



**7<sup>th</sup> Annual Undergraduate Research Conference**  
**Saturday, September 23, 2017**

**2017 Abstracts**

**Skidmore College**  
**Saratoga Springs, NY**

Presentation Abstracts are at [newyork6.org/students/resources](http://newyork6.org/students/resources)

## 9:45-10:45 am Oral Presentations

### *Palamountain 201*

#### **Zongliang Ji, Union College, 2019, Computer Science & Math, Explore Fast Multiplication Algorithms**

ABSTRACT: My summer research project was to find a more efficient matrix multiplication algorithm by locating a relatively big mathematical object called a uniquely solvable puzzle (USP). We implemented and iteratively improved algorithms for checking and searching for USPs using dynamic programming techniques in C/C++. We also enabled our code to run on the Union College Jupiter cluster by using a high performance computing library. By the end of the summer, we had found a USP with dimensions 6 by 14 that should yield a run time of  $O(n^{2.44})$  for the matrix multiplication algorithm.

#### **Giorgos Petkakis, Skidmore College, 2018, Computer Science, Mining Code in Search of Reason**

ABSTRACT: The Web Ontology Language (OWL) is a semantic specification which defines formal logical constructs allowing web sites to find information and connect facts from computers on the Internet. Every day search engines like Google use OWL-based software to seamlessly combine maps, events, locations, venues, weather conditions, and more. A limitation with using OWL more broadly is the lack of a freely available computer programs implementing the complete specification. Our project's goal was to extend Apache Jena, a free, albeit non-comprehensive, software library for OWL. We used a basic logic problem as our Jena test case to identify which OWL constructs were missing. As we began exploring Jena, we discovered that our understanding of its design was incomplete. We gained an appreciation for its extensibility, which comes at the cost of significant complexity. This presentation will focus on key aspects of semantic technologies, OWL, and key concepts involved when implementing computer software to support reasoning.

#### **Natasha Turyasingura, St. Lawrence University, 2018, Biochemistry, The role of USP8 in lymphocyte activation**

ABSTRACT: The activation of lymphocytes is an essential event in the body's immune response to an infection. The proliferation, activation and survival of lymphocytes is tightly governed by a variety of cell signaling pathways, which control the expression of specific genes when the antigen receptor is triggered. The NF- $\kappa$ B pathway is one of the pathways implicated in the activation, survival and proliferation of lymphocytes. One important element in this signaling pathway is the formation and activation of the CARMA1-BCL10-MALT1 (CBM) complex. The MALT1 protein (mucosa associated lymphoid tissue translocation protein 1) has both scaffold and protease functions. Understanding the regulation of MALT1 protease activity could offer novel therapeutic treatments for patients of diffuse large B cell lymphomas of the Activated B cell sub-type, which are dependent on constitutive NF- $\kappa$ B activity. The protease activity of MALT1 is controlled by the addition of ubiquitin, but the regulation of this process is not known. We studied an enzyme (USP8) which has been identified to be a binding partner of MALT1 and is also known to remove ubiquitin. We found that overexpressing USP8 in cells has no effect on MALT1 protease activity and reduced USP8 levels do not have an apparent effect on different lymphocyte activation markers. However, a surprising reduction in IL-2 production was observed in cells with reduced USP8. Further study into the effect of USP8 on IL-2 transcription, translation and secretion is needed to try and understand the precise role of USP8 in lymphocyte activation.

## **Bolton 280**

### **Veronica Mierzejewski, Skidmore College, 2019, Chemistry, Design and Development of a Novel Antibiotic: a GatCAB Inhibitor**

ABSTRACT: Two distinct routes for attaching asparagine (Asn) to its cognate transfer RNA (tRNA<sup>Asn</sup>), an essential step in protein synthesis, are known. In the direct pathway, Asn is attached to tRNA<sup>Asn</sup>; in the indirect pathway, Asn is synthesized on the tRNA using a non-discriminating aspartyl-tRNA synthetase and our enzyme of interest, GatCAB. The inhibition of GatCAB would disrupt translation and kill pathogens that depend solely on the indirect pathway, such as *Helicobacter pylori* and *Staphylococcus aureus*. We are purifying *B. subtilis* GatCAB to perform future inhibition experiments while also conducting *in silico* molecular docking studies using *Autodock 4* to test the efficacy of potential inhibitors. The work lays the foundation for the potential development of novel antibiotics.

### **Anne Buck, St. Lawrence University, 2018, Biochemistry, Progress Towards Efficient Synthesis of Morphine Analogue Using the Wagner-Jauregg Reaction**

ABSTRACT: A Diels-Alder cycloaddition allows for the creation of two new sigma bonds along with a new six membered ring. This reaction allows for different conformations to be produced depending on how the diene interact with the dienophile resulting in new stereocenters. The Wagner-Jauregg reaction, is a specialized Diels Alder reaction in which the diene is an aromatic ring. Aromatic compounds are exceptionally stable and unreactive due to an extended conjugated network. It normally requires very harsh conditions to cause an aromatic ring to react. This method can be used in the production of opioid-like compounds. Opioid molecules are composed of 5 rings, with the proper one ring starting material, through a Wagner-Jauregg reaction it is possible to create a three-ring structure in one step. Three starting compounds were produced through Wittig reactions followed by purification via column chromatography and characterization via proton nuclear magnetic resonance. These compounds then underwent a series of variable reaction conditions, such as high temperatures, to try and promote a Wagner-Jauregg cycloaddition. Up to the present date none of these attempted high temperature reactions have result in the desired cycloaddition product. This data gives us information about the stability of the starting compounds and future starting conditions, which are more likely to produce the desired product.

### **Kaitlyn Rodriguez, Colgate University, 2017, Molecular Biology, Serine Hydroxymethyltransferase Isoforms are Adapted for Plant Stress Response**

ABSTRACT: Serine hydroxymethyltransferase (SHM) is an enzyme ubiquitously found in prokaryotes and eukaryotes that plays a critical role in cellular one-carbon metabolism. In humans, the SHM1 regulates a key reaction in the folate metabolic pathway. Previous research has shown that elevated SHM activity is present in rapidly proliferating cells, specifically tumor cells, which has rendered the role of SHM in nucleotide biosynthesis a popular target for cancer chemotherapy drugs. In plants, SHM is essential for the reversible conversion of glycine into serine for photorespiration in leaf mesophyll mitochondria. Ongoing research has sought to explain why humans contain only two SHM genes, whereas plants contain several isoforms. The *Arabidopsis* (*Arabidopsis thaliana*) genome contains a SHM gene family, coding for seven enzymes. We performed a real-time PCR analysis and found tissue-specific expression among the SHM isoforms. The photorespiratory SHM1 was abundantly expressed in leaves, while the cytosolic SHM4 was more ubiquitously expressed across the different tissues, suggesting a more general metabolic function. We also found that the SHM5 is induced during pathogenic infection, whereas the SHM7 was upregulated by osmotic stress and dehydration, indicating they play important roles in plant immunity and stress response. Genetic analysis revealed that the *shm7* mutant is defective in osmotic stress tolerance, as demonstrated by

the stunted phenotype of the plant in elevated salt or sugar concentrations. We report that the expanded Arabidopsis gene family exhibits differential localization and tissue-specific expression, as well as novel roles in plant immunity and abiotic stress.

**George Chakalos, Laura Noejovich, Skidmore College, 2018, Neuroscience, Charting the Uncanny Valley**

**ABSTRACT:** As simulations of our physical world approach reality, their appearance creates feelings of unnaturalness. In robotics, the relationship between human likeness and perceived plausibility experiences a 'dip' as appearances approach realism - the "Uncanny Valley". Traditional animation avoids the pitfall into this chasm by exaggerating movement of real objects beyond what is physically accurate. A series of simulations of bouncing balls were created using deformable exaggeration. Subjects evaluated each animation as to its plausibility. For generic balls, exaggerated bounces were regarded as significantly more plausible than those that were physically accurate, regardless of their modeled elasticity. When subjects are shown the type of ball being simulated, they subjectively modify their plausibility ratings accordingly. Thus, exaggeration acts as a bridge across the uncanny valley.

**Bolton 281**

**Lily Capstick, Hamilton College, 2018, Sociology major, creative writing minor, Exploring the Value Transformations of Ex-Tigistes in Rwanda: The Case of TIG**

**ABSTRACT:** Directly following the Genocide Against the Tutsis in Rwanda in 1994, the new Rwandan government had to decide how to rebuild the country. At the time, over one hundred thousand Rwandan citizens had participated in genocide, creating unprecedented problems for the justice and correctional systems in place in the country. To address this problem, the Rwandan government implemented the Gacaca trials and TIG camps to not only bring justice, but reconciliation and peace to all Rwandans, genocide perpetrators included. Since TIG, Rwanda has been united in unprecedented speed. Ex-tigistes, genocide perpetrators who went through TIG, are almost completely reconciled with their communities and the people whose families they killed, stole property from, or harmed. This study seeks to conceptualize the experiences of these ex-tigistes in Rwanda. The study follows the journey of individual ex-tigistes directly following their engagement in the genocide, through their participation in TIG, and into their release into society in order to understand whether, to what extent, and how ex-tigistes went through transformations and "changed". The findings of this study can be broken into three main parts. First, the way a tigiste changed was dependent on the reasons for their involvement in the genocide. Those that were forced to participate in the genocide learned forgiveness and reconciliation, while those that willingly, or even enthusiastically, participated in the killings, dismantled the genocide ideology they previously held. Second, TIG was by no means the only cause of transformation for ex-tigistes, but was a supplementary component of them. Many ex-tigistes expressed how important the decision to confess was for them in their transformation. In order to fully benefit from the teachings in TIG, ex-tigistes needed to want to change, which came from confessing truthfully to all their crimes and asking for forgiveness before arriving at TIG. Experiences outside of TIG helped ex-tigistes fully realize their transformations, whether it be in the form of discussions or interactions with survivors. Third, TIG was not a positive, transformative experience for all of the participants, where the women interviewed told remarkably different accounts of life in the camp.

**Yohary Fabian, Colgate University, 2018, Spanish; Elisa Smith, Skidmore College, 2018, Social Work; Sydney Keane, Union College, 2018, Neuroscience; Kristen St. Andrews, Union College 2018, Biology; Community, Action, Research, and Education (C.A.R.E) Program**

**ABSTRACT:** Measuring satisfaction with end-of-life care is important because it's the first step in improving care in settings such as hospitals, nursing homes, or homes for the dying. The Joan Nicole Prince Home (JNPH) in Scotia, NY is one of 30 homes in Upstate New York, and where this research was conducted. In addition to having the opportunity to serve as a caregiver in the home, the goal of this project was to be able to identify any areas for improvement in assessing the satisfaction with care of residents. Data from 87 completed surveys were analyzed and compared to similar surveys used by other institutions providing palliative care. The results of analyses revealed that the families of residents cared for by the JNPH were extremely satisfied with the care received. Surveys showed 100% satisfaction in all domains of care measured. The literature review on satisfaction instruments used by other healthcare organizations revealed a myriad of approaches. There were key items on the various surveys addressing common areas of care such as symptom management, communication and overall satisfaction. After comparing these various instruments with that used by the JNPH, the home might consider adding an item that explicitly measures the family's satisfaction with the communication of the JNPH staff/volunteers and combining two items on the survey that both assess the home's environment (safety vs. quality). Regardless, both quantitative and qualitative analyses suggest that the home is providing stellar care to its residents.

**Kali Villarosa, Skidmore College, 2018, International Relations, News Coverage of Urban Marginalization.**

***Bolton 282***

**Ana Sosa, Skidmore College, 2018, Sociology, Identifying the Haitian Second Generation**

**ABSTRACT:** We set out to find if there is substantial selective ethnic attrition among second generation Haitians in the U.S. Ethnic attrition is a way of integrating into the host society by forfeiting one's ethnic identity. Measuring ethnic attrition is important because it may lead to a misrepresentation of the group's achievement in the U.S. We measure the extent to which parents' and respondents' characteristics bear on identify in the Haitian second generation. We use Census data to track identificational changes from 1990 to 2014. Our results suggest that family structure, socioeconomic status, and parents' and respondents' characteristics have a significant effect on Haitian identity.

**Ruby Thompson, Skidmore College, 2018, Sociology, To Be or Not To Be: Ethnic Identity For Second Generation West Indians**

**ABSTRACT:** Ethnic attrition refers to the process through which immigrants stop identifying with the nationalities and ethnicities of their predecessors. Our central research questions are: 1) is there evidence of ethnic attrition among second generation West Indians, and 2) to what extent is it selective? Using 1990 to 2014 Census Data, we identified a cohort of West Indian second generation children in order to track how they identify across two decades. If West Indians are no longer identifying as such we cannot track their progress in the United States, which may give an unduly positive outlook on the group's success in the U.S. Our preliminary findings demonstrate that less than half of West Indians identify primarily as West Indian, and suggest that family structure, parents' characteristics, and respondents' characteristics are significant predictors of ethnicity.

**Alec Rhodes, Hobart and William Smith Colleges, 2018, Sociology and Economics, The Syrian Community in Geneva: Past and Present**

ABSTRACT: Geneva NY, a small city in the Finger Lakes Region, has been home to a community of Syrians since the turn of the twentieth century. Employing in-depth interviews on Syrian-identifying Genevans, this study delineates past and present community institutions and seeks to understand participants' extent and kind of connections to Syria and the ongoing refugee crisis. Given changes in the past 100 years, participants describe evolving roles to their main community institution, the local Orthodox Church. New patterns of residential settlement have also altered Syrian ethnic life and identity expression. While many retell family arrival narratives surrounding escaping conflict, economic opportunity, or family ties to Geneva, few participants exhibit strong connections to relatives or friends in Syria themselves. Instead, they rely on news media and church-affiliated channels to obtain information about the crisis in Syria. These tenuous links to current economic, social, and political events in Syria are reflected in participants' lack of a clear-cut opinion on how to respond to the refugee crisis.

