



Student Research Conference Abstract Booklet 2018

Justin Abbott

Poster | 11:00-12:30 | Frank Livak Ballroom | Biological Sciences

Title: VIP Binding and Differentiation of VPAC Type Receptors Regarding Downstream ERK Signaling**Faculty Mentor:** Victor May, Neurological Sciences

Abstract: VIP is a broadly expressed neuroendocrine peptide that is both highly and diversely biologically active. It is implicated in a myriad of functions including, but not limited to, the promotion of neuronal survival, regulation of circadian rhythms, release of endogenous hormones, systemic vasodilation, and T cell proliferation. VIP binds three receptors; with equally high affinity as PACAP to the VPAC₁ and VPAC₂ receptors, and with low affinity to the PAC₁ receptor. Upon VPAC receptor activation, VIP largely mobilizes the G α s subunit to elicit activation of adenylyl cyclase and production of cAMP, a chemical second messenger that facilitates downstream ERK activation. Additionally, upon VIP binding, VPAC type receptors will be tagged for clathrin mediated endocytosis by receptor phosphorylation, which has also been shown to lead to simultaneous ERK activation.

In contrast to the PAC₁ receptor and its isoforms, little focus has been concentrated on further exploration of either VPAC type receptors, particularly in regards to their differentiation from one another. One way of differentiating them must certainly exist in the novelties of their activation. We began to explore this concept through western blotting of HEK-293 cells treated with a myriad of previously described acyl hydrazide antagonists, as well as the drug MK-0893 that has been previously shown to antagonize glucagon receptors. We found that this glucagon receptor antagonist in fact serves as a potent agonist of VPAC₁, but not VPAC₂, receptors. Based on the molecular composition of both the drug and crystallized glucagon receptor structure, insight may be offered into VPAC type receptor structure differentiation. In order to determine which aspect of the trichotomy of ERK activation the agonist elicits, future pulse experiments should follow.

Khadar Abdi

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences

Title: TARS signaling through Integrin Receptor Induces Angiogenesis**Faculty Mentor:** Karen Lounsbury, Pharmacology; Christopher Francklyn, Microbiology

Abstract: Angiogenesis, a process of forming new blood vessels, is an important process for providing cancer cells a route for nutrients and their escape to tissues in the body. Research in drug-targeting therapy approach cancer treatment through inhibiting angiogenesis to localize cancer cells within tissue, thus this would improve survival rate and increase surgical success of cancer patients. The Lounsbury/Francklyn labs became intrigued in antiangiogenic research after observing extracellular threonyl-tRNA synthetase (TARS) secreted in an ovarian cancer tumor environment and bound to fibronectin in the extracellular matrix. These results supported the hypothesis that TARS modifies the function of $\alpha\beta$ 3 integrin, a stretch receptor on blood vessels cells that is active during angiogenesis. In this study, the dose-dependent effects of purified human TARS in the presence of integrin inhibitor peptide, RGDS, was assessed to test the hypothesis. Human TARS were expressed under bacteria cells and purified using Nickel and Anion exchange chromatography. Angiogenic activity was tested by plating cultured human umbilical vein endothelial cells (HUVECs) onto Matrigel, treating with a range of concentration of TARS (10nM-500nM) in the presence low serum media with or without 100uM RGDS. After 2-4hrs, cells were fixed and stained with fluorescently-labelled phalloidin. Images of tube formation of endothelial cells were analyzed under ImageJ angiogenesis analyzer and statistical significance was determined using Graphpad. Preliminary results show a bell-shaped curve response to different concentration of TARS which mimics the effects seen in other studies looking at dose response effects of RGDS. The combination of the two led to an additive effect of angiogenesis. These results further support the idea that TARS signaling pathway and the $\alpha\beta$ 3 pathway are connected. The research of TARS signaling angiogenesis could lead to future development of drug target therapy in ovarian cancer.

Peter Ackerman

Creative | 1:00-2:30 | Fireplace Lounge | Arts & Humanities

Title: From Away | A Peter Ackerman Film**Faculty Mentor:** Deborah Ellis, Film & Television Studies

Abstract: From Away is a look at immigration in small-town America. Focusing on the town of Augusta (Maine), it considers the town's recent influx of immigrants from Iraq and Syria and draws comparisons to past immigration waves. What challenges do small-town immigrants face? What solutions are currently being implemented?

I believe that "From Away" is relevant to many small towns in Maine and across the United States. This short doc focuses on recent refugee immigrants in Augusta, their stories, their culture, and most importantly, who they are as individuals. The film also focuses on pre-existing, "Old Mainer" residents of Augusta, and how the community,

through small-government, is coming together to problem solve, despite divisive trends in US politics. Throughout this process, I learned more about Augusta's history of immigration, the current political tensions, the challenges refugees face integrating in small-town America, and the stories unfolding amongst all of this- I am excited to share these stories with a wide audience.

Brandon Ackley

Oral | 9:00-9:55 | Sugar Maple Ballroom | Mathematical & Physical Sciences

Title: Rhodium-Catalyzed Dehydropolymerization of Arsine Boranes

Faculty Mentor: Rory Waterman, Chemistry

Abstract: The polymerization of arsine boranes has been investigated using chloro(1,5-cyclooctadiene)rhodium(I) dimer as a catalyst. In this study, the synthesis of novel polymers of primary and secondary arsine boranes will be discussed, as well as their potential applications as ceramic precursors. Secondary arsine boranes can be polymerized to form polymers of molar masses greater than 36,000 Da. This is in contrast to phosphine borane polymers, which can only be polymerized when using primary phosphines. Structural information was obtained using solution and solid state NMR spectroscopy, and polymer mass was determined using gel permeation chromatography and dynamic light scattering.

Alison Adams

Poster | 9:00-10:30 | Frank Livak Ballroom | Food & Environmental Sciences/Vermont Studies

Title: Modeling carbon storage across a heterogeneous mixed temperate forest: The influence of forest type specificity on regional-scale carbon storage estimates

Faculty Mentor: Jennifer Pontius, Rubenstein School for Environment & Natural Resources

Abstract: Accurately assessing forest carbon storage is critical to understanding global carbon cycles and the effects of land cover changes on ecological processes. However, calculations of regional-scale forest carbon storage typically rely on maps that reflect only broad forest classes. How species-specific differences in carbon storage may affect assessments of forest carbon in heterogeneous forests is largely unexplored. We used new maps of tree species relative basal area, degraded to various levels of species composition specificity, to examine whether species-specific information improves the accuracy of forest carbon in heterogeneous forests is largely unexplored. We used new maps of tree species relative basal area, degraded to various levels of species composition specificity, to examine whether species-specific information improves the accuracy of forest carbon estimates in the northeastern U.S. The forest classification schemes tested, from highest to lowest specificity, were: 1) relative basal area by species, 2) species association classes, and 3) general forest types per IPCC (2006) guidelines.

The level of forest type specificity did influence results. Generally, lower carbon storage estimates were generated by models using higher-specificity forest classifications. The two most specific models, with mean carbon storage values of 102-107 Mg/ha, were the most accurate compared to field validation plots and best reflected the finer resolution spatial pattern of carbon storage across the landscape. Northeastern forests may be storing more carbon than previously thought; our species-specific regional estimates are higher than both U.S. Forest Service-generated estimates (84-90 Mg C/ha) and IPCC carbon storage guideline best estimates (75 Mg C/ha). Our results suggest that considering carbon storage capacities of different tree species can improve accuracy of carbon assessments, and better reflect carbon storage patterns across heterogeneous landscapes. However, stand age heavily influences carbon storage values, and more work is needed to improve landscape-scale stand age data.

Muriel Adams

Lightning | 11:00-12:30 | Sugar Maple Ballroom | Mathematical & Physical Sciences

Title: Safety Performance Functions for Bicycles in the Burlington Area

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: With the implementation of complete streets becoming popular in many areas of Burlington, bicycle safety needs to be considered during analysis and design. The lack of accurate wide-spread measures of bicycle volume or exposure to traffic crashes has been a long-standing limitation in safety analysis. Strava is an athletic tracking app that allows users to track specific routes and user records are combined by Strava to provide on bicycle traffic volume by road segment. The Vermont Agency of Transportation compiles data on vehicular and bicycle crashes from police reports. Through the use of Strava data on volume on road segments and bicycle crash data from the VTrans database, analysis can be conducted to develop safety performance functions for bicycle crashes. Safety Performance Functions, or SPFs, are prediction models based on previous crash data and vehicular volume that summarize expected

Abstract (Adams, cont'd): crash numbers based on volume. The Strava data purchased by VTrans for this study are 2013 and 2014 and therefore crash data from 2011–2016 are used in order to have sufficient observations, and the area of observation is the city of Burlington and surrounding towns. Since SPFs rely on volume as the predictor variable, two SPFs can be estimated one for bicycle volume and one for vehicular volume. These models will be analyzed using quadratic or cubic regressions to maximize the fit of the model. These SPFs can be used to help estimate how bicycle crash numbers may change if ridership increases.

Cara Ahlgrim, Caleb Beal, Lucas Higgins, Kirk Meier, & Joseph Vogel

Oral | 4:00–4:55 | Chittenden Bank Room | Professional Studies – Education/Health Sciences/Social Sciences

Title: Pain Neuroscience Education: Does Dosage Matter? A Systematic Literature Review

Faculty Mentor: Elizabeth Sargent, Rehabilitation & Movement Sciences

Abstract: Objective: Systematic literature review of randomized control studies, case studies, and case series for the dosage and implementation strategy of pain neuroscience education (PNE) on pain, and functional outcome measures for patients with chronic low back pain (CLBP). Data sources: Systematic search in 6 different online databases with the addition of hand searching of selected articles not captured by the search strategy. Study Selection: Studies evaluating the effectiveness of various PNE methods on individuals with CLBP. Additional Limitations: Studies published in English, and within the last 13 years. No inclusion or exclusion criteria was required for outcome measures, age, or demographics. Data Extraction: Data were extracted using the author(s), delivery method of PNE, age and demographics of the patients, sample size, study date, study design, outcome measures used, and the type of control. Data Synthesis: To date our search strategy yielded 4 qualifying studies. Additional hand searched studies are still being evaluated. Quality of studies will be assessed by two independent reviews using the PEDro scale, and Oxford Center for Evidence Based Medicine levels of evidence and grades of recommendation. Conclusion: Data collection and results will be analyzed to determine the method of PNE implementation that is most effective in the treatment of CLBP.

Katherine Aho

Poster | 11:00–12:30 | Sugar Maple Ballroom | Mathematical & Physical Sciences

Title: Modeling of transient voltage pulse propagation on lossy, dispersive transmission lines

Faculty Mentor: Kurt Oughstun, Electrical & Biomedical Engineering

Abstract: Transient voltage pulses can occur on transmission lines in a variety of scenarios. Examples include digital pulses on integrated circuits, a lightning strike on overhead power lines, and time domain reflectometry analysis. Modeling the propagation of a voltage signal on a transmission line may provide insight into material changes within a transmission network and properties of the surrounding media. It is of interest to study the effects of dispersion, loss, and frequency-dependence on propagation of a voltage pulse on a transmission line. A numerical model is developed to observe the behavior of voltage propagation on transmission lines with varying surrounding media. Direct application to time domain reflectometry analysis is considered.

Charlotte Ainsworth

Poster | 11:00–12:30 | Silver Maple Ballroom | Vermont Studies/Food & Environmental Sciences

Title: Evaluating the response of White Cedar to environmental change.

Faculty Mentor: Shelly Rayback, Geography

Abstract: It is currently unknown how temperate conifers in the Northern Forest of eastern North America are responding to the compounds effects of climate and environmental change. Herein, we use dendrochronological techniques to investigate the response of White Cedar (*Thuja ocedentallis*) to various environmental stressors over the 20th and 21st century for a limestone bluff site on Lake Champlain, VT. Xylem increment cores were taken from 20 dominant and co-dominant trees and prepared using standard dendrochronological techniques. Cores were cross-dated visually and using COFECHA. We developed both Basal Area Increment (BAI) and standardised chronologies to examine growth trends and to relate to environmental variables including; precipitation, temperature, drought, Lake Champlain ice out dates and pollution data.

We will conduct correlation analysis between these environmental variables in DedroClim, and we will be able to evaluate stationary and moving correlations over 20th and 21st centuries. We will also use Climate Explorer to do a spatial correlation analysis. Based on previous work done on Red Cedar (*Juniperus Virginiana*) at the same site, we expect this species to show positive correlations between BAI and Palmer Drought Severity Index (PDSI), and for it to show some positive correlations with precipitation and temperature. It is likely that this species will not be

negatively influenced by acid deposition given its low elevation site and the fact that the trees are sitting on calcareous rock (limestone bluffs).

Christopher Aldrighetti

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: Characterization of the sensitivity of Glioblastoma cells to PARP and PARG inhibitors

Faculty Mentor: Delphine Quenet, Biochemistry

Abstract: Glioblastoma (GBM) is a primary brain cancer with few treatment options and a low overall survival of approximately ~15 months. Current treatment options include surgery, radiotherapy and chemotherapy with alkylating agent temozolomide (TMZ). However, resistance to TMZ treatment and recurrence are inevitable, stressing the importance of proposing new therapeutical approaches. One of the biomarkers for GBM is Phosphate Tension Homolog (PTEN). Mutations or loss of this tumor suppressor has been found in 50-70% of GBM patients and is correlated with poor survival. PTEN is an important contributor of DNA double strand break repair. PTEN mutation leads to genomic instability which is one of the hallmarks of cancer. Poly(ADP-ribose) polymerase and Poly(ADP-ribose) glycohydrolase inhibitors (PARPi/PARGi) are promising treatments for cancers displaying DNA damage repair defects. However, the molecular mechanism associated with PARPi/PARGi use in GBM remains elusive. In our project we are characterizing the outcomes of PARP/PARG inhibition aligned with PTEN status in GBM cell lines. Our hypothesis is PTEN-mutated GBM cells will be more sensitive to PARPi and PARGi treatment than PTEN wild-type cells. Yet, using a colony formation assay, we showed that PTEN wild-type cells are more sensitive to PARPi treatment, whereas PTEN-mutated cells are more sensitive to PARGi treatment. Then, we further analyzed consequences of PARPi and PARGi treatment at IC₅₀ by focusing on cell cycle distribution, activation of cell death pathway, and DNA damage response. Our data revealed a difference of cytotoxicity to PARPi and PARGi in function of PTEN status in GBM cells, suggesting potential personalized treatments for GBM patients.

Mattie Alpaugh & Michael Murphy

Poster | 9:00-10:30 | Frank Livak Ballroom | Health Sciences/Food & Environmental Sciences

Title: Cultural Environment and Physical Activity Participation in Vermont Schools

Faculty Mentor: Amy Nickerson, Nutrition & Food Sciences

Abstract: Background: The Centers for Disease Control and Prevention (CDC) Physical Activity Guidelines for Americans (PAGA), recommends 60 minutes or more of moderate to vigorous physical activity (MVPA) daily for children and adolescents. Objective: This observational research study explored the relationship between a school's cultural environment related to students' MVPA within the formal school day. Methods: Data were collected using a multi-component qualitative approach in a Vermont school district comprised of nine schools, grades K-12. A voluntary fifteen question survey based on the Theory of Planned Behavior was developed to assess beliefs and norms regarding student participation in MVPA, and sent to all district educators. A standardized checklist was developed by researchers to collect observational data regarding movement, MVPA, and sedentary behavior of students. Observations were conducted following randomization of schools and settings. Data were compiled and analyzed using IBM SPSS Statistics, and verified through double entry input. Results: Nearly all (90%) educators reported; "Students are likely to have an increased focus and interest in classroom lessons following MVPA breaks" (n=141). Additionally, 61% reported; "MVPA is an important component in my classroom" (n=139). Classroom observations revealed 73% of students moving during classroom lessons; however, only 9% of K-12 classrooms provided breaks for MVPA. During P.E. and recess, average participation in MVPA was 48% and 20%, respectively. Conclusion: While these educators recognized the benefits of MVPA for overall health and attentiveness in class, based on the CDC PAGA, opportunities for MVPA during the school day were inadequate.

Haya Alshaabi

Poster | 11:00-12:30 | Frank Livak Ballroom | Biological Sciences/Health Sciences

Title: The Influence Of Mitochondrial Positioning On ROS levels and Subcellular Redo Status

Faculty Mentor: Brian Cunniff, Pathology & Laboratory Medicine

Abstract: Mitochondria are dynamic organelles that function as a primary source of reactive oxygen species (ROS) in cells. ROS, including hydrogen peroxide (H₂O₂), serve as intracellular messengers and play a critical role in redox signaling pathways. However, due to their association with pathological conditions, mammalian cells regulate ROS levels through multiple pathways including metabolism by peroxiredoxin enzymes (PRXs). PRXs 1-4 are abundant antioxidant enzymes that form di-sulfide bonded dimers, a biochemical readout of cellular redox status, during their

Abstract (Alshaabi, cont'd): catalytic cycle. To determine the influence of mitochondrial positioning on subcellular redox status, we will use two mouse embryonic fibroblast (MEF) cell lines which are Miro 1 ^{+/+} and Miro 1 ^{-/-} (indicating the presence and deletion of Miro 1 gene respectively). Miro 1 is a small mitochondrial GTPase that regulates mitochondrial transport. Therefore, deletion of Miro 1 gene in Miro 1 ^{-/-} MEFs restricts the mitochondria around the nucleus. Since mitochondria function as a primary source of ROS, we hypothesize that the redox status of PRXs in the cell peripherally of Miro 1 ^{-/-} MEFs, devoid of mitochondria, will be different from Miro 1 ^{+/+} MEFs. To test our hypothesis, we will also use a genetically encoded H₂O₂ sensor, live cell imaging and fluorescent microscopy to visualize subcellular redox status in living cells. Furthermore, we will investigate how compounds that alter mitochondrial ROS levels and intracellular transport of mitochondria affect subcellular redox status. Our findings from this study will provide novel evidence that proper mitochondrial positioning is required for local production and metabolism of highly reactive cellular ROS that contribute to diseases including cancer and neurodegeneration.

Alexandria Alveshere

Oral | 9:00-9:55 | Sugar Maple Ballroom | Mathematical & Physical Sciences

Title: Catalytic Advancements in Phosphinidene Transfer

Faculty Mentor: Rory Waterman, Chemistry

Abstract: Within the field of catalysis, formation of new bonds between main group elements has become a key focus. Formation of these bonds allows for the synthesis of more complex, value-added molecules that were either not previously accessible through previous synthetic methods or involved stoichiometric methods that produce many by-products. Of particular interest is the formation of new bonds to phosphorus. These phosphorus-element bonds are desirable as phosphorus containing compounds serve a variety of purposes, including ligands for transition metal containing complexes and materials applications. One method of forming new phosphorus-element bonds is through the transfer of a phosphinidene. Phosphinidenes are the low valent phosphorus equivalent of carbenes and nitrenes and share a similar level of reactivity. Stoichiometric methods of phosphinidene transfer have been widely explored since 1987, but up until 2017, there were no published methods of catalytic phosphinidene transfer. Recently a simple iron compound, (η^5 -C₅H₅)Fe(CH₃)(CO)₂ (FpMe), was shown to engage in phosphinidene transfer processes. However, this catalyst is also catalyzes a competing hydrophosphination reaction and produces a triplet phosphinidene, which has a limited reaction scope. Changes to the FpMe catalyst have shown moderate success at increasing the level of phosphinidene transfer, though much work remains to be done.

Abigail Ames

Poster | 11:00-12:30 | Silver Maple Ballroom | Vermont Studies/Food & Environmental Sciences

Title: PAHS in Coal Tar Sealants: An Analysis and Policy Design for the State of Vermont

Faculty Mentor: Robert Bartlett, Political Science; Bindu Panikar, Environmental Studies

Abstract: Polycyclic aromatic hydrocarbons (PAHs) form during the incomplete combustion of wood, fossil fuels, and cooking. Scientific evidence has proven the toxicity of these compounds on human health and the environment due to their mutagenic, carcinogenic, persistent, bioaccumulative and hydrophilic properties. Coal tar based emulsion is a sealant widely used throughout the U.S. to protect pavement and enhance aesthetic appearance. One of the main chemical compounds in coal tar sealant is PAHs. PAHs come in both gas and particulate form and threaten human health and the environment. With this evidence, locations throughout the U.S. have taken the initiative to implement policy initiatives/ regulations at the state, county, city, town, university, or watershed level. A selection of case studies from each level of ban was chosen for analysis: Minnesota; Austin, Texas; Suffolk, NY; Westwood, MA; Anacostia Watershed; the University of Michigan. Each analysis will highlight and map commonalties and differences between the implemented policy or regulation to inform my latter policy analysis and design for the State of Vermont on coal tar sealants.

Merelise Ametti

Poster | 3:00-4:30 | Silver Maple Ballroom | Food & Environmental Sciences/Health Sciences/Social Sciences/ Vermont Studies

Title: Differential effects of food insecurity and SES on the development and transmission of psychiatric symptoms

Faculty Mentor: Robert Althoff, Psychiatry; Masha Ivanova, Psychiatry

Abstract: Objective: This study was conducted in order to isolate and compare the effects of food insecurity (FI) and socioeconomic status (SES) on child emotional-behavioral health. More specifically, this study examines FI and SES both as direct predictors of child internalizing and externalizing symptoms and as mediators of the effects of

parental symptomatology. Methods: Participants were 155 clinically-referred and community children aged 7-17 (Mean=11.41, 63% male) who were accompanied by a parent. The USDA Household Food Security Survey was used to assess FI during the past year. Demographic characteristics and psychiatric symptoms were collected using the Adult Self Report (ASR) for parents and the Youth Self-Report (YSR) for children. A series of multi-level structural equation models with FI as a latent variable and child age, sex and IQ as covariates were tested in MPlus. Results: After controlling for the effects of demographics, greater FI was related to higher levels of both child internalizing and externalizing symptoms, whereas SES was negatively associated only with child externalizing symptoms. Additionally, FI mediated the path between parental internalizing symptoms and child internalizing symptoms. SES mediated the effect of parent externalizing symptoms on both child internalizing and externalizing symptoms and the effect of parent internalizing symptoms on child externalizing symptoms. Conclusions: Although SES and FI are related, these findings suggest that they have differential effects on child emotional-behavioral well-being. In general, FI was a more robust predictor of child psychiatric symptoms, whereas the effects of SES were specific to only child externalizing problems. However, FI was only related to the intergenerational transmission of internalizing problems, whereas SES mediated the transmission in all other paths. Given that FI has a role separable from SES in the development and transmission of psychiatric symptoms, it is important for mental health clinicians to be educated and trained to assess for FI.

Mahraz Amini

Poster | 11:00-12:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: Trading off robustness and performance in receding horizon control with uncertain energy resources

Faculty Mentor: Mads Almassalkhi, Electrical & Biomedical Engineering

Abstract: Increased utilization of residential and small commercial distributed energy resources (DERs) has led DER aggregators to developing scalable concepts such as the virtual power plants (VPP). VPPs aggregate the energy resources and dispatch them akin to a conventional power plant or grid-scale battery to provide flexibility to the system operator. Since the level of flexibility from aggregated DERs is uncertain and time varying, the VPPs' dispatch can be challenging. To improve the system operation, flexible VPPs can be formulated probabilistically and can be realized with chance-constrained model predictive control (CCMPC). This can be solved using scenario-based methodology, which provides a-priori probabilistic guarantees on constraint satisfaction. This paper focuses on understanding the robustness and performance trade offs in receding horizon control with uncertain energy resources. The CCMPC dispatches robustly the uncertain VPPs and conventional generators while taking into account economically optimal, secure reference trajectory for generating assets. Closed-loop performance is with respect to minimizing the deviation of conventional generators from their reference trajectory. To evaluate the trade off between robustness and system performance with uncertain energy resources, a simulation-based analysis is carried out on the modified IEEE 30-bus system.

Maddie Andrews

Poster | 11:00-12:30 | Frank Livak Ballroom | Biological Sciences/Health Sciences

Title: A role for the protein synthesis regulator TARS in autophagy of ovarian cancer

Faculty Mentor: Karen Lounsbury, Pharmacology

Abstract: As ovarian cancer cells replicate, they require an abundance of cellular resources. Since the environment does not contain sufficient nutrients to match their needs, ovarian cancer cells survive through the physiological process of autophagy, which recycles proteins and nutrients for cell use. Although some regulators of autophagy have been discovered, the relationship between autophagy and protein synthesis is not known. Our lab has discovered a possible role for the protein synthesis regulator, threonyl-tRNA synthetase (TARS), in ovarian cancer cell growth. As ovarian cancer advances, the level of TARS becomes upregulated. TARS is suspected to inhibit the process of autophagy through AMP-mediated kinase (AMPK) and autophagy activating kinase (ULK1). In order to determine the role of TARS in autophagy of ovarian cancer, our lab tested the hypothesis that reducing TARS levels in ovarian cancer cells will directly stimulate autophagy pathways. To test this hypothesis, SKOV-3 human ovarian cancer cells were cultured and then transfected with siRNA against TARS to reduce TARS levels. A non-targeting siRNA was used as a control. The cellular components of the resulting cultures were subjected to Western blotting and probed with antibodies recognizing p-AMPK, p-ULK1, and TARS. The structural protein α -tubulin was detected as a loading control. Effects of TARS reduction was also tested under conditions of autophagy induction by amino acid starvation, an mTOR pathway inhibitor (Torin1), and an autophagosome stabilizer (chloroquine). Our results show a successful reduction in TARS levels by siRNA and that reducing TARS leads to autophagy induction through p-ULK and p-AMPK pathways. These results

Abstract (Andrews, cont'd): affect the resistance of ovarian cancer cells to chemotherapy agents. This research could also extend to broader relationships between autophagy pathways and protein synthesis regulators that may lead to future cancer therapies.

Alexandria Attenasio

Oral | 11:00-11:55 | Williams Family Room | Health Sciences

Title: Sex and dietary fat quality impact the colonic bacterial community structure in aged CD-1 mice

Faculty Mentor: Jana Kraft, Animal & Veterinary Sciences

Abstract: This study examined the effect of dietary fat quality (i.e., fatty acid composition) and sex on the relative abundance of colonic bacteria in aged outbred CD-1 mice. At the age of one month, 42 male and female CD-1 mice were placed onto one of four isoenergetic diets (40% fat as energy; n = 4/group) until 14 months of age: i) control diet (CO) consisting of a fat blend reflecting the average fatty acid profile consumed by U.S. Americans (negative control), ii) fish oil diet (FO), 70% control fat + 30% fish oil (positive control), iii) echium oil diet (EO), 70% control fat + 30% echium oil, or iv) butter oil diet (BO), 70% control fat + 30% butter oil. At the end of the study (at the age of 14 months, mice are considered geriatric), mice were placed in metabolic cages for 24-hour fecal collection. Microbial DNA was extracted and the V1-V3 region of the bacterial 16S rRNA gene was amplified via PCR for sequencing. Bacterial density was determined using RT-PCR. Sequences (via Illumina Miseq (v.3)) were classified to determine bacterial relative abundance. Bacterial relative abundance and density were analyzed by two-way ANOVA and Tukey test in JMP Pro 13. Bacterial density was not different regardless of diet or sex. When comparing sex, at the phylum level, Bacteroidetes were more abundant in females ($P < 0.05$), while Firmicutes were more abundant in males ($P < 0.01$). At the genus level, Alistipes, Barnesiella, Bilophila, and Parabacteroidetes were more abundant in female mice than in male mice, whereas Allobaculum and Lactobacillus were more abundant in male mice than in female mice ($P < 0.05$). Regardless of sex, EO-fed mice had a greater relative abundance of Alistipes than CO-fed mice ($P < 0.05$). In conclusion, this study indicates that in an aged population the relative abundance of colonic bacteria differs in male and female mice and is less influenced by dietary fat composition.

Ariel Ayers

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences/Vermont Studies

Title: Fine-tuning supplementation strategies on organic dairies during the pasture season to improve productivity

Faculty Mentor: Sabrina Greenwood, Animal & Veterinary Sciences

Abstract: There is currently a critical need for research on specific feeding strategies during pasture season of Organic Dairy Farms in Vermont and the New England region, and for the organic dairy industry in general to develop economically sustainable feeding guidelines. The implemented rule is that 30% of the daily DMI for the cows must come from pasture at least 120 days per year. Management of the pasture and the forage composition of the pasture is a big factor in the productivity of organic dairy farms, especially when evaluating the productivity of animals on a pasture only diets. Farms that use supplementation strategies as well as pasture, have the capability of filling the gap between the nutrients supplied by pasture and the nutrient requirements of the animal if they are not met, which can impact milk productivity as well as profitability. The quantity of supplements to feed, as well as the income over cost value must be taken into consideration when generating an economically sustainable feeding guideline. The first phase of this project was completed during the grazing season of 2017 (May, July, and September), and the second phase will begin in the spring of 2018. The long-term goal of this research is to create an economically sustainable feeding and supplementation strategy for organic dairy farmers in the New England region.

Skylar Bagdon

Oral | 12:00-12:55 | Jost Foundation Room | Mathematical & Physical Sciences

Title: Power Scavenging from Human Activity

Faculty Mentor: Paul Hines, Electrical & Biomedical Engineering

Abstract: This project is based on the idea of finding alternative ways to produce portable, reliable, electricity without using large quantities of finite resources or producing any harmful pollutants. Humans travel, live, work and explore in nearly every part of the world. Due to varied infrastructure, resources, and climate found in different areas, accessibility to reliable electricity, fuel or sunlight is a major concern for billions of people. Because of this uncertainty it is extremely difficult to find a power generation method that works in all of the varying environments that humans find themselves in. Any power generation method that can be widely applicable to people as they travel and survive all over the planet must be able to use a resource that is constant to all human activity. The only devices that comes

close to meeting this criteria are portable solar charges but anyone that has tried to produce reliable, portable electricity in this way knows that direct, bright, unobstructed sunlight is far from a constant for all people. The only constant that accompanies all human activity is human activity itself. The objective of this project is to explore the potential of creating passive systems that can scavenge usable amounts of portable electricity from the movement and activities that human already undertake globally in their travels, work, or daily life. This research would be helpful in increasing energy independence of outdoor enthusiasts, researchers, people in developing nations or those affected by a natural disaster.

Lauren Banister

Poster | 11:00-12:30 | Silver Maple Ballroom | Vermont Studies

Title: The First Twenty Years of the Community Garden Movement, 1972-1989

Faculty Mentor: Richard Watts, Geography

Abstract: This research project documents the community garden movement by examining the foundations and growth of Gardens for All (GFA), a non profit organization that started in Burlington, Vermont in 1972. The project juxtaposes the growing popularity and demand for community gardening in Burlington with the growth of GFA as a clearinghouse for establishing community gardening programs across the country. The success of this Burlington-based organization provided the Burlington community with resources and opportunities that contributed to a strong base for the vibrant community gardening programs that are currently organized by the Vermont Community Garden Network (VCGN). The movement is examined by looking through a collection of newspaper articles, letters, newsletters and other documents from 1971 to 1989. The research is supplemented with interviews with movement leaders of community gardening in Burlington throughout the ages.

Sarah Barrett

Lightning | 11:00-12:30 | Sugar Maple Ballroom | Social Sciences/International Research

Title: Seeking Asylum Across the International Boundary: Implications of Temporary Protected Status and the Safe Third Country Agreement

Faculty Mentor: Pablo Bose, Geography

Abstract: This project began as research on the 2016-2018 migration of asylum seekers across the International Boundary into Canada. The trajectory of this research necessitated study of the implications of the US-Canada Safe Third Country Agreement (STCA) for asylum seekers as well as the evolving nature of Temporary Protected Status (TPS) in the United States.

When I began this research in September 2017, the Royal Canadian Mounted Police (RCMP) reported that they had processed 13,211 asylum seekers between January - August, 2017. The majority of these asylum seekers voluntarily reported themselves to the RCMP after illegally crossing the border. At this time, hundreds of asylum seekers were crossing the border each day; most through rural back roads in upstate New York and northern Vermont en route to Montreal, Quebec (BBC, 2017; Government of Canada, 2017).

The focus of this project revolves around three central guiding research questions:

- First, the project examines who is seeking asylum, why they are seeking asylum in Canada, and what has motivated or obligated them to leave the US;
- Second, the project reviews how international law and geopolitics structures the lives of these asylum seekers as well as the driving forces behind this policy and the differentiation in status between asylum seekers, refugees, and undocumented immigrants.
- And third, the project will consider what the future may hold for those seeking asylum in Canada, as well as for those who have lost their TPS in the US.

My project examines these migration events in consideration of the literature on contemporary border crossing and asylum, analysis of US-Canada immigration policy, and qualitative research in the form of interviews with key informants, including: immigration lawyers, refugee researchers, government officials, and community leaders. These interviews will provide contextual accounts of these migration events that go beyond my review of data, policy, and law.

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AND SCIENCES**

Caitlin Beaudet

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences

Title: The Dynamic Relationship Between Tumor Suppressor TRb and Tumor Promoter ERa in Thyroid Tumorigenesis**Faculty Mentor:** Frances Carr, Pharmacology

Abstract: By 2019, thyroid cancer is predicted to be the third most common cancer for women. Currently, thyroid cancer is 3-4 times more frequent in females than in males. Emerging evidence suggests that ERs (ER α , ER β) also may play a significant role in thyroid cancer development. The transcription factors Runt-related transcription factor 2 (RUNX2), and thyroid hormone receptor beta (TR β), both regulators of growth and differentiation, have been implicated in opposing functions in thyroid tumorigenesis. Molecular mechanisms in which these factors moderate tumorigenic gene expression pathways are currently unknown. The Carr lab has revealed a novel signaling pathway in thyroid cancer, TR β suppression of the oncogene RUNX2 expression. Since this discovery, we found ERs expressed within our thyroid cell lines. We have shown through siRNA knock down of ER α that as ER α levels decrease, RUNX2 levels decrease in malignant thyroid cells. We identified an ER α response elements in the RUNX2 promoter (P1) that overlaps with our characterized TR β site. Thus, TR β and ER α may interact at the genomic level to modulate regulation of gene programs associated with tumor development. In this study, stable cell lines were created containing an inducible CRISPR-dCas9 system to regulate the expression of ERa and TRb. Normal thyroid cells containing the dCas9-KRAB Plasmid and TRb targeting guide RNA plasmid successfully expressed the dCas9 plasmid when induced and decreased TRb expression shown through RNA and protein. Knocking down TRb increased the expression of known proliferation markers shown through qPCR. Experiments with ERa will be completed once the cell lines containing the guide plasmid are complete. These results show that this method is an effective way to target genes of interest and manipulate their expression. The stable cell lines that contain this inducible system will be used within other studies in the Carr lab.

