bullatus* is least affected, the arctic strain moderately affected, and the temperate strain least tolerance to these three stresses.

*Faculty Mentor: Dr. Karolina Fucikova*

### ***Understanding the Role of Integrin Ligands in Spine-like Projection (SLP) Development***

Nicholas Villani '18

Natural Sciences

The human brain has over 87 billion specialized cells, called neurons, that are essential to brain function. Neurons communicate to each other and to other cells via specialized regions known as synapses. Synapses include structures called dendritic spines which are critical for receiving signals and are integral to processes such as learning and memory. This project employs the nematode, *C. elegans*, to study dendrites because of several advantages including powerful genetics, the ability to view dendrites in a living animal, and a fully mapped nervous system. Similar to human dendrites, *C. elegans* dendrite formation relies on several molecules including the family of heterodimeric transmembrane receptors, called integrins. Our studies aim to more fully characterize integrins role in dendrite development by examining integrins' downstream effectors. We are developing strains of worms that express fluorescently tagged dendrites in the background of specific mutant strains with defective integrin downstream effectors. We will use fluorescent microscopy to analyze which genes are important to dendrite formation. We expect to unravel which integrin downstream effectors are essential to proper dendritic development.

*Faculty Mentor: Dr. Michele Lemons*

### ***Exploring the Relationships between Social, Motor, Emotional, and Sensory Development in Childhood***

Lindsay Gomes '18

Psychology

Social skills and interaction are critically important for learning, family and peer relationships. Social behavior is dynamic and involves a variety of social communication activities. Consequently, research is needed that explores the relationships among various developmental domains to better understand developmental change. The goal of this pilot project is to explore the relationships between social behavior and sensory, cognitive, motor, and emotional/mental health development in typically developing children between the ages of 6 and 12 years old. We asked participants to engage in tasks designed to measure the aforementioned domains. Correlations were conducted to evaluate the relationships between the seven social measures and the motor, cognitive, sensory, and emotional/mental health measures. Our preliminary results show that social behavior is related to sensory, cognitive, motor, and emotional/mental health measures in typically developing children. Conversational skill was correlated with age, suggesting that as children age they increase the amount of

participation they have in conversations. Conversational skill was also negatively correlated with one measure of cognitive development and one measure of motor development. Multiple parental-report measures of social skill were related to sensory, cognitive, and emotional/mental health measures. These inter-relationships suggest that a comprehensive approach to monitoring behaviors across dimensions is important even in typically developing children because behaviors in one domain may have unexpected consequences in other domains. Interestingly, our measure of conversational skill was not correlated with the other social measures included in this study. These findings have important implications for monitoring development across multiple domains in typically developing children.

*Faculty Mentor: Dr. Paula Fitzpatrick*

### ***Cyberbullying as a Form of Dehumanization***

Julia Merchant '19

Psychology

Our poster will present a critical literature review of research on cyberbullying and dehumanization. The internet can enhance feelings of anonymity and invisibility, which can lead people to act in ways they might not if the interpersonal exchange was in person. People online often demonstrate in "disinhibition," which is the loosening of social restrictions and inhibitions that are present in face-to-face interactions. This disinhibition can be toxic, which refers to acting out without any personal growth, or benign, which refers to acting out to attempt to better understand and develop oneself. Social media is known to increase people's feeling of social connection to their peers. Surprisingly, studies show that feelings of social connection can enable dehumanization of out-group members. This paper will review scientific literature on the relationship between cyberbullying and dehumanization, including the contributions of anonymity, disinhibition, and social media.

*Faculty Mentor: Dr. Sarah Cavanagh*

### ***Emotional Expressiveness in Families at Risk for Postpartum Depression***

Holly Olson '18

Psychology

Mothers' Postpartum Depression (PPD) has been shown to negatively impact mothers' parenting quality, relationships with their children, and hinder infants' attachment and other aspects of their development. In contrast, relatively little is known about the impact of paternal PPD on child and family functioning and specifically on family expressiveness. Previous studies found that depressed parents express more negative emotions compared to nondepressed parents, but it is unclear whether and how parental PPD impacts families' emotional expressiveness as a whole. The present study used parental self-reports as well as observations of whole family expressiveness with a sample of 26 pregnant couples. Family expressiveness was observed longitudinally during the prenatal and 3-month Lausanne Trilogue Play (LTP) and coded using global scales to capture whole family, parental and infant expressiveness. Parental reports of expressiveness were also assessed using Halberstadt's SEFQ. Findings indicated that families with mothers who had PPD expressed fewer positive emotions and more frequent and intense negative emotions compared to families without maternal PPD. Parental reports and observations of family expressiveness were overall not consistent suggesting that future studies should include observations as well as parent-reported measures of expressiveness. This presentation summarizes collaborative research conducted with a faculty member made possible by an Honors Summer Fellowship.

*Faculty Mentor: Dr. Regina Kuersten-Hogan*

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**Next year's Symposium will be held on  
Monday, April 22 & Tuesday, April 23, 2019**

*Please mark your calendars!*

**“Knowing is not enough,  
*We must apply.*  
Willing is not enough,  
*We must do.”***

- Bruce Lee, quoting  
Johann Wolfgang von Goethe