**Sabrina Callender-Clewett, Colgate University, 2019, Environmental Economics / Philosophy, Débrouillardisme: Martinique's Past, Present, and Future**

ABSTRACT: Through analyzing existing literature dealing with débrouillardism and the colonial history in Martinique, this paper and poster presentation aims to explore the relevance and impact of cultural identity in relation to current economic realities in Martinique. By exploring the history and transforming relationship between the French metros and Martinicans over the years, this presentation aims to provide a historical backdrop to Martinique's current economic realities (specifically débrouillardism). Often when creating economic plans and policies, culture and history are neglected and fail to be considered when crafting these policies. The main purpose of this presentation is to provide an in-depth historical look at Martinique's past in order to aid in the creation and proposal of sustainable and informed economic future policies. For by considering the past and its impact on the present, we can help build a more successful and resilient future not only in Martinique, but in all regions of the world. For truly, history is not only relevant to a nation's past, but also its present and future.

***Palamountain 202***

**Bridget Lavin, Hamilton College, 2018, Theatre and Women's & Gender Studies, Speaking Out: How Documentary Theatre Provides a Voice to Sexual Assault Survivors**

ABSTRACT: *Speaking Out: How Documentary Theatre Provides a Voice to Sexual Assault Survivors* investigates the experiences of sexual assault survivors on small college campuses in New England and New York. After conducting background research into documentary theatre performance methods and federal Title IX policy, I interviewed participants about their experiences with sexual assault at college. Then, I transcribed these interviews and edited the audio recordings to create a play, which I performed at Hamilton College on September 8-9. The play subverts common rape myths, which dictate how society as a whole often views sexual assault. Rather than a stranger in the bushes, most participant's assailants were close friends or intimate partners. Most participants did not immediately recognize their experience as assault, and instead came to terms with their experience much later. Even more, some participants did not endure outright penetration, but rather misconduct like groping or ejaculation while they slept. Despite these experiences being different than traditionally understood experiences of assault, all participants were all still deeply affected by their abuse. Most importantly, this project sought to provide a platform survivor's voices; to share their words publically

and allow them to anonymously, but publically, sharing their story. In doing so, I have sought to allow them to feel validated and heard, because they know that someone is listening, and that someone believes them.

**Priyadarshinee Dhawka, Colgate University, 2019, Computer Science; Annie Wang, Colgate University, 2019, History, Multilingual Experiences of International Students at NY6 Campuses**

ABSTRACT: This research began with our desire to see “us” – international students who speak English as a non-native language on NY6 campuses. We were interested in the relationship between English as a non-native language and matters of race, gender, class, sexuality, and cultural orientations, which were factors that we observed in our own experiences. We position ourselves and our interviewees as equal. We included our (Priya’s and Annie’s) own stories, and listened to our interviewees with empathy and a respect for originality and diversity. Two themes we have discovered in these stories are border-crossing and agency. Our research explored how we can survive and thrive under unfavorable circumstances. Our research essentially explored our understanding the complex, full experiences of these international students, but we intend it to be the first stage of institutional change, on campuses that interviewees had described as not diverse. Institutional change is the collective work of international students and the different stakeholders on our campuses.

**Benjamin Ringel, Colgate University, 2018, International Relations & Spanish, Apartheid South Africa Manipulates its Nuclear Program for Political Gain**

ABSTRACT: In 1993, South African President F.W. de Klerk confirmed decades of speculation on behalf of the international community by admitting that South Africa had developed, and since completely dismantled, fully functional nuclear weapons. Although many have studied South Africa’s successful and responsible denuclearization as a paradigm to be replicated around the world, there is a noticeable gap in literature regarding South Africa’s decision to proliferate in the first place. My research examines the unique South African political and diplomatic landscape to determine why states choose to proliferate. This question has important ramifications in understanding why nations, particularly small nations, choose to proliferate and how their pursuit of nuclear arms can be curbed in the future.

In this piece, I argue that South Africa developed their nuclear weapons as a matter of domestic consolidation, as they believed that nuclear capabilities would quell internal dissent and coerce Western powers to come to their aid in times of crisis. I tested two hypotheses in addition to the one previously listed in order to fully investigate all possible reason why states might proliferate. The second hypothesis states that a small nation will pursue nuclear weapons in the face of ostracization from the international community because the benefits of national security and prestiges outweigh the drawbacks of further isolation. The third and final hypothesis states that a small nation will pursue nuclear weapons in the face of intense domestic opposition, volatility, and rebellion as a way of suppressing dissent and consolidating the power of the ruling regime. I conducted this research by travelling to South Africa and visiting archives, nuclear power plants, and interviewing various experts in the field.

After examination of the evidence supporting and opposing each hypothesis, I concluded that each of these factors cumulatively played a role in South Africa’s decision to pursue nuclear weapons. Although my original hypothesis holds merit in its own right, it becomes much stronger when viewed in the context of external threats and international isolation that South Africa faced simultaneously. These findings could have worldwide implications, as small nations like North Korea continue to develop nuclear weapons in pursuit of their national interests. If applied correctly, this research would stress the need for a broad, intersectional view in dealing with small nations considering acquisition of nuclear arms.

**Elizabeth Dunne, Hobart and William Smith Colleges, 2019, Refugee Studies, Detention Centers and the Rights of Migrants in EU today**

ABSTRACT: My official project title was Detention Centers and the Rights of Migrants in EU today. My responsibilities within this project included the collection and analysis of recent writings on the topics of migration, detention, and human rights policy within the EU and the US. I worked with Professor Cidam to work through where human rights belong in the conversation about immigration, the relationship between citizenship rights and human rights, and where stateless individuals fall in the equation. We also grappled with the idea of the law serving as both the protector and assailant of the rights of vulnerable populations, as legal justification can allow for inhumane treatment in detention centers while also providing the space to challenge such treatment. During the course of the fellowship I took on a personal research topic concerning the role of neoliberal policy in the growth and strengthening of the for profit detention system within the United States. Largely focusing on the post 9/11 system, I attempted to trace the ways in which detention has been made into a profitable market for companies who enter into contracts with the government. I also attempted to account for the the ways in which neoliberal policy aides in the dehumanization and commodification of migrant and stateless people, and nationalist rhetoric which allows detention centers to exist and thrive.

**10:50-11:55 am Poster Session #1**

**(3 locations)**

***Bolton 280***

**Shivam Tewari, Sarah Sveen, Hobart and William Smith Colleges, An Initial Investigation into the Development of Desalination Methods for the Stennett Research Lab**

ABSTRACT: The increased need for freshwater has led to the use of desalination, a water purification technique based on reverse osmosis. This process is less prevalent due to easy fouling of the semipermeable membranes; the rate fouling occurs is affected by many factors. Therefore, it is important to learn more about this process and find ways to decrease the efficiency of fouling. Being a new lab, methods were developed for desalination simulation set-up, permeate flux measurements, and infrared spectroscopy (IR) to study protein and membrane interactions. Hydrophobic and hydrophilic polyvinylidene fluoride (PVDF) membranes with a 0.22  $\mu\text{m}$  pore size were tested against model proteins hemoglobin (Hb) and bovine serum albumin (BSA). First, a comprehensive test was done into membrane conditioning which leads to opened pores and higher initial permeate flux. Hydrophobic PVDF membrane conditioning was maximized by soaking the membrane in absolute ethanol for fifteen minutes, while data suggests hydrophilic PVDF membranes condition better in deionized water. Fouling was observed through the rate at which the permeate flux declined. Hb was tested at 0.2 g/L and 2.0 g/L and BSA was tested at 0.2g/L. Both concentrations of Hb showed a high rate of permeate flux decline which indicated fouling of the membrane. Further support of fouling was provided by IR scans of the Hb tested membranes, which showed the presence of functional groups that were not present on untested membranes. Hydrophilic PVDF membranes showed a lower susceptibility to Hb fouling than hydrophobic counterparts. BSA showed a much smaller decline in permeate flux which suggested less membrane fouling. This was corroborated through IR spectroscopy, which showed no visible difference between the BSA tested membranes and untested membranes. More flux experiments with higher concentrations of BSA are needed to investigate the conditions at which BSA fouls the membrane.

**Sampriti Thapa, Skidmore College, 2018, Biochemistry, Effect of Cullin-5 Protein on Conformational Flexibility of HIV-1 Vif Protein**

ABSTRACT: HIV-Vif protein is an intrinsically disordered protein (IDP) that gains stability when bound to Elongin-B (EloB), Elongin-C (EloC), CBF- $\beta$ , and Cullin-5 (Cul5), forming the VCBC-Cul5 Complex. Cul5 is a scaffold protein that is directly involved in the ubiquitination and degradation of antiviral proteins. While the crystal structure of the VCBC-Cul5 Complex has been solved, the role of conformational flexibility of the complex without Cul5 is not known. To investigate the role of Cul5 on the conformations sampled, molecular dynamics (MD) simulations were run on VCBC. Using principle component and dihedral angle analysis, it was determined that VCBC is more flexible without Cul5 bound and the alternate states sampled by the VCBC complex may be important for function.

**Charmaine Bing Bing Chung and Jasmine Jackson, Hobart and William Smith Colleges, Biochemistry, Effects of Macromolecular Crowding on Enzyme Kinetics**

ABSTRACT: Previous understanding of enzyme kinetics was based on experiments conducted under dilute conditions. However, these conditions do not accurately represent the more realistic crowded intracellular environment of the cell, which contains a substantially large total concentration (300-400g/L) of various macromolecules such as proteins, carbohydrates and ribosomes. High concentrations of macromolecules reduce the volume of solvent available for other molecules in the solution. This exclusion of volume increases the effective concentrations of all molecules, which could potentially impact the behavior of enzymes. To study these potential consequences, the Michaelis-Menten kinetics of yeast alcohol dehydrogenase (YADH) and citrate synthase were monitored under crowded conditions. Assays were performed in the presence and absence of high concentrations of synthetic polymers such as polyethylene glycol (PEG) and dextran. Surprisingly, synthetic polymers impeded citrate synthase catalysis less than their small-molecule counterparts. For YADH kinetics, the effects from crowding differed for the forward and reverse reaction. Furthermore, the presence of the small molecule ethylene glycol increased the  $K_m$  value of YADH between 3-5 fold, while larger crowding agents had little to no effect. These results indicate that high concentrations of small molecules play just as much if not more of an effect than macromolecules on enzyme kinetics in a cell.

**Hannah Forman, Hongwei Yu, Skidmore College, 2019, Biochemistry, Expanding the genetic code with pyroglutamate**

ABSTRACT: Non-canonical pyroglutamate incorporation during protein synthesis will aid the study of medical conditions like Alzheimer's disease. To better understand pyroglutamate's role in protein structure and function, an *E. coli* model system was developed to directly incorporate pyroglutamate into proteins. Key to this process is the use of a modified archaeal RNA-dependent glutamine biosynthetic pathway in which pyroglutamate is synthesized on an amber suppressor tRNA. Enhanced yellow fluorescent protein was used as a reporter system to determine levels of read-through, and therefore incorporation, of pyroglutamate in response to an amber codon. In order to determine presence of eYFP, fluorimetry was used. As yield was poor, we are developing a new pyroglutamate system using mesophilic enzymes. Success of this system will be confirmed by mass spectrometry.

**Aaron Beguelin, Hamilton College, 2018, Biology, The gut microbiome of two sympatric species of sea urchin from two locations in Fiji: Does geographic location or sea urchin specificity result in differences between gut microbiomes?**

ABSTRACT: The sea urchin species *Tripneustes gratilla* and *Echinothrix calamaris* have sympatric distributions throughout much of the Indo-Pacific Oceans and exhibit no clear niche partitioning on coral reefs. Both species are typically cryptic by day, hiding under boulders or within the reef structure

to avoid predators, only emerging at night to graze on nearby algal or sea grass species. In this investigation we collected *T. gratilla* and *E. calamaris* that were found together sharing niches on the back reefs from two locations in Fiji, The Beach House (BH) Namatakula, and Yanuca Island (YI), some 24 miles apart. Thirty-five gut samples (*T. gratilla*, BH=14, YI=6; *E. calamaris*, BH=8, YI=7) and two water samples were collected in situ and preserved in DMSO salt saturated solution. In the lab the V4 region of 16S rDNA was amplified using Illumina MySeq, the microbial composition identified, and the relative abundance calculated. From these data a Pearson's correlation coefficient was calculated. Our results show that both sea urchin species and geographic location influence the microbiome. The relative abundance of *Photobacterium* sp. in *E. calamaris* had a strong positive Pearson's correlation coefficient at both BH and YI locations, with a strong negative Pearson's correlation coefficient observed at both locations in *T. gratilla*. Such differences suggest that even on a small geographic scale, sea urchin specificity is important, with each species selecting for different microbial components that make up its microbiome. However, the relative abundance of members of the bacteria genus *Cohaesibacter*. and of the family *Phyllobacteriaceae* both had a strong correlation with location (BH vs YI) rather than species, and demonstrates that it is the combination of both sea urchin species and geographic location that determines their gut microbiome.