Shawn Beaulieu

Oral | 12:00-12:55 | Jost Foundation Room | Biological Sciences/Mathematical & Physical Sciences

Title: Combating catastrophic forgetting with developmental compression.**Faculty Mentor:** Joshua Bongard, Computer Science

Abstract: Generally intelligent agents exhibit successful behavior across problems in several settings. Endemic in approaches to realize such intelligence in machines is catastrophic forgetting: sequential learning corrupts knowledge obtained earlier in the sequence, or tasks antagonistically compete for system resources. Methods for obviating catastrophic forgetting have sought to identify and preserve the features of the system that are necessary to solve one problem when learning to solve another, or to enforce modularity such that minimally overlapping sub-functions contain task specific knowledge. While successful in some domains, both approaches scale poorly because they require larger architectures as the number of training instances grows, causing different parts of the system to specialize for separate subsets of the data. Here we present a method for addressing catastrophic forgetting called developmental compression. It exploits the mild impacts of developmental mutations to lessen adverse changes to previously-evolved capabilities and 'compresses' specialized neural networks into a generalized one. In the absence of domain knowledge, developmental compression produces systems that avoid overt specialization, alleviating the need to engineer a bespoke system for every task permutation and suggesting better scalability than existing approaches. We validate this method on a robot control problem and hope to extend this approach to other machine learning domains in future.

Carli Beisel

Poster | 11:00-12:30 | Silver Maple Ballroom | Mathematical & Physical Studies

Title: Clays impact on carbon bioavailability in batch experiments**Faculty Mentor:** Julia Pedrial, Geology

Abstract: Clay minerals are ubiquitous in soils and are thought to play a major role in the stabilization of carbon (C) by chemically and physically protecting it from microbial attack (Sposito, 2008). Clay related reduction in C accessibility for microorganisms in soils should therefore decrease bioavailability of dissolved C and limit the production of CO₂. However, Pedrial et al. (2009) showed in batch experiments that swelling clays can support microbial growth by providing nutrients and sorption sites. In these experiments emphasis was given to the fate of microorganisms, but the interaction between the clay and C was not assessed. In order to close this knowledge gap we incubated leaf litter leachate (LLL), as proxy for fresh dissolved C entering a soil, in presence and absence of montmorillonite and kaolinite in batch experiments and observed changes in dissolved C and nitrogen concentrations as well as changes in absorbance and fluorescence characteristics. Compared to kaolinite and LLL, montmorillonite showed a less pronounced decrease in DOC over the 5 weeks of incubation. Furthermore, dissolved C in

presence of montmorillonite showed a more microbial, less aromatic absorbance and fluorescence signature. These results are consistent with our hypothesis that montmorillonite will retain C for longer than kaolinite because of its' structure, which decreases immediate bioavailability of carbon and increases prolonged bioavailability.

[Works Cited: 1. Perdrial JN, L.N. Warr, Lett M, Elsass F, Perdrial N (2009) Interaction between smectite and bacteria: implications for bentonite backfill in nuclear waste disposal. *Chemical Geology* 264: 81-294
2. Sposito G (2008) *The Chemistry of Soils*. Oxford University Press, New York.]

Noah Bell

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences

Title: Evaluation of Passenger Railroad Safety in the United States

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: The specific objective of this study was to identify trends in U.S. passenger rail crash data. Recently, it seems that more often incidents of passenger rail crashes are being reported involving multiple fatalities. With climate change continuing to be a pressing issue, there is a greater need for trains as a mode of transportation in America. How are companies and governments addressing safety issues on trains to encourage ridership? The Bureau of Transportation Statistics and the Federal Railroad Administration both have extensive railroad safety data. Each year, data was collected on passenger fatalities, injured persons, and train miles traveled. This data was used to compare Amtrak and commuter rail incidents across the country. Linear regression analysis was conducted to determine whether passenger railroad fatalities and injuries have increased or decreased since 1990 and how it compares to trends in other modes of transportation over the same time period.

Renee Beneski

Oral | 12:00-12:55 | Williams Family Room | Mathematical & Physical Sciences

Title: Critical Films on Graphene Substrates

Faculty Mentor: Adrian Del Maestro, Physics

Abstract: When depositing a substance onto a surface, it follows that as one adds more of the substance, the thickness of the film formed on the surface will grow. However, a particle's ability to adsorb onto the surface is dependent on the interaction potential and geometry. For atomically flat two-dimensional materials such as graphene, it is predicted that the interactions between the graphene sheet and light atoms in a nearby gas are so weak that film growth may become arrested at a critical thickness. We report on molecular dynamics simulations of nitrogen near graphene to explore the existence and properties of the predicted critical film and investigate the role of temperature and pressure during the adsorption process.

Joy Benner

Poster | 11:00-12:30 | Frank Livak Ballroom | Biological Sciences

Title: Evaluating the Appropriate Monitoring for Isotretinoin Through Chart Review

Faculty Mentor: Melanie Bui, Dermatology

Abstract: The purpose of this project is to assess changes in laboratory values of patients using isotretinoin therapy for the treatment of severe recalcitrant acne vulgaris. Isotretinoin is a synthetic Vitamin A analog often used in cases of acne that fail first line treatment, including antibiotics, and is an effective treatment leading to complete remission of acne in 60% of patients. Despite its efficacy, isotretinoin is associated with several abnormal biomarkers and is contraindicated in pregnant individuals due to its teratogenic properties. Historically, clinicians have routinely ordered numerous baseline and monitoring labs on a monthly basis for patients being treated with oral isotretinoin. Recent literature citing a lack in actionable laboratory values has called this costly practice into question. It is important for clinicians to understand the degree and timing of lab abnormalities to weigh the risks and benefits of placing patients on isotretinoin, and to better establish the importance of regular monitoring intervals during treatment. Chart review of 364 patients treated with isotretinoin between 06/2009 and 04/2014 at University of Vermont Medical Center in Burlington, Vermont was reviewed. Relevant laboratory data that was collected included serum triglyceride, total cholesterol, AST/ALT, WBC, Platelet, and hemoglobin levels. Only patients with normal baseline values in all markers evaluated were included in the study. Patient lab values were collected at baseline and during isotretinoin treatment for comparison. Current analysis of data is ongoing presently and will be included as completed.

Alex Bennett

Poster | 11:00-12:30 | Silver Maple Ballroom | Vermont Studies/Biological Sciences

Title: An evaluation of vectors for the spread of quagga mussels (*Dreissena bugensis*) into Lake Champlain

Faculty Mentor: Ellen Marsden, Rubenstein School for Environment and Natural Resources

Abstract: Quagga mussels (*Dreissena bugensis*) are not currently known to be present Lake Champlain, but are present in interconnected waterways such as the Erie Canal and the St. Lawrence River. Since their invasion of the Laurentian Great Lakes around 1989, quagga mussels have reduced important spring phytoplankton blooms, impacted water column carbon dynamics, and displaced native mussel populations. Quagga mussels may also displace previously established populations of zebra mussels (*Dreissena polymorpha*), which currently inhabit Lake Champlain. Quagga mussels are known to colonize boat hulls, which poses one possible mode of entry into Lake Champlain. The purpose of this study is to understand the role of boats as potential vectors for quagga mussel introduction into Lake Champlain and to determine whether a population of quagga mussels already exists in Lake Champlain. Sampling took place at three marinas located in the northern section of the lake: Ladd's landing Marina, Chazy Yacht Club, and Gaines Marina. The northern end of the lake was deemed a priority for sampling due to its proximity to the Chambly canal which connects Lake Champlain to areas where quagga mussels are present. Samples were taken from floating docks, pilings, and submerged rocks within sampled marinas, and boat hulls were examined. In addition, approximately 10 L of dead mussel shells were sampled from windrows at the north end of the lake. Ladd's Landing Marina yielded robust samples (>200 mussels per sample) while Chazy Yacht Club and Gaines Marina yielded no more than 30 mussels per site. A paucity of boat hull-derived mussel samples limits this study and no quagga mussels have been detected thus far. Samples taken from Ladd's Landing Marina indicate a well-established population of zebra mussels at that site. This study provides an initial effort at early detection of a quagga mussel invasion in Lake Champlain.

Renee Benoit

Poster | 11:00-12:30 | Silver Maple Ballroom | Social Sciences

Title: How Parental Depression and Cumulative Risk of Socioeconomic Status Impact Child Outcome

Faculty Mentor: Rex Forehand, Psychological Science

Abstract: Introduction: Low socioeconomic status (SES) adults are more likely to experience depression (Everson et al., 2002). Despite parental depression (Goodman et al., 2011) and low SES (Wadsworth et al., 2016) being risk factors for child maladjustment, research on the additive effects of SES to parental depression in predicting child outcomes is limited. Measuring SES with a cumulative risk (CR) framework transforms multiple risk factors into a simple scale. Further, although observations are preferred in assessing parenting (Hawes & Dadds, 2006), most research measures parental depression using self-reports or interviews. This study aimed to explore the additive relationship of CR to observed parental depressive affect in predicting child outcomes. We also explored whether child gender moderated the relationship between CR and child problems.

Method: This project was a secondary analysis of baseline data of 180 families with children in which a parent had a history of depression (see Compas et al., 2015). Parent depressive affect was measured through observations of low positive mood and sadness (Melby et al., 1997). We created a five-point CR scale by dichotomizing and summing measures of family income, use of public assistance, education, single parent status, and teen parent status. The Child Behavior Checklist and Youth Self Report (Achenbach & Rescorla, 2001) were used to assess child problems.

Results: Hierarchical regression analyses indicated that the addition of CR to observed parent depressive affect predicted increased parent and child reports of child internalizing problems, whereas observed parental depressive affect predicted increases in parent and child reports of externalizing problems. Further, girls increased in internalizing and externalizing problems as CR increased.

Conclusion: CR explained variance in child internalizing problems, and gender moderated this relationship, such that girls only were at increased risk for internalizing and externalizing problems with high CR. Limitations and implications will be presented.

Suraj Bhattarai

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences

Title: Conservation of DNA Methylation in the 5'AMPK Gene Family of Cattle and Bison

Faculty Mentor: Stephanie McKay, Animal & Veterinary Sciences

Abstract: The 5'AMP-activated protein kinase (AMPK) gene family comprises an evolutionary conserved serine/threonine heterotrimeric protein kinase. The primary function of this kinase is regulation of cellular energy and metabolism. The activation of this gene family primarily occurs when there is a depletion of cellular ATP due to environ-

mental and nutritional stressors, which is associated with a rise of AMP levels. Subsequently, the genes initiate energy-conserving measures within the cell to protect it from the decrease in ATP levels. The regulation of these genes has been linked to the epigenetic mechanism of methylation. Methylation is an epigenetic modification of DNA that regulates gene transcription. DNA methylation primarily involves the addition of a methyl group to the 5th carbon of cytosines that are found in CpG dinucleotides. The location of 5-methylcytosine relative to genic regions can either facilitate or prevent transcriptional machinery from binding to its target site. Earlier we have shown that methylation sites are conserved in Angus and Charolais breeds of cattle in AMPK genes using Combined Bisulfite Restriction Analysis (COBRA). Here, we will investigate the methylation levels and patterns of bovine AMPK genes; PRKAA1 and PRKAB1 at 34 different methylation sites by pyrosequencing across three different breeds of cattle and Bison. Subsequently, we have designed biotinylated primers and optimized PCR parameters. We propose that the conserved methylation levels and patterns across cattle and Bison highlight the need of maintaining function of this kinase protein. This may eventually represent a context in which both genetics and epigenetics come together to preserve function of a protein, vital to the life processes.

Jessica Bocanegra, Kyle McKay, & Dillon McCarthy

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences

Title: Toward Precise Molecular Shape Control

Faculty Mentor: Severin Schneebeli, Chemistry

Abstract: In the Schneebeli group, we are investigating how to build structural complexity from simple molecular and colloidal building blocks, inspired by LEGO. We are particularly interested in connecting uniquely designed chiral units to access programmable molecular belts, which can act as highly selective catalysts for functionalizing both biological and synthetic polymers. Therefore, our research presents significant practical implications for the creation of new classes of materials.

Eric Bolf

Oral | 10:00-10:55 | Jost Foundation Room | Biological Sciences

Title: Regulation of a Breast Cancer Oncogene via Thyroid Hormone

Faculty Mentor: Frances Carr, Pharmacology

Abstract: Breast cancer is the most commonly diagnosed cancer in American women. Novel treatments for the disease require a stronger understanding of the fundamental biology of cancer cells. The hormone receptors for thyroid hormone have been implicated as having a role in breast carcinogenesis. The alpha gene family is associated with more severe breast cancer and the beta gene family has been characterized as a tumor suppressor. In this study, we aim to elucidate the actions of thyroid hormone and thyroid hormone receptors on an oncogene, RUNX2, in breast. Our lab has previously characterized RUNX2 as a target of thyroid hormone receptor beta in thyroid cancer. We show here that thyroid hormone treatment represses RUNX2 expression, that thyroid hormone receptor beta associates with the promotor of RUNX2. Additionally, through the use of overexpression vectors and siRNA, we demonstrate an inverse relationship between thyroid hormone receptor beta expression and RUNX2 expression. Conversely, pharmacological manipulation of the receptors and manipulation of the expression of thyroid hormone receptor alpha suggests that this pattern of regulation is selective to thyroid hormone receptor beta. We can therefore conclude that thyroid hormone represses the oncogene RUNX2 in breast tissue and this regulatory action is mediated through thyroid hormone receptor beta.

Micah Botkin-Levy

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences

Title: Distributed Optimal Control of Electric Vehicle Charging under Dynamic Grid Constraints

Faculty Mentor: Mads Almassalkhi, Electrical & Biomedical Engineering

Abstract: As changing economics and global climate change concerns increase the adoption of renewables and electric vehicles, it is vital to study how best to integrate these in our existing energy systems. Plug-in electric vehicles (PEVs) are on track to quickly become a large factor in the energy grid. If left uncoordinated, the charging of PEVs will become a burden on the grid by increasing peak demand and overloading transformers. However, if the proper strategies and coordination is implemented, the problems will be mitigated without the need for expensive investments. A distributed control algorithm will be used to compute optimized charging schedules of a fleet of electric vehicles under multiple scenarios. Further work will compare optimized schedules against low-information packetized EV charging control schemes and will consider hardware in the loop validation to ensure practicality.

Saranduti Brahma

Poster | 3:00-4:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: A Stochastic Linearization Approach to Optimal Primary Control of Power Systems with Generator Saturation

Faculty Mentor: Hamid-Reza Ossareh, Electrical & Biomedical Engineering; Mads Almassalkhi, Electrical & Biomedical Engineering

Abstract: Quasilinear Control (QLC) is a set of methods used for analysis and design of systems with nonlinear actuators and sensors. It is based on the method of stochastic linearization, which replaces a nonlinearity by an equivalent gain and bias. Here, we leverage QLC to systematically design an optimal droop controller for the purpose of primary frequency control of power systems with asymmetric generator saturation and renewable penetration. The droop parameters are found by solving an optimization problem wherein the cost function is a combination of the change in frequency and the actuator input. Simulation studies show that the combined output and control cost is improved compared to a baseline design, and that the systematic design process provides an appropriate response to any change in input or system parameters.

David Brandt & Louis Augeri

Poster | 11:00-12:30 | Silver Maple Ballroom | Vermont Studies/Arts & Humanities/Social Sciences

Title: George D. Aiken and the Vietnam War: the Evolution of a Statesman

Faculty Mentor: Richard Watts, Geography

Abstract: Senator George D. Aiken's (1892-1984) political career spanned four decades, during which time he propelled from the Vermont General Assembly to the Governor's Office and eventually the United States Senate. Throughout his time in the Senate, Aiken made a name for himself as an independent-minded Republican—a maverick. Perhaps no moment from his career better reflects his autonomous style of thinking than when, in October 1966, he declared from the floor of the U.S. Senate that he thought the U.S. should declare victory in Vietnam and begin withdrawing troops. Many of Aiken's peers were puzzled by this pronouncement, as he had previously supported the Johnson Administration's Vietnam policy. It is the purpose of our research to examine Aiken's foreign policy thinking in the years leading up to his notorious 1966 floor speech. Working with Steve Terry, a Vermont journalist and former legislative aide to Senator Aiken, we track the evolution of Aiken's remarks on foreign affairs, especially regarding his stances toward communism, the Korean War, and the Vietnam War. By integrating Aiken's constituent communications with his statements on the Senate Floor and in the Senate Foreign Relations Committee (of which he was a member from 1954-1975), we intend to paint a comprehensive portrait of his impact on U.S. foreign policy.

Kristian Brevik

Oral | 2:00-2:55 | Chittenden Bank Room | Biological Sciences

Title: Keep it in the Tree: Genome Ecology of Transposable Elements in *Drosophila melanogaster* within the Gene Ontology Directed Acyclic Graph/Network

Faculty Mentor: Yolanda Chen, Plant & Soil Science

Abstract: This paper explores a novel method for describing the distribution of transposable elements in genomes with the intent to discover functional relationships between transposable elements and genes of certain function. We take two intertwined approaches. First, we transpose the genomic locations of transposable elements into the Gene Ontology network by placing TEs into the gene ontology terms of those genes mapped to the specific gene ontology functions. Second, we associate TE distribution with chromatin domains determined by epigenetic marks (histone modifications and DNA methylation), as a step towards disentangling the interactions of genes and TEs, akin to how bears and pine beetles may be found together, but not because they are directly interacting, but because of a third environmental variable (forest). The third portion of this paper reconciles the two types of analysis in order to move towards a comprehensive analysis of transposable element distribution in the genome.

Zoe Brier

Poster | 11:00-12:30 | Silver Maple Ballroom | Social Sciences

Title: PTSD Symptom Severity as a Moderator for Response Inhibition and Opioid Use

Faculty Mentor: Matthew Price, Psychological Science

Abstract: Post-Traumatic Stress Disorder (PTSD) and substance use are highly co-occurring disorders. More specifically, individuals with opioid misuse have increased severity of PTSD symptomology. Decreased response inhibition, defined as the ability to inhibit an automatic response, has been found separately in individuals with PTSD and opioid misuse. The present study examined response inhibition in individuals with co-occurring PTSD and current

or past opioid misuse. Participants (N = 53) had a current PTSD diagnosis and were either currently misusing opioids (56.6%) or in abstinent from or in recovery from opioid misuse (43.4%). Response inhibition was measured using the Stop-Signal Task, which examines response inhibition across different emotional valences. There was decreased response inhibition for angry stimuli compared to neutral stimuli across both active and past opioid users. Additionally, decreased response inhibition was associated with increased PTSD symptom severity in past opioid users, but not active users. This has important implications for those in recovery from opioid misuse, in that timing may be important for targeting reduction of PTSD symptoms in opioid users. Future studies would need to be completed in order to understand when a targeted intervention for PTSD symptoms would be most beneficial for those actively using or who recently stopped using opioids.

Tiger Britt

Oral | 9:00-9:55 | Williams Family Room | Arts & Humanities

Title: Tropes of Spectacle: Gladiatorial Representations in the Ancient Roman World

Faculty Mentor: John Franklin, Classics; Angeline Chiu, Classics

Abstract: We found significant morphological and phylogenetic evidence that supports a new clade of epibiotic (and one epibryotic) fungi within the family Acrospermaceae, of which two species are recognized as spec nov. Results also resolve an uncharacterized anamorph (*Gonatophragmium triuniae*) of the species *Acrospermum maxonii*. The two new species: *A. species1* and *A. species2* (along with *A. maxonii*) form black clavate fruiting bodies which reside exclusively on the underside of fern leaves within the family Grammatidaceae. Morphological characteristics distinguish these two new species as being different. Additionally a fossil calibrated chronogram of the dothideomycetes (larger phyla of *Acrospermum*) was created using BEAST analysis to better infer the epibiotic life habit to the evolution of the grammatid ferns.

Max Buchholz & Owen Hudson

Poster | 3:00-4:30 | Frank Livak Ballroom | Biological Sciences

Title: Nov. *Acrospermum* Species Recognized Residing on Tropical Ferns Within the Ascomycete Clade, Dothidiomycetes

Faculty Mentor: Michael Sundue, Plant Biology

Abstract: We found significant morphological and phylogenetic evidence that supports a new clade of epibiotic (and one epibryotic) fungi within the family Acrospermaceae, of which two species are recognized as spec nov. Results also resolve an uncharacterized anamorph (*Gonatophragmium triuniae*) of the species *Acrospermum maxonii*. The two new species: *A. species1* and *A. species2* (along with *A. maxonii*) form black clavate fruiting bodies which reside exclusively on the underside of fern leaves within the family Grammatidaceae. Morphological characteristics distinguish these two new species as being different. Additionally a fossil calibrated chronogram of the dothideomycetes (larger phyla of *Acrospermum*) was created using BEAST analysis to better infer the epibiotic life habit to the evolution of the grammatid ferns.

Sonya Buglion Gluck

Creative | 9:00-10:30 | Fireplace Lounge | Professional Studies - Education/Food & Environmental Sciences/Social Sciences

Title: Racism in Rubenstein; A Critical Climate Assessment

Faculty Mentor: Rachelle Gould, Rubenstein School for Environment and Natural Resources (RSEN); Kaylynn Sullivan TwoTrees, RSEN; Zachary Ispa-Landa, RSEN

Abstract: This study seeks to evaluate the racial climate of the Rubenstein School of Environment and Natural Resources at the University of Vermont, one of the least racially diverse colleges within UVM, in order to catalyze further inquiry and identify avenues for improvement moving forward. Through in depth analysis of demographic statistics as well as affinity based focus groups with students in Rubenstein, the study quantitatively compared Rubenstein with other colleges and qualitatively assessed students' perspectives of the school's racial climate.



Adrian Burnett

Poster | 11:00-12:30 | Silver Maple Ballroom | Vermont Studies/Social Sciences

Title: Frank Bryan Town Meeting Day Research**Faculty Mentor:** Richard Watts, Geography

Abstract: For thirty years Political Scientist Frank Bryan and his students attended more than fifteen hundred Vermont town meetings, cataloging more than two hundred and thirty thousand individual acts of participation – commenting, voting, raising hands – by more than sixty thousand citizens – documenting Vermont’s town meeting as an authentic and meaningful form of direct democracy. When Frank retired in 2013, data collection ended, until now. In 2018, a group of researchers and students at the University of Vermont, Castleton University and Northern University collected data from 34 town meetings across the state March 3, 5 and 6. Findings include town by town participation rates, attendees, issues with the highest number of people participating and Frank Bryan’s measure of “democraticness” – a correlation between town population size and rate of attendance and participation.

Aileen Button

Poster | 11:00-12:30 | Silver Maple Ballroom | Mathematical & Physical Sciences/Biological Sciences

Title: Why is Selenium in tRNA?**Faculty Mentor:** Robert Hondal, Biochemistry

Abstract: Sulfur and selenium modifications occur naturally at U₃₄ – the wobble base position of the anticodon loop – of E. coli tRNAs Lys, Glu, and Gln. Due to the varying chemistries of sulfur and selenium, selenium containing compounds can be oxidized without being subject to deselenization while the corresponding sulfur compounds are dethiolated under the same conditions. This gives selenium containing molecules protection from oxidative stress. As such, the selenium modifications in tRNA, which occur as 5-methylaminomethyl-2-selenouridine (mnm_{5se2U}), are likely to have a protective effect, allowing accurate protein translation to continue. By monitoring translation of these tRNAs with and without selenium, I aim to improve the understanding of the cellular role of these modifications.

Julia Camuso

Poster | 11:00-12:30 | Silver Maple Ballroom | Social Science

Title: Psychological and Physiological Predictors of Treatment Outcome in Light Therapy and Cognitive-Behavioral Therapy for Seasonal Affective Disorder**Faculty Mentor:** Kelly Rohan, Psychological Science

Abstract: Front-line treatments for winter seasonal affective disorder (SAD) include light therapy (LT), which targets a physiological vulnerability, and SAD-specific cognitive-behavioral therapy (CBT-SAD), which targets a psychological vulnerability. To inform precision medicine, the present study examined baseline vulnerability profiles as prognostic and prescriptive predictors of outcomes in CBT-SAD vs. LT.

177 adults with current SAD were randomized to 6 weeks of either group CBT-SAD (n = 88) or LT (n = 89). Depression symptoms were measured at post-treatment and 1st and 2nd winter follow-ups with the Structured Interview Guide for Hamilton Rating Scale for Depression-Seasonal Affective Disorder Version (SIGH-SAD) and the Beck Depression Inventory-Second Edition (BDI-II). Before randomization, participants completed vulnerability measures: Dysfunctional Attitudes Scale (Weissman & Beck, 1978), Ruminative Response Style-Brooding Subscale (Nolen-Hoeksema, 1991), Seasonal Beliefs Questionnaire (Rohan et al., 2007), and Morningness-Eveningness Questionnaire (Horne & Östberg, 1976). Separate linear regressions examined treatment, each baseline vulnerability measure, and their interaction in predicting depression symptoms at each timepoint.

The treatment main effect predicted BDI-II and SIGH-SAD scores at 2nd winter in all models, with less severe depression in CBT-SAD than LT (all $p < .05$). There was a main effect of brooding rumination on 2nd winter BDI-II scores ($b = .69$, $p = .01$), with higher brooding associated with more severe depression. There was a main effect of morningness-eveningness on BDI-II scores at post-treatment only ($b = -.13$, $p = .04$), with greater eveningness associated with higher depression severity.

These findings suggest that regardless of baseline patient vulnerabilities, treatment modality is the best predictor of outcomes at 2nd winter. Two negative prognostic indicators were revealed: Higher brooding rumination predicted more severe depression at 2nd winter and greater eveningness predicted more severe depression at post-treatment. Further research should examine these vulnerabilities as potential mechanisms (i.e., mediators) of treatment outcomes.

Bonnie Cantrell

Poster | 3:00-4:30 | Frank Livak Ballroom | Biological Sciences/Food & Environmental Sciences

Title: Prevalence of DNA Methylation in the Bovine Brain Methylome

Faculty Mentor: Stephanie McKay, Animal & Veterinary Sciences

Abstract: Phenotypic variation in complex traits is regulated by genetics and epigenetic mechanisms. Our research focuses on determining the extent to which DNA methylation may affect phenotypic variation in docility. Whole genome bisulfite sequencing (WGBS) was undertaken in five functionally distinct brain regions for each of eight Red Angus X Simmental steers with extreme measures of docility (n=4 per group). Whole genome bisulfite sequencing was used to gain a single base pair resolution characterization of the methylomes of the amygdala, cingulate gyrus, hippocampus, periaqueductal gray, and prefrontal cortex. An average of 32 million sequence read pairs were generated from each sample. Reads were quality trimmed with trim galore using a phred score of 20. Trimmed reads were aligned to a bovine reference index using BS seeker2 and the bowtie2 aligner. BS seeker2 was then used to measure DNA methylation levels for methylated and non-methylated CGs, as well as methylated CHG (H= A, C or T) and CHH. Next, global percentages of DNA methylation was measured for CG, CHG, and CHH by tissue type. Further analysis was undertaken to determine the prevalence of each base in the in the H context for CHG and CHH. To the best of our knowledge, this project is the largest WGBS data set for brain tissues in the world and it only begins to explain the relationship between DNA methylation, the bovine brain, and phenotypic variation for extreme measures of docility.

Anthony Carbonar, Matthew Dunning, Julia Greenenbaum, & Shannon Mahoney

Oral | 4:00-4:55 | Chittenden Bank Room | Health Sciences

Title: Rapid Screening tools for asymptomatic mild traumatic brain injury

Faculty Mentor: Sambit Mohapatra, Rehabilitation & Movement Sciences

Abstract: Mild traumatic brain injuries (mTBI), also known as concussions, account for a significant amount of all traumatic brain injuries in the US. Early identification of concussions leads to early intervention, which has been shown to help reduce post concussive symptoms. This necessitates a comprehensive diagnostic tool that allows for accurate identification of concussion following trauma, as there is no current "gold standard" diagnostic tool (Center for Disease Control and Prevention, 2017).

In this experimental study, individuals diagnosed with (both symptomatic and asymptomatic) and without concussion will be compared through a battery of validated exams. The assessment tools that will be used to screen for concussion assesses the most commonly injured areas of the brain (frontal lobe and corpus callosum) with the following exams: cognitive tests (NIH Toolbox), bimanual coordination (TEMPA-Physiopro Inc, Perdue peg board), and standing balance (force plate).

It is expected that the mTBI group will show significant deficits in performance on all the assessment measures in comparison to the control group. There will be no significant difference in deficits between the symptomatic and asymptomatic mTBI groups.

Based on the expected results, we will be able to determine the specific assessment tools were most sensitive for diagnosing concussions in asymptomatic individuals. These results will help to guide future research in developing a less time-consuming screening tools that is able to accurately diagnose individuals with concussion especially in those who do not present with any symptoms, by implementing the most reliable and valid components of our findings.

Daphnee Cardella

Poster | 3:00-4:30 | Frank Livak Ballroom | Biological Sciences/Health Sciences/Vermont Studies

Title: A behavioral economic approach to smoking cessation in disadvantaged mothers

Faculty Mentor: Diana Keith, Psychiatry

Abstract: Introduction: Socioeconomically-disadvantaged mothers smoke at disproportionately high rates, making these women and their children at greater risk for smoking-related illnesses. Unfortunately, most smoking cessation interventions have a <20% chance of success. This study examines the effectiveness of an incentives program in comparison to a state-sponsored smoking cessation program for socioeconomically-disadvantaged mothers.

Methods: 250 mothers will be randomly assigned into one of three experimental conditions: 1) control group with state-sponsored usual care, 2) incentives program, and 3) incentives program plus nicotine replacement pharmacotherapy. The incentives program consists of a 12-week program of monetary incentives for smoking abstinence. The incentive value increases with the consecutive number of tests that show negative tobacco use, and mothers who do not smoke for the whole 12 weeks can make up to \$1360. Abstinence will be biochemically confirmed at 6-, 12-, 24-, and 48-weeks after their chosen quit date.

Abstract (Cardella, cont.'d): Results: To date, 144 women have been recruited into the study. Preliminary data shows that at the end of the treatment (e.g., week 12), 5%, 38%, and 43% of mothers had quit smoking in the control, incentives, and incentives plus nicotine replacement therapy groups, respectively.

Conclusions: Our data shows that incentives work well as a motivator for smoking cessation among socioeconomically-disadvantaged women. This intervention may reduce the disproportionate amount of smoking-related illnesses in families with low socioeconomic status.

Alisa Cario

Oral | 3:00-3:55 | Chittenden Bank Room | Biological Sciences

Title: Structural Changes in Tau Underlie Static and Diffusive Binding to the Microtubule Lattice

Faculty Mentor: Christopher Berger, Molecular Physiology & BioPhysics

Abstract: The study of structural changes in highly dynamic proteins, such as the microtubule associated protein (MAP) Tau, has proven challenging. Tau, primarily expressed in neurons, is known to have a variety of axonal functions. Tau has been shown to regulate microtubule dynamics, modulate kinesin motor motility and participate in signaling cascades. Although the structural change representative of disease state Tau is well characterized, structural differences and the subsequent effect in non-disease state Tau are less understood. Some studies on non-disease state Tau indicate a “folded” conformation in solution while others show an “open” conformation when Tau is bound to the microtubule surface. Interestingly, research on the microtubule binding behavior of Tau reveals that Tau binds to the microtubule surface in an equilibrium between static and diffusive states. However, implications of the binding state equilibrium have remained elusive. Using single molecule Total Internal Reflection Fluorescence (TIRF) Microscopy, we developed a three-color imaging technique to study structural changes underlying behavior differences in dynamic proteins through implementation of Fluorescence Resonance Energy Transfer (FRET). This technology is utilized to reveal structural differences between the two binding states of the 3RS isoform of Tau to the microtubule surface.

Chace Carpenter

Poster | 1:00-2:30 | Silver Maple Ballroom | Health Sciences

Title: Physical Activity and Cancer Related Distress with Women at Increased Risk for Breast Cancer

Faculty Mentor: Marie Wood, Hematology Oncology

Abstract: Women at increased risk for breast cancer have high levels of anxiety and distress related to their cancer risk. We sought to investigate whether adaptive behaviors (physical activity) were associated with lower distress in high-risk women. We hypothesized that physical activity would be associated with lower distress.

Individuals were identified from UVM’s High-Risk Breast Program; a prospective cohort of cancer-free women with elevated breast cancer risk. Cancer risk-related distress and energy expenditure were both evaluated using self-reported questionnaires; The Impact of Events Scale (IES: a sum of two subscales measuring avoidant and intrusive stress responses) and the Seven-Day Physical Activity Recall. Women who completed both questionnaires at two time points within a four year period were evaluated. Changes over time in each IES and energy expenditure were examined, and relationships between distress and energy expenditure were evaluated at both a single time point and over time.

Ninety-six women were eligible for our analysis. Overall IES scores decreased over time ($t = -3.31$, $p < 0.01$). This pattern was driven by reductions in both avoidant ($t = -2.08$, $p = 0.04$) and intrusive ($t = -3.39$, $p < 0.01$) stress responses among all women evaluated, although avoidant stress responses did not significantly change over time in a post-hoc subgroup analysis of women with strong family history ($p > 0.05$, $n = 76$). Mean daily energy expenditure was 2697.80 kcal/day, and did not significantly change over time. No significant relationships were found between energy expenditure and IES scores at either a single time point or over time.

We were unable to demonstrate a relationship between physical activity and cancer-related distress. However, we observed a decrease in distress over time. This suggests that other factors play a role in the adaptation of women to their cancer-related distress. Further investigation will be important in assisting high-risk women cope with this distress.

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Marissa Carranza

Oral | 4:00-4:55 | Jost Foundation Room | Food & Environmental Sciences

Title: The relationship of financial resources and food security among female-headed households in Africa

Faculty Mentor: Meredith Niles, Nutrition & Food Sciences

Abstract: In many developing nations agriculture is used as the primary source of income for families. In the face of a changing climate smallholder farmers in developing nations are known to be at a considerable risk due to limited ability to adopt adaptive techniques to help with climate change. Financial resources have shown to be a way to allow smallholder farmers to adopt different adaptations, consequently increasing income and food security for the family at large. The purpose of this study is to explore relationships between access to different types of financial resources among male and female-headed households and its effect on food security. Our analysis utilized data from the CGIAR Climate Change, Agriculture, and Food Security (CCAFS) program. Four sites were chosen including Nyando, Uganda, Senegal and Kenya These sites were chosen by the CGIAR to represent major farming systems and agro-ecological zones across Africa. We found male-headed households are more likely to access formal loans compared to female-headed households (14.0% to 1.5%, $p=0.0001$) and that female-headed households are more likely to use their credit for food, medical expenses and education than male headed (39.2% to 28.3%, $p=0.0088$), (20.8% to 7.5% $p=0.000$), (20.8% to 13.2%, $p=0.017$). Female-headed households that attempted to borrow money in the past 12 months were less likely to borrow food and other goods compared to female-headed households that did not attempt to borrow money in the past 12 months (26.2 % to 42.5%, $p= 0.0138$). These results help to understand how men and women are receiving and spending money differently, and can be used in the future to strategically develop financial initiatives.

Brittany Carroll

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: The crystal structure of human NTHL1 shows mobility between domains

Faculty Mentor: Sylvie Doublet, Microbiology & Molecular Genetics

Abstract: Base excision repair (BER) is the primary pathway for removing and replacing oxidized bases. The BER pathway is initiated when a DNA glycosylase binds an oxidized base and cleaves the N-glycosidic bond between the base and the deoxyribose moiety. The DNA glycosylase, Endonuclease-like III (Nth), recognizes and excises oxidized pyrimidines. To date, there is no crystal structure of any eukaryotic Nth-like (NTHL1) enzyme. The bacterial homologs, of which there are several crystal structures, exhibit a bilobal protein fold with Helix-hairpin-Helix and iron sulfur [4Fe4S] cluster domains linked by a flexible linker region [1-2]. Differences in regulation and biochemical function suggest a structural divergence between prokaryotic Nth and eukaryotic NTHL1 enzymes. We solved the first crystal structure of human NTHL1 (apo-hNTHL1 Δ 63), which revealed a novel open conformation not reported in its prokaryotic orthologs. The novelty of this configuration, in which the glycosylase domain has tipped away from the [4Fe4S] binding site (unpublished), suggests a conformational change upon DNA binding unique to the human enzyme. Moreover, we have obtained two crystal forms of hNTHL1 Δ 63 bound to DNA and currently are working to derive structural information describing the DNA-bound state of hNTHL1. These models will reveal specialization unique to human DNA glycosylase and demonstrate how hNTHL1 functions in the context of eukaryotic DNA repair.