**Jessica Gilbert, Union College, 2018, Biology, The Impact of Biological Soil Crusts on the Success of Seedling Germination in the Albany Pine Bush Preserve**

ABSTRACT: Biological soil crusts (BSCs) are soil aggregations comprising bacteria, algae, and moss or lichens, and are primarily found in desert and other semi-arid ecosystems. They provide soil stability to help prevent wind erosion, are a main nitrogen fixer for those ecosystems, and affect water absorption. BSCs can, indeed, affect a wide variety of micro-ecosystem components that then impact the greater whole of the ecosystem. Research has shown that these crusts can also influence seed germination, and thus can affect the species of plant that are able to grow and be sustained in that environment. Little study has been done on crusts in areas of the Northeast United States, and yet our group has found them to be much more widespread than previously thought. Our test ecosystem is the Albany Pine Bush Preserve, an area whose soil is dominated by sand and, as a result, is functionally dry even though our climate is wetter than deserts. We investigated the success rate of seedling germination of three species of plant native to the Albany Pine Bush Preserve: Little Bluestem, Bush Clover, and Lupine. Due to the fact that crusts are compact and could present mechanical and chemical barriers to germination, we believed that all species would have a greater rate of seed germination on sand than on crusts. Seeds were scattered on crusts collected from the area as well as on sand, and germination was recorded for 21 days. Little Bluestem was unable to successfully germinate on either condition, and thus the data has been omitted from this presentation. Both Bush Clover and Lupine germinated at a significantly higher rate in the sand condition compared to the crust condition, though Bush Clover had a higher initial rate of germination than Lupine. We conclude that biological soil crusts present a barrier to the success of seedling germination, and could therefore alter the distribution and establishment of species within the Albany Pine Bush Preserve.

**Yao Xiao, Skidmore College, 2019, Chemistry, Daytime and Nighttime Atmospheric Processing of US Fly Ash**

ABSTRACT: In this study, we compare the iron mobility from fly ash in nitric acid to that in hydrochloric acid. In the presence of nitrates, we hypothesize that surface phenomena, combined with redox reactions from leached iron, will reduce nitrates into nitrites. In this project, the yield and rate of iron and nitrite leached from fly ash has been investigated under both pH 1 conditions in both daytime and nighttime conditions.

**Gabrielle Mascarin, Skidmore College, 2018, Biology, The impacts of N-acetyl-L-Cysteine on the cell wall of *Penium margaritaceum***

ABSTRACT: One of the biggest threats to plants because of climate change are oxidative stressors, which can damage cellular structures and interfere with normal plant function. These occurrences known as reactive oxygen species or even reactive oxygen intermediates are partially reduced forms of atmospheric oxygen which are involved with cell maintenance as well as cell destruction. Antioxidants, however, are molecules that have been observed to reduce some of the harmful effects of these reactive oxygen species such as N-acetyl-L-Cysteine (NAC). Recently, the results from several experiments where cultures of *Penium margaritaceum* were exposed to NAC, shows cellular damage that could possibly be a result of oxidative stress. Therefore, this experiment studies the various effects of N-acetyl-L-Cysteine on *Penium margaritaceum* and whether it induces destruction by Reactive Oxygen Species.

**Bolton 281**

**Michelle Taylor, Tessa Ruff, Colgate University, 2018, Cellular Neuroscience, Effects of antidepressants on nitric oxide production by microglia and astrocytes**

ABSTRACT: Microglia and astrocytes are two types of glial cells in the brain, both of which have neuroprotective roles. Microglia act as the macrophages of the brain by engulfing debris, whereas astrocytes make up the blood-brain barrier, protecting the brain from unwanted infiltration. These cells can be activated by inflammatory stimuli, causing the cells to release nitric oxide (NO), a free radical that damages surrounding cells. Treatment with lipopolysaccharide (LPS) increases the transcription of inducible nitric oxide synthase (iNOS), leading to higher levels of proinflammatory NO• molecules. These activated microglia and proinflammatory stimuli are correlated with periods of depression in Major Depressive Disorders (MDD).

Fluoxetine (FLX), Desipramine (DES), Imipramine (IMI) and Nortriptyline (NOR) are antidepressants that act at synapses to block the reuptake of serotonin or norepinephrine in the presynaptic terminals to increase its availability in the synaptic area. This increased availability prolongs the time of interaction between the neurotransmitter and its receptors on the postsynaptic neuronal membrane. In addition, these drugs have been shown to have anti-inflammatory effects.

The inflammatory response was measured through the release of nitrite by primary mixed glial cultures (containing astrocytes and microglia), purified microglia, and a microglial cell line (BV2) treated with LPS. For BV2 cells and purified microglia, the addition of the antidepressants reduced the release of nitrite induced by LPS over a range of concentrations. The BV2 cells treated with 20µM FLX and DES were inhibited by 20% (at higher concentrations of LPS) to 100% (at lowest concentrations of LPS). 20µM NOR produced between 25-50% inhibition of nitrite release. Purified microglia were treated with LPS with or without the antidepressants. Once again, FLX, DES and NOR all inhibited the release of nitrite induced by LPS from 30% to 90%. In contrast, the mixed glial cultures containing astrocytes and microglia had an augmented release of nitrite when treated with the antidepressants and LPS. The increase ranged from 20-40% for FLX, DES, NOR and IMI.

Purified astrocytes populations were obtained by addition of cytosine arabinoside (AraC) to inhibit the proliferation of microglia and subsequently treated with L-leucine methyl ester (LME) to eliminate any remaining microglia. The reduction of microglia by AraC and LME resulted in no detectable nitrite release when the astrocytes were treated with LPS.

Therefore, the cultured astrocytes are not producing NO themselves but rather are signaling to the microglia for the increased inflammatory response. Overall, our research indicates that antidepressants reduce the inflammatory response of microglia in isolation, despite increasing the

response in mixed glial cultures. This suggests that the astrocytes signal to the microglia to increase the inflammatory response in the presence of antidepressants.

**Giovanny Dominguez, Hamilton College, Chemistry, 2018; Mackenzie Morshead, Hamilton College, 2018, Biochemistry and Art, Synthesis and antimicrobial evaluation of 3-hydroxy-2-oxindoles**

ABSTRACT: 3-Hydroxy-2-oxindoles are an emerging class of drug leads possessing a broad range of bioactivities. Our laboratory has designed a unified synthetic strategy for rapid access into 3-hydroxy-2-oxindole systems via one- and two-step oxidation protocols of tryptamine derivatives. Multiple synthetic and natural products were synthesized by this strategy and subsequently evaluated for their antibacterial and antifungal properties. *o*-N-Sulfonamide derivatives in particular showed modest potency toward several strains of *E. coli* and *C. diff*. Further medicinal chemistry aimed at examining structure-activity relationships and the development of more potent analogues is underway.

**Deborah Kim, Kathleen J. Maas, Skidmore College, 2018, Chemistry, Daytime Chemistry of Sea Spray Aerosols: Alternative Pathways of HONO Formation**

ABSTRACT: Sea spray aerosols (SSA) are particles of varying size and composition released from bubble bursting on the ocean's surface, or marine boundary layer (MBL). SSA are known to contain complex organic chromophores known as humic-like substances (HULIS), which are naturally emitted from the MBL and/or formed through SSA atmospheric processing. HULIS are known photosensitizers that can open alternative photochemical pathways within SSA. In this study, we investigate the photosensitization of NO<sub>2</sub> and NO<sub>3</sub><sup>-</sup> to produce HONO, an important source of hydroxyl radicals in the troposphere, and nitrogen oxides.

**Claudia Bennett-Caso, Skidmore College, 2019, Chemistry; Chris Ostaszewski, Skidmore College, 2019, Chemistry and Mathematics; Non-Thermal Plasma for the Heterogeneous Chemistry of Chemisorbed Volatile Compounds with Free-Radicals**

ABSTRACT: In this work we present a state-of-the-art system to study the heterogeneous reactions between adsorbed hydrocarbons and free radicals generated via non-thermal plasma. The system allows for the exposure of a well-characterized oxygen plasma plume on a hydrocarbon-coated alumina powder. Two pairs of windows in the chamber allows in-situ two-dimensional spectroscopy: UV-Vis and IR. The oxidation of chemisorbed hydrocarbon on the alumina powder via non-thermal plasma was investigated in-situ in order to determine the conditions for an effective oxidation. Our results show a novel and effective method for the free-radical reaction with adsorbed volatile or semi-volatile compounds. Quantum mechanically calculated vibrational frequencies of the adsorbed oxidized products suggest the first oxidation of cyclohexane is the limiting step.

**Woohee Kim, Colgate University, 2018, Educational Studies, Korean Youth Activism and Education: Taking Learning beyond the Educational System into Activism**

ABSTRACT: This research focuses on how Korean youth activists create activism as a new site of learning, producing knowledge beyond the educational system. Youth activists shape spaces where they challenge established systems of knowledge and power often perpetuated through schooling and produce alternative frameworks of understanding the world and visions for the society. The research explores youth activists' production and sharing of alternative knowledge as creative acts of extending learning beyond the formal educational system. This research presentation is based on 3 months of fieldwork research in Seoul, South Korea and draws from 15 in-depth interviews with Korean youth activists as well as participant observations. This research project was funded by Colgate University's Lampert Fellowship in Public Affairs.

**Ronald Caruso, Skidmore College, 2018, Exercise Science, Effects of DhamaSPORT™ Cooling Band Technology on Recovery from Exercise-Induced Heat Stress Associated with Firefighting Personal Protective Equipment (PPE)**

ABSTRACT: Enhancing recovery from firefighting is paramount due to the high cardiovascular strain associated with firefighting. **PURPOSE:** To determine the effects of the DhamaSPORT™ cooling bands on recovery from Exercise-Induced Heat Stress associated with wearing PPE. **METHODS:** In 8 male participants (23±5 years old, 176±4 cm tall, 84±12 kg mass) we measured the recovery of heart rate (HR), core temperature ( $T_{CO}$ ), thermal sensation (TS), and rating of perceived exertion (RPE) after 30 min of exercise (3 mi/hr, 5% grade) in PPE, and in a randomized counterbalanced design, a DhamaSPORT™ cooling band was placed on their wrist but only activated during one trial. Pre- and post-exercise, indices of heart rate variability were recorded. **RESULTS:** During exercise HR,  $T_{CO}$ , TS, or RPE were not different between trials (all,  $p>0.05$ ). Time to recovery was not significantly different with the band active (473±299 vs. 484±295 sec, control vs. cooling,  $p>0.05$ ). During recovery, there was no significant differences in  $T_{CO}$  or HR ( $p>0.05$ ), though,  $T_{CO}$  tended to be lower (37.7 vs. 37.5°C), HR, NN50, and pNN50 also tended to be lower with the band active. **CONCLUSION:** Use of the DhamaSPORT™ cooling band after exercise-induced heat stress might contribute to enhancing recovery of core temperature, HR, and though some indices of heart rate variability might be adversely affected.

**Ivy Raines, St. Lawrence University, 2018, Government, The Discourse of Divide: Explaining the Divorce Between Egyptian and Jordanian Policy and Public Sentiment Towards The Israeli Palestinian Conflict**

ABSTRACT: Perhaps the most interesting feature of modern Middle Eastern Politics is the divide between public sentiment and state policy among Arab states. This is especially interesting in the case studies of Egypt and Jordan given their open relations with Israel being only two of twenty two Arab nations to establish peace. The divorce between public opinion and state stature and policy vary significantly in comparison to other nations in regards to the Israeli/Palestinian Conflict. Four schools of thought work to explain the driving factors of the foreign policies of Egypt and Jordan which include Pan Arab ideology, resurgence of Islam as an ideology, reliance on the United States, and neoliberal policies both countries have adapted. These four schools of thought are examined through public speeches and public opinion polls in both Jordan and Egypt specifically looking at events taking place in the Gaza Strip from 2006 to 2014.

**Bolton 282**

**Alexandra Cassell, 2019, Mathematics and Computer Science; Alexander Smith, Skidmore College, 2018, Mathematics; Developing an Oscillator Model for Group Behavior in *Drosophila melanogaster***

ABSTRACT: The wild-type *Drosophila melanogaster*, the common fruit fly, has an intrinsic 24-hour circadian rhythm with peaks of activity near dawn and dusk. In large groups, fruit flies exhibit similar patterns of activity around dawn and dusk but has also shown a presence of random activity spikes during the light period. Our goal is to develop a mathematical model to explain and predict the population dynamics. We use the phase and Van der Pol oscillators to represent a morning and an evening oscillator as two components of the circadian rhythm. We entrain the morning to dawn and the evening to dusk and couple them to other flies. Future research will address the inclusion of the random daytime activity.

**Allison Mogul, Hamilton College, 2018, Neuroscience; Gianna Davino, Hamilton College, 2020, Psychology; Putting Fear in Context: Elucidating the Role of the Retrosplenial Cortex in Context Discrimination in Rats**

ABSTRACT: The retrosplenial cortex (RSC), which receives multimodal sensory input and interacts with a number of hippocampal memory system structures, has a well-established role in contextual learning and memory. While it has been demonstrated that RSC function is necessary for the learning and retrieval of a single context in a first-order conditioning paradigm, the role of the RSC in discriminating between two different contexts, whether learned through first or through higher-order conditioning remains largely unknown. To address this, Experiment 1 tested the hypothesis that the RSC is necessary for context discrimination when learning occurs through first order conditioning and Experiment 2 tested a similar role of the RSC when contextual information is learned through higher order conditioning. In Experiment 1, RSC-lesioned (electrolytic) rats were exposed to two different contexts: one that was paired to an aversive footshock (context A: striped walls and a peppermint scent) and one which was not paired with an aversive stimulus (context B: dotted walls and an orange scent). After training, the rats were tested on their ability to discriminate between the two contexts based on freezing behavior. In Experiment 2, two contexts were also used: (context A: striped walls, tone and a peppermint scent and context B: dotted walls, white noise and an orange scent) before one of the auditory cues (tone or white noise) was paired to an aversive footshock in a neutral context (Context C) while the other auditory cue was not. The rats were then re-exposed to Context A and Context B and freezing behavior was assessed to determine whether the rats had applied the newly learned auditory information to the original context that the auditory stimulus was associated with. The results revealed that under the present experimental conditions, higher order, but not first order conditioning is dependent on the RSC. Overall the results suggest that the RSC may not be necessary to simply discriminate between two contexts but may be involved with a more nuanced higher-order learning which involves updating contextual knowledge with information obtained independent of initial learning episodes.

**Abigail Dayton, Hamilton College, 2019, Neuroscience, Strategies to Improve the Novel Object Recognition Task**

**Skye Conlan, Union College, 2018, Physics, PIXE Analysis of Artificial Turf**

ABSTRACT: In recent years, there has been debate regarding the use of the crumb rubber infill in artificial turf on high school and college campuses due to the potential presence of heavy metals and carcinogenic chemicals. We performed Proton-Induced X-Ray Emission (PIXE) analysis of artificial turf infill and blade samples collected from high school and college campuses around the Capital District of New York State to search for potentially toxic substances. Crumb rubber pellets were made by mixing 1g of rubber infill and 1g of epoxy. The pellets and the turf blades were bombarded with 2.2 MeV proton beams from a 1.1-MV tandem Pelletron accelerator in the Union College Ion-Beam Analysis Laboratory and x-ray energy spectra were collected with an Amptek silicon drift detector. We analyzed the spectra using GUPIX software to determine the elemental concentrations of the samples. The turf infill showed significant levels of Ti, Fe, Co, Ni, Cu, Zn, Br, and Pb. The highest concentration of Br in the crumb rubber was  $1500 \pm 100$  ppm while the highest detectable amount of Pb concentration was  $110 \pm 20$  ppm. The artificial turf blades showed significant levels of Ti, Fe, and Zn with only the yellow blade showing concentrations of V and Bi.

**Grant Kiefaber, Hamilton College, 2019, Religious Studies, Muslim Refugees in Utica: Perception and Reality**

ABSTRACT: Current crises in the Middle East and influx of Muslim refugees in the United States has been a source of political debate and contestation. It is imperative to understand the impact and experience of Muslim refugees in the United States. Funded through an Emerson Summer Research Grant, this study aimed to examine the integration of diverse Muslim communities, different generations, and ethnic groups, within their new homeland of Utica, New York. Through ethnographic interviews, this study sets out to investigate the challenges and hardships that Muslim communities face in their efforts to integrate themselves. It will also study the socio-economic impact of Muslim refugees in Utica to question the narrative of Utica being a city that openly accepts and supports refugees. My study demonstrates that despite economic hardships and social pressures from both native-born U.S. citizens and members of their own community, the Muslim refugees have played an important role in revitalizing the local economy and enhanced the cultural diversity of Utica. It is also noticed that race, religion, background, ethnicity, and socioeconomic statuses impact the experience of a Muslim refugee integrating into the United States. Overall, this study seeks to complicate the narrative of Muslim refugee integration into the United States.

**Alicia (Phuong) Nguyen, Colgate University, 2020, Undeclared, The Nation in the French Indochina: An Ethno-symbolist Approach**

ABSTRACT: Most scholarships on Vietnamese history either neglect to define what constitutes the Vietnamese nation or approach the topic of nationalism from a modernist angle without providing sufficient explanation for their choice. What is a nation? After defining the nation, how should one account for its rise? About the first problem, the study of nations never has much agreement even from the most basic definitions. Charles Tilly once claimed that the 'nation' is among the most confusing concepts in political science, and it is also the case in the field of history as well. There are only two propositions that almost all nationalist historians agree: nationalism is a modern phenomenon dating from the eighteenth century in Europe, and the European system of nation-states dates back to the Treaty of Westphalia in 1648. Other than that, the issues of the nature and origin of the nation are open to argument. Regarding the second problem, the Western modernist model of nationalism tends to make itself universal while it is particular as any other model. Therefore, it cannot be applied to other historical cases. This research contributes by examining the model that is the most suitable for the case of the Vietnamese nation, and, after discovering ethno-symbolism as the fitting model, explains ways in which the present day Vietnamese nation is formed through ethno-symbolism.

**Anouk Nouet, Union College, 2018, Environmental Science, Pervious Concrete Behavior in Freeze-thaw Conditions: Does the Inclusion of Recycled Materials Affect Performance?**

ABSTRACT: Although there have been many studies on various mixtures of pervious concrete and its viable uses in society over the years, the material remains to be used very sparsely across the world. One reason for this behavior is that current mixtures of pervious concrete does not have the same comprehensive strength and tensile strength as conventional concrete and therefore cannot support very large loads. By introducing recycled industrial materials, like tires, tensile fibers, and fly ash, into mixtures of pervious concrete, the overall performance of the concrete samples could be improved, as well as find a way to recycle these materials in a sustainable way. Through the following experiments, I explored the behavior of multiple different mixtures of pervious concrete; each with a different recycled material, and determined which mixture is the most beneficial. Over the course of eight weeks, I made over two hundred 3-inch cubes that were tested for permeability potential, compression strength, and freeze-thaw durability. By developing a mixture of concrete that can be

stronger, more durable, and allow water to freely infiltrate through, pervious concrete could begin to be used for more applications and replace conventional concrete, reducing the amount of impervious surfaces in cities and towns.

**Noon-1:00 pm      Lunch**

*Murray Aikins Dining Hall*

**1:10-2:15 pm      Poster Session #2**

**(4 locations)**

*Bolton 280*

**Kristina Foley, Skidmore College, 2018, Biochemistry, Effects of conformational changes and flexibility from ArkA binding to the ABP1-SH3 domain**

ABSTRACT: SH3 domains are common protein interaction domains found across all forms of life, including over 400 domains in humans. These domains bind to intrinsically disordered proteins (IDPs), proteins that do not fold into a stable secondary structure. One SH3 domain in yeast, Abp1SH3, has a binding site for the ArkA IDP, but little is known about the binding process. Molecular dynamics simulations were used to model Abp1SH3, the Abp1SH3-ArkA complex, and a hybrid linking Abp1 and ArkA. ArkA binds to Surface I and Surface II of the SH3 domain in a hypothesized two-step method. There are conformational differences between the wildtype and hybrid bound structures including differences in dihedral angles and backbone fluctuations, suggesting the linker may have an entropic effect on the complex.

**Robyn Stix, Skidmore College, 2018, Biochemistry, Conformational Changes of ArkA12**

ABSTRACT: SH3 domains are common protein interaction domains that are found across all forms of life and bind flexible intrinsically disordered proteins (IDPs). IDPs are difficult to model using only experimental methods. Molecular dynamics (MD) simulations mimicking experimental conditions were used to model the ArkA IDP which binds to the SH3 domain found in yeast, Abp1SH3. ArkA IDPs are believed to bind to SH3 domains in a multi-step binding process. Conformational analysis was applied to the ArkA IDP to gain a better understanding of conformations that may promote this binding. ArkA was found to sample a higher population of polyproline II helices compared to experimental data, which is likely due to restriction of the omega bond of proline to the trans conformation in the MD simulations.

**Jack Sherwood, Hobart and William Smith Colleges, 2019, Biochemistry, Developing a Synthetic Pathway for Production of Fluorescein-Labeled Peptides**

ABSTRACT: Our group is interested in studying the interactions between labeled peptides and reverse osmosis membranes as this can lead to inefficiency in water purification. Solid-phase peptide synthesis, a common protein synthesis technique, was used to construct labeled peptide chains. Fmoc-protected amino acids were attached in a step-wise manner to a resin by modifying well-documented protocols. The concluding step involved attaching a fluorophore, fluorescein, to the peptide chain before deprotecting and detaching the now labeled peptide from the resin. Liquid chromatography-mass spectrometry (LC-MS) was used to confirm the successful synthesis of the peptide. However, the LC-MS method for purification needed to be optimized by modifying the composition of the mobile phase. Alanine-methyl ester was first used as a substitute for a peptide to test activation and reaction times as well as reaction conditions. Successful attachment of

carboxyfluorescein to the peptide was observed after reaction with the activating and coupling reagents HOAt and DIC followed by deprotection with Reagent B, a standard deprotection solution. Challenges arose when attempting to attach fluorescein sodium salt to the peptide. Despite successful attachment to the alanine-methyl ester, no attachment was observed to the peptide. Additional testing is underway to understand if the failure of this attachment is a result of attachment protocols or the deprotection procedure.

**Emily De Jong, Hamilton College, 2019, Biochemistry and Hispanic Studies, Ovaries from diabetic mice exhibit loss of follicles leading to reproductive failure**

ABSTRACT: Non-insulin dependent (type 2) diabetes is characterized by a cell's inability to efficiently process insulin, resulting in high blood glucose levels, or hyperglycemia. While glucose is necessary, high concentrations accelerate oocyte maturation (Chang, Dale and Moley, 2005). These increased glucose levels impair meiosis and cause lower rates of ovulation by inhibiting extracellular communication (Colton, Pieper and Downs, 2002). Diabetes has been shown to affect the meiotic maturation of oocytes during folliculogenesis, resulting in reduced embryo development and decreased fertility (Chang, Dale and Moley, 2005). In the ovarian follicle, somatic granulosa cells surround the developing oocyte and support oocyte growth through paracrine signaling and gap junctions. Decreases in oocyte-granulosa cell communication impair oocyte maturation (Chang, Dale and Moley, 2005). These cells aid in glycolysis by metabolizing glucose into products like pyruvate and ATP and transferring them to oocytes via gap junctions to promote oocyte maturation (Wang, Chi, and Moley, 2012). Previous studies have shown that hyperglycemia also induces mitochondrial dysfunction and apoptosis within oocytes via granulosa cells in diabetic ovaries that produce less pyruvate and ATP (Wang et al., 2010). The decrease in glucose uptake from the granulosa cells has been associated with meiotic spindle abnormalities, chromosome misalignment, and double-strand breaks (Blasiak et al., 2004). These genetic errors trigger the apoptosis of the cells, which reduces the ovulation rate and decreases fertility. This study examines the potential correlation between non-insulin dependent diabetes and the formation of oocytes by comparing the number and size of follicles in wild type and diabetic mice.

**Karl Brown, Colgate University, 2018, Biology, The utilization of soundscape ecology to measure and track changes to biodiversity in the forests surrounding Colgate University**

ABSTRACT: An ecosystem is characterized by a number of geographic and biological factors, but often overlooked is the role of sound in an ecosystem. Soundscape ecology is the study of the acoustic component of an ecosystem, which is made up of three types of sound: natural sound from living organisms (biophony), natural sound not from living organisms (geophony), and sound generated by humans (anthrophony). These sounds, their sources, and their interactions can often reveal important information about the environment. As Colgate University continues to make decisions about how to manage its landscape and forested areas and temperatures continue to rise due to climate change, soundscapes can reveal how these changes impact biodiversity and abundance in the forested land around campus. Thus, by recording and analyzing the soundscapes of Colgate University's forests, we can measure the health of this land and track changes that occur over time. While many organisms can be heard in these soundscape recordings, the most acoustically prominent are migratory songbirds that reside in the forests during the summer. As a result, we collected recordings with the intention of focusing on the vocalisations of birds. We used microphones to gather soundscape recordings from specific locations in the forests around Colgate University at dawn and dusk, the times of the day when birds are most vocal. Using R software, we computed indices for measuring biodiversity and the levels of anthropogenic disturbance within the forest. We found that as temperatures rose across the summer season, the levels of bioacoustic activity decreased within each

recording. Implications of rising temperatures due to climate change may further silence these ecosystems.

**Erin Biggar, Mary Kathryn McCann, Colgate University, 2018, Biology, Lack of refractory period in Red-eyed vireo song causes a decrease in Ovenbird song productivity**

**ABSTRACT:** Soundscape recordings allow analysis of bird song to understand behavior and interactions between bird species within an ecosystem. We recorded soundscapes at Colgate University to understand how bird song changes across the breeding season. The recordings obtained from Colgate's wooded areas shows a repetitive pattern containing an Ovenbird song directly following the completion of a Common Yellowthroat song when males of both species occupy the same area. Previous experiments demonstrate that Ovenbirds sing during the refractory period of other individuals' song to avoid song interference. The period of silence following the completion of a bird song is the refractory period. Ovenbirds have been found to have fairly even spacing between songs during the morning chorus. Our data was consistent with previous research showing that Common Yellowthroats have sporadic songs and sing within the same frequency band as the Ovenbirds. Based on the data we have collected, Common Yellowthroats and Ovenbirds will space out their song in order to avoid song overlap. This behavior can ensure a bird's entire song is heard and this may help to increase mating success. Furthermore, our data shows an increase in the number of Red-eyed Vireos in the area as the breeding season progresses. Red-eyed Vireos, unlike the Common Yellowthroats, sing continuously and offer less refractory periods for the Ovenbirds to sing without interference. We hypothesize that the lack of a refractory period in the Red-eyed Vireo's song disrupts the rate of song production of Ovenbirds in Colgate's forested lands. Our results support our hypothesis: when Red-eyed Vireos are present and singing, Ovenbirds decrease their rate of singing. As climate change intensifies, it is possible that Red-eyed Vireos could start to migrate to their summer breeding grounds earlier. The early arrival of Red-eyed Vireos during the Ovenbird nesting and mating period could cause a decrease in Ovenbird song frequency that could potentially lead to reduced mating success and overall abundance. Further research could demonstrate what impact the Red-eyed Vireo may have on neighboring species abundance and diversity in relation to global climate change.