[Works Cited: 1. Thayer, M. M., Ahern, H., Xing, D., Cunningham, R. P. & Tainer, J. A. Novel DNA binding motifs in the DNA repair enzyme endonuclease III crystal structure. *EMBO J.* 14, 4108-4120 (1995).

2. Fromme, J. C. & Verdine, G. L. Structure of a trapped endonuclease III-DNA covalent intermediate. *EMBO J.* 22, 3461-3471 (2003).]

Siera Carusone

Poster | 3:00-4:30 | Silver Maple Ballroom | Social Sciences

Title: An Assessment of Campus Perspectives on Factors Affecting Student Mental Health and Help-Seeking Behavior at the University of Vermont

Faculty Mentor: Jeanne Shea, Anthropology

Abstract: The University of Vermont has been affected by a rise in mental health concerns and a growing number of students seeking mental health services through the university. In order to better understand what factors are influencing student mental health, both positively and negatively, this qualitative study was developed. This study aims to understand how students at the University of Vermont view the state of mental health in the on-campus community, how students understand and utilize the mental health services on-campus, and how these actions and perspectives of students relate to mental health staff perceptions and goals. This research hopes to enrich the university's understanding of student perspectives on mental health. Rather than provide a large amount of data points on the student population, this research sought to provide more in-depth perspectives. This may enlighten the university to

Abstract (Carusone, cont'd): to aspects of mental health that may not be initially apparent, as well as allow for these student perspectives to be related to those of the current mental health staff. In order to provide this more in-depth data, this research used qualitative research methods from anthropology. An interpretivist approach was taken towards methodology and analysis, in its focus on the ways that students and staff perceive their everyday interactions with student mental health on campus. In addition, behavioral ecology theory was incorporated to understand how perspectives and expectations of both providers and users interact on a community level. Overall, UVM students and staff had similar views concerning the state of student mental health at the university, the effects of campus climate on student mental health, whether positively or negatively, and what factors played into student help-seeking behavior. In terms of the effectiveness of student mental health services on-campus, staff were consistent in their views, while students' perceptions varied.

Jordyn Chace

Oral | 1:00-1:55 | Chittenden Bank Room | Biological Sciences

Title: Modeling Coral Traits to Assess Vulnerability to Climate Change

Faculty Mentor: Brent Lockwood, Biology

Abstract: Corals serve as a habitat for one of the world's most diverse and important ecosystems. However, due to increases in temperature and acidity in the oceans, most corals face extreme threats that may result in mass extinction. This paper ranks various species on likelihood of survival in the coming years of climate change. This score will be based on the presence or absence of various traits that aid or depress adaptability, through both physiological plasticity and evolutionary adaptation. The modeling framework presented in this paper allows for further research to be conducted regarding species with less available information. This score, once compared to IUCN Red List Categories, allows a quantitative comparison to be drawn between species and provide the ability to create a comprehensive conservation plan.

Lisa Chamberland

Oral | 2:00-2:55 | Chittenden Bank Room | Biological Sciences

Title: Evolutionary history and biogeography of ocre-faced spiders

Faculty Mentor: Ingi Agnarsson, Biology

Abstract: We explore the evolutionary history of the ocre-faced spiders (*Deinopis*), from its early Cretaceous origins through the present day. To investigate roles of both vicariance and dispersal in this expectedly dispersal-limited taxon, we focus on Caribbean island biogeography, placed in a global context. We test the putative Gondwanan origin of the group, and the role of GAARlandia, a hypothesized land bridge connecting South America to the Greater Antilles during the Eocene/Oligocene transition (~35-33 Ma), in the biogeography of *Deinopis*. Combining standard Sanger sequence data with an Anchored Hybrid Enrichment (AHE) phylogenomic dataset, we use Bayesian inference to estimate the phylogenetic relationships of *Deinopis*, BioGeoBEARS to test the GAARlandia hypothesis, and pinpoint major dispersal events in the biogeographic history of *Deinopis*. The phylogeny supports an ancient separation between New and Old World clades, as well as the nesting of a Caribbean clade within a continental grade. We find support for the GAARlandia hypothesis and phylogeny reflecting geologic history within the Caribbean. Rare overwater dispersal events are also indicated within this lineage. *Deinopis* phylogeny corresponds well with geography. This is reflected in the 1) 113 Ma fundamental split into Old and New World clades consistent with the separation of Gondwana, 2) support for the GAARlandia land bridge hypothesis, and 3) phylogenetic relationships within and among Caribbean islands mirroring nuances of Caribbean geological history. Surprisingly, overwater dispersal plays an important role in the biogeographic history of this largely vicariant lineage. It is implicated in the colonization of the volcanic and sedimentary Lesser Antilles, in a GAARlandia-mediated 'reverse' colonization of North America, and possibly colonization of Madagascar and Australia.

Arielle Cheifetz

Poster | 3:00-4:30 | Silver Maple Ballroom | Social Sciences

Title: A Conservationist, An Economist, and A Medic Walk Into a Moral Dilemma

Faculty Mentor: Brendan Fisher, Rubenstein School for Environmental & Natural Resources

Abstract: A recently published study in Biological Conservation found that that despite the involvement of conservationists in environmental issues, conservation scientists do not seem to have a significantly smaller ecological footprints than other professionals. The researchers conducted a multi-national study with a survey of 732 respondents which tested across 11 domains of human behavior that have large environmental externalities. Using their survey database, I tested whether the reasons participants gave for their behavior differed across the sample populations of conservationists, economists, and medical professionals. This line of study seeks to answer questions about

the rationalization of behavior of conservationists despite their knowledge for the impacts their behaviors have on the environment. We have found evidence that conservationists are more ready to rationalize their behavior, both negative and positive. This research helps us better understand the dissonance between ones morals and actions. A deeper understanding of this dissonance gives us insight into how to design interventions to help close the attitude-behavior gap of people who are trying to mitigate their negative impacts on the environment.

Kirsten Chick

Poster | 11:00-12:30 | Silver Maple Ballroom | Mathematical & Physical Sciences/International Research

Title: Legal Drinking Age and Traffic Crashes: A Cross-Jurisdiction Analysis Between the United States and Australia

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: Various studies have shown a correlation between alcohol-related crashes and young drivers. This study aims to juxtapose two different jurisdictions; the United States and Australia, to examine the influence that the legal drinking age has on alcohol-related crashes for young drivers. Three driver categories will be studied, 1) drivers aged 16-18 years, representing drivers who are not legally allowed to drink in either jurisdiction, 2) drivers aged 18-21 years, representing drivers who are legally allowed to drink only in Australia, and 3) drivers aged 21-25 years, representing drivers who are legally allowed to drink in both jurisdictions. This study uses the quasi-induced exposure technique to assess the relative probability of young drivers to be at fault in a crash where alcohol is involved and then uses binary logistic regression to determine the statistical significance of these odds ratio results. Through comparing the results of both Australia and the United States, this study answers the research question: to what degree does the legal drinking age in a country influence the likelihood of a young person causing a crash that involves alcohol?

Alison Chivers

Poster | 1:00-2:30 | Silver Maple Ballroom | Health Sciences/Biological Sciences

Title: Impact of depleting co-repressor TLE1 on pancreatic cancer cell growth

Faculty Mentor: Seth Fietze, Medical Laboratory & Radiation Sciences

Abstract: Cancer can be broadly defined as a collection of more than 100 different diseases that all share the common fundamental feature of uncontrolled cell division. Although all types of cancer share this characteristic and cancer can develop in nearly any tissue of the body, each type of cancer possesses its own unique characteristics. Understanding both the common and unique features of different cancers is important for understanding the disease and for the development of new and improved treatments and diagnostics. Among the different types of cancer, pancreatic cancer is one of the deadliest, currently ranking as the fourth leading cause of cancer death in the U.S. with approximately 40,000 deaths per year. Current therapies for pancreatic cancer include radiation, surgical resection, and conventional chemotherapies. Unfortunately, these treatments are not effective, only 24% of patients who are treated survive one year after their diagnosis. In order to develop alternative treatments, more research is needed to gain a better understanding of the molecular mechanisms that contribute to pancreatic cancer. My research involves investigation of the basic molecular processes that promote the uncontrollable growth and division of pancreatic cancer cells. Specifically, my project seeks to define the roles of the TLE1 protein, a co-repressor of transcriptional factors, in the suppression of cancer cell proliferation. I hypothesize that the TLE1 co-repressor protein, which is highly expressed in pancreatic cancer cells, suppresses gene expression pathways that normally function to control cell division and induce apoptosis. By depleting TLE1 from human pancreatic cancer cells, the impact of the absence of this co-repressor on cell growth, proliferation, and viability will be examined. The results from this study will provide an understanding of the role of co-repressor proteins in pancreatic cancer and may ultimately be used for future studies to design therapies that target co-repressors for cancer treatments.

Michael Cibuzar

Oral | 9:00-9:55 | Sugar Maple Ballroom | Mathematical & Physical Sciences

Title: Lanthanum catalyzed heterodehydrocoupling of silanes with amines

Faculty Mentor: Rory Waterman, Chemistry

Abstract: Lanthanum tris(trimethylsilylamine), $\text{La}[\text{N}(\text{SiMe}_3)_2]_3$, an inexpensive and readily synthesized compound, is a competent heterodehydrocoupling pre-catalyst for coupling silanes with amines. For example, primary, secondary and tertiary aryl silanes can be dehydrocoupled with a variety of primary and secondary amines to yield silamines, often in greater than 90% conversion. Less sterically hindered amines tend to undergo the maximum number of Si-N bond forming events, making quaternary silanes. Many of these reactions are performed at ambient temperature, have with catalyst loadings between 1 and 5 mol%, and are completed in minutes.

Matthew Ciminella

Oral | 12:00–12:55 | Jost Foundation Room | Mathematical & Physical Sciences/Vermont Studies

Title: Optimizing Signal Timing Along Pearl Street in Downtown Burlington, Vermont**Faculty Mentor:** Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: Pearl Street is a minor arterial road, linking downtown Burlington, Vermont to its New North End neighborhood and the adjacent municipalities of Winooski and South Burlington. The road is the subject of a recent (2015) study by Stantec, commissioned by the City of Burlington and CCRPC, that evaluates alternative designs to convert a section of Pearl Street into a “complete street” with an emphasis on pedestrian and bicycle accessibility. This paper aims to build upon this study by determining an optimal coordinated signal timing plan for a corridor containing seven traffic signals on Pearl Street in downtown Burlington. The half-mile long corridor includes the three signals from the area of focus in the Stantec Study, as well as four nearby signals with similar characteristics.

Traffic turning volume data are gathered from VTrans records and supplemented by on-site physical data collection. The corridor, under the proposed “complete street” conditions, is modeled with Synchro traffic modeling software. Existing PM peak hour conditions are evaluated through four performance metrics: average vehicle delay, intersection level of service, average maximum queue lengths, and volume to capacity ratio. Evaluating intersection performance through these metrics is corroborated by previous studies for CCRPC and the City of Burlington by firms such as RSG and Stantec. Individual signals in the corridor have the listed performance metrics optimized, and the signal timing plans offset one another to further promote efficiency. For all signals, the existing conditions are compliant with all performance metrics. Optimizing the signals and aligning them as a corridor expands on this compliance and maximizes performance across all metrics.

Laurence Clarfeld

Oral | 1:00–1:55 | Jost Foundation Room | Mathematical & Physical Sciences

Title: Assessing Risk from Cascading Blackouts Given Correlated Component Failures**Faculty Mentor:** Maggie Eppstein, Computer Science; Paul Hines, Electrical & Biomedical Engineering

Abstract: Despite the infrequent occurrence of cascading power failures, their large sizes and enormous social costs mean that they contribute substantially to the overall risk to society from power failures in the grid. Therefore it is important to accurately understand the risk associated with such events. A cascading event may be triggered by a small subset of k components failing simultaneously or in rapid succession. While most prior work, including our own work into an efficient “Random Chemistry” method for risk analysis, has assumed that components fail independently, this paper proposes a method for deriving correlated outage probabilities such that pairs of branches that are proximate in space are more likely to fail together than distant ones. Combining Random Chemistry risk analysis with this approach to correlated outage probabilities shows that overall blackout risk can greatly increase with even small amounts of correlation. Results from the 2383-bus Polish test case under various load levels illustrate the substantial impact that correlation has on blackout risk.

Nora Cleary

Poster | 11:00–12:30 | Frank Livak Ballroom | Biological Sciences

Title: Myosin A Phosphorylation Effect on *Toxoplasma gondii* Motility**Faculty Mentor:** Gary Ward, Microbiology & Molecular Genetics

Abstract: Apicomplexans are obligate intracellular parasites that require a unique form of gliding motility to invade and exit host cells. In the apicomplexan parasite *Toxoplasma gondii*, motility is driven by a motor complex that includes an unconventional class XIVa myosin, TgMyoA. During parasite motility, the phosphorylation of TgMyoA is calcium dependent and the calcium dependent protein kinase, TgCDPK3, was determined to be responsible for regulating phosphorylation at Serine 21 and 743. Mutating Serine 21 and 743 to phosphomimetic glutamic or aspartic acid residues (along with the neighboring Serine 20 and Serine 744 residues, to better represent the localized charge of a phosphate group) enabled parasites expressing the mutant TgMyoA to move normally in the absence of TgCDPK3 (Gaji et al, PLOS Pathogens 11: e10052678). The purpose of this project is to determine which of these individual or pairs of phosphorylated amino acids contributes to TgCDPK3’s role in supporting motility. Using the Baculovirus Expression System, a recombinant motor complex was purified which included TgMyoA with individual or neighboring pairs of phosphomimetic mutations on Serine 20, 21, 743, and 744. The expressed proteins will be used in an In vitro Motility Assay to determine which of the phosphomimetic mutations is/are ultimately responsible for the motility phenotype seen in parasites.

Julia Cline

Oral | 9:00–9:55 | Jost Foundation Room | Biological Sciences

Title: The effect of a trehalose diet on cold tolerance in *Aphaenogaster picea*

Faculty Mentor: Sarah Helms Cahan, Biology

Abstract: Ants living in thermally variable environments need to be able to tolerate both high and low temperature extremes. One way that insects handle cold is through the accumulation of cryoprotectants, such as sugars, that increase cold tolerance by lowering the freezing point of liquids in the hemolymph. The disaccharide sugar molecule trehalose is an important cryoprotectant in many insect species, but its role has not yet been studied in ants.

I investigated whether the northern forest ant *Aphaenogaster picea* resists cold by producing trehalose from sugars in their diet. To determine whether workers produce trehalose in response to cold exposure, whole-organism metabolite concentrations following rapid cold hardening (RCH) or gradual acclimation were compared to room-temperature (RT) controls. To understand whether dietary trehalose or its monosaccharide, glucose, increases cold tolerance, recovery from cold shock was compared for ants maintained on trehalose, glucose or no-sugar diets.

RCH and RT ants had more similar metabolite regulation to each other than to the acclimation ants, and acclimation ants had more downregulation overall, suggesting the involvement of different physiological mechanisms. Allantoin increased under both exposures, indicating that amino acid or purine metabolism is an important part of ant response to cold. Metabolites involved in amino acid metabolism also increased under both exposures; however, proline increased in acclimation ants, suggesting that certain amino acids are involved in cryoprotection.

An unidentified disaccharide, Stachyose, and D-Raffinose all decreased under acclimation, and trehalose did not appear under either exposure. However, dietary trehalose and glucose improved recovery time across cold exposure types, and ant mortality was higher for the starvation diet, indicating that as an energy source, sugar was important for cold tolerance. Therefore, while there is no evidence that trehalose is directly involved in increasing cold tolerance, *A. picea* may rely on other metabolically-expensive molecules to handle the cold.

Gabe Cohn

Poster | 11:00–12:30 | Frank Livak Ballroom | Biological Sciences

Title: Cross Talk Between IKAROS and RUNX1 in Myeloid Leukemia

Faculty Mentor: Jessica Heath, Hematology Oncology; Matthias Brewer, Chemistry

Abstract: Background: IKAROS is a transcription factor that plays an essential role in normal lymphopoiesis, and mutations of IKZF1, the gene encoding IKAROS, are frequently seen in acute lymphoblastic leukemia (ALL). Despite reports of the presence of IKZF1 mutations in acute myeloid leukemia (AML), there remains a paucity of information regarding a possible role for disrupted IKAROS function in AML. RUNX1 is critically important for normal hematopoiesis within both the lymphoid and myeloid lineages. Mutations or translocations involving RUNX1 have been identified in a variety of myeloid and lymphoid lineage hematopoietic malignancies.

Emerging evidence indicates that the transcriptional programs of IKAROS and RUNX1 converge on critical pathways in hematopoiesis. We hypothesize that IKAROS contributes to a gene regulatory program in AML, and that the IKAROS and RUNX1 regulatory networks intersect in the pathogenesis of myeloid malignancies.

Methods: Chromatin immunoprecipitation followed by next generation sequencing (ChIP-Seq) was utilized to identify the genome-wide binding sites of IKAROS, RUNX1, and a panel of activating and repressive histone modifications in the human myeloid sarcoma U937 cell-line. The genes bound by IKAROS and RUNX1 as well as the chromatin patterns of these binding sites were analyzed to understand the mutual and shared roles of these transcription factors.

Results: We identified that greater than 30% of RUNX1 binding sites in this myeloid sarcoma cell line are also bound by IKAROS. These sites of co-occupancy are enriched at distal sites marked by the enhancer histone mark H3K27ac. Of the high-confidence IKAROS–RUNX1 shared binding sites, RUNX1 binding motifs predominate; while ETS, IRF4 and CEBPA motifs are also present. A Genome Regions Enrichment of Annotations (GREAT) analysis of the IKAROS–RUNX1 shared binding sites reveals enrichment for several biological associations, including leukocyte activation, migration, and chemotaxis.

Katelynn Conedera

Poster | 11:00–12:30 | Silver Maple Ballroom | Vermont Studies/Social Sciences

Title: Willingness-to-pay for community biodigesters and compost removal services: A case study in Vermont

Faculty Mentor: Qingbin Wang, Community Development & Applied Economics

Abstract: Anaerobic biodigesters are emerging as a renewable energy source that can convert cow manure and compost into electricity for public use. However, there is little research on their viability in consumer markets. This

Abstract (Conedora, cont'd): article focuses on a survey conducted in Randolph, Vermont exploring support and willingness-to-pay (WTP) for the local community biodigester and Cow Power program that provides electricity generated by biodigesters in Vermont to Green Mountain Power customers. A 35-question survey was distributed to 1,900 Randolph, Vermont households through the local newspaper and an online survey link. The response rate was 7.6%, with 144 total surveys returned. Questions were asked about familiarity and support for both the biodigester in Randolph and the Cow Power program, in addition to selected demographic characteristics. These questions were then used to evaluate WTP for both energy from the Cow Power program and compost collection to support the operation of the community biodigester. The data is analyzed through quantitative analysis, including two binary logistic regression models. It is expected that WTP for both the Cow Power program and compost collection will be low in general, with less than half of respondents willing to pay any amount for either. Respondents who are willing to pay for these services will likely be more familiar with and supportive of the services than those who are not.

More questions on WTP, especially in relation to income, are needed to understand what changes may be necessary to improve community participation in these programs. Low rates of WTP suggest that more public communication and outreach is necessary to ensure the success of biodigesters as a renewable energy source in Randolph and other similar Vermont communities. The results from this analysis can guide community outreach efforts and help to develop targeted methods to increase support and participation across demographic groups.

Samantha Connolly

Poster | 3:00-4:30 | Frank Livak Ballroom | Biological Sciences

Title: Determining the function of NPF1B and NPF1C in *Lotus japonicus*

Faculty Mentor: Jeanne Harris, Plant Biology

Abstract: The Nitrate and Peptide Transporter Family (NPF) is widespread. It consists of eight subfamilies and encodes transporters for a variety of substrates, including nitrate, peptides, amino acids, hormones, and more. Subfamily 1 (NPF1) has been divided into five clades (A, B, C, D1, and D2) based on evolutionary relationships. Since the dawn of flowering plants, there were NPF1 genes. The species that contain genes from clades C, D1, and D2 have lost clade A genes, but many contain a clade B gene. This maintenance of NPF1B genes throughout angiosperm radiation, even in species that carry genes from other NPF1 clades, suggests that NPF1B's function is unique and important. In addition, plants often contain multiple copies of clade C, D1, and D2 genes, but the majority have only one copy of NPF1B, suggesting a dosage limit. Although many NPF genes have been characterized, the NPF1 subfamily is mostly unexplored, with the only characterized gene being the *Medicago truncatula* (Mt)LATD/NIP in clade C. In the model legume *M. truncatula*, LATD/NIP is involved in root meristem organization, Abscisic acid (ABA) signaling, and symbiosis with rhizobium bacteria. Has this function been conserved in LATD/NIP in other plant species? What is the function of clade B genes? The goal of my project is to determine the function of the NPF1B and NPF1C genes in a different legume species, *Lotus japonicus*, by characterizing the phenotype of *Ljnpf1b* and *Ljnpf1c* mutants. Investigating the function of NPF1B is an opportunity to learn more about the biological role of this subfamily of genes. Investigating the function of NPF1C in *Lotus japonicus* is an opportunity to expand our understanding of the LATD/NIP gene.

Julie Connor

Poster | 9:00-10:30 | Silver Maple Ballroom | Health Sciences

Title: The Influence of Pain on the Development of PTSD Across the Acute Post Trauma Period

Faculty Mentor: Matthew Price, Psychological Science

Abstract: Exposure to potentially traumatic events is fairly common among US adults, yet only a small fraction develop post-traumatic stress disorder (PTSD). It is unclear, however, why some individuals develop PTSD and others do not. Higher pain after a traumatic injury has been associated with higher PTSD symptomology and may be a risk factor for developing PTSD. However, few studies have examined symptoms during the period immediately after a trauma to determine how they relate to PTSD outcome. The goal of this study was to identify trajectories of pain throughout the first month after a traumatic injury and examine their relation to PTSD symptoms at 1 month. A sample of (n = 88) individuals who had experienced a traumatic injury assessed their pain through daily mobile assessments for the first month after injury. Daily mobile assessments consisted of self-report surveys sent to the participants' mobile device. A follow-up interview was conducted at 1 month after injury to assess PTSD symptomology. Using growth mixture modeling, three trajectories of pain were identified: low pain, decreasing pain, and persistent high pain. Membership to the low pain group was associated with lower PTSD, depression and disability symptoms at 1 month after injury. Membership to the high pain group was associated with higher levels of PTSD, depression and

disability symptoms at 1 month. These results demonstrate that there are distinct trajectories of pain after a traumatic injury and these trajectories may relate to later symptoms of psychopathology.

Amanda Cornetta

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences

Title: Measurement of Changes in Heme Ruffling Caused by Heme-Degrading Enzyme, IsdG

Faculty Mentor: Matthew Liptak, Chemistry

Abstract: This project analyzed the interaction of IsdG, an enzyme involved in the spread of *Staphylococcus aureus* bacterium, and the iron-containing protein complex heme found in hemoglobin. This investigation was done in hopes to gain further insight into the mechanism of heme degradation, which plays a critical role in the enzyme's potential as a drug target of the bacterium. Iron serves as an essential nutrient for *S. aureus* that is predominantly acquired using IsdG. Specific amino acid residues lining IsdG's catalytic pocket are used to precisely interact with the iron in heme, such as Tryptophan-67 (Trp, W). Trp has a very bulky side-chain that creates distortions to heme, subsequently aiding in its degradation. We intended to understand and decrease the amount of ruffling, thereby reducing the bacteria's ability to degrade heme, by mutating Trp into a less bulky amino acid, Phenylalanine (Phe, F). Upon successfully forming the W67F mutant of IsdG, spectroscopic techniques were used to fully understand and characterize our mutation, including: ultraviolet-visible (UV/Vis), magnetic circular dichroism (MCD), and nuclear magnetic resonance (NMR) spectroscopy. These characterization methods provided information regarding the mutated enzyme's geometric structure, electronic structure, and enzymatic function, all of which are crucial to understanding the interaction between IsdG and heme.

Angelica Crespo

Oral | 4:00-4:55 | Jost Foundation Room | Food & Environmental Sciences/Social Sciences

Title: "Chopped Cheese" or the "Cheese Burger on Sub Roll": An Alternative Perspective to Food Deserts in the Inner City of New York

Faculty Mentor: Daniel Baker, Community Development & Applied Economics (CDAE); Joshua Farley, CDAE; Rasheda Weaver, CDAE

Abstract: This project will investigate the ways in which small local grocery stores differ from larger corporate supermarkets in communities of color that are mapped as urban food deserts. I intend to complete my goal through a summer of locating small local grocery stores and supermarkets, surveying the community, creating a culture index via this survey, and then surveying these small stores in comparison to larger corporate supermarkets. My research target size will be small local food stores in Uptown, New York City and their neighboring supermarkets. The methods will include mapping out which small, local food stores and supermarkets will be surveyed.

Paul Cronin

Poster | 11:00-12:30 | Frank Livak Ballroom | Biological Sciences

Title: Investigating the effect of salt stress on the cell divisions during early development of symbiotic root nodules in *Medicago truncatula*

Faculty Mentor: Jeanne Harris, Plant Biology

Abstract: Legume root nodules are the site of the economically important legume-rhizobia symbiosis that fixes atmospheric nitrogen into a form usable by plants. These lateral root organs are derived from cells of the cortex and pericycle of the developing root. Excess salt in the soil is a major stressor on plants, causing changes in growth and development as the plant attempts to cope. Salt stressed *M. truncatula* produce fewer nodules than control plants. Salt stressed nodules are white, indicating a lack of leghaemoglobin, a key indicator of nitrogen fixation. The effect of salt stress on the formation of the early nodule primordia is therefore an important topic. To test this, I am growing *M. truncatula* plants under salt-stressed and control conditions in the presence of rhizobium bacteria. To visualize the pattern of cell divisions during early nodule development, I am examining whole root sections (7 days after infection with rhizobium bacteria) using a Pseudo-Schiff Propidium Iodide technique that fluorescently stains cell walls and observing them under a confocal microscope. This technique allows for excellent visualization of cell division in early primordia and has the advantage of not requiring sectioning. Key points of interest will be the location and orientation of cell divisions in the developing primordia and the relative numbers of nodule and lateral root primordia found. In this way I hope to come to a better description of abnormal nodulation in salt stressed legumes at its earliest stages—the cell divisions that produce the nodule primordium.

Claire Crowley

Poster | 11:00-12:30 | Silver Maple Ballroom | Social Sciences

Title: Young Adult Dating Violence and Coercive Control: A Comparative Analysis of Men and Women's Victimization and Perpetration Experiences

Faculty Mentor: Nicole Conroy, Leadership & Development Sciences

Abstract: This study compares men and women's experiences of dating violence (DV) and coercive control (CC) and tests the applicability of Johnson's typology of intimate partner violence (IPV) to young adult (YA) dating relationships. YA reported being in violent (24%) and high CC (no violence: 19%) relationships. Women were more likely to experience multiple forms of violence, particularly sexual violence (SV), and experience greater injury and fear toward abusive partners, thus supporting the idea of gender asymmetry in DV. Additional typologies of violence beyond those proposed by Johnson were found.

Patrick Cruden

Poster | 9:00-10:30 | Silver Maple Ballroom | Health Sciences

Title: Hospitalist Assessment of Venous Thromboembolism and Bleeding Risk: A Survey Study

Faculty Mentor: Allen Repp, General Internal Medicine

Abstract: Background: Venous thromboembolism (VTE) is a leading cause of preventable death in hospitalized medical inpatients. Pharmacologic prophylaxis has been shown to decrease the incidence of VTE while increasing the risk of bleeding in medical inpatients. Hospitalists must make daily decisions about prescribing VTE prophylaxis for patients admitted to the hospital, but there is no universally accepted method for weighing the risks and benefits of pharmacologic prophylaxis in medical inpatients.

Objective: To characterize how academic hospitalists assess VTE and bleeding risk in medical inpatients.

Methods: We performed an electronic survey of academic hospitalists at eight academic centers and affiliated hospitals.

Results: A total of 121 hospitalists responded. Thirty-two point six percent (29/89) of respondents reported they perform a formal VTE risk assessment at the time of admission. The most commonly utilized risk assessment model was one developed at their home institution, 58.6% (17/29). Sixty-five point two percent (58/89) reported performing an informal assessment of VTE risk and identified active cancer, prior DVT or PE as the most important factors. Twelve point eight percent (11/86) of respondents reported performing a formal assessment of bleeding risk at the time of admission. The most popular risk assessment model was one developed at their home institution 45.5% (5/11). Seventy-eight percent (67/86) performed an informal assessment and assigned the highest weights to previous major bleed and platelets <50,000.

Conclusions: Given the high incidence, morbidity and mortality of VTE, it is paramount the risk of VTE and bleeding are assessed for each medical inpatient. However, few academic hospitalists use a formal method of assessing risk and most rely on informal assessment based on patient factors.

Ben Crystal

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences

Title: FCFW Image Producing System

Faculty Mentor: Tian Xia, Electrical & Biomedical Engineering

Abstract: The proposed research is an extension of the research conducted by Professor Tian Xia up to date. The project is to develop a method to create 3-D images for self-driving electric vehicles and using a singular, fairly-simple microcontroller. The basis for this research is NXP's radar sensor chip, the BEST3-S1, in combination with their Opal Kelly microcontroller. When these two components are combined, the BEST3-S1's seven antennas can analyze the size, shape, location, and speed of its surroundings. The goal of this research is to standardize the radar system used to create detailed images for self-driving, clean energy vehicles, making electric cars more accessible and accurate than ever before.

Katrina Czar

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences

Title: Study of Electrons in Organic Thin Film Semiconductors

Faculty Mentor: Madalina Furis, Physics

Abstract: Our modern world of electronic devices relies heavily on the use of silicon semi-conductors for transistors and printed circuits. Silicon is costly to produce and detrimental to the environment, but there is a potential

for an alternative. Organic semi-conductors made of molecules that can behave like a semi-conductor offer a promising alternative that is cheaper to produce and could even lead to innovations like flexible electronics and wearable technology. These molecules can be deposited on substrates like glass or plastic which cannot withstand the stress of the necessary techniques needed for silicon deposition. A technique developed at UVM that uses a hollow capillary pen allows us to “write” organic films with grain size on the order of several millimeters. These large grain sizes allow us to use optical techniques to study the flow of electron like quasi-particles called excitons. It was observed that contrasting triangle shaped structures could be viewed when using polarized light on metal alloyed films produced utilizing UVM's capillary pen technique. We also observed these structures in pictures taken with a scanning electron microscope (SEM). Our goal was to determine the nature of these triangular structures. We hypothesized that they were either regions with a different crystalline phase, regions with a higher metal concentration or physical structures on top of the film. Using a laser system built in-house we scanned these triangles using the techniques of linear dichroism and photoluminescence and determined that these triangles were physical structures of the film. Our next step in this project is to determine what deposition speeds and concentrations produce these structures and how we can best eliminate them.

Ekraj Dahal

Poster | 3:00-4:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: Organic Charge Transfer Crystal Complex for Use in Solar Cells

Faculty Mentor: Matthew White, Physics

Abstract: Solar panels are currently expensive to manufacture and some technologies use toxic metals such as cadmium or lead in their production. Organic (carbon-based) semiconductors promise solar cells and other electronics that do not use any such toxic elements and could be cheap to manufacture at large scales. However, at this point the best power conversion efficiency (PCE) of organic solar cells is roughly a factor of 2 lower than conventional solar cells. We have studied the electronic and optical properties of the organic solar cells using charge - transfer (CT) crystals, specifically of Pyrene-TCNQ and Perylene-TCNQ. Our results showed that Pyrene being a small molecule had processing difficulties in including in the cell layer. However using Perylene, a big molecule, we were able to make our proof-of-concept solar cells using CT crystals. Our research gives an insight in the properties of these CT solar cells.

Alexa Dahler

Poster | 3:00-4:30 | Frank Livak Ballroom | Biological Sciences

Title: Determining the effectiveness of using acetylsalicylic acid to control damping off (*Rhizoctonia solani* Kühn) on common bush bean (*Phaseolus vulgaris* L.) and red radish [*Raphanus raphanistrum* subsp. *sativus* (L.) Doman ‘Red Satin’]

Faculty Mentor: Mark Starrett, Plant & Soil Science

Abstract: The agricultural industry faces numerous challenges including drought, pests, and disease. A very damaging disease that decimates crops before they are able to establish themselves is damping off disease. This is caused by the fungus *Rhizoctonia solani* Kühn. Seedling death, both before and after emergence, as well as stem splitting lesions are characteristics of infection. The purpose of this study is to determine a readily accessible method for both commercial and home gardeners that reduces the incidence of this disease in bush beans and radishes. Acetylsalicylic acid (ASA) is the main component of aspirin, a staple in most households, and a chemical precursor to salicylic acid, a common plant hormone. This study looks at how effective using a 0.11mM (1/4 of a 325mg aspirin tablet/ 4L water) solution of ASA as a soak on bean seeds and a 0.22mM (1/4 of a 325mg aspirin tablet/ 2L water) soil drench or soak of radish seeds is at preventing damage by *R. solani*. Thiram, a commercially used fungicide to control *R. solani*, was used in combination with ASA or by itself as a control treatment. We also examined the effects of an ASA bean seed soak on subsequent plant growth. Treatment with ASA significantly increased the leaf dry weight of treated bean seeds. However, leaf area, leaf number, pod number and dry weight were not significantly impacted. Thiram coated bean seeds soaked with ASA germinated slower than untreated controls, yet they germinated faster when challenged by *R. solani*. Both the soil drench and seed soak with ASA increased the percentage of radish seeds that emerged. Both drench and seed soak treatments also increased the rate at which the seedlings emerged from the soil. In some cases, the presence of *R. solani* in the potting media increased the rate at which seedlings emerged.