**Clare Munroe, Hamilton College, 2018, Chemical Physics, High-Resolution Atomic Force Microscopy of alpha-Quartz in Air and Liquid**

**ABSTRACT:** Quartz is a polymorph of silicon dioxide ( $\text{SiO}_2$ ). It is one of the most abundant minerals on Earth, and has many applications ranging from construction to electronics to molecular biology. Many of these applications take advantage of the surface properties of quartz; however, there have been surprisingly few experimental studies which directly address the surface structure of bulk quartz. Atomic force microscopy is a reliable technique that can be used to study the surface of insulating materials like quartz in real space. I present high-resolution AFM images of a well-prepared quartz surface. Images taken in air with dimensions in the hundreds of nanometers show three domains of stripes, similar to those reported by Eder *et al.* Nanoscale images acquired with liquid AFM show near-atomic resolution. Analysis of the atomic-scale structures reveals strong agreement with expectations from atomic models for  $\alpha$ -quartz.

**Danielle Couture, St. Lawrence University, 2018, Chemistry, Synthesis of Multi-ringed Compounds Using an Intramolecular Wagner-Jauregg Reaction**

ABSTRACT: The Wagner-Jauregg reaction can be used to build large, multi-ringed molecules. However, in the past, it has most commonly been utilized to connect two different molecules. This project examines the Wagner-Jauregg reaction as an intramolecular reaction (within a molecule), and more specifically, it builds on previous research by examining the effect of tether length. Multiple molecules were synthesized and subjected to various conditions in order to test whether or not the reaction would take place. Radical chemistry was also used to obtain the final target molecule. Crude  $^1\text{H}$  NMR spectra suggest that both the Wagner-Jauregg and radical conditions were successful and the target molecules were formed. However, due to limited amounts of material, the products could not be purified and further work needs to be done on the project to confirm these results.

**Lieza Chan, Skidmore College, 2018, Chemistry, Effect of Elongin-B C-terminus on Correlated Motions in HIV Vif Complex**

ABSTRACT: HIV-1 Vif is an intrinsically disordered protein (IDP) that gains structure through interactions with Elongin-B (EloB), Elongin-C (EloC), and CBF- $\beta$  creating the Vif-CBF $\beta$ -EloB-EloC (VCBC) complex. Vif is responsible for the ubiquitination of virus fighting proteins allowing HIV to thrive in host cells. The crystallized structure contains a truncated C-terminus EloB tail; however, NMR data has shown that with the full-length EloB tail, there was improvement to the NMR signal due to quenching of dynamics. Through Molecular Dynamics (MD), the conformations of the VCBC complex including the full-length EloB C-terminus tail were simulated. Principal Component Analysis (PCA) was used to observe different global movements by separating them into essential dynamics based on correlated motions of the backbone. The combined PCs of VCBC with and without the full-length tail had greatest correlated motions being a clamshell opening and a second an opposing twist. Looking directly at EloB, there were more fluctuations with the full-length tail compared to the truncated tail. However, the atomic flux decreases in EloC via interactions with the full-length tail EloB residues. Overall the additional residues allowed for better NMR signal possibly through decreasing fluctuations in EloC but do not affect the global conformational dynamics sampled by the VCBC complex.

**Zhengqi Yang, Union College, 2018, Electrical Engineering and Mathematics, Image Classification via Convolutional Neural Network**

ABSTRACT: Breast cancer is the most commonly diagnosed cancer for women. It has a higher death rate than any other types of cancers for women in the United States. Detecting tumors in their early stages through screening examinations is key to reducing breast cancer mortality. Mammography has its limitations and might miss breast cancers in some cases. The high false positives rate of screening ultrasound results in additional imaging/biopsy and anxiety. In this work, we present an effective method to automatically classify breast cancer images using convolutional neural network (CNN). CNN is inspired by connectivity patterns between biological neurons. This is an effective method of image classification in supervised machine learning because the network has ability to learn the parameters that in traditional approaches are hand-engineered. Before we use this method to deal with challenging medical images, we apply it to solving regular image classification tasks. The classification procedure usually includes data augmentation, training the network, and testing the network. In order to speed up CNN training, we explore different toolboxes to implement CNN.

**Angelica Greco, Colgate University, 2018, Geography, Who's Calling the Shots on Nuclear Decommissioning: A Case Study of Scriba, NY and Vernon, VT**

**ABSTRACT:** Nuclear power plants in the US today face an uncertain future. An increasing number of plants are shutting down before their licenses expire, leaving host communities struggling to cope with the economic shock of decommissioning. Yet few studies focus on where the power lies in decommissioning decisions; what roles do the state, county, grassroots activists, and residents of the host community play? This case study investigates two nuclear power plants with divergent decommissioning outcomes: the James A. FitzPatrick Nuclear Power Plant in Scriba, NY, which was not decommissioned, and the Vermont Yankee Nuclear Power Station in Vernon, VT, which began decommissioning in 2014. Theoretically, this study draws on the work of Rick Eckstein in *Nuclear Power and Social Power* (1997), a case study on the commissioning of the Shoreham and Seabrook nuclear power plants, and investigates whether Eckstein's findings also apply to decommissioning. The results of this study echo Eckstein's conclusion: the state-level "official" perspective carries the most weight, and those acting at the local level are minor players in decommissioning decisions. Interviews with 26 people, including state and county officials, reporters, grassroots activists and community members, supplement analysis of written material, and also show how local people have been engaging with processes surrounding decommissioning, despite their lack of control over the outcome of these processes. Ultimately, this project contributes to the body of research on how nuclear decommissioning plays out at the community level, and will be of interest around the country as more and more towns find themselves facing nuclear power plant closure.

**Alexs Matias, Monique Dudar, Josip Kauzlaric, Skidmore College, Health and Exercise Science, Rehydrating Efficacy of Maple Water after Exercise-Induced Dehydration: Potential Sex Differences**

**ABSTRACT:** Dehydration impairs physiological function, and thus physical performance; therefore, understanding effective rehydration strategies is paramount. Despite growing interest in natural rehydrating beverages (e.g. coconut or maple water), research is limited, and no study has examined maple water (MW). **PURPOSE:** To investigate the rehydrating efficacy of maple water (MW). **METHODS:** Using a single-blind, counterbalanced, crossover design, we compared the rehydrating efficacy of MW vs. maple-flavored bottled water (control) in 26 young healthy ( $22\pm 1$  yrs,  $24\pm 1$  kg/m<sup>2</sup>) males (n=13) and females (n=13) after exercise-induced dehydration ( $\sim 2.0\%$   $\Delta$  Body Weight [BW]) in an environmental chamber (30°C, 50% RH). Post-exercise, subjects consumed 1L of MW or control. Assessments of hydration (BW, salivary and urine osmolality [S<sub>osm</sub>/U<sub>osm</sub>]), urine specific gravity (USG), urine output (UO), urine color (UC), thirst, fatigue, heart rate (HR), and HR variability (HRV) were taken at baseline, immediately post-exercise, 0.5, 1, and 2h post-consumption. **RESULTS:** After dehydration (p<0.05), MW had no significant (p>0.05) impact on rehydration. Thirst sensation was 12% higher in the MW condition (p<0.05). When analyzed by sex, females had higher  $\Delta$ BW, USG, U<sub>osm</sub>, lower UO (p<0.05) but similar S<sub>osm</sub> (p>0.05). Analysis of beverages and urine for antioxidant potential (FRAP assay), revealed greater potential of the MW ( $3.9\pm 0.0$  vs.  $1\pm 0.1$ ) and urine following MW consumption ( $9.4\pm 0.7$  vs.  $7.6\pm 1.0$  mmol, MW vs. control). **CONCLUSION:** MW is an effective rehydrating beverage when volume is prescribed, but may be superior when rehydration is ad libitum. Furthermore, we revealed that sex differences existed in urinary, but not salivary, markers of hydration with variations in kinetics.

**Jose Giron, Skidmore College, 2020, Chemistry/Biochemistry, Direct Pathway For Bacillus Anthracis tRNA Asparaginylation**

ABSTRACT: Protein synthesis is essential for life and requires the correct pairing of amino acids to their cognate transfer tRNA (aminoacylation). To date, only two routes exist to attach asparagine (Asn), to its cognate tRNA<sup>Asn</sup>: the direct and the indirect pathways. The direct path uses asparaginyl-tRNA synthetase to attach Asn to tRNA<sup>Asn</sup> when free Asn is present. The Asn is synthesized by asparagine synthetase A. The second pathway involves synthesizing Asn on the tRNA itself. The causative agent for anthrax, *Bacillus anthracis*, appears to encode both routes for Asn-tRNA<sup>Asn</sup> formation. We would like to understand why *B. anthracis* codes for both routes. This summer we have focused on the direct pathway. We report the successful purification of the asparagine synthetase A and asparaginyl-tRNA synthetase along with both variants of the *B. anthracis* tRNA<sup>Asn</sup> in order to characterize the pathway under different physiologically relevant conditions.

**Bolton 282**

**Kathryn Wall, Union College, 2018, Neuroscience, Effects of Neuropsychological Testing Media on Results**

ABSTRACT: As our society grows more intertwined with technology it is important to assess how common medical practices are altered by using electronic mediums. The present study investigated the relationship between electronic and paper neuropsychological tests. These tests are commonly used to gauge a patient's cognitive abilities. The study consisted of 12 college students (YA) average age of 21.0 ( $SD=1.2$  years) and 12 older adults (OA) with an average age of 70.8 years ( $SD=11.7$  years). Participants were assigned to either paper testing first or electronic testing first. Paper tests consisted of Trails B 1 and 2, Stroop A, B and C and Digit Span task. Electronic tests were administered using Brain Baseline software on iPads. The electronic tests were Stroop, Flanker and Trails A and B. When comparing Z-scores of paper vs. electronic versions of the Stroop A/C ratio, young adult scores were comparable ( $r=0.55$ ), while older adult scores had a weaker association between formats ( $r=0.24$ ). More research is needed to evaluate the comparability of the electronic versions of Stroop and Trail Making tests when trying to move from paper and pencil to electronic platforms. It seems that preliminary evidence suggests younger adults may have more comparable results/higher validity across formats; this may be due either to less variability in performance among younger adults (e.g., smaller SDs) and/or it may be that young adults are more familiar with the technology of electronic administration platforms and thus a more accurate/comparable performance may be extracted in the younger age range.

**Stephen Wisser, Hamilton College, 2020, Neuroscience, Environmental Studies; Kai Scarangella, Hamilton College, 2020, Environmental Sciences; Aneka Sheppard, Hamilton College, 2019, Biochemistry and Molecular Biology; Analysis of water column and sub-chemocline biofilm samples from meromictic Green Lake (Fayetteville, NY)**

ABSTRACT: Green Lake in Fayetteville, NY was formed approximately 13,000 years ago as glacial meltwater carved out a deep basin in the Syracuse Formation. The lake is 55 meters deep and is situated within Green Lakes State Park. Green Lake is meromictic meaning that it is comprised of an upper layer that mixes annually (mixolimnion), a stagnant lower layer (monimolimnion), and a boundary layer (chemocline). The mixolimnion is well oxygenated but nutrient poor, whereas the monimolimnion is anoxic and sulfide rich. Our objective was to measure various environmental parameters in the water column and to further characterize unusual sub-chemocline microbial mats that form on the lake basin walls. Water column data revealed a distinct increase in turbidity at a depth of 20 m, due to an abundance of purple sulfur bacteria. At the same depth, there was a sharp

drop in dissolved oxygen and oxidation reduction potential. The sub-chemocline microbial mat samples were collected using a remotely operated vehicle (ROV). Brightfield microscopy showed the presence of *Beggiatoa* like bacteria, organisms that use oxygen or nitrate to oxidize H<sub>2</sub>S and diverse ciliates in the mat material. These observations, coupled with prior data, support our hypothesis that these mats are comprised of chemotrophic sulfur-oxidizing communities forming in a novel redox setting, the interface of oxidant seeps discharging into the aphotic sulfide-rich waters of a meromictic lake. To our knowledge this is the first study to describe chemolithoautotrophic microbial mats forming in such an inverted redox setting.

**Sajju Chalise, Union College, 2019, Physics, Proton Induced X-Ray Emission (PIXE) Analysis to Measure Trace Metals in Soil Along the East River in Queens**

ABSTRACT: The Union College Ion-Beam Analysis Lab's 1.1 MV tandem Pelletron accelerator is used to determine the presence of heavy trace metals in Queens, NY between Astoria Park and 3.5 miles south to Gantry State Park. A PIXE analysis was performed on 0.5 g pelletized soil samples with a 2.2 MeV proton beam. The results show the presence of elements ranging from Ti to Pb with the concentration of Pb in Astoria Park ( $2200 \pm 200$  ppm) approximately ten times that of the Gantry State Park. We hypothesize that the high lead concentration at Astoria Park is due to the nearby Hell Gate Bridge, painted in 1916 with lead based paint, then sandblasted and repainted in the '90s. If the lead is from the repair of the bridge, then we should see the concentration decrease as we go further from the bridge. To test this, soil samples were collected and analyzed from seven different locations north and south of the bridge. The concentrations of lead decreased drastically within a 500 m radius and were approximately constant at greater distances. More soil samples need to be collected within the 500 m radius from bridge to identify the potential source of Pb. We will describe the experimental procedure, the PIXE analysis of soil samples, and present preliminary results on the distribution of heavy trace metals.