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Lorraine Dang

Oral | 3:00-3:55 | Chittenden Bank Room | Biological Sciences

Title: Determining the Mechanism by which the LCMV Matrix Protein Z Recruits Cellular ESCRT Machinery for the Production of Defective Interfering Particles**Faculty Mentor:** Jason Botten, Immunobiology

Abstract: The arenavirus lymphocytic choriomeningitis virus (LCMV) can cause severe disease in humans, including aseptic meningitis in healthy individuals, birth defects in the developing fetus, and high rates of lethality in immunocompromised people. There are currently no FDA-approved treatments for LCMV infections. Unraveling the mechanism of the last stage of LCMV's life cycle – the budding and release of new virus particles from host cells – is valuable for the discovery of new antiviral targets. The multifunctional LCMV matrix protein Z is the sole viral protein responsible for driving the release of new virus particles from infected host cells. We recently demonstrated that the PPXY late domain in the LCMV Z protein recruits the cellular Endosomal Sorting Complex Required for Transport (ESCRT) for the formation of a specific class of LCMV particles called defective interfering (DI) particles. However, the molecular link between Z's PPXY late domain and ESCRT proteins is unknown. Because ESCRT proteins can bind ubiquitinated proteins, we hypothesized that ubiquitination of Z by host ubiquitin ligases provides a molecular link between Z and ESCRT components to drive DI particle production. We identified several human Nedd4-family ubiquitin ligases that bind to LCMV Z in the PPXY-dependent manner. Further, we show that LCMV Z is ubiquitinated on specific lysine residues and that disrupting the function of host ubiquitin ligases or the PPXY domain in Z strongly impaired the ubiquitination of Z. Thus, our results give new insight into the mechanism by which the LCMV Z protein promotes viral budding and release.

Steven Dannenberg

Lightning | 11:00-12:30 | Sugar Maple Ballroom | Mathematical & Physical Sciences

Title: Generating a Terminal Phosphinidene Tantalocene Complex**Faculty Mentor:** Rory Waterman, Chemistry

Abstract: This project is in the initial phases. The goal of the first stage of this project is to make a terminal phosphinidene tantalocene complex. A phosphinidene is a low valence electron phosphorous atom with the structure RP:. Phosphinidines are phosphorous analogs of the ubiquitous carbene. Carbenes have been extensively studied and have revolutionized synthetic organic chemistry. However, phosphinidene

chemistry, in addition to tantalum chemistry, remains underdeveloped in the scientific literature. The initial stages of this project aim to determine if the transition metal complex Cp*₂TaCl₂, which has been shown to be a precursor to oxo, imido and methylidene ligands (Antonelli, Schaefer, Parkin, & Bercaw), is able to generate the terminal phosphinidene ligand.

Aayudh Das

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: Drivers of Pooideae grass adaptation in response to drought and cold stress**Faculty Mentor:** Jill Preston, Plant Biology

Abstract: Future climate projections predict increased aridity (drought) and seasonal temperature extremes that will likely affect plant fitness, causing them to move, locally adapt, or go extinct. The major goal of this study is to test the relative importance of phylogeny versus local adaptation in two primarily temperate clades of Pooideae grasses that overlap in their geographic ranges. Specifically, we hypothesize that degree of drought and/or cold tolerance is explained by the (1) precipitation/temperature niche, and/or (2) phylogenetic relatedness of Pooideae species. Projected climate change over the next decades predict significant changes that will impact cereal crops and their relatives through in situ changes in seasonal drought and cold. To predict how easily Pooideae will adapt to these novel environmental conditions, we selected five species from both Melica (Meliceae) and Nassella (Stipeae) that have overlapping ranges in geographic space and initiated a growth chamber experiment with four treatments (warm-watered, warm-drought, cold-watered, and drought-cold) to measure several response variables including photosynthetic rate, stomatal aperture, relative growth rate (RGR), and specific root length (SRL), survival rate, flowering time, and seed set. Our data so far demonstrate both similarities and differences in physiological responses between freezing and drought treatments, and between species. Results of chlorophyll fluorescence suggest compromised photosynthetic systems in both drought- and freezing-stressed plants in most species, whereas the RGR profile indicates minimum growth during freezing rather than drought stress. Response variables like SRL and biomass identified high root to shoot ratio during drought and cold-drought combined stress for various Nassella species, which reveals a key

strategy for drought acclimation. Overall, our study will evaluate the evolutionary history of drought and cold adaptation in Pooideae and determine to what extent this history might constrain rapid local adaptation in response to current and future climate change.

Jenn Davidson

Poster | 1:00-2:30 | Silver Maple Ballroom | Health Sciences

Title: Beyond Motor Function: The Role of the Cerebellum in Rodent Cognitive Flexibility

Faculty Mentor: John Green, Psychological Science

Abstract: Individuals diagnosed with certain disease states such as schizophrenia, Attention-Deficit/Hyperactivity Disorder, and autism spectrum disorder, often present with impaired behavioral flexibility and cerebellar abnormalities. To further understand the role the cerebellum may play in such disease states and determine the role of the cerebellum in behavioral flexibility, we compared rats that underwent pharmacological inactivation of a region of the cerebellum with control rats in their completion of a maze task (Stefani et al., 2003). The maze was always in a T configuration and, on each trial, rats started from the stem of T and chose either the left or right arm of the T. A food reward was at the end of one of the arms. The two arms always differ in both color (black vs. white) and texture (rough vs. smooth). The task required the rats to pay attention to one dimension (color or texture) on day 1 and then, on day 2, to shift to the opposite dimension in order to obtain the food reward. For example, a rat might learn that food reward was available in black but not white arms on day 1 and then on day 2 might learn that food reward was available in smooth but not rough arms. Day 2 is known as a “set shift” (in the example, shift from color to texture). Comparison between vehicle infused rats and rats with cerebellar pharmacological inactivation showed that pharmacological inactivation did not significantly impact rodent ability to set-shift. The finding that pharmacological inactivation of a small region of the cerebellum did not significantly impact rodent set-shifting leaves open the possibility that a different region or a larger area of the rodent cerebellum must be inactivated to affect set-shifting ability. It is also possible that cerebellar function in rodents differs from that of humans.

Veronica Davis

Oral | 3:00-3:55 | Williams Family Room | Arts & Humanities

Title: Becoming What You Always Were: Etiology and Backward Causality in Trans Narratives

Faculty Mentor: Hilary Neroni, English

Abstract: The past decade has seen a tremendous proliferation of media featuring trans people and characters. While these representations are diverse, one commonality among narrative works featuring trans people is their use of etiologies (narratives of causality) to frame and make legible trans experience and desire. These etiologies most often rely on the notion that gender transition is a process of revealing an authentic gendered core or gender identity that was in reality always present, but merely hidden. Such narratives are understood to have positive political effects for trans people by naturalizing their desires or by construing their desires as immutable. Yet these theories of gender identity are often seen as metaphysically suspect for their tendency to place gender outside of its social context. Through staging an engagement between these narratives and the tools of psychoanalytic theory, a tradition with a rich history of both producing and deconstructing narratives of causality, I argue against these straightforward etiologies by suggesting that the causes of trans desire can only be retroactively located. Further, I contest the notion that gender identity is a politically desirable concept for trans people by examining the ways in which it functions not to explain but rather to obscure the experience of transitioning genders, the ways in which it is invoked in order to remove desire from the process of transition, and its uses in assuaging anxieties of trans contagion.

Kiara Day

Oral | 1:00-1:55 | Williams Family Room | Arts & Humanities

Title: “A Mighty Woman with a Torch”: Dorothy Thompson’s Call for American Action, 1931-1945

Faculty Mentor: Alan Steinweis, History; Felicia Kornbluh, History

Abstract: This research explores Nazi Germany and the refugee crisis from a biographical perspective. Combining American, German, and women’s history, I tell the story of Dorothy Thompson’s underappreciated role in American journalism and politics as well as her relentless personal actions to condemn Hitler’s regime and aid Jewish refugees. By examining this period through the life of a prominent individual, I am able to weigh in on the existing historical research about American apathy during the 1930s and 1940s. In particular, the American press has been scrutinized for its reporting, or lack of reporting, on Nazism and the “Jewish Question.” Likewise, the Roosevelt administration’s strict stance on refugees and “inadequate” foreign intervention has also been disputed. Using extensive archival

Abstract (Day, cont'd): sources such as letters, diaries, newspapers, and speeches, I show that Thompson tuned into these pressing issues at the beginning of the Third Reich. She consistently did three things throughout the 1930s and 1940s: (1) attempt to educate American masses about Nazism and its threat, (2) warn of the Jewish plight, and (3) perform political and humanitarian activism. This research showcases the persistent and courageous efforts of an influential woman who challenges the American bystander narrative, expanding our historical analysis of the international response to Nazism and Jewish persecution.

Jacob DeBow

Oral | 2:00-2:55 | Sugar Maple Ballroom | Biological Sciences/Food & Environmental Sciences/Vermont Studies

Title: Overview of Calf Moose Mortality Research in Northern Vermont

Faculty Mentor: Jed Murdoch, Rubenstein School for Environment & Natural Resources (RSENR);
Therese Donovan, RSENR

Abstract: Moose (*Alces alces*) research in Maine and New Hampshire identified three consecutive years (2014-2016) of winter tick (*Dermacentor albipictus*) epizootics causing >70% annual calf mortality. Epizootics have not occurred recently in Vermont, but ticks are most likely causing reductions in the moose population as evidenced by decreasing carcass weights and ovulation rates of cows in recent years. In response, the State of Vermont initiated a 3-year study similar to those in New Hampshire and Maine to investigate the population characteristics of Vermont's northeastern population. Between January 2017 and January 2018, 90 moose (60 calves, 36 adult cows) have been fitted with GPS radio-collars. Calves are being monitored for winter mortality as they are most impacted by high tick densities. Calf mortality from March to April 2017 was 40% (95% CI = 0.25 - 0.59). Dead calves displayed overt signs of severe winter tick infestation, substantial weight loss (22.3 - 48.8kg) and musculature atrophy. Histological studies of tissue samples show serous atrophy of fat consistent with emaciation as leading cause of death. Comparison of preliminary mortality and productivity data shows similar trends throughout Maine and New Hampshire. Calves captured in 2018 will be monitored for winter mortality during the months of March and April, 2018. Vermont plans to radio-collar a final 35 moose in January of 2019 and continue monitoring cows and calves for the 2018-2019 field seasons.

Tao Deng

Poster | 3:00-4:30 | Silver Maple Ballroom | Food & Environmental Sciences/Mathematical & Physical Sciences

Title: Causes and trend of US bicycle crash

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: Recent years, bicycles become more and more popular. Because bicycles lack effective protection measures and are in a disadvantaged position in traffic crashed, it is necessary to study bicycle safety issues.

My research question is what main causes US bicycle crashes. I will figure out which states of the United States are more prone to bicycle crashed. What are the causes and whether there is a trend or a regularity? I will use my variable test coefficient of driver's behavior, road conditions, weather, helmet use, etc. with pedalcyclist traffic fatalities.

I already get some database cover total number of bicycle crash in all states between 2010 and 2015 and crash detail in some states such as Florida from NHTSA. Analyzing which states are more prone to crashed and which states have a higher crash rate. Then according to the specific state of the state of the data analysis of high crash rates and the reasons for the rising rate of crashed. Linear regression analysis was used to calculate the growth rate. In addition, exclude states with fewer than 10 annual fatal bicycle fatalities.

The average fatalities rate in California, Florida, and Louisiana, which is the highest in all states. The highest total number of bicycle fatalities in California, Florida, and Texas. In general, the greater the state's total population and the total number of traffic crashed, the greater the number of bicycle fatalities, which may be related to population density, education level, and degree of urbanization, and further analysis based on detailed state data.

This study can reduce the odds of bicycle deaths and make people trust their bike more. Not only does it reduce traffic congestion, it can also reduce carbon emissions. In addition, it also makes it possible to promote public bicycle systems on a large scale.

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Victoria DeVault

Oral | 11:00-11:55 | Chittenden Bank Room | Biological Sciences/Health Sciences

Title: Regulation of NKT cell development and function by a 0.1 Mbp locus on chromosome 1: a possible role for Fcgr3

Faculty Mentor: Jonathan Boyson, Surgery

Abstract: NKT cells are tissue-resident innate-like T cells critical to the host immune response. We previously reported that the host genetic background significantly influences the response of NKT cells to α -galactosylceramide (α GalCer) and identified a 6.6 Mbp region on chromosome 1 as a major regulator of NKT cell number and function in C57BL/6 and 129X1/SvJ mice. Here, we fine-mapped this locus by assessing the NKT cell response to α GalCer in a series of B6.129 congenic lines. This analysis revealed a significant reduction in α GalCer-induced serum cytokines and a significant decrease in NKT cell cytokine production in B6.129c3 mice which harbor a 0.14Mbp 129-derived interval. Analysis of sorted NKT cells showed that the effect was NKT cell-intrinsic. B6.129c3 mice exhibited reduced thymic NKT cells as compared to B6, indicating that this minimal interval regulates NKT cell development. Candidate gene analysis revealed a 5-fold increase in Fcgr3 gene expression in B6.129c3 NKT cells, and we observed increased expression of Fc γ R3 protein on B6.129c3 NKT cells, NK cells, and neutrophils. These data identify the B6.129c3 interval as a novel locus regulating the response of NKT cells to glycosphingolipid, revealing a link between this phenotype and a polymorphism that regulates Fcgr3 expression.

Jacqueline Diaz

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: High throughput Screening of the Pathogen Box for Anti-Cryptosporidium Activity

Faculty Mentor: Christopher Huston, Infectious Disease

Abstract: Cryptosporidium is a gastrointestinal parasite that causes the diarrheal disease cryptosporidiosis. It is of largest concern for immunocompromised patients and malnourished children; Cryptosporidium is the third leading cause of life threatening diarrheal disease globally in children under 12 months old. In addition, the only currently approved treatment option has been proven to have little efficacy in the patient groups previously mentioned, which clearly highlights a need for improved treatment options. To accomplish this goal, we preformed a high throughput screen on the Pathogen Box, a collection of 400 diverse drug like compounds provided by Medicines for Malaria for anti-cryptosporidium activity, which produced over 40 compounds with high activity against the parasite. Assays to determine the effective concentrations for 50 and 90 percent anti-cryptosporidium activity were then preformed on the most promising candidates, and based off of those results a number of the drug like compounds will be moved into mouse and calf models.

Christopher Diehl

Oral | 11:00-11:55 | Jost Foundation Room | Mathematical & Physical Sciences

Title: Modeling hybrid--electric and conventional passenger vehicle tailpipe emission "hot spots" as a function of transportation network characteristics

Faculty Mentor: Britt Holmen, Civil & Environmental Engineering

Abstract: Hybrid-electric vehicles (HEVs) achieve improved fuel economy compared to conventional vehicles (CVs) by operating without the internal combustion engine (ICE) during part of each driving trip. These periods of electric-only operation result in zero fuel consumption and tailpipe emissions. Under certain circumstances, however, the smaller internal combustion engines of HEVs must operate at a higher load than their CV counterparts. Additionally, each time the internal combustion engine restarts, there is a period of elevated emissions. The conditions that result in increased ICE load and ICE restarts are spatially localized and may be attributable to various transportation network characteristics. These localized high emissions events, or "hot spots", may be different for HEVs and CVs.

This research investigates a data set collected through previous UVM Transportation Air Quality Lab studies that involved driving two comparable Toyota Camrys (one CV and one HEV) over a specified driving route to collect real-world emissions and vehicle parameter data. Quality control and statistical analyses were performed to determine "hot spot" limits and GIS was used to perform spatial analysis of the data to compare HEV and CV "hot spots" with respect to transportation network characteristics such as road grade and traffic controls.

Ashley Dobbins & Jennie Lukoff

Poster | 3:00-4:30 | Silver Maple Ballroom | Social Sciences

Title: Risky sexual behavior and sex offenses in adolescent offenders: The role of callous-unemotional traits**Faculty Mentor:** Timothy Stickle, Psychological Science

Abstract: High levels of Callous-Unemotional (CU) traits have been found to identify a subset of antisocial youth with low levels of empathy, lack of remorse, and high levels of risky and impulsive behavior (Frick et al., 2014). Despite evidence of risk taking among this group of youth, it remains unclear if CU traits are directly correlated with risky sexual behavior in adolescence. The aim of this study is to explore the extent to which adolescent offenders high in CU traits engage in risky sexual activity, and if they are also more likely to commit sexual offenses compared with juvenile offenders who are lower in CU traits. Data were collected from 150 adolescents (female = 40%; age: M = 15.21, SD = 1.40) incarcerated from two rural juvenile detention centers. Offenses ranged from minor, non-aggressive to severe, violent offenses. CU traits were measured via the Inventory of Callous Unemotional Traits (ICU) using multiple informant (self, teacher, and staff). Risky sexual behavior was measured using self-report data from the Risk Involvement Perception Scale (RIPS). Offense data was collected retroactively by reviewing official records. The authors hypothesize that individuals who scored higher on CU traits would be more likely to report engaging in risky sexual activity and also more likely to have committed a sexual offense. Lastly, it is also hypothesized that males would be more likely to engage in risky sexual behavior and have committed a sexual offense, as compared to their female counterparts regardless of level of CU traits. A better understanding of risky sexual behavior and the specific subset of perpetrators who engage in sexual offenses would be a valuable contribution to the literature, and inform treatment. Findings would be also be beneficial in potentially identifying those at risk for future offending and for informing preventative interventions.

Nicole Donahue & Drew Bates

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: Building a Device to Recreate Ocean Currents for Copepod Plankton**Faculty Mentor:** Andrew Mead, Biology

Abstract: Copepods, an aquatic crustacean, are a type of plankton that are the most abundant metazoan in aquatic environments. Warming sea water due to climate change contributes to changes in ocean currents and wind patterns, which may result in an increase in prevalence of the toxic algae *Alexandrium*. Lauren Ashlock, a PhD student in the Pespenti lab in UVM's Department of Biology, is studying the copepod's local adaptation to the algae by monitoring their diets, as it may be changing their growth and reproductive habits. Our challenge was to design, prototype and build a device that would recreate an ocean current so the phytoplankton, their food, wouldn't sink to the bottom of the containers. Requirements of the device were that it had to be able to hold 20-26 containers, not agitate the copepods, maintain a constant temperature, and the containers had to be easily insertable and removable. Other objectives that we came up with through the brainstorming process were that the lights needed to be programmed to maintain the copepod's circadian rhythms, and that each container should be experiencing identical conditions. We set out to build a device that would meet these criteria, as well as an incubator to maintain the temperature. Our current prototype of the device is constructed of two pieces of acrylic and eight dowels with a gear mechanism controlled by a motor. Future plans would include learning how to use Arduino to program the motor, as well as build the incubator. We hope that our design will aid in the lab's continued study on the copepods.

Liam Donnelly

Poster | 9:00-10:30 | Silver Maple Ballroom | Health Sciences

Title: Finally spliced together; functional evaluation of clinically observed STK11 splice-site variants using an in-vitro splicing assay.**Faculty Mentor:** David Seward, Pathology & Laboratory Medicine

Abstract: STK11 (serine/threonine kinase 11), also known as LKB1, is an important tumor suppressor and energy sensor, regulating the central cellular energy modulator-activated protein kinase (AMPK) [1]. Clinically, STK11 loss of function (LoF) germline mutations cause Peutz-Jeghers syndrome which predisposes to malignancy [2], and somatic LoF mutations occur in several cancers including non-small cell lung cancer [3], cervical cancer [4], and melanoma [4]. For patients with lung adenocarcinoma, knowing whether STK11 is mutated has critical prognostic and potential therapeutic significance. Specifically, patients with activating KRAS and LoF STK11 mutations (~5% of all cases) have worse outcomes than those with activating KRAS alone, and STK11 LoF tumors have increased metastatic potential [5,6]. In regards to therapy, lung cancers with concomitant activating KRAS and LoF STK11 mutations may be suscep-

tible to MEK inhibitors, while tumors with STK11 LoF in the absence of KRAS activation have shown responses to the unique metabolic drug phenformin [7,8]. Germaine to our current work, some STK11 single nucleotide variants (SNVs) detected in tumors by next generation sequencing occur at intron–exon junctions. These mutations could potentially alter exon splicing and protein function. Currently, however, this functional outcome cannot be assessed using DNA sequencing data alone. Our goal for this project was to develop a rapid, cost-effective method for determining the functional impact of STK11 splice-site variants in clinical samples. We demonstrate that the clinically observed STK11 splice-site SNVs evaluated significantly reduce STK11 splicing efficiency relative to non-mutated controls in vitro using a mini-gene splicing assay. Our data demonstrate the utility of employing a rapid in vitro expression system to validate the functional consequences of splice site variants identified by NGS panel assays. This approach may supplement NGS assays where splice site alterations are routinely identified, allowing functional implications to be assessed. In the case of STK11, this data has both prognostic and therapeutic impact.

Nata Dudkina

Oral | 11:00–11:55 | Chittenden Bank Room | Biological Sciences/Mathematical & Physical Sciences

Title: Imitating Nature: Facilitated Self-Assembly of Hydrazone-Based Molecular Cages and Their Binding Properties

Faculty Mentor: Severin Schneebeli, Chemistry

Abstract: Every second we breathe, a complex system of molecular machines, such as cytoskeleton, ribosomes, and enzymes, is performing an endless number of well-controlled chemical reactions. How does Nature do that? To understand an endless diversity of molecular expression and its ability to create topologically interesting molecules, this research study uses the principles of supramolecular chemistry, ("the chemistry beyond the bond"), such as self-assembly, dynamic covalent chemistry (DCC), and non-covalent interactions to synthesize hydrazone based molecular cages. The experimental procedure for the synthesis of both tetrahedral and dimeric molecular cages was optimized, and the underlying driving forces behind cage formation reactions were examined. In addition, the binding properties of these cages to polymers such as polyvinylpyrrolidone and biologically active molecules, such as picrocrocin were investigated. The generation of three-dimensional molecular architectures, such as these dimeric and tetrahedral molecular cages can serve as chemical models capable of providing insights into the mechanisms of biologically complicated molecular systems.

Bryce Dzialo

Lightning | 11:00–12:30 | Sugar Maple Ballroom | Social Sciences

Title: Charging down the road: A historical analysis of the American auto industry and Tesla Inc.

Faculty Mentor: Curtis Ventriss, Rubenstein School for Environment & Natural Resources; Brendan Fisher, Environmental Studies; Rob Williams, Community Development & Applied Economics

Abstract: I have examined the role of electric vehicles in the past, present and the future of personal transportation. Additionally, I have brought together the history of the American automobile industry and the complex contemporary narrative of Tesla Inc, the young and ambitious auto manufacturer that exclusively builds electric vehicles. To the best of my knowledge and research, these two stories have never been told within the same volume, and thus never objectively compared in one sitting. With these narratives written and examined side by side, my thesis paper concludes with a discussion comparing the narratives with the goal of finding similarities and trends that could uncover potential questions for further research and possible solutions to the many difficulties that exist in transitioning to an electric vehicle focused future.

Lindsey Eastman

Poster | 9:00–10:30 | Frank Livak Ballroom | Professional Studies-Education/Health Sciences

Title: A Regional Transition to Residency Course in Obstetrics and Gynecology Facilitates the Transition from Student to Doctor

Faculty Mentor: Elise Everett, Gynecological Oncology

Abstract: Objective: To evaluate the effectiveness of a regional, Obstetrics and Gynecology (Ob/Gyn) Transition to Residency Course (TRC) on improving fourth-year medical student knowledge and confidence in Ob/Gyn Milestone Level 1 (M1) and Core Entrustable Professional Activity (CEPA) objectives, technical skills, and the ability to perform intern duties.

Design: We conducted a retrospective study of a two-week Regional TRC (RTRC) for fourth-year medical students who matched in Ob/Gyn or Family Medicine from three New England medical schools. Curriculum was developed to meet M1 and CEPA objectives. Participating students were surveyed immediately preceding and following the RTRC

Abstract (Eastman, cont'd): to assess changes in knowledge through performance on the APGO Preparation for Residency Knowledge Assessment Tool (PRKAT) and confidence in multiple domains. Setting: The Robert Larner, MD College of Medicine at the University of Vermont in Burlington, Vermont.

Participants: Medical students from three New England medical schools participated in the course over three years.

Results: Forty-eight students participated in the three years over which the RTRC was conducted (2015, 2016, and 2017). Students across all three years demonstrated significantly improved confidence in M1 and CEPA objectives ($P = 0.001$), technical skills ($P < 0.001$) and intern duties ($P = 0.016$). There was a significant improvement in student knowledge demonstrated on the APGO PRKAT ($P < 0.001$).

Conclusions: Regional Resident Readiness Courses (RTRCs) are an effective means by which to improve fourth-year medical student knowledge and confidence in the majority of M1 and CEPA, technical skill, and intern duty objectives and can potentially bridge the transition from medical student to intern.

Laura Edling

Oral | 1:00- 1:55 | Jost Foundation Room | Food & Environmental Sciences/Social Sciences/Vermont Studies

Title: The Transition to Automated Wood Heating Technology in the Northern Forest Region: a Case Study of Sustainable Energy System Transition Initiatives

Faculty Mentor: Cecilia Danks, Rubenstein School for Environment & Natural Resources

Abstract: In the northern forest region of the United States; consisting of northern Vermont, New Hampshire, Maine, and New York; heat is a major source of energy and is thus an important focus for public policies and non-government programs that attempt to transition energy use to low-carbon technologies. Due to being a heavily forested region, to having a long history of using wood for heat, and to the many perceived advantages of automated wood pellet heating, the four states in the northern forest region are including high-efficiency, low-emissions wood pellet heating technology as part of their renewable energy goals. Despite this strong interest, the rate of adoption has been varied across the region. This study examines the programs and policies aimed at accelerating the transition to automated wood pellet heating technology. We use diffusion of innovation and multiple level perspective theory as a means for taking a whole systems approach on this case study of an energy system transition. To achieve this, University of Vermont researchers collaborated as Principle Investigators with staff at the Northern Forest Center, a non-government organization that runs the Model Neighborhood Program, a private program that runs in tandem with public programs aimed at increasing the adoption of automated wood pellet heat. By working collaboratively on interviews and surveys in this mixed methods research, we were able to compare the state-sponsored initiatives with the approach of the Model Neighborhood Program, which includes production and consumption elements not included in the state-run programs. Results indicate that the Model Neighborhood Program has more success at increasing adoption rates than state programs. These results indicate that efforts to transition energy use to low-carbon technologies need to coordinate with dynamics occurring across the entire socio-technical regime—from shifting cultural norms to large-scale economic and political changes.

Kylie Elliot, A.J. Banach, Jordan Mitchell, Lauren Rayson, Nicholas Hanoian, Ryan Wolbach

Creative | 11:00-12:30 | Fireplace Lounge | Arts & Humanities

Title: Northeast Intercollegiate Band Festival

Faculty Mentor: D. Toner Jr., Music & Dance

Abstract: Students attended the Northeast Region Intercollegiate Band Festival at Yale University from March 9-10, 2018; the event was held in conjunction with the College Band Directors National Association's Regional Conference. The Intercollegiate Band is an honors ensemble chosen by audition that Universities throughout the eastern United States participate in — any student can participate regardless of major. Under the direction of guest conductor Cynthia Johnston-Turner from the University of Georgia, students performed four exciting pieces: Alleluia! Laudamus Te (Alfred Reed); High Water Rising (Sally McCune); Dream of Oenghus, Part 1 (Rolf Rudin); and Landscapes (Rossano Galante). Students had the privileged opportunity to not only play such challenging music, but also perform with other passionate musicians from throughout the northeast.

Alexander Ellis

Oral | 10:00-10:55 | Williams Family Room | Arts & Humanities

Title: From debate to creative writing: A brief history of UVM's student-led literary organizations

Faculty Mentor: Nicole Phelps, History

Abstract: UVM's earliest student-led literary organizations were founded during the first decade of the nineteenth-century, primarily for the purposes of spirited debate upon current events and as a training ground for future politicians, lawyers, and civil officials. The most prominent literary organization found on campus today is called Vantage Point, a mixed-media periodical founded in 2002 with an emphasis upon student submitted poetry and art. The functionality of student-led literary organizations at the University of Vermont has transformed significantly over the course of two hundred years, but for what purposes? What might this transformation reveal about the organization of UVM's English department and its curriculum or perhaps the greater U.S. collegiate system as a whole? Methodologically, this historical investigation intends to explore the answers to these questions through two objectives: first, to create a chronological framework for tracking and interpreting the development of student-led literary organizations from the university's founding in 1791 until today, and second, to utilize this framework to examine the demographical and didactic relationships between these organizations, the University of Vermont, and the greater U.S. collegiate system.

This project relies heavily upon the primary source materials available at Bailey Howe's Special Collections, notably, the numerous periodicals left behind by various literary organizations over the years (Phi Sigma Nu, Centaur, Vantage point, etc.). Regarding secondary source material, there has been minimal scholarly attention in English addressing the topic of collegiate student-led literary societies in general, and even less concerning UVM's student-led literary societies. Because of this limitation, however, this project also offers an exciting opportunity to conduct novel research useful to the university, its English Department, and contemporary student-led literary organizations.

Jennifer Etter & Luis M. Garcia

Oral | 12:00-12:55 | Williams Family Room | Biological Sciences/Health Sciences

Title: Alginate Based Heparin Hydrogel for Promoting Neovascularization

Faculty Mentor: Rachael Oldinski, Mechanical Engineering

Abstract: An innovative alginate based polymer has been developed to have shear-thinning properties for use as an injectable material to promote local vascularization. We propose acrylate, cyclodextrin, RGD and heparin modified alginate for the controlled delivery and presentation of multiple combinations of bioactive molecules and regenerative factors into surrounding tissues via heparin covalent conjugation onto the alginate backbone. The affinity of specific growth factors to the heparin also helps prevent denaturing of the protein as well as a controllable release of the growth factors into a defect and/or surrounding tissues to promote neovascularization. [1]

The fabrication of the modified alginate was as follows. Methacrylated alginate (Alg-MA) and β -CD-EDA was synthesized as previously described. [2,3] Heparin sodium salt was dissolved in DI water and reacted with carbodiimide hydrochloric acid (EDC), N-hydroxysuccinimide (NHS), and ethylenediamine (EDA) to form Hep-EDA. Each conjugation was made by dissolving the previously purified and lyophilized material in DI water, mixing with EDC and NHS for 24 hours then adding: β -CD-EDA, Hep-EDA, or RGD. To verify conjugations onto the alginate backbone ¹H-NMR was performed.

Neovascularization will be analyzed using an ex ovo chick chorioallantoic membrane (CAM) assay because embryos do not experience any pain until the 14th day of gestation thus eliminating unnecessary animal studies. [4] On the 6th day of gestation, polymers containing growth factor VEGF will be injected onto the CAMS and crosslinked via green light. Samples will incubated for 7 days and imaged daily. [4] The conjugation of the heparin sodium onto the alginate backbone should promote vascularization and be evident in an increased number of blood vessels compared to the Alg-MA control group.

[References: 1. Ho, Yi-Cheng et al. Inter. J. of Pharm. (2009)

2. S. L. Fenn, J Biomed Mater Res B Appl Biomater, (2015).

3. T. Miao, S. L. Fenn, Biomacromolecules 16, (2015).

4. R. DeVolder et al, J. Contr. Relea. (2013)]

Amanda Falcon & Rebecca Mirhashem

Poster | 11:00- 12:30 | Silver Maple Ballroom | Social Sciences

Title: Development of a Risk Assessment Inventory for the Vermont Department of Children and Families (DCF)**Faculty Mentor:** Timothy Stickle, Psychological Science

Abstract: According to a 2015 census, approximately 48,000 juveniles in the U.S. were being held in residential or correctional placements (Sickmund et. al, 2017). This substantial incarceration of juveniles is accompanied by its many threats to normative development, including a high prevalence and substandard treatment of mental health/substance abuse problems (Abram, et. al, 2015; Swank & Gagnon, 2016), detriments to physical wellbeing and social functioning (Barnert, et. al, 2016), hindrance of school completion, and the increased likelihood of future offending and incarceration (Aizer & Doyle, 2015).

The decision to incarcerate is influenced by assessment of risk, particularly whether an individual will re-offend in the community following arrest. Several institutions have endeavored to employ a validated measure of risk to be utilized by juvenile correctional facilities. Best practices in the field require use of a structured risk inventory to aid in distinguishing between youth requiring placement in a secure setting and those better served in the community. Additionally, its objectivity and empirical basis may tentatively mitigate an apparent overrepresentation of racial and ethnic minorities in correctional facilities (Abram, et. al, 2015).

In that vein, we have initiated the development of such a measure with the Woodside Juvenile Rehabilitation Center and the Vermont DCF, which do not consistently use formal, structured risk assessment. Phase 1 of this project involves collecting DCF data from which to determine predictors of recidivism and protective factors. Based on these analyses and the input of our collaborators, we will develop and refine a brief risk assessment inventory to be used by DCF. Phase 2 entails the validation of this measure. The primary goal of this project is to create an efficient and beneficial tool for the state of Vermont, and to use this research as the basis for further work tied to the juvenile correctional system.

Lauren Fedewa

Oral | 4:00- 4:55 | Williams Family Room | Arts & Humanities

Title: Between Extermination and Child Rearing: The Rühren and Velpke Children's Home**Faculty Mentor:** Jonathan Huener, History

Abstract: During WWII, approximately 460 Ausländerkinder-Pflegestätten, or foreign child-care facilities, were established across Germany as collection centers for the infants of Polish and Soviet forced laborers employed in the German war economy. This paper examines two such foreign child-care facilities, the Velpke and Rühren children's homes, where 450 Polish and Soviet infants died of calculated neglect. Three themes provide the framework for this analysis: the conflict between the two main principles of the Third Reich—racial cleansing versus the exploitation of forced labor; the question of whether the establishment of the facilities and treatment of the children depended on orders from upper-level or local-level authorities; and the issue of whether the children's deaths stemmed from malicious intent or indifference. This paper addresses the following questions: In terms of racial ideology and economic pragmatism, was one factor more significant in the establishment and use of the Velpke and Rühren children's homes? Who, among upper-level and lower-level Nazi officials, ordinary Germans, medical professionals, and factory executives, was responsible for the children's deaths? Were the children at these two facilities intentionally murdered? And what do these two facilities tell us about the larger phenomenon of foreign child-care facilities? This research draws upon two British War Crimes trials held in Braunschweig and Helmstedt, Germany in 1946, the "Velpke Baby Home Trial" and "Ruehen Baby Farm Case." Exploring the treatment of children at two children's homes fills a gap in scholarship, demonstrates how Nazi control over the progeny of "inferior races" was a fundamental aspect of Nazi racial ideology and practice, and highlights the relationship between Nazi racial and economic policies among the upper and lower levels of the Nazi administration. Finally, this case study of two children's homes provides a thematic lens to facilitate the future study of all 460 facilities in Nazi Germany.

Karl Fetter

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: Admixture mapping identifies genomic regions associated with fungal disease in hybrid poplars.**Faculty Mentor:** Stephen Keller, Plant Biology

Abstract: Hybrids formed from a mating between resistant and susceptible hosts to a common pathogen can create offspring with altered patterns of disease severity. In nature, hybrids are frequently formed between species and in human agroforestry systems, hybrids are often created to take advantage of heterosis for growth-associated

traits (e.g. fast growth rates). Heterosis comes at a cost however, as hybrids may transgressively segregate for disease and exhibit greater susceptibility than either parent. We investigated the dynamics of disease severity in a set of hybrid and non-hybrid poplars (*Populus*) to a fungal basidiomycete (*Melampsora medusae*) that infects leaves. Balsam poplars (*P. balsamifera*) along with naturally formed hybrids from crosses with cottonwoods (*P. deltoides*), narrow-leaf cottonwoods (*P. angustifolia*), and black balsam poplars (*P. trichocarpa*) were planted in a common garden in Vermont. We use quantitative genetics to describe patterns of disease from trees naturally infected by wind-dispersed spores. Genomic sequences were collected using genotyping-by-sequencing and imputed to create a dataset of 373,773 SNPs. Neutral variation of allele frequency is expected to be high in any dataset containing such a diverse collection of taxa, and association tests created for within species comparisons would perform poorly. Thus, we used admixture mapping to take advantage of patterns of introgression of chromosomal regions from the susceptible species (*P. deltoides*, *P. trichocarpa*, and *P. angustifolia*) into hybrids formed from the resistant species (*P. balsamifera*). We identified genomic regions that contain disease-associated genes. These results contribute to our understanding of genome evolution in populations of organisms that freely hybridize, and the phenotypic consequences of natural and man-made hybridization. These results can also inform future efforts to breed trees with beneficial heterotic traits while decreasing disease in agroforestry systems.

Gilana Finogenov & Matteen Hakim

Poster | 1:00-2:30 | Silver Maple Ballroom | Health Sciences

Title: Structuring Clinical Encounters

Faculty Mentor: Dennis Beatty, General Internal Medicine; Timothy Fries, Neurology; Alan Rubin, Psychiatry

Abstract: Medical students learn how to conduct an acute outpatient visit in the doctoring skills courses of their preclinical years. However, clerkship year brings with it a host of new tasks and responsibilities, such as admitting a new patient to the hospital and conducting a follow-up visit in which the patient presents with no complaints. These tasks are routine for an experienced clinician, but they are not intuitive for the new learner. We designed a session to be held during the Orientation Bridge Week for rising clerkship students at the Larner College of Medicine at the University of Vermont to address how to structure various clinical encounters. This session addresses clinical reasoning topics such as problem representations, illness scripts, and differential diagnoses, and it includes two breakaway sessions to model new and follow-up visits in both the inpatient and outpatient settings. Notably, we also present the structure of the problem-oriented medical record (“SOAP” note) developed by Dr. Larry Weed in the 1950s as a way to guide the clinical reasoning process. This project aims to develop students’ clinical reasoning skills and to increase students’ proficiency in the tasks expected of them during their clinical clerkships.

Will Fitz

Oral | 4:00-4:55 | Williams Family Room | Arts & Humanities/Social Science

Title: Reactionary Postmodernism? Neoliberalism, Multiculturalism, and the Origins of the New Far Right in Germany since 1989

Faculty Mentor: Alan Steinweis, History

Abstract: My thesis aims to map the material, discursive, and ideological foundations of the new far right in Germany within the context of multiculturalism and neoliberalism, the social and economic regimes of late modern globalization. Together, these have given rise to new conceptions of race, culture, and identity, many of which have been appropriated by radical nationalists. Though similarities exist between the populist right of today and the fascists of the 1930s, the “new far right” must be understood as a product of a very different world. The thesis will examine narratives and established theories of the resurgence of right-wing extremism in Germany.

Christian Fjeld

Poster | 11:00- 12:30 | Frank Livak Ballroom | Biological Sciences

Title: Novel CMT associated HARS variants disrupt aminoacylation and neurite outgrowth.

Faculty Mentor: Christopher Francklyn, Biochemistry

Abstract: A number of aminoacyl-tRNA synthetases (ARS) have been implicated in neurological disorders including Charcot-Marie-Tooth syndrome (CMT). CMT is a inherited peripheral neuropathy that has been linked to mutations in ARS genes corresponding to glycine, tyrosine, alanine, tryptophan, and histidine. While progress has been made in characterizing CMT-associated ARS mutations, the underlying pathological mechanisms remain unclear, and no disease modifying treatments are available. Here, we identify and characterize three novel HARS mutations

Abstract (Fjeld, cont'd): associated with CMT2W. These mutations are dominantly inherited point mutations that result in substitutions (Y330C, S356N, and V155G) in the HARS domain. Expression of CMT2W-HARS mutants failed to compliment HST1 deletion in yeast, suggesting a loss of function mechanism. A steady state kinetic analysis revealed that all mutants display impaired aminoacylation. Molar mass determined by analytical ultra-centrifugation indicates that all variants form stable dimers, with sedimentation velocities similar to wild-type. These in vitro experiments were extended by investigating the effect of CMT2W-HARS overexpression in differentiated PC12 cells. Although all mutant HARS proteins localized normally to the soma and sprouting neurites of PC12 cells, overexpression resulted in neurite shortening. Notably, this effect was also observed in cells treated with the ARS inhibitors L-histidinol and L-tyrosinol. Similar to threonyl-tRNA synthetase (TARS) macrolide inhibitors borrelidin and BC194, these inhibitors induced phosphorylation of eIF2 α . L-histidinol and L-tyrosinol differed from borrelidin and BC194 in that they did not induce cleavage of caspase-3 and did not affect cell viability at the concentrations tested. Additionally, the amino alcohol inhibitors decreased expression of the differentiation marker, growth associated protein 43 (GAP43). In future work, we will further characterize the pathological mechanisms underlying CMT2W-HARS mutations using both in vitro (PC12 cells and primary neurons), and in vivo (zebrafish) approaches.

Brandon Follansbee

Lightning | 11:00-12:30 | Sugar Maple Ballroom | Food & Environmental Sciences

Title: A Geochemical Analysis on Lake Iroquois Groundwater Seepage: Is There a Relationship between Cations and Phosphorus?

Faculty Mentor: George Pinder, Civil & Environmental Engineering; Julia Perdrial, Geology

Abstract: The contribution of nutrients via groundwater seepage is poorly understood. However, research suggests that the input from groundwater seepage could be quite significant (Belanger and Mikutel, 1985). Thus, an analysis of what chemical-biological actions occur at the sediment-water-interface is important and needed. Of particular importance are the relationships between cations and phosphorus. A full diagnostic study of Lake Iroquois during the 1980's by Roesler and Regan described the lake's water quality parameters thoroughly, but only discussed a few select cations, not a whole array. In the study reported here, the relationship between eight cations (Fe, K, Mn, Mg, Al, Si, Na and Ca) and phosphorus is described. Groundwater seepage collected from the lake during the summer of 2017 by students Matthew Trueheart and Samuel Marano was analyzed by ICP-OES after proper dilution and digestion. The ongoing study of relationships of the cations with phosphorus may provide an understanding of sediment-water-interface chemical processes which may, in turn, prove crucial in reducing the eutrophication of Lake Iroquois and potentially other water systems. The data will be examined for relationships on JMP statistical software. The investigation is currently ongoing and anticipated results will provide insight into what cations, if any, control or influence phosphorus release from sediments. This information will help home owners on Lake Iroquois understand why the lake is susceptible to large algal blooms and perhaps, what could help resolve the issue.

Kati Galligher

Poster | 3:00-4:30 | Silver Maple Ballroom | Social Sciences/Vermont Studies

Title: Unpacking the Use of Social Enterprise as a Community Development Tool in Vermont

Faculty Mentor: Rasheda Weaver, Community Development & Applied Economics

Abstract: As Vermont communities face increasing pressure from economic and environmental change, social enterprises -- a novel type of hybrid business -- work to address social problems. Yet, little is known about the context in which these firms have developed, or their organizational activities and characteristics. This research explores social enterprise as a tool for community development in Burlington, Vermont, by analyzing the social, economic, and legal characteristics of social enterprises in the city, and determining what place-based factors have helped or hindered their development.

To answer these questions, an online survey of Vermont social enterprises will be conducted and quantitatively and qualitatively analyzed. Weaver (2017)'s Social Enterprise Model Questionnaire covers the organizational, legal, and financial structure, as well as information on critical success factors and challenges while operating in the state. Subjects will be recruited to participate in the survey through Weaver (2017)'s Social Enterprise Directory. In addition, a qualitative content analysis will be conducted to examine Vermont legislation and literature relating to the historical and cultural factors that have allowed social enterprises to emerge.

Expected results from this study include the findings that social enterprises in Burlington maintain a strong "sense of place," a commitment to community well-being and services, and they address a wide variety of social and environmental issues. It is also expected that the state's contextual factors have played a significant role in the

development of Burlington's social enterprise sector, and that this combination of factors has facilitated strong community economic development in the area.

This study will be the first of its kind to contribute to the understanding of how social enterprises operate in Vermont, identify specific points of contributions to community development, and deepen knowledge about place-based factors influencing the progress of the state's social enterprises.

Noelle Gillis

Oral | 10:00-10:55 | Jost Foundation Room | Biological Sciences

Title: Understanding Thyroid Hormone Receptor Mediated Chromatin Remodeling in Thyroid Cancer

Faculty Mentor: Frances Carr, Pharmacology

Abstract: Thyroid cancer is the most common cancer of the endocrine system. Overall, the prognoses for patients with thyroid cancer receiving standard therapies is quite good. The outcome for patients with resistant or recurrent disease, however, is extremely poor. Due to the lack of effective therapies, patients with advanced or metastatic thyroid cancer have a higher mortality rate than all other endocrine cancers combined. Additionally, the link between thyroid disease, corresponding thyroid hormone levels, and thyroid cancer progression has been of clinical concern and yet remains unresolved. Dysregulation of the transcription factor TR β , a member of the thyroid hormone receptor (TR) family, is characteristic of thyroid tumors. Restoration of TR β function in malignant cells decreases tumor growth in xenograft studies. Despite a recognized role as a tumor suppressor, the mechanisms by which TR β regulates tumor growth are not clear. TR β is a ligand-dependent transcription factor that mediates the effects of thyroid hormone (T₃) in a number of biological processes. At the genomic level, TR β mediates the effects of T₃ via the regulation of gene expression through the recruitment of co-regulators and chromatin remodeling complexes. TR β has been shown to induce reorganization of chromatin and local nucleosome structures via interaction with genomic regulatory elements to alter target gene transcription. Disruption of TR β is therefore expected to alter assembly of co-regulator complexes needed for initiation of gene transcription. Our recent studies have revealed a novel interaction between the ATPase subunit of the SWI/SNF chromatin remodeling complex, BRG1, and TR β , in thyroid cells. BRG1 has been implicated in a number of cancers, however our studies are the first to demonstrate its potential as a biomarker in aggressive thyroid cancers. Furthermore, since BRG1 is currently being explored as a therapeutic target, its interaction with TR β to alter tumor progression is a compelling question to address.

Margaret Gish

Oral | 2:00-2:55 | Williams Family Room | Professional Studies - Education

Title: "Cuz he has empathy for those little peoples": A Study of the Development of Empathy and Activism in 3rd Grade Students

Faculty Mentor: Holly-Lynn Busier, Leadership & Developmental Sciences; Kieran Killeen, Educational Leadership & Policy Studies; Kelly Becker, Elementary Education

Abstract: In today's world of increasing anthropogenic climatic changes in which children are spending more and more time indoors, it is vital that children develop an empathy for and activism towards the earth. One way to develop this empathy and activism is through education, especially using the arts. Some recent research has looked into how engaging in theatre allows students to develop deeper empathy and increases a student's likelihood of acting, however these two themes have rarely been studied together. In this qualitative research project 3rd grade students participated in an environmental play, while I observed what changed about their perceptions of empathy and activism through interviews, surveys and reflective journaling. These 3rd grade students attended a school in a high, poverty urban VT environment. It is clear that students came into the experience not knowing much about nature. Many students initially thought of activism as being active physically, a perception which seemed to have changed somewhat after the play. After the play many students were able to gain a deeper understanding of empathy and articulate that it is being able to put yourself in another person's shoes. More research needs to continue to be done related to younger student empathy and activism development, especially in connection with teaching the skills of resilience and social emotional learning and creating centers of care. Teaching the skills of resilience, social emotional learning, empathy and activism in a caring setting will no doubt transform the way in which students learn and the way in which people and the planet are cared for.

Tatiana Gladkikh

Poster | 9:00- 10:30 | Frank Livak Ballroom | Food & Environmental Sciences/Social Sciences/Vermont Studies

Title: Nature, cultural ecosystem services, and human well-being: A community-based study with New Americans.

Faculty Mentor: Rachele Gould, Rubenstein School for Environment & Natural Resources

Abstract: My research focuses on the effects of urban forests on New Americans (i.e., refugees), a group often under-represented in forest research and planning. Deeper understanding of the nuanced ways that nature affects the well-being of this community will help support work toward making green areas more inclusive and accessible to diverse users. I will explore cultural ecosystem services (CES) – such as spiritual fulfillment, psychological well-being, and social cohesion – that New Americans obtain from interacting with different types of natural landscapes and ways to incorporate them into management of natural resources.

I am particularly interested in assessing CES associated with foraging practices in Burlington's forests. The issue of foraging in these forests is complex: It is culturally important to portions of the New American community, but ecologists have concerns about sustainability. Based on research with diverse stakeholders and applying community-based lens to my analysis, I hope to advance the scholarly understanding on the roles of urban forest and the relationship between community involvement and sustainable use of forest resources.

To ensure multiple perspectives and applicability, I am building a network of research partners and will design each stage of my research by building on inputs these partners. My data collection methods will include questionnaires, interviews and observations. I will conduct interactive workshops with the New American community and forest managers and use visual aids and participatory mapping exercises to lead a conversation on accessibility of urban green areas, preferred uses, and foraging sites.

Annie Glessner-Fisher

Poster | 11:00-12:30 | Frank Livak Ballroom | Biological Sciences/Health Sciences

Title: The Role of Hormones in Inducing Maternal Uterine Remodeling and Vasodilation During Pregnancy

Faculty Mentor: George Osol, Obstetrics Gynecology & Reproductive Health; Bryan Ballif, Biology

Abstract: Vascular growth and vasodilation are needed to support increased uteroplacental blood flow during pregnancy. In previous work, increased shear stress has been correlated with both vasodilation and vessel enlargement. This experiment seeks to determine the influence of estrogen and progesterone on these processes. It is predicted that increasing the levels of estrogen and progesterone to pregnancy levels in ovariectomized rats will result in vessel growth and vasodilation to the extent seen in pregnant rats. Understanding the mechanisms that guide maternal uterine vascular remodeling can help to better address pregnancy-related diseases, such as preeclampsia, in which uterine vessels fail to remodel. This experiment uses Sprague Dawley rats. Two surgical methods are utilized: cervical and oviductal ligation. Cervical ligation alters the hemodynamics of the uterus and changes shear stress, one of the primary mechanisms for initiating vascular growth. Oviductal ligation restricts pregnancy to one horn of the uterus. Vessels from each horn of the uterus will be dissected, cannulated, and placed in an arteriograph system. Vessel diameter and reactivity to vasoconstrictor/vasodilator drugs will be measured for vessels from both horns for each rat. Data are still in the process of being collected and analyzed. The statistical program, Graphpad Prism 7, will be used to draw graphs and analyze the data for significance ($p < 0.05$). No conclusions can be made yet since data collection are not complete; however, preliminary data have shown some level of vasodilation in response to increased hormone levels. If hormones help facilitate vascular remodeling, vessel reactivity and remodeling will be similar between implanted and non-implanted horns of late-pregnant rats, as well as OVX + pellet rats. If vascular remodeling is significantly greater in the implanted horn, the hypothesis is not supported.

Mahalya Gogerly-Moragoda

Oral | 11:00-11:55 | Chittenden Bank Room | Biological Sciences

Title: Ligands for human synovial gamma delta T cells

Faculty Mentor: Ralph Budd, Immunobiology

Abstract: Gamma delta ($\gamma\delta$) T lymphocytes are an immunological enigma, functioning at the intersection of the innate and adaptive immune systems. They typically reside in mucosal and epithelial barriers and accumulate in sites of inflammation during infection or autoimmunity. Additionally, $\gamma\delta$ T cells have been found to possess anti-tumor capabilities. While the function of $\gamma\delta$ T cells is still being defined, the evidence suggests a role for these cells in both promoting inflammatory responses and limiting inflammation to protect host tissue. $\gamma\delta$ T cells differ greatly from alpha beta ($\alpha\beta$) T cells in antigen recognition. While $\alpha\beta$ T cells require processed peptides to be presented by the major histocompatibility complex (MHC) on antigen presenting cells, $\gamma\delta$ T cells do not require MHC/peptide recognition, but

rather, are able to recognize complete protein antigens. Very few ligands for TCR-gd have been identified and there is little consistency in their structures. Recent functional studies suggest a role for intact host proteins in activation of gd T cells. We are in the process of identifying a ligand(s) using a novel soluble TCR-gd (sTCR-gd) developed from a synovial fluid gd T cell clone of a Lyme arthritis patient. The sTCR-gd can be tetramerized and used in flow cytometry to provide a non-biased approach toward identifying cells expressing candidate ligands. In this study, we examined a panel of tumor cell lines for expression of TCR-gd ligand(s). We show that a ligand(s) is present in the cytoplasm of tumor lines and capable of being transported to the plasma membrane of a subset of tumors. These surface ligands are sensitive to trypsin and surface expression can be reduced by inhibiting transcription, translation, and ER-Golgi transport. This work demonstrates the high rate of ligand cycling and is further evidence of a host protein(s) acting as ligand for gd T cells.

Eliaquin Gonell

Oral | 2:00-2:55 | Williams Family Room | Professional Studies - Education/Social Sciences

Title: Token Teachers: School Takeover as Experienced by Teachers of Color

Faculty Mentor: Tracy Arambula Ballysingh, Higher Education & Student Affairs

Abstract: School takeover efforts are occurring almost exclusively within districts that serve highly marginalized Black and Brown student populations. Research has shown that while increasing teacher diversity in these contexts can be a catalyst for school improvement, turnover rates are higher for teachers of color (Achinstein, Ogawa, Sexton, & Freitas, 2010). This study examines the experiences of teachers of color within school takeover context at various schools in a school district serving a largely homogeneous Latino/a community. Within-case analysis suggests sacrifice syndrome brought on by demands associated with teacher-of-color-tokenism; lack of culturally-informed decision-making at leadership levels; and evidence of pervasive cultural and class bias at all personnel levels are major factors contributing to steady regression in teacher self-efficacy, self-esteem, and motivation.

Jeremy Greenhaus & Laura Chartrand

Poster | 9:00-10:30 | Frank Livak Ballroom | Food & Environmental Sciences/Health Sciences

Title: Effectiveness of the Vermont Foodbank 3SquaresVT Outreach Program and Perceived Food Security Status

Faculty Mentor: Amy Nickerson, Nutrition & Food Sciences; Linda Berlin, Nutrition & Food Sciences; Peter Callas, Mathematics & Statistics

Abstract: Background: To improve access to and enrollment in the Supplemental Nutrition Assistance Program (SNAP), known as 3SquaresVT (3SVT), the Vermont Food Bank (VFB) administers an outreach program to assist individuals with the application process.

Objective: To assess satisfaction with VFB 3SVT outreach and evaluate perceived food security among 3SVT participants through qualitative interviews.

Methods: The 24-question telephone survey, which included validated USDA food security questions, was administered to 3SVT applicants from January - August 2017. Those individuals received VFB application assistance from January 2016 - March 2017. Of the 434 individuals who applied for 3SVT through the VFB, only 341 were eligible to complete the survey. From that group, 105 3SVT applicants completed the telephone survey, resulting in a 31% response rate.

Results: Both quantitative and qualitative data were coded and analyzed using SPSS. Of the survey respondents 60% were aged 56 - 95 years, 93% had health insurance, and 91% had a high school diploma or greater. For those receiving 3SVT benefits, 27% reported eating more fruits and vegetables. Overall, individuals were satisfied with VFB outreach. Respondents who were approved for 3SVT had higher satisfaction scores than respondents who were not approved for 3SVT.

Conclusion: VFB outreach helps individuals successfully navigate the 3SVT application process and individuals currently receiving 3SVT are more likely to eat more fruits and vegetables than before they received 3SVT benefits.

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THE UNIVERSITY OF VERMONT
**ENGINEERING AND
MATHEMATICAL SCIENCES**

Evan Greenwald

Creative | 11:00-12:30 | Fireplace Lounge | Mathematical & Physical Sciences

Title: An Analysis of Splatter Painting Wooden Paddleboards

Faculty Mentor: Chang Dong Lee, Mechanical Engineering; John Novotny, Mechanical Engineering

Abstract: The market value of wooden paddleboards can be increased by the addition of decorative accents. Splatter painting a paddleboard is a potential form of decoration for these products, however splatter painting presents a number of unknowns that might impact the proprieties of the finished product. Sandwich construction test samplers were fabricated with multiple layers of epoxy and fiberglass to emulate wooden paddleboards. Quantitative and qualitative testing was performed to evaluate the changes in mechanical and aesthetic properties of the various test samplers when splatter painted at three levels during fabrication. Statistical analysis is being performed to test the hypothesis that there are no differences among the samples splatter painted at any of three fabrication levels tested. Testing and analysis will be completed by early April 2018.

Diana Grinberg

Poster | 11:00-12:30 | Frank Livak Ballroom | Biological Sciences/Health Sciences

Title: A role for the protein synthesis regulator TARS in angiogenesis and autophagy of ovarian cancer

Faculty Mentor: Karen Lounsbury, Pharmacology

Abstract: Ovarian cancer progression is dependent on the ability of tumor cells to survive despite a poor growth environment. Tumor cells survive by recruiting new blood vessels (angiogenesis) and using fewer resources by recycling proteins (autophagy). Our laboratory has previously shown that the protein synthesis regulator threonyl-tRNA synthetase (TARS) is overexpressed in ovarian cancer and stimulates angiogenesis. The goal of this project was to determine if blocking TARS with BC194 has an effect on tumor growth, angiogenesis and autophagy in a mouse model of ovarian cancer. Mice were subcutaneously injected with ovarian cancer cells (ID8). At three weeks, animals were treated with either vehicle or BC194 3x/week for 3 weeks. Tumors were then extracted, fixed and analyzed by immunohistochemistry to visualize TARS, blood vessels, macrophages, and autophagy markers. The results showed that in comparison to the vehicle samples, treated samples appeared to have less TARS present and slightly less blood vessel growth – in reflection to the hypothesis, this would suggest that BC194 decreased the aggressiveness of the tumor by decreasing blood vessel growth. The treated samples had about the same or more expression of autophagy markers, which would suggest that TARS inhibition promotes autophagy. Surprisingly, the BC194 treated tumors were larger in size, although there was a large amount of macrophage infiltration which may have caused the size difference. Overall, the tumors were very small at 6 weeks of growth and control tumors did not exhibit much angiogenesis, so future experiments with a longer period of growth may lead to stronger conclusions. Although not all the results were conclusive, this research has shown that TARS has the potential to be considered a target in cancer treatment, and the groundwork has been laid for future studies that would determine if blocking TARS with BC194 prevents progression of ovarian cancer.

Do young Gwak

Poster | 1:00-2:30 | Silver Maple Ballroom | Health Sciences

Title: Scoping Review on Suicide Teaching

Faculty Mentor: Sanchit Maruti, Psychiatry

Abstract: Suicide teaching needs improvement. Deficiency in patient management regards to suicide has been noted in our healthcare system, from gatekeepers to residents and healthcare professionals. There are many different teaching modalities to deliver suicide education. The most common modalities are simulation, workshop, film, vignette and e-learning modules. They all shown to be effective but more systematic approach to measure effectiveness of different teaching modalities are warranted.

Diana Hackenberg

Lightning | 11:00-12:30 | Sugar Maple Ballroom | Social Sciences/Vermont Studies

Title: Cyanobacteria, Cultural Ecosystem Services, Communication, and Community Action

Faculty Mentor: Rachelle Gould, Rubenstein School for Environment & Natural Resources

Abstract: Cyanobacteria blooms in Lake Champlain harm more than just the health of ecosystems and property values. They pose significant threats to human health and well-being, especially for communities that rely on the cultural ecosystem services provided by the lake. Despite efforts to improve water quality, St. Albans Bay continues to experience blooms that impact how the surrounding communities use and relate to the bay. How do community

members talk about their relationship to bay and how the blooms impact that value? Do the media or other sources of water quality information touch on the important but intangible benefits derived from these cultural ecosystem services? This qualitative study looks at these nonmaterial connections between people and St. Albans Bay, how the blooms affect this relationship, and if different informational sources communicate these impacts. Additionally, this research explores the potential role of cultural ecosystem services in building community support for action. These questions are being explored through interviews, observations, a community storytelling project, and an analysis of local media related to the blooms.

Hester Hall

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: The genetics governing flower colour in *Penstemon kunthii*

Faculty Mentor: Lena C. Hileman, Ecology & Evolutionary Biology, University of Kansas; Carolyn Wessinger, Ecology & Evolutionary Biology, University of Kansas

Abstract: Parallelism occurs when related species evolve the same trait independently. An outstanding question is whether parallel trait evolution involves parallel genetic changes. *Penstemon*, a genus of ~280 flowering plants, is a good model for studying parallelism because it has experienced 10-12 parallel transitions from bee to hummingbird pollination syndromes. Pollination syndromes are suites of floral traits that attract specific pollinator groups. The hummingbird syndrome includes red flowers, while the bee syndrome includes blue-purple flowers. Parallel flower colour evolution in *Penstemon* is due to parallel loss-of-function of the gene *F3'5'h*, which codes for an enzyme required to produce blue pigment. I hypothesised that despite its unusual colour, the magenta flowered, hummingbird pollinated *Penstemon kunthii* fits into the pattern of parallelism found with other members of *Penstemon*. I tested this hypothesis by assessing association of flower colour and *F3'5'h* variation in offspring from a genetic cross between magenta *P. kunthii* and closely related, blue flowered *P. amphorellae*. I extracted the pigments from offspring and identified magenta and blue compounds through thin layer chromatography (TLC). I tested for significant deviation from expected ratios given Mendelian segregation of parental traits and found none. I also designed a PCR-based genetic marker method to distinguish between *P. kunthii* and *P. amphorellae* alleles at *F3'5'h*. I tested whether genotype at *F3'5'h* predicts pigment production in offspring using a Chi-square test, and found that there was a significant association. I conclude that genetic parallelism in *Penstemon* flower colour evolution extends to the unique magenta petals of *P. kunthii* hummingbird pollinated flowers.

Josamine Hall

Oral | 4:00-4:55 | Jost Foundation Room | Arts & Humanities

Title: Porphyry's Argument Against Eating Animals

Faculty Mentor: Riin Sirkel, Philosophy

Abstract: In this paper I reconstruct an argument, which Porphyry (c. 234 – c. 305 AD) ascribes to the Stoics, that is in favour of using and eating animals. The Stoics articulate a dilemma that says that if we do not exploit animal labour, absurdities ensue. I detail Porphyry's response to the Stoic argument, in which he denies the dilemma and upholds justice as applicable to animals (meaning that we cannot kill them for food). Then I give an overview of Porphyry's alternative theory of justice and decide that his argument against the Stoics is successful.

James Hammerton

Oral | 9:00-9:55 | Sugar Maple Ballroom | Mathematical & Physical Sciences

Title: Fp_2 catalysed Si-N dehydrocoupling

Faculty Mentor: Rory Waterman, Chemistry

Abstract: SI-N dehydrocoupling is a well-documented reaction that has been performed by various catalysts over the past 50 years. However, there are few instances of using a commercially available catalyst such as Fp_2 . Another advantage of the using Fp_2 as the catalyst is that it is relatively easy to store over long periods of time and is not particularly air sensitive like most of the catalysts used in these reactions. Fp_2 is also based on an earth abundant metal making it much cheaper to use than some of the precious metals used in other catalysts making it a much cheaper alternative which is one of the main goals of the project. The conditions I have been using involve activating using an LED bulb shining visible light onto the solution activating the catalyst via the homolytic cleavage of the Fe-Fe bond. I have set up this reaction with a few different substrates with varying success due to the different steric hindrances of the substrates used. These reactions have also been set up under heat at 383K and under UV light conditions however these reactions did not perform as well due the activation pathways of the catalyst.

Courtney Hammond Wagner

Oral | 3:00-4:30 | Sugar Maple Ballroom | Food & Environmental Sciences/Social Sciences

Title: The role of water quality policy in shaping farmer decision making on Vermont and New Zealand farms

Faculty Mentor: Breck Bowden, Rubenstein School for Environment & Natural Resources; Asim Zia, Community Development & Applied Economics

Abstract: Diffuse runoff of nitrogen and phosphorous in agricultural lands is a growing challenge to water quality across the globe. Governance bodies in nutrient impaired watersheds are increasingly tasked with managing agricultural land use for water quality. The design of water quality policies determines whether the policy is successful at motivating farm management change. In particular, the ability for farmers to maintain autonomy in the future of their farm system is of importance for the policy reception. I examine the impact of choice rules, or what farmers must, must not or may do under a policy regime, on farmer autonomy and behavior amongst farmers in New Zealand and Vermont, USA policy regimes. These regimes represent two variations of water quality policy choice rules: practice-based rules, which require farmers to adopt specific practices, and performance-based rules, which require farmers to choose a set of practices to meet a measured performance standard. Using social psychological theory and structural equation modeling, I investigate the variation in how choice rules influence farmer's perceived control in nutrient management and their intention to adopt nutrient management behaviors. This research contributes an improved understanding of how water quality policy gives landowners flexibility of choice in running their farm system.

Olivia Harris

Poster | 11:00-12:30 | Silver Maple Ballroom | Vermont Studies/Social Sciences

Title: Behind the Tweet: Exploring Effective Mass Communication

Faculty Mentor: Richard Watts, Geography

Abstract: Introduction: Throughout the past semester, I have created and posted content as former Vermont Governor Peter Shumlin on his official Twitter account. With each tweet, I have investigated which factors (time, tone or length) have the greatest impact on engagement. I track overall engagement by watching levels of retweets, favorites, and responses.

Motivation: The motivation behind my work is to track what styles of tweet get the largest reaction from followers. By figuring out a certain time, tone and length that appeals to a larger crowd, individuals involved in mass communication can create more effective pieces to spread messages to the public.

Problem: Through my research, I am attempting to explore a current knowledge gap surrounding effective mass communication. I am experimenting to see if there is a certain style of tweet that is received by the largest audience.

Methods: I have tweeted about five times a week for the past seven weeks and tracked the overall engagement each tweet has received. By organizing the tweets into categories based on their time (of post), tone and length I have been able to figure out which were the most impactful.

Results: I have not completed my test trial period yet and therefore do not have my results. My test trial period will end on the first of April and I will then be able to note which tweets gained the most attention.

Conclusions: I do not have a conclusion drawn yet but will have one by the first of April after organizing my results.

Hannah Hatch

Poster | 9:00-10:30 | Silver Maple Ballroom | Health Sciences/Biological Sciences

Title: Generation of FCGR3a Expressing Vero Cells

Faculty Mentor: Sean Diehl, Microbiology & Molecular Genetics

Abstract: Dengue virus is a mosquito-borne flavivirus with 4 serotypes. There are an estimated 390 million infections each year, and incidence has grown dramatically in recent decades. Infection typically causes flu-like symptoms but can develop into severe disease or dengue hemorrhagic fever. There is currently no specific treatment for dengue.

Antibodies induced by infection or vaccination can be serotype-specific or cross-reactive. Heterotypic secondary infections are most associated with disease. This is due to antibody dependent enhancement (ADE), a process by which cross-reactive, non-neutralizing antibodies bind to dengue virus of a different serotype but fail to neutralize it. This binding then allows increased uptake by cells bearing receptors for the Fc portion of the antibody. One such Fc receptor is Fc γ Receptor 3a (FCGR3a), also known as CD16. CD16, along with CD32 (FCGR2a), has been implicated in ADE of dengue infection. There is also a risk of ADE in vaccinated individuals. An assay to detect potential for ADE does not currently exist.

Gabriela Heermans

Paper | 11:00-12:30 | Silver Maple Ballroom | Social Sciences

Title: Bhutanese Refugees and Acculturation

Faculty Mentor: Emily Manetta, Anthropology

Abstract: After thousands of Bhutanese refugees were expelled from their homeland, many were forced to repatriate to Western countries where cultural differences are significant. There have been issues among the Bhutanese communities throughout the United States, including alcohol abuse and suicide. The focus of my research is to explore how refugees cope with the stresses of the aftermath of being stateless and acculturating in the United States. I look at the colliding perspectives between Western and Eastern cultural perspectives on healing and mental and the Bhutanese culture.

I explore how different aspects of Bhutanese Culture, including religion and traditional activities, may be better alternatives to the Western approach to healing mental health issues in order to help Bhutanese refugees cope with their stresses. I look at the connection between karma and mental illness. I look at why mental illness is stigmatized in Bhutanese culture, and how the degrees of this stigmatization vary. I came across research that shows refugees who have managed to keep a strong connection to their religion actually tend to embody more signs of distress, which indicates to us that the issue of mental health and Bhutanese refugees still needs to be researched further, and their needs must be better tended to. Questions I had as I did my own research are: Do American communities provide support services that respond to the needs of refugees with cultural sensitivity? Are there enough programs to help the Bhutanese keep their culture while allowing them to feel at home in the United States?

Alaina Hendrickson

Poster | 11:00- 12:30 | Sugar Maple Ballroom | Arts & Humanities

Title: Art as Power: Francis I's Incorporation of the Italian at Château de Fontainebleau

Faculty Mentor: Kelley Helmstutler Di Dio, Art & Art History; Charles-Louis Morand Metivier, Romance Languages

Abstract: My research investigates the connection between King Francis I's patronage of Italian antique sculpture and his assembly of artists for his renovations at the Chateau de Fontainebleau with the development and overall success of the French Renaissance. The project seeks to define Francis I's central techniques of self-fashioning through patronage of Italian art and employment of Italian artists, as well as his relative success in 'conquering' Italy in his feud against Holy Roman Emperor Charles V through a cultural adoption and popularization of Italian Renaissance style. I particularly focus on the lasting effects of the housing and display of these antique-style works at the lavishly decorated Chateau de Fontainebleau, and in his personal gallery, the Galerie François Premier.

Shaelynn Hickey

Poster | 11:00-12:30 | Silver Maple Ballroom | Social Sciences

Title: The Moderating Effect of Fitness on the Peer Functioning of Children with and without Attention Deficit-Hyperactivity Disorder (ADHD)

Faculty Mentor: Betsy Hoza, Psychological Science; Erin Shoulberg, Psychological Science

Abstract: Children with ADHD are often given inflexible, negative reputations by their peers, but investigating possible protective factors could potentially benefit this population. The goal of this study is to examine whether fitness moderates the relation between ADHD symptomatology and peer functioning in 202 children with a mean age of 6.83 years old. ADHD symptoms were assessed using the ADHD-IV Rating Scale and an in-person screening with parents. The Progressive Aerobic Cardiovascular Endurance Run and Body Mass Index percentile were used to assess fitness level. Parents and teachers completed assessments of peer functioning. Regression analyses will examine the association between ADHD symptomatology and peer functioning, and the moderating effects of fitness.