**Claudia Karademas, Hamilton College, 2020, Psychology, Do Gustatory Processing Styles Prime Vision?**

ABSTRACT: When we perceive sensory information, we can concentrate on either the whole or the details of the object or experience. Global or local processing styles occur in all five senses. J. Förster (2011) conducted research in which adopting a global or local processing style in one sensory modality influenced which processing style participants adopted within a different sensory modality. His paper was later retracted based on statistical analyses conducted during an institutionally-driven investigation. We replicated one of his experiments examining gustatory priming of vision. As in Förster's study, we looked at whether instructing participants to focus on either the details or the whole during a tasting task involving a cereal mixture affected whether they would subsequently adopt a more global or local processing style during an ambiguous visual matching task. In the visual task, participants were presented with a sample figure, and chose between two options which either matched globally or locally (never both). We analyzed the proportion of global choices in the visual task as our measure of priming. Contrary to Förster's findings, gustatory global or local focus did not have an effect on visual processing. However, we aim to further increase our power in this study, and will conduct an additional replication study using stimulus-based gustatory global or local biases, rather than instructions, to investigate additional gustatory-visual cross-modal priming reported in Förster's (retracted) paper. The current study not only contributes to our understanding of cross-modal priming, but also more broadly to scientific self-correction through research replication.

**Sophie Staton, Skidmore College, 2018, Social Work, VOICES: Voicing Our Individual and Collective Experiences**

ABSTRACT: Using the participatory action research method photovoice, this project explored the experience of homelessness in New York, including difficulties, coping mechanisms, and actions for addressing homelessness. Over the course of 6 weeks, participants in Saratoga Springs and New York City used visual images and narratives to share the story of their everyday reality and construct strategies for change. Data consisted of images, corresponding narratives and group dialogue. Descriptive coding and thematic analysis were conducted using NVivo 11. Preliminary findings highlight themes related to 1) the 'identity' and stigma of being homeless, 2) the double jeopardy of being old/disabled and homeless, and 3) the role of providers/caseworkers. Findings suggest implications for research and practice.

**Lukuo Lee, Jack Herrick, Colgate University, 2018, Molecular Biology, Interdisciplinary Chemical Biology Approach for the Identification of Novel Compounds Promoting Plant Disease Resistance**

ABSTRACT: Small molecule plant activators have been shown to defend crops from pathogens by triggering the plant's immune response. This study will conduct a low throughput screen of a compound library in an effort to identify novel compounds promoting plant immunity. The library will contain, among other compounds, pyridinium compounds, which have recently been shown to induce pathogen immunity in plants. This may serve as a control to test the efficacy of our system. We will systematically treat the model plant, *Arabidopsis* with candidate compounds and then challenge them with the bacterial pathogen, *Pseudomonas syringae* and perform phenotypic analysis by monitoring disease symptoms. Partial or complete reduction of disease symptoms with a compound pretreatment would suggest an activation of disease resistance by that compound. Should a compound prove effective in triggering disease resistance, it will be subjected to further characterization, for eventual application in economically significant crops.

**Taylor Coursey, Hamilton College, 2019, Environmental Studies, Perceptions of the link between Meat Consumption and Greenhouse Gas Emissions**

ABSTRACT: With the acceleration of global climate change, it is becoming increasingly important for individuals to reduce their personal ecological footprint. One of the single most effective decisions a person can make in the 21<sup>st</sup> century is to reduce their meat consumption. Research has been shown that transitioning from a mostly meat-based diet to a plant-based diet positively affects biodiversity, land use, climate change, human health, and animal welfare. Though dietary choices have such a large impact on greenhouse gases, the majority of the U.S. population is largely unaware of its significance. With the recent withdrawal from the Paris Climate Agreement and other environmentally toxic decisions that have been made over the past year, it is common to feel that one's political agency has been stripped away by the current administration. As an environmental studies major, I want to restore individual power back to the population in some respect. This summer, with the help of Professor Jamie Bodenlos of Hobart & William Smith Colleges, I sought to see what research about the perception between diet and climate change had been conducted in hopes of building upon past studies to engage the public in some way to adopt more environmentally sustainable behaviors. First, to familiarize myself with what was already out there, I searched multiple databases, finding studies that were related to meat consumption, dietary choices, and climate change. I found that researchers have examined individual's perceptions of plant-based diets and found that generally health and well-being are much bigger motivators for changing their diet than environmental issues. Additionally, studies have investigated how people view sustainable behavior and have found that compared to other actions, recycling, eating organic, walking, people rate eating a vegetarian diet as the least

effective behavior. After this initial search, I found that there wasn't much, if any, research looking at how this link between meat and greenhouse gas emissions varies by age, gender, and income status. This is important to address because interventions may need to vary based on population. For the rest of my time in Geneva, I created a psych study to be implemented both at HWS and Hamilton College in fall 2017. This study seeks to investigate demographic differences in the perceptions of meat consumption and climate change. Specifically, the purpose of the study will be to look how consumer ratings of the environmental impact of different proteins (chicken, pork, beef, tofu, etc.) differ based on region, sex, and income and how this affects their willingness to reduce meat consumption. Moving forward, I am in the application process to run the study at both Hamilton and Hobart and William Smith. These results will hopefully aid into some sort of intervention amongst the two campuses in the 2018-2019 year, seeing how educating individuals on the impact of meat affects their consumption.

### ***Palamountain 202***

#### **YiZhi Lin, Union College, 2018, Neuroscience, Differences in emotional brain areas in people with chronic facial pain**

**ABSTRACT:** Trigeminal Neuralgia is a chronic pain condition in which the aberrant function of the fifth cranial nerve, innervating the head and face, gives rise to some of the worst shock-like pains imaginable. This kind of pain is both physically and psychologically grueling for patients. Prior studies found that people with trigeminal neuralgia have both brain grey matter volume and white matter connection abnormalities, compared to healthy people. Hence, we hypothesized that trigeminal neuralgia patients have grey matter abnormalities and white matter connectivity abnormalities in brain circuits which process emotional information, such as the cingulum, hippocampus. We compared patients with left- (n=14) and right- (n=28) sided pain, to age- and sex-matched healthy volunteers using magnetic resonance imaging (MRI). Grey matter volumetric analysis was done using Freesurfer software and white matter analysis was done using FSL and Tract-Based Spatial Statistics software. Other statistical analyses were carried out with SPSS 17. Results showed significant decreases in grey matter volume ( $p < 0.05$ ) in the cingulate cortex, hippocampus and amygdala. However, the side of pain was not a significant factor. A t-test was done for the white matter analysis, and the result showed significant lower ( $p < 0.05$ ) fractional anisotropy in cingulum, hippocampus and other non-emotional processing regions, such as corpus callosum. These results supported the hypothesis that people with chronic pain develop abnormalities in brain circuits which process emotions -- which is likely related to their experiences of intense pain.

#### **Kathleen Murray, Colgate University, 2019, Neuroscience, A novel experimental setup for the analysis of social interaction in the zebra finch**

**ABSTRACT:** The zebra finch (*Taeniopygia guttata*) has been used in many studies as a strong model organism for neuroscience research involving areas such as vocal learning and circuit development. Zebra finches are a particularly comparable animal model because they demonstrate strong connections between social interaction and song learning capability. In this study, we use a novel experimental setup to track social interactions between subjects with reflective paint and a video camera. Video recordings are then analyzed frame-by-frame using a program in MATLAB. Preliminary results indicate success using five paint colors for simultaneously tracking multiple interacting individuals than previous methods. Future research will involve data collection of father-son interactions during the sensitive period for song learning, as well as improvement of the protocol and MATLAB program for accessibility and reproducibility. This methodology will provide a simple and

noninvasive way for researchers to quantify the effects of genetic and environmental manipulations on laboratory test subjects, particularly zebra finches.

**Christopher Ostaszewski, Skidmore College, 2018, Chemistry, Mathematics, Quantum Mechanical Calculations of O(3P) Reactions with Cyclohexene Chemisorbed onto Al<sub>2</sub>O<sub>3</sub>**

ABSTRACT: Petroleum processing generates an important fraction of relatively inert hydrocarbon compounds with little commercial value. The ever-increasing worldwide demand of petroleum and its derivatives, along with the depletion of light crude oil supplies, has increased the proportion of these hydrocarbon residuals generated in refineries. Thus, the need of new greener technologies to functionalize these organic compounds is paramount. Yet, technologies that oxidize and functionalize hydrocarbons, such as non-thermal plasma processing, have been largely overlooked because hydrocarbons can partition the gas phase, making the reaction with plasma difficult to control. Here, we present an alternative pathway that prevents the hydrocarbon partition to the gas phase by adsorbing it onto an active metal oxide surface. Upon adsorption, the properties of the organic molecule change, leading to different reaction pathways to be energetically possible. In this work, the chemisorption of cyclohexene on alumina was modeled and correlated to experimental data. The energy minimization and vibrational frequency calculations were performed on a binuclear cluster including an Al<sub>2</sub>O<sub>3</sub> active site. These calculations revealed where a chemisorbed cyclohexene had a lower electron deficiency than a free gaseous cyclohexene, indicating the position of the chemisorption bond between it and alumina. In addition, the energies of several reactions of cyclohexene and radical oxygen on the surface were calculated. The experimental data indicates multiple oxidations of cyclohexane, leading to the ring being opened and ultimately the formation of carbon dioxide.

**Sarah Gowan, Skidmore College, 2019, Neuroscience, Atmospheric Particle Aging: Daytime Chemistry in the Ocean/Atmosphere Interface**

ABSTRACT: To date, little attention has been given to the photochemistry of the sea surface microlayer (SML) and sea spray aerosol (SSA), leading to large uncertainties in the roles of both systems as they pertain to climate, biogeochemical cycles, and the chemical balance of the atmosphere. Recent studies have found that the SML is enriched with light absorbing organic material, including humic-like substances (HULIS). Upon interaction with solar radiation, photoexcited HULIS can transfer energy to neighboring volatile organic compounds (VOCs), affecting its interaction with SSA. In this project, we investigate the daytime changes in particle mass when humic acid, a proxy of HULIS, interacts with common biogenic VOCs such as isoprene and  $\alpha$ -pinene.

**Natalie Stuart, Skidmore, 2018, Chemistry, Computational Calculations of the Effects of Surface Water on the Photocatalysis of HNO<sub>3</sub> on TiO<sub>2</sub>**

ABSTRACT: SH3 domains are common protein interaction domains that are found across all forms of life and bind flexible intrinsically disordered proteins (IDPs). IDPs are difficult to model using only experimental methods. Molecular dynamics (MD) simulations mimicking experimental conditions were used to model the ArkA IDP which binds to the SH3 domain found in yeast, Abp1SH3. ArkA IDPs are believed to bind to SH3 domains in a multi-step binding process. Conformational analysis was applied to the ArkA IDP to gain a better understanding of conformations that may promote this binding. ArkA was found to sample a higher population of polyproline II helices compared to experimental data, which is likely due to restriction of the omega bond of proline to the trans conformation in the MD simulations.

2:20-3:30 pm

Poster Session #3

(4 locations)

*Bolton 280*

**Danielle Rodriguez, Hamilton College, 2019, Biochemistry; Olivia Simone, Hamilton College, 2019, Chemistry; Caroline Sullivan, Hamilton College, 2020, Undecided; Use of N-(1-alkoxyvinyl) pyridinium salts in organic synthesis**

ABSTRACT: *N*-Substituted pyridinium salts represent one of the most valuable reagent classes in chemical synthesis due to their versatility and ease of use. Recently, our laboratory discovered a new class of pyridinium salts containing *N*-(1-alkoxyvinyl) groups, enabling divergent reactivity toward multiple synthetic transformations. Preliminary investigations of amidation, esterification, electrophilic aromatic substitution, nucleophilic aromatic substitution, Diels-Alder and 2+2 cycloadditions will be presented.

**Rebecca Wales, Skidmore College, 2018, Biochemistry, Direct Route for Asparaginyl-tRNA Formation in *B. subtilis***

ABSTRACT: *B. subtilis* uses two distinct pathways to attach asparagine to tRNA<sup>Asn</sup>. Asparaginyl-tRNA<sup>Asn</sup> formation is essential for protein synthesis, but why the organism encodes for both asparaginyl-tRNA<sup>Asn</sup> routes is unknown. In the direct route, asparagine is first synthesized by an asparagine synthetase. Asparagine is then attached to tRNA<sup>Asn</sup> by asparaginyl-tRNA synthetase. For the indirect path, asparagine is synthesized on the tRNA. Characterization of the two routes will provide insight into bacterial life cycles. Accordingly, we have purified the *B. subtilis* asparaginyl-tRNA synthetase and asparagine synthetase to characterize the direct pathway. Also, we are attempting to knockout the direct pathway in *B. subtilis* to better understand its physiological role. The work will provide insight into how bacteria adapt metabolism to survive under different environmental conditions.

**Elissa Williams, Yutong Li, Skidmore College, 2019, Biochemistry, B. Anthracis Indirect Pathway Of Asparaginyl-Trna Formation**

ABSTRACT: Two distinct routes for attaching asparagine (Asn) to its cognate transfer RNA (tRNA<sup>Asn</sup>), an essential step in protein synthesis, are known in *Bacillus anthracis*. In the direct route, asparaginyl-tRNA synthetase directly ligates Asn to tRNA. In the indirect pathway a non-discriminating-AspRS attaches aspartate to tRNA<sup>Asn</sup> which GatCAB then amidates. In this path asparagine is synthesized on the tRNA using a complex between a non-discriminating aspartyl-tRNA synthetase, tRNA<sup>Asn</sup>, and GatCAB, the transamidosome. We are purifying the components of the transamidosome in order to characterize the indirect pathway under various conditions to understand the role of the indirect route in this human pathogen and why it acquired an archaeal aspartyl-tRNA synthetase for this purpose.