Elisabeth Hodgdon

Oral | 9:00-9:55 | Jost Foundation Room | Biological Sciences

Title: Smelling out the competition: Testing for pheromone autodetection in female swede midge (*Contarinia nasturtii*; Diptera: Cecidomyiidae)

Faculty Mentor: Yolanda Chen, Plant & Soil Science; Rebecca Hallett, Environmental Sciences, University of Guelph

Abstract: Since the beginning of pheromone mating disruption (PMD) research for insect pests, research has focused almost exclusively on effects of pheromone treatments on males. Far fewer studies have considered how female insects respond to unnaturally large doses of synthetic conspecific pheromones. For some insect species, pheromone titers in the air serve as indicators for population density and competition by conspecifics. Mating

Abstract (Hodgdon, cont'd): disruption-level pheromone exposure can affect female calling behavior and propensity to mate, which can further enhance the efficacy of PMD systems by inhibiting normal female reproductive behavior. The objective of our research was to test whether pheromone blends for PMD influence the reproductive behavior of female swede midge, a challenging invasive pest of brassica crops in Canada and the U.S. Specifically, our research question was: Does continuous exposure to large doses of pheromones influence calling (pheromone-releasing) behavior in unmated female midges? In a laboratory setting, we compared the number of times calling behavior was observed during known peak activity periods between female midges housed in flasks with pheromone dispensers versus with solvent-only control dispensers. We found that females significantly increased calling activity when exposed to both three-component chiral and racemic pheromone blends compared with those in the solvent-only control treatment. Females exposed to only one component in the swede midge pheromone blend did not increase calling, indicating that the other components in the pheromone blend are required to elicit a behavioral response. Here, we consider the implications of our results on the design and efficacy of a PMD system for this species.

Mallory Honan

Poster | 3:00-4:30 | Frank Livak Ballroom | Biological Sciences/Food & Environmental Sciences

Title: Inclusion of ground coffee to dairy cattle rations and its impact on the milk proteome

Faculty Mentor: Sabrina Greenwood, Animal & Veterinary Sciences

Abstract: Use of alternative feeds in the dairy industry can affect milk production and composition, including the milk proteome. The purpose of this study was to analyze the effect of feeding ground coffee, a phytochemical-containing alternative supplement, on the milk proteome of dairy cattle. Given the impact of coffee residues on the rumen microbiota and metabolizable protein profile, it was hypothesized that inclusion of ground coffee in dairy cattle diets would impact the milk proteome and healthfulness of the milk produced. The objectives of this study were to use proteomic analyses to identify and characterize the milk proteome produced by cows fed ground coffee. Ten mid lactation (151 ± 25 DIM) Holstein cows were selected and fed the same base diet ad libitum over a 28 day period in a complete randomized block design, which included two supplementation treatments of either 1) 140 g/d (DM basis) of molasses (CON) or 2) 140 g (DM basis) of molasses + 70g/d of ground coffee (GC). Thrice weekly samples of milk were taken during morning and afternoon milkings during the last week of the trial stored for milk proteomic analysis. Milk samples were analyzed by HPLC for analysis of high abundance protein concentrations, including casein isoforms, alpha-lactalbumin, and beta-lactoglobulin. For analysis of the low abundance protein-enriched milk fraction, LC-MS/MS techniques were utilized. All parameters were statistically analyzed using the PROC MIXED of SAS. While no differences in DM intake, milk yield, or high abundance milk protein concentrations were observed across treatments, 102 proteins were identified using LC-MS/MS techniques and abundances of 7 proteins were affected due to dietary treatment. The changes in the milk proteome are likely due to shifts in post-absorptive metabolism and confirm the potential use of secondary compounds in feeds as a mechanism to alter the milk protein profile.

Lynda Howell

Oral | 10:00-10:55 | Williams Family Room | Arts & Humanities

Title: Which Way Is Up? Exploring account books for historical research

Faculty Mentor: Nicole Phelps, History

Abstract: Historians can gain valuable insights into the daily lives of individuals and communities through the financial records they left behind. A family's purchase and credit history can tell historians what they ate, what they wore, and how they worked. On a larger scale, these records illustrate the scope and changing character of financial, industrial, and trade relationships across time or place. Account books are frequently avoided by student researchers, however, because the conventions and idiosyncrasies of their composition make them daunting to the beginner. This presentation describes one researcher's experiences and attempt to create a roadmap for the use and interpretation of historical account books in the UVM collection.

This project starts with an account book kept by John Walworth during his military service just before and during the War of 1812, and in his early years of establishing a family and a dry goods store in Plattsburgh, New York after the war. It then uses supplemental primary- and secondary-source materials available at UVM and beyond to place the book and its records into context. This presentation presents preliminary results from the analysis of Walworth's book in context.

Although this project draws a picture of one man's military service and personal life in the Early Republic, its primary endpoint is the creation of a guide for the use of other researchers working with similar materials. The guide – freely available on the Web but with a focus on UVM-accessible resources – contains pointers on questions to ask,

annotated bibliographies of helpful primary and secondary sources, and tips for locating account books in the UVM collection.

Sarah Howerter

Poster | 1:00- 2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences/Social Sciences

Title: The Size & Shapes of Social Networks: classifying geographic extent of people in space

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: As global social networks expand due to migration, telecommunications, global business and travel itself, social networks may be an important factor in the number of trips, trip lengths and destination choice. With long-distance intercity travel on the rise, its impacts and implications socially, economically, and environmentally are of importance for research and policy. This research project aims to find more accurate methods for measuring the spatial extent of people's social networks so that these measures can then be compared to not only travel behavior, but also social capital and other quality life measures. Data for the research was collected during a pilot survey in 2017 where approximately 110 respondents were asked for information about people in their social network including the location of residence. With the goal to classify the size and spread of the home locations of contacts, new ways to measure the spatial distribution are being explored to advance beyond average distance or confidence ellipses, both of which have limitations. The proposed classification method utilizes the average distance from the person to all of their social network contacts as well as the distance between contacts. The variance in these distances is used. Together these measures point to six different types of social network geography among survey respondents and correlations to socioeconomic variables are explored.

Allison Hrycik

Oral | 12:00-12:55 | Chittenden Bank Room | Biological Sciences/Vermont Studies

Title: Impacts of winter severity on plankton communities

Faculty Mentor: Jason Stockwell, Rubenstein School for Environment & Natural Resources

Abstract: Climate change is expected to alter water temperatures and ice cover duration in north temperate lakes, with implications for aquatic communities that persist under ice as well as community structure and function later in the year. In particular, plankton that comprise the base of the food web may experience shifts in the timing and magnitude of their seasonal successional patterns as they are exposed to altered light levels and thermal regimes during winter. Despite the potential impact of winter conditions on aquatic communities, very little research has been done to tease apart the ways by which physical conditions affect plankton under ice. We have monitored biotic and abiotic factors in Shelburne Pond, Vermont year-round since spring 2014. Our results indicate that timing of spring peaks of zooplankton are taxon-specific, but depend on winter severity. Cyclopoid copepod spring peaks tend to track timing of ice-out, while *Daphnia* peaks appear to depend on water temperature. Phytoplankton sample processing is in progress, and we hypothesize that phytoplankton communities during colder winters are characterized by mixotrophic or more motile taxa. These results will help us to understand the implications of climate change on food webs north temperate lakes.

Kaitlin Huber

Poster | 3:00-4:30 | Frank Livak Ballroom | Biological Sciences

Title: Negative impacts of four plastic leachates on the early development of *S. purpuratus* urchin larvae

Faculty Mentor: Melissa Pespeni, Biology

Abstract: Plastic waste materials leach harmful substances into our oceans as they degrade. Some of these are known endocrine disrupting chemicals and have been researched extensively in recent years. Other additives have yet to be studied in marine animals. We tested the toxicity of four chemicals known to leach heavily from plastic debris into marine environments: an ultraviolet stabilizer (UV327), a synthetic antioxidant (Irganox1010), and a known endocrine disruptor (DEHP), and a paraben with suspected endocrine activity (methylparaben). Purple urchin *S. purpuratus* larvae were grown in increasing doses of each leachate compound from fertilization. At 96hrs, pluteus stage larvae were measured for overall body length. In DEHP, UV327, and Irganox1010, we found significant decreases in body length at intermediate doses, following the nonmonotonic response patterns often expected from endocrine disrupting compounds. Methylparaben, however, showed the greatest effect on body length at the highest dose. Larvae grown in Irganox1010 showed significant increases in deformities or halted development, with the most affected plutei in the highest dose. Our findings indicate that all compounds in this study have detrimental effects on purple urchin larval development, and that UV327 and Irganox1010 follow similar patterns to the known endocrine disruptor DEHP. Further

Abstract (Huber, cont'd): investigations should be done to assess the endocrine disrupting potential of UV327 and IrganOX1010.

Lindsay Hunn

Poster | 9:00-10:30 | Silver Maple Ballroom | Health Sciences/Social Sciences/Vermont Studies

Title: Does high school sexual education affect domestic and sexual violence rates?

Faculty Mentor: Qingbin Wang, Community Development & Applied Economics

Abstract: The purpose of this study is to identify if sexual health material taught in high school health classes affects domestic and sexual violence reports. If this research finds that sexual health material does impact the rate of violence reports, changes in high school health class curriculums could have a strong impact on teenage and young adult health and well-being.

Sexual health teachings data will be gathered by collecting curriculums from 30 randomly selected Vermont high schools in various regions of the state, as well as interviewing health teachers on the material they presented and if they did follow the curriculum as directed. Sexual education will be compared based on specific factors, such as: family planning, class time spent on reproductive health, knowledge of access to support services, obtaining consent, and sexually transmitted infections.

Domestic and sexual violence reports will be obtained through public police reports and organizations which specialize in sexual violence counseling, as well from the high schools themselves. A regression analysis will be used to estimate the relationship between these variables.

Based on unofficial interviews, we expect to find a correlation between superficial sexual health education and a higher rate of violence in current and former students; but the final understanding and strength of expected relationship between the variables is unknown as of this time.

The findings of this research could be used in developing more comprehensive and extensive sexual health curriculums for all Vermont high school students.

If the expected correlation is found, we would suggest a policy change and a new, more extensive statewide curriculum standard for sexual health classes.

Expected limitations include the number of people involved in domestic and/or sexual violence who did not report the crime, and student access to sexual health education outside of high school.

Tim Hwang

Poster | 11:00-12:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: Evaluating Emergency Vehicle Operator Age, Emergency Warning Equipment Usage, Speed, and Time of Day in Minimizing Risk of Crashes

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: For emergency responders, ambulance crashes are the third leading cause of injury to EMT's and fire-truck crashes are the second leading cause of firefighter deaths in the line of duty. In 2015, the National Highway Traffic Safety Administration (NHTSA) assessed data from its Fatality Analysis System (FARS) and its National Automotive Sampling System (NASS) to determine that between 2011 to 2014, on average 4,500 vehicle crashes occurred annually involving an ambulance. Although these studies produced compelling research on restraint usage of providers and patients, other factors including: emergency warning equipment usage, driver age, speed at crash vs. speed limit, and time of day are not examined. This study expands the research time frame of 2014 to 2016 and continues the trend of crashes and occupant restraint usage. The objective of this study is to examine the relationship of co-variables including (1) emergency warning equipment usage, (2) driver age, (3) speed at crash vs. speed limit, and (3) time of day with emergency vehicle[ambulances and firetrucks] crash fatality rates. This analysis will help identify factors and driver behavior that contribute to fatal crashes to minimize the risk of potential crashes to first responders and patients.

Stephen Indrisano

Creative | 11:00- 12:30 | Fireplace Lounge | Arts & Humanities

Title: Welcome Here: How Theater Defines History

Faculty Mentor: Kathleen Gough, Theater

Abstract: As a playwright concerned with defining our political moment in a greater context of the history of the United States of America, my research has been devoted to understanding how previous works of Theater engage with the very concept of history itself. Within the medium of Theater, playwrights ranging from William Shakespeare to Arthur Miller have used a variety of formats, dramatic devices, and narrative structures to craft models of history

which bely a greater truth about humanity. Some of the forms of Theater which I have engaged with during this process include single-document adaptations, fictionalized accounts of historical moments, and nonfiction docudramas. The creative portion of my research explores how the rich cannon of historical theater has informed my own writing, as I have written a one act narrative-docudrama which presents its own theory of American political history. Thus, this project is a combination of literature review, critical reflection, and original script with production elements. The play itself, entitled Welcome Here, is fictional debate between an Alt Right speaker and an acclaimed research librarian. The debate is interrupted by sections of document presentation, in which nonfictional texts, interviews, and broadcasts are used to provide context and weight to the battle of ideologies occurring on stage. Audiences are thereby encouraged to view the contemporary debate as part of a larger historical context of uneven progress and social upheaval.

Ben Isenhardt

Oral | 11:00-12:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: Transport Anisotropy in Pyrene: TCNQ Charge Transfer Crystals

Faculty Mentor: Matthew White, Physics

Abstract: Charge transfer crystals have recently garnered attention as a potential alternative to Perovskites as efficient organic photovoltaics. The pyrene:TCNQ co-crystal has been shown to form in alternating stacked geometries, implying anisotropy in charge transfer characteristics. In order to determine the photoconductivity along the various crystalline axes, impedance spectroscopy was utilized in both relaxed and photoexcited states and comparisons made between the resulting electrical properties. Using this method, photoconductivity was found along two of the primary axes of these crystals while none was measured along the third axis. The knowledge of the anisotropy in the charge transport properties is crucial for the design of photovoltaic devices using the pyrene:TCNQ charge transfer crystal.

Lisa Izzo

Poster | 3:00- 4:30 | Frank Livak Ballroom | Biological Sciences/Vermont Studies

Title: Estimating Abundance of Spawning Lake Sturgeon in the Winooski River, VT Using Dual-Frequency Identification Sonar (DIDSON)

Faculty Mentor: Donna Parrish, Rubenstein School for Environment & Natural Resources

Abstract: Lake sturgeon (*Acipenser fulvescens*) in Vermont are only found in Lake Champlain, and the species was listed as endangered in the state in 1972 following declines in commercial harvest. Whereas monitoring efforts have confirmed that spawning still occurs in three of the four historic spawning tributaries, there are no abundance estimates for any life stage of lake sturgeon in Lake Champlain. The goal of this study is to develop a hydroacoustic sampling protocol to estimate the abundance of spawning adult lake sturgeon in one historic spawning tributary. In 2017, a fixed-location dual-frequency identification sonar (DIDSON) was deployed downstream of the lake sturgeon spawning site in the Winooski River, VT to count upstream migrating lake sturgeon. During the 2017 spawning season, hydroacoustic data were paired with data from an array of five stationary acoustic receivers that monitored the movements of tagged adult lake sturgeon that entered the river (n=10, tagged in 2015 and 2016). From May 10 to June 21, 1000 hours of DIDSON footage were collected and 271 sturgeon targets (fish > 1 m) were observed moving upstream. Acoustic receiver data indicated that 6 of 10 tagged sturgeon made multiple movements upstream during the spawning run, suggesting that sturgeon behavior during this period had the potential to inflate abundance estimates obtained from fixed-location hydroacoustic equipment. To estimate overall spawning abundance, counts from the DIDSON will be combined with acoustic telemetry data to account for repeat movement past the DIDSON throughout the spawning season. Results of this work, which will continue through 2019, will provide managers with an estimate of spawning adult abundance without the need to handle pre-spawn fish. In addition, the methods developed during this study can be used to track progress towards lake sturgeon recovery in Lake Champlain.

Tarek Jalleb

Poster | 11:00-12:30 | Silver Maple Ballroom | Social Sciences/Food & Environmental Sciences/International Research

Title: Food prices shocks and food security

Faculty Mentor: Joshua Farley, Community Development & Applied Economics

Abstract: Following the food crisis of 2007-2008, in which grain prices doubled, an estimated 40 million people faced increased undernourishment. With nearly 800 million of the world's poor already food insecure, food crises are likely to become increasingly common due to new threats to global food security, ranging from climate change to speculation. This paper examines the extent of impacts of commodity speculation on the supply and demand for food.

Abstract (Jalleb, cont'd): The scope of this work is to estimate the price and income elasticity of demand for different types of food, and the cross elasticity of demand between food and various other economic products, in order to determine which populations will become food insecure as the result of shifts in the supply and demand of food. This article utilizes data from the World Bank's International comparison program to estimate own-price, cross-price and income elasticities for different types of food and different categories of consumption in 199 countries. Price elasticity of demand is defined as the percentage change in quantity consumed of a product divided by the percentage change in price; income elasticity of demand is the percentage change in quantity consumed divided by percentage change in income; and cross-elasticity of demand is the percentage change in quantity consumed divided by the percentage change in price of another good. This article also looks at existing research on threats of food supply and drivers to demand through the ecological economic lens to help identify a realistic range of possible changes in food supply. Our findings will suggest that lower-income countries are the most at risk from a food crisis, especially when there are price shocks. Commodity speculation and other factors could lead to a major and sudden increase in prices, affecting the food supply in low-income countries and potentially leading to food security issues.

Laura Jarvis

Poster | 1:00-2:30 | Silver Maple Ballroom | Health Sciences

Title: The Attitudes and Experiences of Undergraduate Nursing Students Working with Opioid Dependent Patients in the Clinical Setting

Faculty Mentor: Laura Lewis, Nursing; Deborah Wachtel, Nursing

Abstract: Upon entering the third year of BSN nursing curriculum many students are exposed to working with patients in the clinical setting for the first time in their undergraduate education. It is not unexpected for these students to experience challenges navigating the healthcare system. Novices rely on experienced nurses as mentors in combination with the education they receive, and it is during this phase in their careers that they begin to develop their own nursing practice. These students have clinical rotations on several units including maternity, pediatrics, Medical-Surgical, psychiatric/mental health. While each unit has a primary focus, opioid addiction is a prevalent public health issue that presents itself on every unit.

The purpose of this study is to explore the first encounters of undergraduate nursing students entering their final year in the nursing curriculum and providing insight into their experiences working with patients struggling with opioid use disorder. This is a qualitative study where students are interviewed about their experiences, measuring perceptions of educational preparation, as well as their current levels of comfort working with this growing population. There is currently a deficit in research that specifically explores the experiences of nursing students caring for those struggling with opioid dependence. If successful this study will provide undergraduate institutions insight into the lived experiences of nursing students so that potential improvements may be made to undergraduate nursing education to enhance the delivery of care provided by nursing students in clinical settings. Skills that are developed early on in nursing education have the potential to enhance quality of nursing care as students transition into professional practice upon graduation.

Tyler Jaynes

Oral | 12:00-12:55 | Williams Family Room | Mathematical & Physical Sciences

Title: Iterative Exponential Growth through Manipulation of Sulfide Oxidation States

Faculty Mentor: Severin Schneebeli, Chemistry

Abstract: For decades, chemists have searched for methods of generating precisely sequenced polymers, emulating the ordered macromolecules produced by nature. In this research, I have pursued the synthesis of well-defined oligomers through a technique called iterative exponential growth (IEG) in which chain lengths of exact size and sequence are built in an exponential fashion. I have utilized the mutable character of sulfur to activate positions solely through the manipulation of oxidation states to advance a novel IEG approach.

Benjamin Jewkes

Poster | 3:00- 4:30 | Frank Livak Ballroom | Biological Sciences/Health Sciences

Title: Cyclophosphamide Induced Disruptions to Appetitive Qualities and Detection Thresholds of NaCl: Comparison of single dose and dose fractionation effects

Faculty Mentor: Eugene Delay, Biology

Abstract: Chemotherapy is one of the most common treatments for cancer, however a side effect is often altered taste. This study examined how cyclophosphamide, a chemotherapy drug, affects salt taste in mice. Based on previous

findings, it was predicted that cyclophosphamide-induced disruptions in salt taste would be observed near days 2–4, 8– 2, and 22–24 days post treatment, and that multiple, smaller doses would cause more severe disruptions to taste. To test these predictions, two experiments were performed, one using brief access testing to measure appetitive qualities, and another using operant conditioning to measure detection thresholds. After a single 100 mg/kg cyclophosphamide injection, peak alterations in brief access lick rates were seen near days 5–8 and 15 post treatment, whereas peak alterations in detection thresholds were seen 6, 14 and 20 days post treatment. After five 20 mg/kg injections of cyclophosphamide, brief access lick rates revealed disruptions only on post injection day 8 whereas thresholds appeared to cycle, gradually increased to and decreased from peak elevations on post treatment days 4, 10, 15, 20, and 23. While salt taste functions were disrupted by cyclophosphamide, the patterns of these disruptions were less severe and shorter than expected from cell morphology studies, suggesting a functional compensation mechanism. Fractionation of cyclophosphamide dosing had minimum effect on brief access test but caused longer, cyclic-like disruptions of detection thresholds compared to single dose administration.

Anders Johnson

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: The Role of Glycogen Metabolism in B Lymphocyte Activation

Faculty Mentor: Eyal Amiel, Medical Laboratory & Radiation Sciences

Abstract: Upon stimulation, B cells increase their metabolic activity and have an increased demand for glucose. While recent studies have focused on the role of extracellularly sourced glucose in supporting B cell activation, little is known about the contribution of intracellular energy stores in supporting B cell effector function. In these studies, we have begun to characterize the role of glycogen, an intracellular polymer of glucose, in supporting B cell biology. Our preliminary results show that B cells express the metabolic machinery required for glycogen metabolism. These include the two rate limiting enzymes required for the breakdown and synthesis of glycogen: glycogen phosphorylase (PYG) and glycogen synthase 1 (GYS1), respectively. Preliminary results also suggest that inhibiting the usage of PYG, the rate limiting enzyme in glycogen catabolism, reduces activated B cell proliferation and IgM production during the initial immune response. These results provide a framework that will allow for specific characterization of the immune response from B cells, as well as the role that glycogen plays in these processes.

Margaret Johnston

Poster | 1:00-2:30 | Silver Maple Ballroom | Health Sciences

Title: Evaluation of the Management and Outcomes of Patients with Cutaneous Squamous Cell Carcinoma of the Lip at the University of Vermont Medical Center

Faculty Mentor: Melanie Bui, Dermatology; Christopher Anker, Radiation Oncology; Corey DeWitt, Dermatology

Abstract: Background: Cutaneous squamous cell carcinoma (cSCC) is the second most common malignancy in the U.S. population with an estimated 700,000 cases diagnosed annually. Most people have an excellent prognosis, the majority of cSCCs can be cured with surgical resection. However, between 3.7% and 5.8% metastasize and an estimated 3,932 to 8,791 deaths occur annually in the United States as a result of cSCC. There are clinical and histologic factors that increase the risk of recurrence, metastasis and death, including a diameter of 2cm or greater, location on the ear or lip, poorly differentiated histology, perineural or lymphovascular invasion, and depth beyond the dermis. At the University of Vermont Medical Center we use the Brigham and Women's Hospital (BWH) tumor staging system to identify high risk patients who would benefit from adjuvant radiation therapy to decrease the risk of local recurrence, nodal metastasis, and disease-specific death.

Objective: Characterize survival and patterns of failure for patients with cutaneous squamous cell carcinoma of the lip so we may more accurately discuss expected outcomes with our patients and further support the decision to offer radiation therapy to a subset of patients with multiple risk factors.

Methods: A retrospective review of the management and outcomes of the 207 cases of cutaneous squamous cell carcinoma of the lip at The University of Vermont Medical Center over the past 8 years (2010-2018). The cohort will be analyzed for its characteristics, management, survival, and prognostic factors.

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Kiara Kane-Owens

Poster | 11:00- 12:30 | Silver Maple Ballroom | Social Sciences

Title: How has housing policy contributed to pockets of high crime and incarceration rates in low-income areas?**Faculty Mentor:** Qingbin Wang, Community Development & Applied Economics

Abstract: As violent police confrontation with people of color has come to the forefront of American politics and news and brought fervent public debate, one must analyze the political and social powers and policies that have contributed to the landscape of crime, police-civilian interaction, and incarceration in modern day America. The “war on crime” movement and the harsh policing tactics associated with it can be directly associated with discriminatory housing policy. In understanding the root causes of this landscape, it is essential to investigate the ways in which discriminatory housing policy has contributed to the development of high pockets of crime and incarceration in low-income areas.

I will investigate housing policy and both economic and sociological studies in order to create an analysis of the impacts of living in concentrated and segregated poverty. Using both quantitative and qualitative evidence, I will attempt to understand the ways in which living in segregated and concentrated poverty results in the diminishing of personal-financial, social, built, and human capital. I will then aim to present the long term economic impacts of discriminatory housing policy, how said economic impacts contribute to high rates of incarceration and crime in these areas, and finally, how high rates of incarceration and crime feed into the cycle of financial peril in the area by limiting the economic opportunity of the formerly incarcerated. ‘

Preliminary results point to redlining, FHA mortgage lending practices, and housing project site zoning as some of the biggest contributors to the creation of concentrated poverty and resulting high crime and incarceration rates. In my research, I will use Chicago’s Robert Taylor homes as a case study in understanding the economic and social effects of concentrated poverty, how it contributes to high crime and incarceration rates, and as a proxy for understanding how to recommend future policy.

Alina Karki

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences/Biological Sciences

Title: Ultrasound as a vehicle to deliver drugs inside the cells**Faculty Mentor:** Jun-Ru Wu, Physics

Abstract: A sound wave with frequency between 1 megahertz to 10 megahertz can excite specially prepared gas encapsulated micrometer size bubbles to oscillate. The bubble oscillations may generate the shear stress to the cell membranes of the nearby cells; the nanometer size holes on form on the cells’ membrane temporarily, the specific drug in the same solution where ultrasound propagates can be delivered into the cells by the radiation force of the ultrasound. Shortly after that, the nanometer holes are patched by the cells themselves. This process is called sonoporation. The objective of this study is to establish sonoporation as a delivery vehicle for delivering siRNA (Small interfering RNA) drug into mice and human liver CD8 cells to silence the expression of MCJ protein. Methylation control-J (MCJ) protein is developed as a therapeutic target for the Non- Alcoholic Fatty liver disease (NAFLD), which occurs by the presence of the fat accumulation in the liver and is emerging as an epidemic disease. Blocking MCJ expression in the liver could be a strategy to increase lipid metabolism in the liver using siRNA drug. The preliminary experimental results will be presented.

Judith Keller

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences

Title: Temporal variation of blood meal detection ability comparing protein mass spectrometry and DNA PCR in Chagas disease insect vectors**Faculty Mentor:** Lori Stevens, Biology; Bryan Ballif, Biology

Abstract: Chagas disease is most prevalently found in Latin America, where transmission by insect vectors in the subfamily Triatominae are responsible for the majority of cases. As vector control is the most effective control strategy to date, identifying vector blood meals is important, especially in regard to how various detection methods can vary over time. We have previously shown that liquid chromatography tandem mass spectrometry is a valuable tool for identifying blood meals using hemoglobin peptides. However, additional proteins such as albumin, the most abundant blood serum protein, have not been explored. In this study we determine the ability to detect vector blood meals over time of individuals fed before or after molting with LC-MS/MS and a DNA-based approach. We determined the ability to detect blood meals by comparing Triatoma protracta specimens experimentally fed on mouse at time points post-feeding and post-molting. Hemoglobin and albumin peptides were detected using LC-MS/MS and assigned to

species to evaluate blood meal detection in addition to SINE-based mouse-specific DNA PCR. At time points post-feeding, blood meals were detected up to 4 weeks and 1 week after feeding using LC-MS/MS and DNA-based PCR, respectively. No post-feeding individuals survived past 4 weeks. Post-molting, hemoglobin and albumin were detected up to 12 weeks post-molting, while no blood meals were detected using PCR. In our study, the hemoglobin signature in the blood lasted longer than that of albumin. Even if less useful for species identification, the presence or absence of albumin peptides could provide an estimate of the time window in which the insect vector fed. Mass spectrometry-based techniques such as LC-MS/MS using hemoglobin peptides for species identification provide a valuable tool for identifying blood meals over long temporal scales and can ultimately aid in identifying vector blood meal prevalence to make sound management and ecohealth decisions.

Alexis Kelly

Oral | 2:00-2:55 | Williams Family Room | Professional Studies - Education

Title: Exploring Mental Health in Elementary School Classrooms: A Mindfulness Approach

Faculty Mentor: Holly-Lynn Busier, Leadership & Development Sciences

Abstract: This project addresses the need for more comprehensive and effective mental health education for elementary school students in our country. As time passes, the stigma associated with mental illness is unfortunately continuing to increase. Elementary schools are the places where students are introduced to language, friendship, and so many other things that they will use daily for the rest of their lives. In my eyes, it is in these years that we can really begin to change the way mental illnesses are viewed in our society by providing students with the tools they need to take care of themselves and others as well as how to reach out for help when they need it.

I began my research process by reading a variety of literature about how to best teach students what mental health and mental illness are as well as how to best educate students about how their minds function. Much of this research points directly at the practice of mindfulness. Therefore I chose to conduct interviews with people who are involved with mindfulness and mental health education. I also enrolled in an online training program through an organization called Mindful Schools that added so much depth and insight to my prior research.

Through my readings, interviews, and online training course I have developed and compiled a variety of resources for educators to bring into their classrooms. These include lesson plans, music recommendations, assorted classroom resources, and examples of how to integrate mindfulness education into other curricular aspects.

Jamie Kelly

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences

Title: Regulation of the Junin Virus Matrix Protein Z by Tyrosine Phosphorylation

Faculty Mentor: Jason Botten, Immunobiology

Abstract: Junin virus (JUNV) is the causative agent of Argentine Hemorrhagic fever, endemic to the Las Pampas region of Argentina, this arenavirus can cause severe disease in humans including hemorrhagic fever. There are currently no FDA-approved vaccinations to prevent JUNV infections, and treatments are currently limited to convalescent immune plasma from survivors and supportive care. The Botten laboratory is investigating host-virus protein interactions that JUNV and other arenaviruses require to replicate. Particular interest has been placed on the effects of phosphorylation by host cell kinases on the arenavirus matrix protein Z. Z is responsible for viral particle assembly and release from the host cell, two critical steps for the virus life cycle. Because of its important role in viral replication, inhibiting the function of the Z protein could be an effective therapeutic strategy. This study characterized the importance of host-mediated tyrosine phosphorylation of the Z protein. Mutation of the phosphotyrosine site results in a decreased ability for JUNV to grow. In addition, several FDA-approved drugs disrupt this phosphorylation event on the Z protein and could potentially be repurposed as a treatment against JUNV infections.

Marie Kenney

Poster | 9:00- 10:30 | Silver Maple Ballroom | Health Sciences

Title: Effect of Propranolol on Melanoma Outcomes

Faculty Mentor: Melanie Bui, Dermatology

Abstract: Retrospective and preclinical studies have indicated that propranolol inhibits migration and angiogenesis of melanoma tumor cells. A chart review will be conducted on 40 patients diagnosed with melanoma to evaluate for a link between propranolol use and tumor outcomes. Additionally, propranolol use in previously identified Runx2 transcription factor positive cases will be identified. Runx2 activity has been shown to mediate resistance to traditional tyrosine kinase inhibitor chemotherapies. This study will aim to determine if there is a relationship between

Abstract (Kenney, cont'd): propranolol use and tumor outcomes. Additionally, propranolol use in previously identified Runx2 transcription factor positive cases will be identified. Runx2 activity has been shown to mediate resistance to traditional tyrosine kinase inhibitor chemotherapies. This study will aim to determine if there is a relationship between propranolol use and anti-melanoma activity as well as use of Runx2 as a potential biomarker for predicting propranolol benefits.

Erin Keough, Logan Werner, Joseph Foley, Elliot Maker, Silvana Liscano, & Hannah Kirshenbaum

Poster | 11:00– 12:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: Improved Water Reclamation System for the International Space Station

Faculty Mentor: Appala Raju Badireddy, Civil & Environmental Engineering; John Lens, Civil & Environmental Engineering

Abstract: As a vital component of an all-encompassing life support system on board the International Space Station, the National Aeronautics and Space Administration has implemented a water reclamation system that collects and processes everything from waste and sweat, to condensate from one's breath, and recycles it for reuse by the crew for a variety of purposes. Over the past several years, however, NASA has identified a trend of growing concern in the water supply on the ISS. Namely, levels of total organic carbons have been undergoing cyclical trends wherein the concentrations of these compounds increase over time, and begin encroaching on their acceptable limit of 3 mg/L. These compounds can have a significant impact on the health of the crewmembers aboard the ISS, and thus must be eradicated from the water supply. The two pollutants that are currently most concerning to NASA are trace levels of methanol and ethanol, which tend to build up within the system and clog crucial membranes in the filtration process, causing their need to be replaced more frequently.

Originally proposed by New Mexico State University as part of their annual environmental design competition, our team has chosen to approach this unique problem, for which we were tasked with developing a method of reducing the trace amounts of methanol and ethanol in the recycled water on the ISS. Considerations for our design included application in zero gravity, low energy and mass requirements, high recovery ratios of safe drinking water, and a fully regenerative solution, due to the high cost of resupplying the ISS. Our team has developed a method using two techniques—pervaporation and photocatalysis—in order to address this problem and maintain safe and sustainable levels of organic compounds in the ISS water supply.

Y-Lan Khuong

Poster | 9:00–10:30 | Frank Livak Ballroom | Health Sciences/International Research

Title: Evaluation of a Modified Extended Focused Assessment with Sonography in Trauma (mEFAST) Curriculum in Uganda

Faculty Mentor: Kristen DeStigter, Radiology

Abstract: BACKGROUND: As access to ultrasound increases, a growing body of literature supports the use of point-of-care (POC) examination. Studies have shown POC ultrasound expediting triage and minimizing time to treatment, leading to improved operational efficiency and outcomes; however, there remains a dearth of effective and affordable sonography education available to resource-limited areas. Our study thus sought to determine the feasibility of implementing a POC emergency ultrasound curriculum to non-emergency healthcare workers through quantitative evaluation of knowledge, qualitative feedback, and assessment of perceived barriers to sustainability.

METHODS: In a collaboration between Imaging the World (ITW) and Global Emergency Care, 12 ITW-trained sonographers and 1 physician were taught an Emergency POC curriculum via didactics and hands-on instruction. Lectures covered the extended focused assessment with sonography for trauma (EFAST), fluid status, pneumonia, and ectopic pregnancy. Each lecture was followed by a practicum component. Moreover, each participant was taught the modified EFAST (mEFAST), a novel ITW protocol based on surface anatomy, during practicum sessions.

An exam testing mEFAST knowledge was administered before, immediately after, and five months after training. Pre-, post-, and five month-surveys were distributed to investigate mEFAST usage, areas for improvement, barriers, and curriculum satisfaction.

RESULTS: Mean pre- and post-training exam scores were 59.6% and 87.5%, respectively, with significant improvement ($p < 0.0001$).

Post- surveys revealed 100% overall satisfaction with all recommending the course. Resources facilitating better mEFAST usage included having a linear probe (40%), more gel (40%), and continuous medical education (30%). Notable recommendations included more time to train and practice (60%) and a room with less light (30%).

The five month test score average was 84.5% with significant improvement ($p < .05$). The follow up survey identified

71.4% utilizing the mEFAST in their practice.

CONCLUSIONS: In under-resourced areas where personnel and diagnostic imaging are limited, point-of-care ultrasound can be taught to non-emergency healthcare workers.

Adil Khurram

Poster | 3:00- 4:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: Aggregate modeling of a fleet of diverse heterogeneous energy resources

Faculty Mentor: Mads Almassalkhi, Electrical & Biomedical Engineering; Luis Duffaut-Espinosa, Electrical & Biomedical Engineering

Abstract: Packetized energy management (PEM) adapts the concept of packet based data transfer in communication networks into energy packets for distributed energy resources (DERs). An energy packet translates to energy consumption for a fixed period of time. Aggregate models of PEM enabled diverse heterogeneous energy resources are essential for the analysis and control of a large population of DERs such as thermostatically controlled loads (TCL) and energy storage systems (ESS). A state bin transition model has been previously developed to capture the aggregate behavior of a diverse homogeneous population of DERs. The DERs stochastically requests an aggregator for an energy packet of a fixed duration. The aggregator accepts/rejects these requests depending upon the available resources. However, the actual population of DERs consists of devices with different parameters and the state bin transition model assumes a homogeneous population of DERs. Therefore, this work focuses on incorporating the parameter heterogeneity in the state bin transition model. The results are compared with agent based micro-simulations of a fleet of PEM enabled diverse and heterogeneous DERs.