**Caitlin Schroeder, Skidmore College, 2018, Bio-Chemistry Major/Anthropology Minor, Characterization of the Dual Pathways for *B. halodurans* Asparaginyl-tRNA Formation**

ABSTRACT: Protein synthesis requires the attachment of an amino acid to its cognate transfer RNA (tRNA). Two distinct pathways for attaching asparagine (Asn) to tRNA<sup>Asn</sup> are known: the direct pathway, in which Asn is directly attached to tRNA<sup>Asn</sup> by AsnRS; and the indirect pathway, in which Asn is attached to tRNA by non-discriminating AspRS and GatCAB. *Bacillus halodurans* uses both routes for the formation of the Asn-tRNA<sup>Asn</sup> complex. To better understand why *B. halodurans* possesses both pathways, we are purifying its AsnRS and AspRS in order to test and compare their activities under

different chemical conditions such as reactive oxygen species and pH. This research will provide insight into how *B. halodurans* has adapted to survive in different environmental conditions.

**Jodi Weiss, Hamilton College, 2019, Biology, Frequency of Abnormal Chromosome 10 in Tropical Landraces of *Zea mays***

ABSTRACT: Abnormal chromosome 10 (Ab10) is a selfish maize chromosome that promotes its own inheritance to future progeny over normal chromosomes. Extensive genetic analysis of this abnormal meiotic drive system has been carried out mainly on agricultural and research landraces of North America and Mexico. The presence of Ab10, however, has not been widely studied in tropical maize landraces. We investigated the frequency of abnormal chromosome 10 in a variety of *Zea mays* tropical landraces from five South American countries. Only two of 43 tropical landraces tested positive for the presence of Ab10. Of the two positive landraces, 71% of Peruvian individuals, and 60% of Venezuelan individuals contained Ab10. Currently, three types of Ab10 exist and are determined by their cytological structure. Fluorescence *in-situ* hybridization (FISH) revealed that the Peruvian population carries Ab10 variant type-III, which is the most prevalent type. In addition, geographic observations revealed that both Ab10 positive landraces were cultivated from regions at average altitudes of 120m and 115m. These findings support previous research reporting high occurrences of abnormal chromosome 10 within populations found at lower altitudes.

**Edward Gebara, Union College, 2018, Bio-Medical Engineering, Controlling Regioselectivity using Supramolecular Assembly**

ABSTRACT: In organic chemistry, to prevent a functional group from undesired transformations, it is often converted to a more stable group, which is later reverted to the original functionality. Such a method is frequently employed to attain regioselectivity and chemoselectivity in organic synthesis. These selectivities, however, come at the cost of increasing the number of steps in a synthetic sequence, thus decreasing the overall yield. This poster details an alternative approach to this protection-deprotection strategy that involves encapsulating the molecule in a receptor, such as cucurbituril and cyclodextrin, which non-covalently shields the reactive group from the reaction conditions. The product release can be controlled by manipulating pH, temperature and solvent. This strategy was applied on various aromatic compounds giving results with satisfactory selectivity.

**Haley Anchukaitis, St. Lawrence University, 2018, Chemistry, Synthesis of Doxorubicin Analogs for DNA Binding Studies**

ABSTRACT: Anthracyclines are used in the medical field for their antitumor activities. One of the most common drugs of this class, doxorubicin (DOX), has been used to treat cancers in the breasts, ovaries, and lungs. The mode of action for DOX is intercalation between the base pairs of DNA, which disrupts translation and replication. The planar structure of DOX allows the rings to slide in between the base pairs, while the sugar moiety interacts with the minor groove. The sugar connects to the minor groove via hydrogen bonding between the amine of the sugar and the sugar-phosphate backbone of DNA. To determine how the absence of those hydrogen bonding interactions affect the binding mode, a DOX analog (7,10-dihydro-6,11-dihydroxy-naphthacenedione) was synthesized. The analog required a four-step synthesis, starting from hydroquinone and phthalic anhydride; the product was recovered in low purity. The first three rings were built using a variety of Friedel–Crafts and Claisen rearrangement reactions, with a ring closing metathesis to complete the fourth ring. The scheme and final structure can be seen in Scheme 1. Further attempts were also made to introduce an amine group onto this tetracyclic structure, to mimic the DOX amino-sugar, making interaction with the minor groove of the DNA backbone possible, but those efforts have not yet proven successful. This reaction is shown in Scheme 2.

***Bolton 281***

**Alexis Haley, St. Lawrence University, 2018, Chemistry, Investigation of MhuD Iron Insertion into Protoporphyrin IX**

Metalated tetrapyrroles, like heme, are essential in a variety of biological processes, and can be effectively synthesized by distortion to insert specific metal ions using a chelatase. Mycobacterium heme utilization degrader (MhuD) is an enzyme whose primary function is to degrade heme by removing iron, but paradoxically, its structural properties exhibit the potential for its use as a chelatase. Through UV-Vis spectroscopy and ESI-MS analysis, inserting iron into protoporphyrin IX through use of MhuD was investigated.

**Gabriella Gerlach, Skidmore College, 2019, Chemistry, Role of Segments 1 and 2 in the ArkA12 Structural Ensemble**

**ABSTRACT:** SH3 domains are protein interaction domains found across all forms of life and involved in both signal transduction and cytoskeleton regulation. They bind to intrinsically disordered proteins (IDPs), which are challenging to model using only experimental techniques. Thus, little is known about these binding mechanisms. One SH3 domain found in yeast, Abp1SH3, has a binding site for ArkA, an IDP. Replica exchange molecular dynamics simulations were used to model ArkA, and segments one and two of ArkA. It was found that while the entire ArkA peptide samples at least 6 conformations, segment 1 only samples one, where nearly all residues are in the conformation polyproline II. These conformations will be used to run simulations of ArkA binding to the Abp1SH3 domain.

**Leo Ascenzi, Yingsi Qin, Colgate University, 2020, Computer Science & Physics, Design of a Video Co-Watching Web Application**

**Abstract:** The goal of our research is to create an application to improve people's ability to remain connected to one another across distances while still engaging in a meaningful and fun activity. We are working on an application for people to watch videos "together" while they are not in the same place. We designed our application for people who may be unable to see each other regularly, e.g., people in long-distance relationships, military families, students studying abroad, etc. We conducted interviews with people from various backgrounds and ages to learn about their solo and group video watching habits. To analyze this interview data, we created an affinity diagram which we used to define user requirements, brainstorm potential features, and prioritize the essential features. We designed multiple prototypes, sought feedback from potential users, combined the prototypes, and refined the design to meet the user requirements. The primary features of the application are: streaming a YouTube video at the same time as a group of users while video and text chatting those users. More specifically, the YouTube video can be maximized, video chat feeds can be enlarged, the text chat can be hidden, specific users can be hidden and muted, and new users can be added to the call. Once the prototype was finalized, we began programming the front-end of the web application in HTML, CSS, JavaScript, and jQuery. By the end of the summer we had completed the front-end of the application and began to work on the back-end, using PHP.

**Daniel Casarella, Jennifer Cristiano, Skidmore College, 2018, Environmental Science, Tree functional traits vs environmental controls on key ecosystem properties and processes in the Adirondack Park**

**ABSTRACT:** Specific traits of forest trees are regulators of ecosystem processes, including decomposition, nutrient cycling, and carbon storage. Many studies have focused specifically on the mycorrhizal association (ectomycorrhizal (ECM) or arbuscular mycorrhizal (AM)) of dominant trees as a fundamental driver of biogeochemical cycling. However, environmental and abiotic factors related to climate and land-use are also considered master variables. There is a clear need for studies that examine the relative influence of mycorrhizal tree types and environmental controls across natural gradients. We began establishing permanent sampling plots in 4 distinct regions of the Adirondack Park (AP) that vary with respect to climate and tree communities, but have similar land-use history. At each site, 24 15-m radius plots (12 on south and 12 on north aspects) are centered on a dominant focal tree with the goal of varying mycorrhizal tree dominance from 0 to 100% ECM. Thus far, specific mycorrhizal distribution patterns are apparent across short distances and our expectations are better supported on south aspect plots. Early results also demonstrate expected patterns of increased litter accumulation and decreased inorganic nitrogen availability with increasing ECM abundance, however soil ammonium and inorganic phosphorus defied the hypothetical relationship. Further, soil nitrogen availability varied widely and was influenced more by aspect than depth. These results suggest that

climate and species specific traits might decouple expected nutrient cycling and carbon accumulation processes related to mycorrhizal functions.

**Jenny Soonthornrangsarn, Hamilton College, 2019, Geosciences and Mathematics, Monitoring Groundwater and Surface Water Nutrient Fluxes on Lake Erie's Eastern Shore**

**ABSTRACT:** Lake Erie's degrading water quality has become an issue of concern due to excess amounts of nutrients such as nitrogen and phosphorus. The U.S. and Canadian governments released the State of the Great Lakes 2017 Report stating that Lake Erie's status of nutrients is poor. As a result, the federal government is putting efforts to monitor the main tributaries entering Lake Erie to determine the major sources of nutrient flux. This research contributes to the federal government's monitoring goals and expands on current studies by examining both groundwater and surface water as potential sources of nutrient fluxes at Woodlawn Beach State Park, located on the eastern shore of Lake Erie. With two tributaries and a wetland that flow into the lake, Woodlawn Beach was an ideal field site to install stream gages and nested groundwater wells. Four surface waters and ten groundwater wells were sampled bi-weekly during the spring to summer 2017 field season to test for nitrogen, phosphorus, and its constituents (i.e. total phosphorus, nitrite, and total nitrogen). Stream discharge into the lake was calculated using rating curves that plot observed stream stage versus discharge. Comparing nutrient fluxes from groundwater and surface waters showed that ammonia was a major contributor of groundwater nutrient flux into the lake while surface water nutrient fluxes were much lower. These results emphasize the importance of expanding research to consider groundwater nutrient flux in addition to surface water nutrient flux. Further analysis is needed to find the source of ammonia before it becomes detrimental to the health of humans and organisms alike.

**Emily Schlicht, Skidmore College, 2018, Health and Exercise Science, The Impact of a Novel Wrist Cooling Device on Exercise Performance and Recovery in the Heat**

**ABSTRACT:** Environmental heat stress and exercise poses a physiological challenge and impairs performance. While pre-cooling has shown promise, many methods are impractical. A novel wearable wrist cooling band (Dhama) has been developed. The purpose of this study was to investigate whether Dhama bands improve exercise performance in heat and/or lessen physiological strain. **METHODS:** 13 male participants completed three 10km running trials in an environmental chamber (80°F, 60% relative humidity). Participants wore one band on each wrist for three conditions: both bands off (off/off), one band on (off/on), both bands on (on/on). Heart rate (HR, polar H7), core temperature (CoreT, HQ telemetry pill), running speed (RS), rating of perceived exertion (RPE) and thermal sensations (TS) were recorded at baseline, during 10km timed running trial, and during recovery. **RESULTS:** Use of cooling bands had minimal effect at rest ( $\uparrow$ HR, 3-5 beats/min), but resulted in faster RS (~0.25 mi/hr), higher HR (~5 beats/min) and CoreT (~0.5°C) over time. Though, RPE and TS were not different. **CONCLUSION:** Our data demonstrates that Dhama bands improve performance by increasing RS and decreasing projected 10km time (~10-30 seconds). This improvement comes at a cost of increased HR and CoreT. RPE and TS were not different given the faster RS, higher HR and CoreT. Use of cooling bands in the heat likely improves performance due to altered sensation or perception.

**Lucy Walker, Skidmore College, 2019, Geosciences, The Study of Zooplankton Trap Bias and Plastic Content in the Upper Ocean: A Sediment Trap Intercomparison**

**ABSTRACT:** Oceanographers employ a variety of methods to measure particle flux, an important part of the carbon cycle. Sediment traps are the most common and have the longest historical data set. There are several trap designs, including Neutrally Buoyant Sediment Traps, Surface Tethered Traps, and Pelagra Traps. This study focused on evaluating which trap design was most effective at collecting

sinking particles with as little bias as possible. The bias that was measured was the collection of 'swimmers', or zooplankton that enter the traps by actively swimming into them, as opposed to passively sinking. This study also investigated plastic fiber content in undeployed process blank traps compared to deployed traps. It was found that Pelagra traps collected fewer 'swimmers' and had less plastic in the blanks.

### **Bolton 282**

#### **Tatenda Chakoma, Hamilton College, 2018, Neuroscience, DREADDs: A Chemogenetic Technique for Remotely Controlling Neural Activity in Rats**

ABSTRACT: A progressive neuroscience tool for studying neural circuits and behavior in neuroscience is a chemogenetic approach, which is often referred to as DREADDs, (**D**esigner **R**eceptors **E**xclusively **A**ctivated by **D**esigner **D**rugs). DREADDs are muscarinic acetylcholine receptors that are engineered so that they do not respond to their endogenous agonist (acetylcholine) but are activated by a biologically inert ligand, Clozapine-*N*-Oxide (CNO). Their binding to CNO results in intracellular signaling that leads to either inhibition or excitation of neurons. One advantage of using DREADD technology, is temporal control of neural activity. Specifically, after CNO is injected into a rat that expresses the modified receptors, neuronal activity is silenced for approximately two hours. In addition, this neural inhibition only occurs in the neurons and brain region expressing the designer receptor providing the experimenter with spatial control over neural activity. The goal of this project was to infuse DREADDs into four brain regions, the retrosplenial cortex, dorsal hippocampus, perirhinal cortex and prefrontal cortex in rats. Using a stereotactic approach, rats were transfected with either of the two adeno viruses; AAVgi-mCherry which carried the designer receptor gene hM4Di or AAVgfp which carried the gene for a non-functional fluorescent reporter that served as a control. After surgery, rats were left for one to three weeks to allow for DREADD expression after-which their brains were sectioned and imaged. Confocal microscope images show robust fluorescence of both mCherry and gfp showing successful expression of DREADDs in these brain regions. Future studies will examine the effects of mediated neural inactivation during behavioral tasks that involve motivation, memory and learning.