Eva Kinnebrew

Oral | 2:00-2:55 | Chittenden Bank Room | Food & Environmental Sciences

Title: Mapping Land Cover Changes in Cuba after the Soviet Union Collapse

Faculty Mentor: Gillian Galford, Rubenstein School for Environmental & Natural Resources

Abstract: After the collapse of the Soviet Union in 1991, trade imports from Soviet countries to Cuba, such as fossil fuels, fertilizers, and pesticides, declined precipitously and changed the way that Cubans could use and manage their land. Many accounts, including government statistics, describe changes in land cover that occurred as a result of this political and economic shift, but such changes have not previously been mapped using remote sensing. In this project, I use Google Earth Engine to map Cuba from 1985 to 2010, in five-year intervals, and test whether trends I detect throughout this time are consistent with historical accounts. I have created natural imagery and NDVI (“greenness”) images for each time step, and also produced classified images for main terrestrial land classes in Cuba. The maps demonstrate that Cuba has experienced substantial forest regrowth from 1985 to 2010, much more than has been officially reported. NDVI scores in forests also increased over this time, perhaps due to an inability to harvest timber without fossil fuel resources. In agricultural land, I detected an increase in abandoned fields starting in the late 1990s, which is consistent with accounts of food shortages during that time. Much of the abandoned agricultural land then converted to forest by 2010. These findings carry important implications for biodiversity, such as the extent to which forest regrowth consists of native forest species or an invasive tree species called marabu, and how soil communities change with land use abandonment or conversion.

Maxwell Knapp

Poster | 9:00-10:30 | Silver Maple Ballroom | Health Sciences

Title: Insurance Type Causing Delays in Skin Cancer Excision

Faculty Mentor: Melanie Bui, Dermatology

Abstract: Skin cancer is a common and serious malignancy. The American Academy of Dermatology recommends that melanoma be removed within six weeks of diagnosis. However, preliminary data suggests that Medicaid and Medicare patients have a significantly higher risk of waiting for longer than six weeks when compared to patients with private insurance. We look to build on this data by studying patients served by UVM, a population which has not been previously studied. In addition, we will examine basal cell carcinomas and squamous cell carcinomas to see if the same patterns are observed in other types of skin cancer. Finally, we will gather data on other social determinants of health and look for other markers which could increase risk of surgical delay.

Deborah Kraft

Oral | 3:00-4:30 | Sugar Maple Ballroom | Biological Sciences/Food & Environmental Sciences/Vermont Studies

Title: Water Quality Impacts of a Woodchip Bioreactor Treatment System Receiving Silage Bunker Runoff

Faculty Mentor: Stephanie Hurley, Plant & Soil Science; Joshua Faulkner, Plant & Soil Science; Eric Roy, Rubenstein School for Environment & Natural Resources

Abstract: Silage bunker runoff is a form of agricultural pollution that contributes to aquatic ecosystem degradation. Current handling and treatment methods for this process wastewater are often ineffective or expensive. A woodchip bioreactor is an emerging treatment technology designed to facilitate denitrification through the provision of an anaerobic, carbon rich environment. A woodchip bioreactor treatment system receiving silage bunker runoff was studied on a dairy farm in Vermont. Sampling occurred at four points within the system in order to determine the efficacy of various treatment steps and to measure flow. Samples were analyzed for TN, NO₃⁻-N, NH₄⁺-N, TP, SRP and BOD in order to compare inflow and outflow pollutant concentrations and loads. Preliminary data suggests that this treatment system reduced nutrient loads and BOD of the silage bunker runoff. The treatment system will be described in detail and data quantifying its performance will be presented.

Katrina Kunker, Radha Patel, Elizabeth Smith, & Kaylee Wolitzer

Poster | 1:00-2:30 | Silver Maple Ballroom | Health Sciences/Education

Title: Online Clinical Mentoring for Physical Therapists Experiencing Professional Isolation: A Pilot Study

Faculty Mentor: Karen Westervelt, Rehabilitation & Movement Sciences

Abstract: Introduction: Clinical mentoring is essential for the professional development of physical therapists (PTs) and has been demonstrated to improve confidence and clinical decision making. PTs working in professionally isolated settings face a unique set of challenges which can result in diminished job satisfaction, recruitment, and retention. These clinicians often have difficulty accessing clinical mentors. The innovative use of technology, including video-conferencing, can help address the challenges facing these healthcare providers by eliminating barriers associated with professional isolation and improving access to clinical mentoring. The purpose of this study was to examine the effects of online clinical mentoring on PTs who experience professional isolation in an outpatient musculoskeletal setting.

Methods: Eight professionally isolated and four expert PTs were divided into four groups. Three one-hour online mentoring video sessions were held over the course of five weeks, in which each professionally isolated PT presented a case study. Data was collected from pre- and post-participation surveys and post-participation focus groups. A mixed-methods phenomenological analysis was used to evaluate the data.

Results: Qualitative results for the mentee group revealed four themes: perspective, reflection, perceived clinical benefits, and feasibility. Three themes emerged for the mentor group: accessible model, advancing the profession, and perspective. Quantitative analysis revealed significant improvement in four areas of confidence. All participants felt the intervention supported professional attributes; 75% of participants reported the group size as ideal, and 75% of mentees felt the program improved both confidence and clinical decision-making skills.

Conclusion: Online clinical mentoring can address several of the barriers facing PTs who work in professional isolation. The online model allows people who would not otherwise have access to postprofessional education to have access to a mentor remotely. This is important for development of professional attributes that promote the advancement of the profession and for addressing the issues surrounding professional isolation.

Hannah Lachance

Poster | 11:00- 12:30 | Frank Livak Ballroom | Biological Sciences

Title: Gene expression analysis of cisco (*Coregonus artedii*) eggs and larvae reared in varying light treatments

Faculty Mentor: Jason Stockwell, Rubenstein School for Environment & Natural Resources

Abstract: Climate change is expected to increase winter temperatures and reduce ice and snow cover on lakes. Such changes could impact the development and hatch time for fish species that incubate over winter, such as cisco (*Coregonus artedii*). Warmer winter temperatures are expected to result in earlier hatch dates, but impacts of an increased light environment through reduced ice/snow cover remain unclear. To test if changes in the light environment could influence cisco egg and larval development, a pilot experiment was conducted during the winter of 2016-2017. Fertilized eggs were exposed to three light treatments: continuous light, regular photoperiod, continuous dark. To understand how these conditions may impact cisco development the transcriptomes of eggs and larvae from each treatment group were sequenced. Various programs will aid in sequence data analysis, including Trinity for de novo

transcriptome assembly. Differential gene expression (DE) between the treatments will be estimated using DESeq2 and gene ontology (GO) will help to identify the function of the DE genes to yield insights to the physiological and developmental impacts of changing ice coverage.

Joshua Laffin

Poster | 3:00-4:30 | Frank Livak Ballroom | Biological Sciences/Health Sciences

Title: Increased Mitochondrial ATP Production from the Loss of MCJ Expression Fuels Drug Efflux through ABC Transporters

Faculty Mentor: Mercedes Rincon, Immunobiology

Abstract: Cancer is an prevalent condition that affects a large population worldwide with over 35% of people being diagnosed at some point in their lifetime. Normal treatment options include the use of chemotherapeutics, but resistance can arise through the increased efflux of these drugs by ABC transporters, namely ABCB1. A novel regulator of complex I of the electron transport chain, methylation controlled J protein (MCJ) was found in recent years and is associated with chemoresistance but the mechanism of this is unknown. Here we show that chemoresistant cancer cells have increased mitochondrial metabolism. Mitochondrial metabolism is necessary for the efflux of chemotherapeutics through ABC transporters. MCJ mimetics are able to restrict mitochondrial respiration and this restriction is able to restore sensitivity to chemotherapeutics. MCJ can be a potential target for overcoming chemoresistance in cancer cells.

Julia Laramee, Claire Crowley, Jackie Tames, Mesa Merritt, & Emma Archibald

Oral | 1:00-1:55 | Williams Family Room | Social Sciences

Title: Why Some Women Never Call it Rape: Examining Sexual Scripts and Rape Myths

Faculty Mentor: Nicole Conroy, Leadership & Development Sciences

Abstract: This presentation will facilitate attendees' thinking about the barriers to naming sexual assault experiences for what they are, and how those barriers are reflective of rape culture. In particular, we will discuss the links between dominant (hetero)normative sexual scripts, rape myth acceptance, and sexual coercion and assault experiences for victims. We will also explore how models of affirmative consent and female sexual empowerment can be used as tools for dismantling rape culture while also acknowledging the challenges associated with these models within the context of rape culture.

Drew Larsen

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences

Title: Nonlinear Impedance Spectroscopy of Organic MIS Capacitors and Planar Heterojunction Diodes

Faculty Mentor: Matthew White, Physics

Abstract: Impedance spectroscopy is a widely used characterization technique for electrochemical and solid-state devices, including batteries, fuel-cells, LEDs, and solar cells. Impedance spectroscopy functions by applying an AC voltage signal at frequency ω to a test device and measuring the AC current response. In a purely linear system, the current response will be sinusoidal of frequency ω , but with different amplitude and phase reflecting the resistance and capacitance of the test device. If nonlinear processes like electron-hole recombination occur, then the resulting current signal will not be a pure sine wave but will have higher harmonic components (ω , 2ω , 3ω etc.). In this experiment, nonlinear impedance spectroscopy (NLIS) was used to investigate higher harmonics of a planar heterojunction. The results found for the planar heterojunction were compared to the results found for MIS capacitor. The MIS capacitor was created by evaporating aluminum onto a glass substrate, anodizing that aluminum to create AlO_x , then evaporating CuPC and silver on top of the AlO_x . The planar heterojunction was created by evaporating aluminum, C60, CuPC and silver onto a glass substrate. In the planar heterojunction structure, holes move through the copper phthalocyanine (CuPC) and can recombine with electrons at the heterojunction. In the MIS capacitor, holes can move freely through the copper phthalocyanine but there are no electrons for the holes to recombine with. Due to electron recombination, it was expected that the planar heterojunction structure would exhibit both linear and nonlinear behaviors in impedance spectroscopy. In the planar heterojunction, we were able to see transition from recombination limited current in the low-medium voltage regime, to space charge limited current under high forward bias. This result explains results from previous experiments such as negative impedance and inertial currents.

Suma Lashof

Poster | 11:00-12:30 | Silver Maple Ballroom | Vermont Studies/Biological Sciences

Title: Genetic Verification of Differentiating Big Brown Bat (*Eptesicus fuscus*) and Little Brown Bat (*Myotis lucifugus*) Colonies by Size of Fecal Pellets**Faculty Mentor:** Bill Kilpatrick, Biology

Abstract: The purpose of this research is to use the scientific method to test the accuracy of using pellet size for species identification of two bat species found in Vermont, the Big Brown Bat (*Eptesicus fuscus*) and Little Brown Bat (*Myotis lucifugus*). This involves extracting bat DNA from unidentified fecal pellets, then amplifying and sequencing the mitochondrial gene, cytochrome oxidase 1 (CO1), and comparing the DNA to known CO1 sequences of *E. fuscus* and *M. lucifugus*. A larger question of concern that this research will help address is whether the number of *E. fuscus* colonies are increasing and *M. lucifugus* colonies are decreasing as a result of White-nose Syndrome (WNS). If this method is genetically verified, the significant difference in size of fecal pellets can be used to identify species when monitoring colony abundance and distribution of each species.

Samantha Lavertue

Oral | 3:00-3:55 | Williams Family Room | Arts & Humanities

Title: Romancing the Statue: Pygmalion and the Modern Romantic Comedy**Faculty Mentor:** Angeline Chiu, Classics; Brian Walsh, Classics; Craig Wells, Theater

Abstract: From the marble beginnings of the *Metamorphoses* to *My Fair Lady* and *Pretty Woman*, Pygmalion and Galatea have been re-carved and recreated throughout time to share a "classic" love story with ever-evolving audiences. This paper examines the use of the Pygmalion myth as a trope and cultural commentary on the interpretations of the love story genre. Through a representative cross-section of modern theatre and film, I analyze the classical reception of an ancient myth to show how it works in a variety of settings and situations, illuminating the popularity and utility of the myth in adaptation.

Catherine Leary

Oral | 3:00-3:55 | Williams Family Room | Arts & Humanities

Title: Keeping Up with the Psychoanalysts: Applying Lacanian Theory to Reality Television**Faculty Mentor:** Hyon Joo Yoo, English

Abstract: *Keeping Up with the Kardashians* is a staple of modern pop culture and provides rich grounds for exploration due to its prominence, controversial nature, and scope of content. I use critical analysis with a basis in Lacanian psychoanalysis, postfeminist theory, and queer theory to explore reality, sexuality, and gender in *Keeping Up with the Kardashians*. I question how these concepts are utilized within the popular reality television show, how their representations onscreen can contribute to the discourse surrounding and understanding of these concepts, and what the future of women on television could be. I focus particularly on finding the subversive potential of the show's content through each of these lenses, despite the way one might assume reality television upholds societal norms and ideals.

Benjamin LeBlanc & Chandler Smith

Poster | 11:00-12:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: Dynamic Response Damage Indicator for Wind Turbine Blade: Feasibility Study**Faculty Mentor:** Eric Hernandez, Civil & Environmental Engineering

Abstract: One of the key challenges facing the wind industry is reducing the cost of operation and maintenance for remote wind farms. High costs are often associated with the difficulty of performing structural inspections of wind turbine blades. Thus there is a cost driven motivation for a reliable structural health monitoring system which can automatically detect the existence of damage before it has reached a critical threshold. In this research, we conduct a feasibility study by using blade dynamic responses to determine the presence of damage. For large structures the change in dynamic response may be undetectable in the presence of noise for small localized damages. In a simulated environment we estimate the minimum trailing edge disbond, a failure mode of wind turbine blades, which can be detected in the presence of noise. Induced stresses in critical locations for damaged blades are then compared against the undamaged blade. This study is performed on the 5 MW reference turbine blade with various trailing edge disbond lengths using a high fidelity finite element model in ANSYS.

Alison Legrand

Poster | 11:00- 12:30 | Silver Maple Ballroom | Social Sciences

Title: The Effect of Emotionally Valenced Stimuli on Response Inhibition Task in Co-Occurring Substance Use and Anxiety

Faculty Mentor: Matthew Price, Psychological Science

Abstract: Poor response inhibition is viewed as a contributing factor to substance use disorder (SUD). Examinations of this relation have largely ignored co-occurring conditions with SUD, such as anxiety disorders. Related work with anxiety disorders suggests such conditions enhance response inhibition, particularly in response to negatively emotionally valenced stimuli. Although co-occurrence of SUD and anxiety is common, no studies have examined the effect emotional valence has on response inhibition in those with co-occurring SUD and anxiety. The current study will examine stop-signal task (SST) performance, a validated behavioral measure of response inhibition, of 71 individuals with a history of opioid use and anxiety. The effect of emotional valence on response inhibition will be explored by use of angry, happy, and neutral facial stimuli on the SST. Participants with a history of substance use and increased anxiety are hypothesized to show enhanced response inhibition relative to those with lower anxiety. It is also hypothesized that those with increased levels of anxiety will have faster responses for negative faces than to happy or neutral emotions. Results suggested that depression (PHQ9: $t(72) = 1.94$, $p = .05$, $d = .49$) and anxiety (BAI: $t(72) = 2.18$, $p = .03$, $d = .55$) were associated with improved inhibition towards emotional (angry, happy) relative to calm. These results suggest that depression and anxiety may be associated with enhance response inhibition ability.

Claire Leitch

Poster | 1:00- 2:30 | Silver Maple Ballroom | Health Sciences

Title: The Impact of PEG Tubes on QOL in Patients with ALS

Faculty Mentor: Amy Nickerson, Nutrition & Food Sciences

Abstract: Background: The use of percutaneous endoscopic gastronomy (PEG) tubes in patients with amyotrophic lateral sclerosis (ALS) is associated with lower mortality. However, the impact of PEG tubes on health-related quality of life (QOL) is not clear.

Objective: To determine the impact of PEG tubes on QOL in patients with ALS.

Methods: In-person paper surveys were conducted at ALS clinic visits at an outpatient rehabilitation center in Vermont. Participants rated symptoms such as fatigue, pain, strength, and ability to move, using a 10-point Likert Scale. Individuals' responses were averaged to determine overall QOL. Of the 23 patients who participated, three had PEG tubes.

Results: No correlation was found between the use of PEG tubes and QOL in people with ALS.

Conclusions: Multiple factors affect QOL among people with ALS. Future research should include a larger group of participants and compare individuals' responses before and after PEG placement.

Meghan Letizia

Oral | 1:00- 1:55 | Williams Family Room | Arts & Humanities

Title: Abortion Politics in New York State in the 1970s

Faculty Mentor: Felicia Kornbluh, History

Abstract: Under the close supervision of Professor Felicia Kornbluh (History Department/Gender, Sexuality, and Women's Studies (GSWS) Program), I spent the summer of 2017 working part-time collaborating on a previously untouched study of abortion politics in New York State in the late 1960s and 1970s. This research specifically is investigating the law passed in New York State in 1970 that decriminalized abortion- a law notably passed three years before the Roe v. Wade decision.

Erika Lewy

Poster | 3:00- 4:30 | Silver Maple Ballroom | Social Science/Arts & Humanities

Title: There is a positive relationship between the degree of development of feminist identity in a woman's partner and her own psychological well-being

Faculty Mentor: Tao Sun, Community Development & Applied Economics

Abstract: Previous studies showed that women with moderate and developed feminist identities scored higher in terms of psychological well-being than those who held more traditional gender values (Saunders and Kashubeck-West 2006). Other studies showed that people in relationships with partners who they considered to be feminist had healthier relationships and experienced greater sexual satisfaction than those who did not have feminist values, measured

Abstract (Lewy, cont'd): by the degree of acceptance towards assertive and autonomous women (Rudman and Phelan 2007). This research specifically is investigating the law passed in New York State in 1970 that decriminalized abortion— a law notably passed three years before the Roe v. Wade decision. (Saunders and Kashubeck-West 2006). Other studies showed that people in relationships with partners who they considered to be feminist had healthier relationships and experienced greater sexual satisfaction than those who did not have feminist values, measured by the degree of acceptance towards assertive and autonomous women (Rudman and Phelan 2007).

It is known that the healthiness of a relationship affects the psychological well-being of each partner in the relationship (Umberson and Montez 2010). It follows that, because individual's psychological well being is affected by the health of their relationship, and because the health of the relationship is improved when individual's perceive their partners to be more feminist, that people in relationships with partners they perceive to be more feminist have more markers of psychological well being.

Based on the discussions above, I propose the following hypothesis.

Hypothesis: There is a positive relationship between the degree of development of feminist identity in a woman's partner and her own psychological well-being.

Raquel Lima

Poster | 3:00-4:30 | Frank Livak Ballroom | Biological Sciences/International Research

Title: A description of *Triatoma huehuetenanguensis* sp. n. (Hemiptera, Reduviidae, Triatominae) and its epidemiological importance for Chagas transmission in Guatemala.

Faculty Mentor: Lori Stevens, Biology

Abstract: More than a million cardiomyopathy cases in Latin America as of 2010 were caused by Chagas disease due to the parasite *Trypanosoma cruzi*. This illness is mainly transmitted through the parasite-infected feces of insects from the subfamily Triatominae (Hemiptera: Reduviidae). Known colloquially as kissing bugs, the group is currently divided into 5 tribes and 15 genera. Among these genera, the *Triatoma* and *Rhodnius* (tribes Triatomini and Rhodniini, respectively) are the most epidemiologically relevant for Chagas transmission.

The genus *Triatoma* is the most diverse, comprising over half of the described Triatominae species. *Triatoma dimidiata* s.l., the most important Chagas disease vector in Central America, is a species complex including at least three independently evolving lineages, previously referred to as groups 1 – 4, which were suggested to be composed of at least three species: groups 1 and 2 – *T. dimidiata* s.s., group 3 – *T. sp. aff dimidiata*, group 4 – *T. sp. aff dimidiata cave*.

In this study, a new species for the genus *Triatoma* (Hemiptera, Reduviidae) is described here from specimens collected in the department of Huehuetenango, Guatemala. *Triatoma huehuetenanguensis* sp. n. (pronounced: way way ten an gwen sis) is closely related to *Triatoma dimidiata* s.s. (group 1-2) with the following main differences: lighter color, smaller overall size, including head length, width and length of the pronotum. Natural *Trypanosoma cruzi* infection, coupled with the presence in domestic habitats makes this species a potentially important vector for Chagas disease transmission in Guatemala.

Silvana Liscano

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences

Title: The Evaluation of Variation of Crash Contributing Factors After the Implementation of Vision Zero in the Different Boroughs of New York City

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: The alarming number of New Yorkers seriously injured served as an encouragement for the implementation of the Vision Zero plan. In 2014 New York City increased enforcement against dangerous moving violations, such as speeding, failing to yield pedestrians, signal violations, improper turns/ disobeying signage, and

phoning/texting while driving. According to previous studies the first three years of Vision Zero have been the safest three-year period in the City's history. This study describes research aimed at answering two questions about the effectiveness of this plan: (a) What kind of contributing factors for crashes have been reduced and which ones have increased in each borough of the city, (b) According to the contributing factors of the crashes, which of the implemented areas of the plan have been more effective engineering, enforcement or education in the different boroughs. These findings will indicate what kinds of contributing factors remain as the leading causes for crashes fatalities by borough and which kinds of considerations should be made for continuous implementation of the Vision Zero plan.

Sylvie Littledale

Poster | 11:00-12:30 | Silver Maple Ballroom | Social Sciences/International Research

Title: Studying Sense of Place in the Peruvian Highlands

Faculty Mentor: Deborah Blom, Anthropology

Abstract: In the Huarochirí province of Peru, there exists a combination of historical and ethnographic evidence that reflects a dynamic relationship between people and the landscape they live in. The existence of the document known as the Huarochirí Manuscript, a collection of oral traditions written in Quechua by an indigenous scribe in 1608, has generated a considerable amount of academic research in the region. The content of the manuscript includes a detailed geography of Huarochirí that has been utilized as a guide to contextualize archaeological and historical research. My approach was to focus on this content in the context of highland farming and herding communities in Huarochirí today in order to examine the similarities and differences in expression of “sense of place” over time in the Huarochirí region. These communities still use a detailed system of pre-Hispanic place names and maintain oral traditions that reflects their belief in a powerful animate landscape. My research consisted of documenting these toponyms and traditions in two communities in the Rio Seco/Carnacha Ravine in the District of San Andrés de Tupicocha in the Huarochirí Province.

Ryan Lombreglia

Poster | 11:00-12:30 | Silver Maple Ballroom | Social Sciences/Mathematical & Physical Sciences/

Title: The Effects of Roundabouts on Safety in New Jersey

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: Roundabouts have become an increasingly common traffic pattern in the United States due to their ability to reduce idle time and delay, as well as potential safety improvements. Roundabouts have become a very polarizing subject among the transportation sector and public alike because of the complexity and difficulty some drivers experience. This paper assesses the question of whether or not traffic circles are in fact an effective method to improve safety of signalized intersections. Potential influencing variables considered are speed limit, traffic volume, lane configurations, driver license state, and years since major modifications. Yearly crash incident reports and the Traffic Monitoring System provided by the New Jersey Department of Transportation are analyzed to determine crash rates. The data sets are individual for each year and contain rows of crash incidents with details of driver's state of licensure, location, severity, intersection type, etc. Existing roundabout crash data is compared with crash data from conventional intersections with similar conditions. Over 1000 roundabouts currently exist in the United States, yet there is no consensus opinion of their effect on safety. The results of this study can induce a widespread trend in the trend in the transportation industry either toward or away from the incorporation of roundabouts.

Juan Lopez

Poster | 11:00-12:30 | Silver Maple Ballroom | Mathematical & Physical Sciences/Social Sciences

Title: Open Container Laws and their effect on Alcohol-Impaired Driving

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: New efforts to reduce alcohol-impaired driving and study their origins are valuable in reducing casualties related to crashes with intoxicated drivers. In 1998, the federal government enacted the Transportation Equity Act for the 21st Century (TEA-21) with a subsection encouraging States to enact open container laws with the incentive of Federal-aid highway funds. As of 2018, 39 of the 50 states, the District of Columbia, and Puerto Rico currently comply with the TEA-21, with the non-compliant States having no open container law or similar limits to those of TEA-21 compliance. A t-test for mean alcohol crashes per population across states with container laws and without open container laws can provide the following insights: (a) the efficacy of open container laws in their reduction of the risk of alcohol related fatal accidents. (b) how effective non-compliant states' other initiatives to curb drunk driving are compared to similar initiatives in a TEA-21 compliant open container law state. (c) the behavioral implications on drivers depending on their state's open container law. Annual data on the fatal crashes and percent involving alcohol-impaired driving per state since 2010 provided the National Highway Traffic Safety Administration (NHTSA) will be used for analysis. With information gathered from an analysis on the effects of an open container law, the findings can serve as added encouragement for non-compliant States to reevaluate their current legislature, or as data for compliant States to consider the initiatives non-compliant States use to effectively curb drunk driving in addition to their legislature.

Katie Lukes

Poster | 9:00-10:30 | Frank Livak Ballroom | Professional Studies - Business

Title: Eller Ethics Case Competition: Cyberattack**Faculty Mentor:** John Monahan Jr., Grossman School of Business

Abstract: In October 2017, we represented the Grossman School of Business at the Eller Ethics Case Competition in Tucson, AZ to sort out a case asking how -- given ethical, legal, and financial considerations -- a large corporation should respond to a massive data hack. We had a little over a week to research the pertinent issues and then prepare a recommendation and deliver a 20 minute presentation to the hypothetical corporation's Board of Directors. They competed against teams from 25 universities from the United States, Canada, and Mexico, and were runner-up for their district with compliments from the judges. The team advised the Board not to hack back, and recommended the company take proactive measures in line with current industry best practices to defend against future cyberattacks.

Kimberley Mack Nair

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: Overwintering Bumblebee Queens: Habitat conditions and pathogens during hibernation**Faculty Mentor:** Samantha Alger, Biology

Abstract: Bumblebees are important pollinators of wild plant species and agricultural crops. However, numerous bumblebee species (*Bombus* spp.) around the world are facing steep population declines endangering food production, wild plant pollination, and biodiversity. Threats to these species include habitat loss as well as pests and pathogens such as RNA viruses and microsporidian *Nosema bombi*. The persistence of a bumblebee species relies on queens to successfully overwinter and colonize. Therefore, understanding these threats to bumblebee queens, especially while overwintering, is critical to safeguarding these species. However, few studies have examined overwintering queens because they are difficult to find. In 2016, we discovered an overwintering site for *Bombus impatiens* queens and made collections of queens both during the fall and again in the spring after emergence. During collections, we collected data vital to understanding preferred habitat for overwintering queens including soil type, depth under soil, queen density, and temperature. Building on our previous work, we will use molecular techniques to investigate the pathogen community present in the overwintering queens we collected and examine differences before and after hibernation. Very little research has examined overwintering queens and whether pathogen community affects overwintering success. Results of this work will provide novel information on the pathology of the overwintering queens that is needed by conservationists to protect the future population levels as well as contribute to what is known about the habitat selection of the bumblebee queens.

Harlee Madsen

Poster | 3:00-4:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: The Effect that the Age of Passengers has on Adult Drivers in the United States**Faculty Mentor:** Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: Many factors contribute to the traffic crash rates that are seen in the United States. Prior studies suggest that there is a difference in crash rates for young drivers (<21 years) and older drivers (>65 years) based on the presence of passengers in the vehicle, but a study has not been conducted on how having a certain age passenger can affect the crash rates for an adult driver (>21 years and under 65 years). This paper describes research aimed at answering the following questions: Does the age and presence of passengers affect the relative crash causing propensity of adult drivers in the United States? The dataset being used for this research is the 2009-2016 Fatality Analysis Reporting System (FARS) database which contains all the fatal traffic crashes in the United States and is maintained by the National Highway Transportation Safety Administration. The findings of this study will inform educational efforts related to precautions when faced with the potential distraction or beneficial co-piloting effects in the form of passengers.

Sam Magill-Dohan

Oral | 10:00- 10:55 | Chittenden Bank Room | Social Sciences

Title: Price Premiums for the Wild Caught Ornamental Fish: Rio Negro, Brazil**Faculty Mentor:** Donna Theresa Harrington, Economics

Abstract: The wild caught ornamental fish market, that is based out of Barcelos, Brazil can drastically change how we talk about preserving the Amazon rainforest. This is done by providing employment opportunities to the locals in a manner that is dependent on the Amazon to remain in pristine conditions. These individuals are employed in the harvest and export of wild caught fish in the area. To maximize employment opportunities, hobbyist shops in the

United States and Europe must be able to make a higher profit on the wild caught fish than the farmed fish, which will then in part be returned to the fish harvesters in Barcelos. The purpose of this paper is to determine whether shops in the United States will be able to charge a higher price for the wild caught fish, and what steps are necessary to successfully implement a higher price.

Sarah Marchisio, Madelaine Mitchell-Ward, Sydney Swindell, & Rachel Zajchowski

Oral | 2:00- 2:55 | Williams Family Room | Health Sciences

Title: Suicidality, Physical Activity, and Sport Participation in US Middle and High School Students

Faculty Mentor: Jeremy Sibold, Rehabilitation & Movement Science; Erika Edwards, Mathematics & Statistics

Abstract: OBJECTIVE: Exercise is inversely related to both sadness and suicidality in developing adolescents. To date, the literature has addressed neither the contextual factors or the dynamic fluctuations of these relationships in middle and high school children over time. The purpose of this study is to examine the temporal changes in the relationship between physical activity, sport participation, sadness, and suicidality in students in grades 6-12 in the U.S.

METHOD: Using the 2015 National Youth Risk Behavior Survey (N=15,624), regression models adjusted for age, sex, and race estimated the odds ratios between sadness, suicidal ideation, and suicidal attempts, stratified by exercise and sports participation.

RESULTS: Overall, 19.7% of students in grades 6-12 reported suicidal ideation or attempt. Only 68.4% of students reported ≥60 minutes of physical activity on four or more days of the week, and 55.2% reported sport team participation. Physical activity on four or more days per week was associated with a 27% reduction in the odds of suicidality, and sport team participation was associated with 17% reduction in suicidality.

CONCLUSIONS: Exercise and sport team participation are inversely related to sadness and suicidality in adolescents and this relationship persists throughout adolescence. Future research should examine the influence of exercise and sport participation on a longitudinal basis and identify other biopsychosocial factors that may be contributing to these results in developing adolescents.

Edward Marques

Oral | 1:00-1:55 | Chittenden Bank Room | Biological Sciences/Food & Environmental Sciences

Title: Development of Stay-green Chickpea Technology to Benefit Small-holder Farmers in the Semi-arid Tropics

Faculty Mentor: Eric Bishop-Von Wettberg, Plant & Soil Science

Abstract: Chickpea is the second most grown pulse legume worldwide and is a primary source of plant protein for 15% of the world's population living in semi-arid tropical (SAT) regions. In these regions, fluctuations in chickpea production and consumption threaten the nutritional and economic status of the subsistent farming communities. In many of these SAT regions, chickpea crops are typically raised during the low-income post-rainy season in variable rain-fed conditions which largely affects its production. Thus, finding and introducing chickpea adapted to these conditions is a practical strategy to enhance chickpea production value chains of the semi-arid tropics. One viable option to overcome this post-rain season and limited irrigation environment is "cosmetic" stay-green chickpea technology. This stay-green chickpea type carries a deleterious mutation of the StGR1 gene that inhibits enzymes of the chlorophyll catabolism pathway, which leads to extended chlorophyll retention in seeds and leaves. Consequently, elevated levels of chlorophyll may extend the lifespan of light harvesting antennae (and increases production of reactive oxygen species (ROS)) in plant tissues, which in turn, requires additional maintenance in the form of higher carotenoid levels, the ROS scavengers. Higher levels of carotenoids involved in photo-oxidative protection are very likely to enhance the nutritional value of the crop since these are also precursors of vitamin A. Therefore, the goal of this study is to investigate the effect of this trait on key agronomic parameters and response to growth in SAT (drought-prone) regions. With the use of the introgressed StGR1 gene (from donor parent ICC16340) on the background of two cultivars (KAK2, JGK1) fixed for phenology and harvest index. We assessed the StGR1 mutation effect on basic agronomy traits, plant water use-related traits, responsiveness to soil and atmospheric drought, chlorophyll contents, and carotenoid concentrations.

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Carolyn Marquis

Poster | 3:00-4:30 | Frank Livak Ballroom | Biological Sciences/Health Sciences

Title: Investigating the Role of Kif18A in Colorectal and Triple Negative Breast Cancer**Faculty Mentor:** Jason Stumpff, Molecular Physiology & Biophysics

Abstract: Triple negative breast cancer (TNBC), one of the most aggressive breast cancer subtypes with a high rate of patient relapse and a low survival rate, affects approximately 15% of women diagnosed with breast cancer. The median survival for women with metastatic TNBC is less than 12 months, and there are currently no approved targeted therapies for the treatment of TNBC (Abramson et al. 2015). TNBC is characterized by a lack of estrogen and progesterone receptors, as well as the lack of overexpressed human epidermal growth factor receptor; all three of these receptors are commonly used as targets for standard breast cancer therapeutics, making TNBC particularly challenging to treat. One potential for targeted therapy of TNBC is through the exploitation of mitotic spindle regulators involved in cell division. TNBC cells typically lack chromosome stability, leaving them more susceptible to changes in mitotic regulation. Since normal human epithelial cells do not exhibit this chromosome instability, mitotic regulator proteins have potential for being a minimally toxic target for TNBC therapy. Ideally, this difference in chromosome stability would allow for the prevention of TNBC cell division through the inhibition of certain kinesin proteins involved in mitotic regulation, while having no effect on normal human cells. The goal of this project is to test the molecular basis for this hypothesis by inhibiting various mitotic regulator proteins in TNBC cell lines and determining the molecular mechanisms of any proliferation defects upon kinesin inhibition.

Caroline Martin

Poster | 11:00- 12:30 | Silver Maple Ballroom | Social Sciences

Title: The Moderating Role of ADHD Symptoms on the Association Between Physical Activity Behavior and Early Language Ability among a Community Sample of At-Risk Preschoolers**Faculty Mentor:** Betsy Hoza, Psychological Science

Abstract: A growing literature highlights an important link between children's engagement in aerobic physical activity (PA) and their cognitive ability (CDC, 2010). As such, researchers have begun to examine use of PA as a tool to promote cognitive development among children most at-risk for cognitive impairment. Recent work in this domain has focused on Attention-Deficit/Hyperactivity Disorder (ADHD; Hoza et al., 2016), a disorder that often co-occurs with neuropsychological deficits and academic difficulties (Weyandt & Gudmundsdottir, 2015). However, research to date primarily samples elementary-aged children, and therefore, little is known about the possible effects of PA on adjustment for preschool children, a population that has the potential to benefit greatly due to the rapid cognitive development that occurs during early childhood. Thus, the current study sought to examine whether the association between PA behavior and early language ability in an at-risk preschool sample depends on the extent to which children display symptoms of ADHD. Using a sample of 58 children (Mage = 3.99, SDage = .66; 55% male), the present study found that among children with higher levels of ADHD symptoms (i.e., +1SD above the mean), higher percentages of PA were associated with higher levels of early language ability ($b = 173.72, p = .016$). For individuals with lower levels of ADHD symptoms (i.e., -1SD below the mean) the association between PA and early language ability was not significant. Findings from this study highlight that PA may serve a key role in the development of early language ability among preschool children, especially for those children most at-risk for cognitive impairment. Although this work is preliminary, the current study has important potential implications for early intervention. Results demonstrate PA may be a viable intervention to promote school-readiness among preschool children with attention and behavioral problems.