#### **Sara Aldrich, Hamilton College, 2019, Neuroscience, Characterization of a Putative Rat Model for Autism Spectrum Disorder**

ABSTRACT: Autism Spectrum Disorder (ASD) is a neurological disorder characterized by sensory integration impairments, social deficits, and the presentation of repetitive behaviors. While mouse-based animal models of ASD created through genetic engineering exist, they fail to capture the majority of symptoms of ASD and present with a variety of unpleasant and confounding phenotypes. Basing our rationale on the GABAergic model of ASD, which states that dysregulations of the neurotransmitters GABA and glutamate have occurred in persons with ASD, we created a putative rat-based animal model of ASD by injecting rat pups twice daily with (+)-Bicuculine (3 mg/kg), a GABA<sub>A</sub> receptor antagonist. Behavioral testing was conducted after the rat pups matured to juvenile and adult status to ascertain whether sensory, social, and/or motor deficits were present.

In Experiment 1, a measure of sociality was assessed using the Social Odor Recognition Task (SORT), which consisted of three phases. During the Familiarization phase, wooden beads were placed in the cages of recipient rats for self-scenting (familiar beads) and into the cages of male donor rats (social beads). The male donors were unfamiliar to the recipient rats. During the Habituation phase, one social bead and three familiar beads were placed in the experimental rats' home cages. The rats were allowed to freely explore the beads for three one-minute trials. The next day, the Recognition phase

was conducted in which two familiar and two social beads were placed in the cages for 3 exploration trials. We recorded percent time spent with social beads and familiar beads to measure preference for social odors. Rats that sustained GABAergic dysregulation during postnatal development spent significantly less time with the social beads in both Habituation and Recognition phases when compared to the rats that were administered vehicle injections, indicating a potential deficit in social behavior.

In Experiment 2, audio-visual learning and decision-making in control and experimental rats were assessed through a lever press discrimination paradigm that was conducted in operant conditioning chambers. During the first phase, unimodal stimuli (visual cues) were presented and responses on the left lever were reinforced following presentations of one visual stimulus whereas responses on the right lever were reinforced following presentation of a second, distinct visual stimulus. In the second phase of testing, the two-lever discrimination paradigm was similar with the exception being that a third visual stimulus or an auditory stimulus was presented instead of the visual stimuli presented during the first phase. Rats with GABAergic deficiencies were unable to make stimulus-response associations when the stimuli within a pair were of the same modality (i.e. visual vs. visual), however, they were not impaired in the discrimination task when stimuli were of different modalities (i.e. visual vs. auditory). Perseverative behavior (repetitive nose poking into the food receptacle) was also observed in the rats in the experimental group. The results from these experiments reveal the presence of a cluster of deficits in the experimental rats that share similarities with symptoms that are frequently present in persons with ASD. Overall the present preliminary data suggest that dysregulation of GABAergic signaling during postnatal development may serve as a putative animal model of ASD.

#### **Ho Jun (Paul) Sim, Colgate University, 2018, Neuroscience and Music, Development of optogenetic transgenic songbirds**

**ABSTRACT:** In recent years, optogenetics has proven innovative and valuable for providing both spatial and cellular specificity to the manipulation of neural activity. Indeed, much research using optogenetic tools has been done on rodents, offering insight into the function of particular neural circuits on behavior. However, exploring more intricate behaviors such as vocal learning and development demands the use of an animal model that contains an associated vocal circuitry. Songbirds, which possess a dedicated vocal circuitry, serve as a more favorable model for studying the neural mechanisms involved in vocal learning. The purpose of this study was to develop the first transgenic zebra finches expressing channelrhodopsin-2 (*ChR2*), a light-sensitive protein capable of inducing depolarization upon exposure to light. Freshly laid eggs were injected with a lentiviral-mediated transgene containing *ChR2*. Preliminary results on the reporter gene demonstrate effective transfection. By enabling the manipulation of specific neurons in specific brain regions, these transgenic optogenetic songbirds could soon offer a novel approach to investigate the underlying mechanisms involved in vocal development and other forms of learned behavior.

#### **Beatriz Chavez, Tenzin Gyaltzen, Skidmore College, 2018, Physics, Development of Open-Source Hardware for Use with Microfluidic Testing Technology**

**ABSTRACT:** Chemical testing methods are getting smaller, more portable, and easier to perform; therefore, it is important that technology supporting these methods also becomes affordable. For example, our lab has developed testing methods based on paper microfluidic technology. Which is inexpensive and easy to use for a non-specialist. Each of our tests produces a color change which needs to be quantified in order to obtain a meaningful result. This study involves comparison of various cell phone cameras and open source hardware such as a Raspberry Pi-based camera. While

cell-phone cameras are ubiquitous, they need to be interfaced with a computer to produce a result. The advantage of a Raspberry Pi-based system is that the entire analysis can be conducted and automated. Unfortunately, the camera unit itself is not as high quality. We will present our results for both a urine-based diagnostic for malaria and a test to detect surface water contamination from oil and gas drilling.

**Roxanna Martinez, Skidmore College, 2019, Chemistry; Kyla Johnson, Skidmore College, 2020, Undecided; Development of a Paper Microfluidic Test for D-Lactate: A Diagnostic Test for Malaria**

ABSTRACT: Malaria is currently detected through a blood based test which requires expensive modern equipment. This poses problems to developing areas where proper equipment is not present and conditions are unsanitary. Micro paper based analytical devices are portable, easy to dispose of, and are user friendly. Our method uses a coupled enzyme assay to detect D-lactate, a byproduct of the malaria parasite, in urine. We have continued to work on stabilizing our reagents on paper to prolong shelf life and preparing a control set of chips to use alongside the patient's test in order to determine the concentration of D-lactate.

**Alan Xiao, Skidmore College, 2018, Molecular Biology, The effects of flufenacet on cell expansion, morphogenesis and cell wall deposition in the charophyte, *Penium margaritaceum*.**

ABSTRACT: Plant cell expansion and morphogenesis require complex and highly coordinated interactions of the cytoskeletal and endomembrane systems with the cell wall deposition apparatus. However, the structural and spatiotemporal dynamics of the plasma membrane and membrane domains therein during cell and wall development are poorly resolved. In this study, we interrogated the model unicellular charophyte, *Penium margaritaceum*, with flufenacet in order to elucidate its effects on cell expansion dynamics and the role of membrane lipids in cell development. Flufenacet is an elongase inhibitor that impairs synthesis of very-long-chain fatty acids (VLCFAs), causing a reduction in triacylglycerols and sphingolipids. This results in developmental defects in plant cell morphogenesis. A reduction in sphingolipids directly affects the microdomains, lipid rafts, and decreases the efficacy in sorting and trafficking of plasma membrane proteins. The stability of subcellular organelles involved in vesicular trafficking including those associated with cytokinesis may also be affected. When *Penium* was treated with flufenacet, cytokinesis was inhibited but not mitosis, polar translocation of daughter nuclei or cell expansion. The resulting phenotype was an elongate cell with a highly narrowed isthmus, i.e., the site of cell expansion. Immunocytochemical analysis demonstrated that in the expansion zone, cell wall deposition, especially homogalacturonan organization in the outer cell wall layer, was impeded. Cytochemical labeling with FM4-64, FM-143 and MDY-64 showed that significant flufenacet-induced alteration of endomembrane vesicle transport and the vacuolar network of the cell also occurred. Our results demonstrate that flufenacet application damages the structural dynamic integrity of endomembrane organelles, cell division and cell surface events during cell wall development.

**Alisha Blades, Hamilton College, 2020, Undecided; Phoebe Keyes, Hamilton College, 2019, Chemistry; Danielle McConnell, Hamilton College, 2020, Undecided; Direct synthesis of N-(1-alkoxyvinyl) pyridinium salts, a novel class of N-quaternized ketene N,O-acetals**

ABSTRACT: Acid-promoted addition of alkoxyacetylenes to an array of pyridines produce an unusual class of isolable pyridinium salts with potentially broad reactivity. Notably, the super-acids trifluoromethane sulfonic acid (TfOH) and bis(trifluoromethanesulfonyl)imide (Tf<sub>2</sub>NH) are superior promoters for addition of ethoxyacetylene to pyridine bases. A variety of other parameters, including

solvent, time, temperature, stoichiometry, mixing methods, and purification have been examined in detail.

### ***Palamountain 202***

#### **Meichai Chen, Union College, 2020, Psychology, Investigating change in anxiety during exposure meals over time as a predictors of eating disorder recovery**

ABSTRACT: Eating disorders (EDs), characterized by an excessive drive to be thin paired with disturbed eating, affect between .3-2.5% of adolescents, and .9-3% of adults, depending on the diagnosis, and result in significant impairment for most patients. When untreated, EDs are often chronic, have high mortality rates, and even with short-term treatment, some patients still suffer from clinically significant symptoms. Because of the severity and chronic nature of these disorders, it is important to better understand predictors of recovery. The ability to identify who is likely to recover early in treatment can allow researchers to develop techniques strengthening treatment for those patients. One indicator that may help determine whether an individual is likely to improve in ED treatment is anxiety during meals. This experiment examined changes in anxiety over time during exposure meals as a predictor of ED recovery. It was hypothesized that participants whose anxiety level decreased across meals in an intensive outpatient ED program would have lower ED symptoms at the end of treatment compared with participants whose anxiety ratings remained high across sessions. Anxiety levels were rated, from 0 to 100, every 5 minutes during exposure meals. Two sample patients' across exposure meals demonstrated that the patient whose anxiety decreased across meals over time, ED symptoms decreased, whereas for the patient whose anxiety remained high across meals, ED symptoms did not remit. Using self-reported anxiety during meals within the first few weeks of treatment may serve as a reliable indicator of ED recovery.

#### **Devon McLane, Skidmore College, 2019, Chemistry, Nutrient Dynamics and Eutrophication of an Urban-Influenced Lake**

ABSTRACT: Growing seasonal nutrient cycle data from the Lake Lonely tributaries (Spring Run, Bog Meadow Brook, and Bear Swamp) provides an understanding to the current health of Lake Lonely and the cultural eutrophication process currently affecting the lake. Ion chromatography and various colorimetric techniques are used to determine the total nitrogen, total phosphorus, and chloride concentrations of each tributary and the lake. Analyzing past and current data provides observations of these levels changing over time and the effects of human impact.

#### **Corinne Crisfield, Hamilton College, 2018, Public Policy; Ricardo Rios, Skidmore College, 2018, Government; Clifford Elike, Union College, 2020, Engineering; Refugees on the Move**

The *Refugees on the Move* project, overseen by economics professor Paul Hagstrom at Hamilton College, sought to understand the retention and financial inclusion of refugees in Utica, NY. Each day for ten weeks, students planned routes throughout the residential areas in the city and knocked on each door, hoping to implement anonymous surveys to as many refugees as possible. A total of 504 surveys were given by the end of the summer. While the majority of the refugees spoke English or had children at home who were able to translate, some surveys were given in Bosnian, Burmese, Karen, Arabic, and Russian. The survey began by asking questions about what the participant liked and did not like about Utica, as well as whether their siblings and children have moved away or stayed in the area. It then focused on understanding and trust of financial institutions in the United States such as banks and credit cards. While the results of the surveys have not been analyzed yet, simply implementing the survey gave students valuable insight into the lives of refugees in Utica.

**Jeff Okoro, Skidmore College, 2018, Neuroscience; Haoyang Huang, Skidmore College, 2020,**

**Neuroscience; Characterizing ATXN1 aggregation and propagation in Spinocerebellar ataxia type 1**

ABSTRACT: Spinocerebellar Ataxia Type 1 (SCA1) is an autosomal dominant and progressively fatal neurodegenerative disease caused by expanded CAG repeats in the mutant ATXN1 gene. Mutant ATXN1 monomers misfold and aggregate in the cell nucleus. Previous work from our lab and others show that mutant ATXN1 aggregates may spread from the nucleus to the cytoplasm, and later propagate horizontally from cell-to-cell via tunneling nanotubes. Cell-to-cell propagation is the putative mechanism of disease progression in the cerebellum of SCA1 mice. To further understand the processes of ATXN1 aggregation and propagation, we designed experiments to test if ATXN1 aggregates are 1) toxic, 2) oligomeric, 3) transfer vertically, and 4) facilitate aggregation of aggregation-resistant ATXN1. The results of our work are relevant to the propagation of oligomeric, aggregation-prone proteins in SCA1, Alzheimer's, Parkinson's and Huntington's disease.

**Ben Juneau, Skidmore College, 2018, Neuroscience, Investigating the Role of sNPF in Drosophila Using Optogenetics**

**Andrew Przynsinda, Skidmore College, 2018, Biology, Ellipsoid Body Neurons Induce Rebound Sleep in Drosophila Melanogaster**

ABSTRACT: Extensive wakefulness causes a feeling of sleepiness, but how this homeostatic build-up of sleep pressure is generated and persists are still unclear. However, recent developments in the field of sleep homeostasis have shown in the fruit fly, *Drosophila melanogaster*, that increased activity in neurons in the ellipsoid body (EB) may be involved in driving rebound sleep. This was originally tested by activating these neurons using thermodynamic methods. It may be advantageous to activate EB neurons through optogenetic activation of EB neurons, as it offers an automated, temporally precise, and cost-efficient way of doing so through turning lights on and off. To do so, certain fly lines had EB neurons activated with increased temperature and other fly lines with red light. Then we analyzed the sleep data to determine if the EB neuron activation from red light induced a significant amount of rebound sleep as it was found to do with increased temperature. The results confirmed that thermal activation of EB neurons in two different fly lines induced rebound sleep. As well, one EB line was found to induce rebound sleep through optogenetic techniques, while it is inconclusive whether this is the case for the other EB line. Overall the results show promise that rebound sleep through EB neuron activation can be accomplished using optogenetic techniques.

**3:30 pm**

**Departure**