Lea Martin

Oral | 2:00-2:55 | Chittenden Bank Room | Food & Environmental Sciences/Vermont Studies

Title: Iron Oxide Nano-composite Membranes for Phosphorus Removal**Faculty Mentor:** Appala Raju Badireddy, Civil & Environmental Engineering

Abstract: In this study, iron oxide nanocomposite membranes composed of iron oxide nanoparticles, carboxylate multi-walled carbon nanotubes (MWCNT-COOH), and cellulose nanofibers were created to remove phosphorus from water through the process of adsorption. The adsorption ability of the membrane coupons was observed, as well as, the filtration process and other characteristics of the membrane coupons. An adsorption capacity experiment determined a single membrane coupon has the ability to remove about 7% of the phosphate from the initial phosphate solution. The membrane coupons have an area of about 7.065×10^{-4} m². Additionally, the phosphate adsorption Langmuir isotherm model determined that an ideal membrane coupon, which should contain about 0.7236 mg of iron, will have a maximum adsorption capacity of 31.5 mg of solute adsorbed per gram of adsorbent when a complete monolayer is

formed. Furthermore, a filtration experiment was performed to determine if a single membrane coupon could continuously adsorb phosphate under dead-end microfiltration conditions. These preliminary experiments of the iron oxide nanocomposite membrane coupons show promising results of their ability to remove phosphorus from water. As more research is continued on these membrane coupons, the potential for phosphorus recovery, as well as, the possibility of the reuse of the membrane coupons would be a significant area to focus new research on.

Rachel Mason

Oral | 3:00-4:30 | Sugar Maple Ballroom | Food & Environmental Sciences/Mathematical & Physical Sciences/Vermont Studies

Title: Challenges and opportunities for dairy farms in a warmer, wetter Vermont

Faculty Mentor: Scott Merrill, Plant & Soil Science; Josef Görres, Plant & Soil Science

Abstract: Vermont's climate is changing, and dairy farms will need to adapt. In 2017, farms had to cope with wet spring weather that delayed them planting their crops. In 2016, the complication was a hot, dry summer. Overall, temperatures have been rising and heavy rains becoming more frequent. These conditions pose a number of challenges. Heavier rain will increase the potential for erosion, runoff, and nutrient losses from farms, and it is not yet clear whether currently-used best management practices will remain as effective. On the other hand, a longer, warmer growing season could result in higher corn, hay, and pasture yields and more opportunities to plant erosion-preventing cover crops in the winter.

To understand the challenges and opportunities that Vermont's dairy industry may face in the coming decades, we are modeling crop yields, runoff, erosion and nutrient losses from several representative farms. These farms took part in a program that measured the sediment, nitrogen, and phosphorus leaving their fields, and we are using that information to create well-calibrated simulations of their corn- and hay-growing operations. Running the simulations forward in time using artificially-generated weather, we will look for climate factors that tend to lead to especially good and bad outcomes. For example, we may find that cover crops help to conserve nutrients and maintain yields in most circumstances, but that those benefits drop suddenly when heavy rains occur at a particular time of year.

We hope that this study can identify environmental-economic "win-win" scenarios, and also warn of points of particular vulnerability. In this talk I'll show how the model development is progressing, and perhaps also present some preliminary results.

Antonia Matthews

Poster | 3:00-4:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: The Impact of Age on the Injury Severity of Pedal Cyclist Crashes on Roads

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: Every year hundreds of pedal cyclists are casualties of crashes on roads in Great Britain and elsewhere. The Department of Transport (DoT) faces the challenge of reducing that number, for example through education or more dedicated cycle lanes. The objective of this study is to analyse the effect that age of the cyclist has on the severity of the crash. The DoT began collecting data on the ages of cyclists involved in crashes and the severity of those crashes in 1979. Four age brackets are used in this study: children (0-15), young adults (16-29), adults (30-59) and elderly (60+). This paper aims to answer the research question of people in which age bracket are the most injured in crashes and how this proportion has changed over time. The analysis will use statistical modelling to determine which of the variables including gender and road class are associated with the more severe crashes and whether the number of crashes is increasing or decreasing with time. The result will help inform the DoT on the extent that age influences crash severity and therefore aid them in implementing safeguards to reduce the number of crashes.

Cai McCann

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences

Title: Testing for Natural Selection on the COII Gene of the Chagas Disease Parasite, *Trypanosoma cruzi*

Faculty Mentor: Lori Stevens, Biology

Abstract: The protozoan parasite *Trypanosoma cruzi* is the etiological agent of Chagas disease, a neglected tropical disease with ~70 million people at risk, 28,000 new cases/year, and 12,000 deaths/year. People who develop the chronic phase of Chagas may experience severe myocarditis, mega esophagus or megacolon, and often death. Even so, most of Chagas disease research concerning the vector and parasite focuses on South America, with few studies concerning Central and North America.

Organisms, such as this parasite, contain unique variations in the genetic material encoding proteins and thus life.

Abstract (McCann, cont'd): By investigating a protein sequence's evolutionary history, one may infer the mechanisms by which properties specific to these proteins underwent Darwinian selection. Positive selections for these molecular features inform the evolutionary advantages of a protein expressed in an organism, such as evolutionarily conserved protein sequences that express specific enzyme active sites, protein interaction domains, and more.

My project examines the four major forces contributing to genetic variation within populations, selection, random genetic drift, migration and mutation, in the mitochondrial Cytochrome Oxidase subunit II (COII) gene. This project currently utilizes samples of parasite DNA from the abdomens of insect vectors (*Triatoma dimidiata* and *T. nitida*) naturally infected with *T. cruzi* across North and Central America. Understanding how *T. cruzi* strains have evolved can provide information that can be used not only to create new drug targets but also to understand host-parasite interactions and provide information for epidemiology.

Morgan McNellis

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences

Title: Expression of Collapsin Response Mediator Proteins in the vertebrate visual system and their roles in eye development

Faculty Mentor: Alicia Ebert, Biology

Abstract: Collapsin response mediator proteins (CRMPs) are molecules involved in the development of the nervous system in zebrafish (*Danio rerio*). They sit on the microtubule cytoskeleton of growing neuronal axons, keeping them stable. When phosphorylated by downstream signaling from guidance cues, the CRMPs lose affinity for the microtubules rendering them unstable and prone to dissociation. There are six CRMPs in zebrafish (1-4, 5a, and 5b), and while some have been extensively studied, many have not. This project aimed to identify the gene expression patterns throughout zebrafish neural development. Here, we demonstrate expression patterns of CRMPs 1-4 by in situ hybridization. CRMPs 1-4 all show strong expression within the developing eyes. Of particular interest is expression of CRMP 2 and 4, who were both expressed strongly in the developing retinal ganglion cells (RGCs) that form the optic nerve, and were therefore chosen to create CRISPR mutants. Global Cas9 and Nanos-Cas9 mRNA combined with the guide RNA for CRMP 2 or 4 have been injected into zebrafish embryos. Expected phenotypes include retinal abnormalities in tissue layers (specifically the RGC layer), smaller overall eye size, and a decrease in the presence of the optic tract. Phenotypic observations and genotyping of the outcrossed injected Fo population of CRMP 2 and 4 mutant fish will confirm the presence of a mutation.

Kali McPeters

Oral | 10:00-10:55 | Sugar Maple Ballroom | Food & Environmental Sciences

Title: Farm to Facebook: The Role of Social Media in Information Diffusion

Faculty Mentor: Sarah Heiss, Community Development & Applied Economics

Abstract: This project explores how social media facilitates the adoption of farm practices and strategies. Results will focus on how farmers engage with social media platforms and how messages and production strategies are shared and disseminated.

Kevin Melman

Poster | 3:00- 4:30 | Frank Livak Ballroom | Biological Sciences

Title: Global Analysis of Rotifer Guild Ratio in Relation to Daphnia Abundance

Faculty Mentor: Jason Stockwell, Rubenstein School for Environment & Natural Resources

Abstract: Zooplankton community structure is influenced by many forces, including food quality and quantity. Competition for food plays an important role in determining which species will dominate in a system at a given time. The size-efficiency hypothesis predicts that larger organisms will outcompete smaller organisms vying for similar food items. Among freshwater zooplankton, *Daphnia* are large, efficient, herbivorous filter feeders that often outcompete smaller herbivorous zooplankton, such as some rotifers. Numerous studies have found that while *Daphnia* abundance tends to negatively relate to microphagous (i.e., herbivorous) rotifer abundance, predatory rotifer populations remain relatively uninfluenced because they target different food sources. The rotifer guild ratio (GR') describes the proportion of predatory to microphagous rotifer biomass in lakes. Previous work suggests that as the percent biomass of cladocerans increases in a system, GR' increases as predatory rotifer biomass increases relative to microphagous rotifer biomass, likely because *Daphnia* outcompete microphagous rotifers. Our hypothesis is that in more eutrophic systems, pelagic primary productivity is high enough to dampen competition between *Daphnia* and microphagous rotifers, and thus we expect competitive influence of *Daphnia* on rotifer community structure to decrease as lake

productivity increases. We compiled rotifer and zooplankton data from 51 lakes and reservoirs of varying trophic state across 14 countries, and tested our hypothesis. Preliminary results indicate that GR' does not significantly correlate with Daphnia biomass, regardless of system productivity. Recommendations for future research includes investigating the relationship between other zooplankton taxa and GR', along with adding more ultra-oligotrophic and hyper-eutrophic systems into the analysis.

Emily Millar

Poster | 11:00-12:30 | Frank Livak Ballroom | Biological Sciences

Title: How Does Salt Stress Affect the Processes of Infection and Nodulation in *Medicago truncatula*?

Faculty Mentor: Jeanne Harris, Plant Biology

Abstract: The salinization of soils worldwide threatens the use of legumes in agriculture as biological sources of nitrogen. Plants of the legume family are of high agricultural importance, both as fodder for livestock and as a source of protein in developing nations and in plant-based diets. These plants form a symbiosis with soil bacteria, *Rhizobium*, which can fix atmospheric nitrogen into a plant-usable form, by growing a specialized form of root tissue called a nodule to house them. This symbiotic nitrogen source reduces the need for external fertilizer application to the plant, channels excess nitrogen to grow protein-rich seeds, and also enriches the surrounding soil with nitrogen, which explains why it is traditionally used by Native Americans in “three sisters” farming. As salinized soils increase around the world due to climate change, overuse of groundwater, and intensive irrigation, these uses for legumes are under threat, as their symbiosis is inhibited by salt, which reduces nodulation, nitrogen-fixation, and nodule respiration. Because the phytohormone abscisic acid (ABA) is known to mediate plant responses to salt and other environmental stresses, we examined whether ABA levels within the nodule of *Medicago truncatula*, a model legume, are affected by moderate salt stress. We also examined whether infection, the first step in the symbiosis, is affected by moderate salt stress. Together, these approaches will help us understand how salt affects nodulation and how it can be mitigated.

Rebecca Mirhashem

Poster | 1:00-2:30 | Silver Maple Ballroom | Health Sciences

Title: An Investigation of the Directional Relationship Between PTSD Symptoms and Substance Related Problems in a Sample of Opioid Users

Faculty Mentor: Matthew Price, Psychological Science

Abstract: PTSD is highly comorbid with opioid use. Childhood maltreatment and poor emotion regulation are risk factors for both conditions. The severity of maltreatment experienced is correlated with the degree of substance use broadly and substance related problems specifically. The present study used structural equation modeling to evaluate two models in a sample of 83 individuals who had a history of opioid use. One model assessed substance related problems leading to PTSD symptom severity, and the other model assessed PTSD symptom severity leading to substance related problems. The model with PTSD leading to substance related problems revealed better fit statistics ($\chi^2(5) = 2.12, p = 0.83; RMSEA < 0.01, 95\% CI [< 0.01 \text{ to } 0.09]; CFI = 1.00; SRMR = 0.04; BIC = 2143.38$) than the model in which substance related problems led to PTSD ($\chi^2(5) = 26.41, p < .01; RMSEA = 0.23, 95\% CI [0.15 \text{ to } 0.32]; CFI = 0.58; SRMR = 0.11; BIC = 2167.67$). These findings support the need to evaluate trauma symptoms in those seeking substance use treatment. Trauma-targeted interventions may have better treatment outcomes in those with co-occurring substance use and trauma-related disorders than interventions targeting substance related impairment.

Jordan Mitchell, Mattie Friberg, TJ Wasserman, Juliet Duncan, Mark Hendry, & Henry Tynes

Creative | 1:00-2:30 | Fireplace Lounge | Vermont Studies

Title: Telling the Story of Vermont

Faculty Mentor: Richard Watts, Geography

Abstract: The Center for Research on Vermont's mission is to make accessible research in the Vermont “laboratory”—research that provides original knowledge to the world and adds to understanding of the state's social, economic, cultural and physical environment. In this project, students developed nine separate videos examining aspects of Vermont research and prominent Vermont researchers. Stories were chosen based on contribution to understanding Vermont and the state's policy, arts and historical cultures. Students worked with their advisor to choose subjects, conduct the interviews, collect b-roll and archival photos, produce and edit and post to the finished videos.

Subjects include: Kevin McKenna, Peter Shumlin, David Sharpe, David Goodman, Beth Mintz, Geeda Seaforce, Paul Bruhn, Tom Slayton, David Goodman, Shaina Haines, Cynthia Reyes, Cindi Wright, Emma Allen.

Hailey Moll, Eric Guzzetta, & Jon Ancowitz

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: Analyzing the Dispersal Patterns and Diversification of Genus *Eriophora* in the Caribbean Archipelago through Molecular Phylogenetics

Faculty Mentor: Ingi Agnarsson, Biology

Abstract: Our participation in the Caribbean Biogeography project (CarBio) in the Agnarsson lab aims to achieve a biogeographical synthesis at a scale not attempted before in this region. Biogeography refers to the distribution of species in space over geological time-scales (millions of years), including questions such as, when and how did species colonize islands and how (and why) have they diversified? The key goal is to reconstruct the evolutionary and biogeographical history of multiple independent lineages, which subsequently are analyzed comparatively against geographic hypotheses for the formation of Central America. Our study focuses on a genus of orb-weaving spider, *Eriophora*, which is endemic throughout the Caribbean islands, northern South America, and the southern belt of North America. Specimens were collected at various locations throughout its distribution. Specimens were identified to species level, as defined in existing literature, and photographed for species documentation. DNA extraction and polymerase chain reactions (PCR) were run for all 76 specimens, examining the CO1 gene. This matrilineally-inherited gene does not yield a complete picture of historical biogeography, however, it provides us with a preliminary phylogenetic tree that we will use to determine which specimens need further gene-examination.

Specimens with a conspicuous CO1 gene after gel electrophoresis are sent for DNA sequencing. Once the sequences are obtained, we will construct the preliminary phylogenetic tree using the program Mesquite. This phylogenetic tree will be used to determine for which specimens additional genes must be sequenced. Our goals with this project are: to discover genetic evidence that could, in the future, be used to better define the species in the genus *Eriophora*; to better understand the distribution of the species within *Eriophora*; and to publish these findings so that we may make meaningful contributions to the larger CarBio project and better comprehend the source of Caribbean biodiversity.

Brooke Moore, Lee Karlsson, Kelsey Doe, & Meghan Gerry

Oral | 2:00- 2:55 | Jost Foundation Room | Health Sciences

Title: Steady ON: One- and five-month outcomes after community-based fall risk screening

Faculty Mentor: Nancy Gell, Rehabilitation & Movement Science

Abstract: Background: Falls among older adults are highly prevalent and lead to increased physical, social, and medical costs. Research that identifies effective fall prevention interventions is needed. This five-month longitudinal follow-up study assessed the effectiveness of community-based fall risk screenings for older adults by evaluating behavioral and environmental changes made by participants.

Methods: Older adults who participated in Vermont community-based fall risk screenings in 2017 completed questionnaires at baseline, and one month and five months after initial screening. One hundred and twenty-three participants were recruited at baseline and 104 participants completed the one-month follow-up (85%). Baseline questionnaires assessed demographics, falls history, and screening results, while follow-up questionnaires assessed adherence with recommendations and fall risk reduction behaviors.

Results: Preliminary descriptive results show associations between fall risk classification (low, moderate, high) and higher education level ($p = 0.05$), marital status ($p = 0.03$), and housing type ($p = 0.02$). Within one month of screening 25% of participants shared screening results with a healthcare provider and 32% made a new change to reduce fall risk (e.g, exercise, fall prevention class, home assessment). Further analyses will characterize behavioral and environmental changes to reduce fall incidence at one and five months after baseline screening.

Conclusion: The results of this study align with previous research indicating demographic associations with fall risk. Our data also suggest that fall risk screenings elicit behavioral changes to reduce fall risk. Data about participants' follow-up outcomes and relation to fall risk will be assessed once five-month questionnaires are returned.

Mika Moore

Poster | 9:00-10:30 | Frank Livak Ballroom | Professional Studies - Education

Title: Engaging Adolescents in Youth Participatory Action Research and Restorative Practices to Inform School Reform Efforts

Faculty Mentor: Colby Kervick, Education; Lance C. Smith, Counseling

Abstract: This poster will describe in depth the design and implementation of a service learning higher education course for graduate and high school students aimed at utilizing the principles of restorative practices (RP) and youth

participatory action research (YPAR) to elevate authentic student voice in existing school reform efforts. The poster will explore how these two approaches can be implemented in tandem to shift social structures and bolster student voice and engagement.

RP are emerging nationwide as an alternative to exclusionary and punitive discipline practices. RP stem from a restorative justice world-view held by many non-western, indigenous peoples around the world that view crime and wrongdoing as harm done to people and communities (Cameron & Thorsborne, 2001; Zehr, 2015). YPAR is a methodology in which youth are recruited at the outset as research partners to collaboratively assess needs, inform design and implementation, and assist in data analysis (Ozer, 2016). A critical aspect of successful RP implementation is authentic engagement with youth in the design and implementation stages. To meet this outcome, YPAR was identified as a methodology to advance student voice in RP implementation and evaluation efforts.

Attendees will learn about the following elements of the project:

- Course structure
- Design of daily lessons
- Description of student YPAR projects
- Integration of RP and YPAR content
- Partnership with the school district

[References: 1. Cameron, L., & Thorsborne, M. (2001). Restorative justice and school discipline: Mutually exclusive? Restorative justice and civil society, 180, 194.

2. Ozer, E. J. (2016). Youth-led participatory action research. Handbook of methodological approaches to community-based research: Qualitative, quantitative, and mixed methods, 263-272.

3. Zehr, H. (2015). The little book of restorative justice: revised and updated: Skyhorse Publishing, Inc.]

Meghan Morrison

Poster | 11:00-12:30 | Silver Maple Ballroom | Social Sciences

Title: The Interaction Between Parent Socialization of Coping and Child Heart Rate Reactivity as a Predictor of Child Adjustment Outcomes

Faculty Mentor: Jamie Abaied, Psychological Science

Abstract: Background: Learning to cope with stress is a fundamental developmental task for children. The present study examined how parent socialization of coping in real-time and child heart rate reactivity (HRR) contributed to adjustment problems in children. Research suggests that engagement coping socialization (i.e., orienting a child to approach a stressor by problem solving or expressing emotions), can be adaptive in helping children learn effective coping methods for regulating their emotions and behaviors. Additionally, research suggests that HRR is associated with worse adjustment in children.

Method: Participants were children ($n=64$, M age = 9.02, 54.5% females) and a parent completing a laboratory study. The child was instructed to complete a stress-inducing task and the parent was instructed to interact with their child as they would normally. A trained graduate and undergraduate student coded parent engagement coping socialization throughout the task. Parent engagement coping socialization was calculated as the average time it took for the parent to make an engagement suggestion following their last engagement suggestion. Inter-rater reliability was excellent ($k=.84$). Child heart rate was monitored before and during the task. Parent(s) completed the Child Behavior Checklist at baseline and a 6-month follow-up to assess internalizing and externalizing problems.

Results: Two multiple regression analyses were conducted. Parental engagement return time was a significant predictor of externalizing problems ($b=.18$, $p<.05$) and a marginally significant predictor of internalizing problems ($b=.14$, $p<.10$) over time. The main effect of HRR was nonsignificant, as was the HRR x parent engagement interaction, in both regression analyses.

Discussion: These findings suggest that parents with faster return times to engagement suggestions had children with fewer internalizing and externalizing problems. This suggests that parents who contribute more frequent engagement suggestions may help their child socialize to coping with stress more successfully, allowing them to regulate their emotions and behaviors more effectively.

The Student Research Conference would like to thank our generous sponsors:



Joshua Morse

Poster | 9:00-10:30 | Frank Livak Ballroom | Food & Environmental Sciences

Title: Vermont Policymakers' Approaches to Cultural Ecosystem Services: Preliminary Results and Next Directions**Faculty Mentor:** Rachele Gould, Rubenstein School for Environment & Natural Resources

Abstract: Although the ecosystem services framework (ES) has made strides in shaping environmental policy discourse, this progress has been uneven. Cultural ecosystem services (CES)—the non-material benefits that humans accrue from healthy ecosystems—remain under researched, and under-represented in policy processes. This oversight has substantial social and environmental justice consequences. When policy processes do not explicitly attend to the non-material values driving stakeholder agendas, participants already in power tend to shape policy to advantage their interests, often at the expense of other stakeholders' values. Despite these concerns, little research has addressed the question of why CES remain under represented in policy. To begin to address this question, I interviewed 18 members of Vermont's environmental policy community, including elected representatives, agency staff, and non-profit advocates. Our semi-structured qualitative interviews focused on four broad themes: 1) interviewee's awareness of the ES framework broadly; 2) their familiarity with the idea of CES; 3) their use of ES, and specifically CES, information; and 4) their opinions CES' value as a policy tool. Although my findings are preliminary and may develop with additional interviews, two key insights with implications for CES research and environmental policy making have emerged. First, although broadly familiar with the concept of ES, Vermont environmental policy makers are less familiar with CES as a vehicle to extend this framework to non-material benefits from ecosystems. Second, despite their lack of familiarity with language of CES, most Vermont environmental policymakers readily acknowledge the centrality of non-material benefits from ecosystems in their work. These trends suggest that the under-representation of CES in policy may not reflect the utility of the concept or a lack of interest in using it by policymakers, but rather the challenges of communicating and integrating social science research into environmental policy.

Alice Murphy

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences

Title: Visualizing the Grid**Faculty Mentor:** Paul Hines, Electrical & Biomedical Engineering

Abstract: Visualizing electricity and the way it behaves can be a daunting task. Diagrams and technical notation often fill the role of illustrating electrical activity. While this form of presentation provides sufficient information for calculations, it often lacks a physical aspect to help students properly conceptualize electrical systems, such as a power grid. Educators could greatly benefit from something that could help their students visually conceptualize electricity. MechGrid was developed to mechanically model the operation of a power grid. The lego-constructed board has motors, gearboxes, and Arduino components working together to create a physical analogy for the performance of power grids so that any students, from elementary school to college, can understand electricity in a clearer sense. MechGrid continues to be improved on so that it may be more applicable in different education settings. Better labeling and new presentation components are being developed in order to make the tool more useful in classes of children who may be encountering electrical concepts for the first time. The system of sensors and Arduino circuitry continues to be tweaked so that college level labs can look at the electric grid through the MechGrid scope. The more approaches a student can take when studying concepts, the stronger their understanding of the subject becomes. As MechGrid begins being utilized in classrooms, we will be able to watch the students reap the intellectual benefits of viewing electrical studies from a mechanical angle.

Harrison Myers

Oral | 3:00-4:30 | Sugar Maple Ballroom | Food & Environmental Sciences/Vermont Studies

Title: Phosphorus Cycling at the Sediment-Water Interface of Vermont Stormwater Ponds**Faculty Mentor:** Eric Roy, Rubenstein School for Environment & Natural Resources

Abstract: Phosphorus (P) in urban and agricultural runoff is known to cause eutrophication in freshwater ecosystems (Azevedo, et al., 2014). The purpose of my research project was to examine the biogeochemical cycling of P within stormwater ponds (SWPs) at the sediment-water interface (SWI). SWPs are the most widely used stormwater management practice in Vermont (VTDEC, 2016), so understanding P cycling within these ponds is critical to the mitigation of eutrophication in Lake Champlain. My research was part of a larger study that seeks to understand how stormwater pond design influences water quality. Examining the SWI creates a more robust picture of P cycling within SWPs because the SWI is a dynamic region. Nutrient gradients can occur at the SWI due to relatively low nutrient concentrations in the pond inflow, and relatively high concentrations within the sediments of SWPs due to accumulation over

time. The gradient of P from the sediment to the water can drive internal loading of P at the SWI (Roy et al., 2012). The vertical gradient of soluble reactive P (SRP) at the SWI was measured using dialysis porewater samples (“peepers”; Urban et al., 1997). Peepers were deployed in three SWPs, and a clear SRP gradient was observed in two out of the three SWPs. A positive correlation was observed between the vertical SWI SRP gradient and organic matter and % sand in the pond sediment. Organic matter drives down dissolved oxygen (DO) at the SWI, and has been shown to increase porosity in flooded sediments (Avnimelech, et al., 2001), creating a less restrictive path for SRP flux. A higher % sand also causes increased porosity. Additionally, sediments made up of smaller particles are more readily suspended, increasing turbidity and decreasing the sunlight reaching submerged aquatic vegetation (SAV). Decreased sunlight for SAV in turn decreases overall biomass and therefore organic matter in pond sediments.

Lily Myers

Oral | 3:00-4:30 | Sugar Maple Ballroom | Food & Environmental Sciences

Title: Raise the Blade

Faculty Mentor: Kris Stepenuck, Rubenstein School for Environment & Natural Resources

Abstract: Lake Champlain Sea Grant is working with partner organizations on an outreach campaign called Raise the Blade to quantify the impact of low input grounds care practices by businesses on storm water runoff entering Lake Champlain. Ten sites were set up around the Burlington area located at Dealer.com, the University of Vermont, Echo, Curtis Lumber, Hulbert Supply, Farrell Vending, Foam Brewery, Magic Hat Brewery, Queen City Printers, and Main Street Landing. We hypothesize that mowing lawns at a height of 3 inches versus 2 inches over a multiyear period will increase the organic matter, increase levels of phosphorus adsorbed by the soil, reduce the amount of vegetation dieback and bare spots, increase the density of the vegetation, increase the infiltration rate, decrease soil compaction, and maintain visually greener grasses. The soil nutrients, organic matter, vegetation composition and density, infiltration rate, and drought resistance of lawns was tested and no significance was found during the study period. However, the study period may not have been a sufficient time period to allow for differences between the treatments to develop. The sites will continue to be assessed over multiple growing seasons.

Nawaf Nazir

Poster | 3:00-4:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: Receding-horizon optimization of unbalanced distribution systems with time-scale separation for discrete and continuous control devices

Faculty Mentor: Mads Almassalkhi, Electrical & Biomedical Engineering

Abstract: This work presents a method for the optimal control of discrete and continuous devices in an unbalanced three-phase distribution network with significant renewable generation. A hierarchical control scheme is presented where the discrete mechanical assets are dispatched at a slow time-scale as a mixed-integer program (MIP) and the continuous DERs are controlled at a fast time-scale as a convex program. The optimization programs are operated at two time scales as they manage controllable grid resources with different levels of responsiveness and flexibility. The MIP optimizes slow mechanical assets to position voltage robustly against uncertain net-load and a three-phase SOCP program is used to solve the fast loss-minimization optimization for the continuously operated DERs while providing corrective control against the intermittent and variable renewable net-load generation. The controls are tested on the IEEE-13 node test feeder.

Natasha Nixon

Poster | 11:00-12:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: Visualizing the Grid

Faculty Mentor: Paul Hines, Electrical & Biomedical Engineering

Abstract: Visualizing electricity and the way it behaves can be a daunting task. Diagrams and technical notation often fill the role of illustrating electrical activity. While this form of presentation provides sufficient information for calculations, it often lacks a physical aspect to help students properly conceptualize electrical systems, such as a power grid. Educators could greatly benefit from something that could help their students visually conceptualize electricity. MechGrid was developed to mechanically model the operation of a power grid. The lego-constructed board has motors, gearboxes, and Arduino components working together to create a physical analogy for the performance of power grids so that any students, from elementary school to college, can understand electricity in a clearer sense. MechGrid continues to be improved on so that it may be more applicable in different education settings. Better labeling and new presentation components are being developed in order to make the tool more useful in classes of children

Abstract (Nixon, cont'd): who may be encountering electrical concepts for the first time. The system of sensors and Arduino circuitry continues to be tweaked so that college level labs can look at the electric grid through the Mech-Grid scope. The more approaches a student can take when studying concepts, the stronger their understanding of the subject becomes. As MechGrid begins being utilized in classrooms, we will be able to watch the students reap the intellectual benefits of viewing electrical studies from a mechanical angle.

Amanda Northrop

Poster | 9:00- 10:30 | Silver Maple Ballroom | Biological Sciences

Title: Driver-dependent hysteresis in an enriched aquatic ecosystem

Faculty Mentor: Nicholas Gotelli, Biology; Bryan Ballif, Biology

Abstract: The utility of early warning signals to detect impending ecosystem regime shifts depends on whether such ecosystems display nonlinear dynamics. Hysteresis, a phenomenon in which the response of a system depends on the system's state or history, is a hallmark of nonlinearity. Long-term enrichment and recovery studies of aquatic ecosystems show hysteresis in response to nutrient loading; however, such studies lack replication and manipulation of driver variables such as nutrient loading concentration. We conducted a test for driver-response hysteresis in replicated enriched aquatic ecosystems. We induced a regime shift in water-filled leaves of the pitcher plant *Sarracenia purpurea* via the addition of organic matter (bovine serum albumin) at three loading concentrations (low, medium, and high) and monitored both organic matter and dissolved oxygen concentrations during enrichment and subsequent recovery phases. Hysteresis was present at low concentrations of organic matter loading; however, the hysteresis loop was reversed at high loading and absent at intermediate loading concentrations. Our results suggest that 1) the *S. purpurea* microecosystem displays nonlinear driver-response dynamics and is therefore a suitable system for identifying early warning signals and 2) hysteresis in the *S. purpurea* microecosystem is dependent on the magnitude of the driving variable. Such driver-dependence has important implications for the management of ecosystems following a regime shift.

Maryam NouriAin

Poster | 3:00- 4:30 | Frank Livak Ballroom | Biological Sciences

Title: Exploring genetic diversity of the invasive earthworm *Amyntas agrestis* using microsatellites

Faculty Mentor: Joseph Schall, Biology; Josef Görres, Plant & Soil Sciences

Abstract: *Amyntas agrestis* is an aggressively invasive earthworm from Japan. It is probably spread by horticulture and now present in all northeastern states of the USA. It is regarded as a parthenogenetic organism and the expectation is that most populations are clonal. Microsatellites were used to test this assumption. Microsatellites are genetic markers with short repeat base pair patterns. The number of repeats of a microsatellite pattern can be used to assess the genetic variability that exists in a population. Three isolated populations from Vermont forests were investigated. While the microsatellite data supports the assumption that there were clones in the population (identical microsatellites), several clonal lineages were present at the three sites. Further studies are needed to find the source of variability.

Alice Ochterski

Oral | 9:00- 9:55 | Williams Family Room | Arts & Humanities

Title: "What's a Motto With You?" Latin Mottoes of the United States

Faculty Mentor: Angeline Chiu, Classics

Abstract: The United States of America arose from Classical ideas of democracy and liberty. The passion that the founders felt for their beloved Greek and Roman literature impacted every aspect of the new nation, from legislation to iconography to currency. Although the neoclassicist influence wore off over the centuries in some areas, such as art and architecture, Latin has nevertheless remained the most popular language for state mottoes. Twenty-five of the fifty states chose Latin mottoes to represent them, beginning with Connecticut in the colonial period and continuing throughout the history of the country. Three states have even adopted Latin mottoes within the past fifteen years, including Kentucky, North Dakota, and Vermont. Individuals in these states, filled with the same enthusiasm for the Classics as the founders of the country, all proposed and fought for Latin mottoes that would eventually come to fruition. The most recent of these was Vermont's Latin motto, *Stella quarta decima fulgeat* ("May the fourteenth star shine bright,") which the state adopted just three years ago at the behest of an eighth-grade Latin student. As this example demonstrates, every state motto has its own unique history behind it. Together these histories can reveal why Latin has been the favored language choice for mottoes in the United States.

Anuarbek Onayev

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences

Title: Comparison of Crash Severity at Roundabouts and Signalized Intersections in Vermont

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: Transportation agencies throughout the US are considering roundabouts, which are encouraged by FHWA as a safer intersection design choice, during new construction and reconstruction projects as well as for existing intersections that need safety or operational improvements. Interest and implementation of roundabouts in Vermont has created need for data on safety effects of roundabouts. A roundabout was first installed in 1995 in Vermont and there are currently 12 modern roundabouts in 10 Vermont towns. This paper focuses on evaluating the level of resulting injury at roundabouts compared to nearby T- and four-leg intersections in the same towns. Roundabout crash attributes were compared to non-roundabout crashes using logistic regression where other crash and driver characteristics are controlled. The state's police-reported crash data between 2007 and 2016 were used. The results provide the first comprehensive safety evaluation of roundabouts in Vermont, which can be further used to compare Vermont experience to other states. Furthermore, countermeasures to the safety concerns may be implemented to the future designs of roundabouts in Vermont.

Casey O'Reilly

Oral | 10:00-10:55 | Williams Family Room | Arts & Humanities/Professional Studies - Education

Title: Say What You Mean: An Analysis of Silent Resistance and the Ramifications of Politically Correct Culture In First Year Writing Courses

Faculty Mentor: Jean Bessette, English

Abstract: In her book *Rhetorical Listening: Identification, Gender, Whiteness*, Krista Ratcliffe defines rhetorical listening as a technique that allows instructors to "listen" to the nonverbal implications of their students' responses to controversial questions. Ratcliffe argues that in order to expose cultural biases and "invent arguments that bring differences together," instructors must first acknowledge and deconstruct student resistance, as well as instructors' subsequent resistance, through the implementation of rhetorical listening (Ratcliffe 203). I recontextualize Ratcliffe's notion of rhetorical listening within the scope of 2018's politically charged climate to examine how graduate student instructors teach about issues of race, gender and whiteness. Using Simon Western's psychoanalysis of the ideological similarities of politically correct (PC) and politically incorrect (PiC) cultures, I argue that PC culture impacts and guides silences in the classroom that surround complex issues of identity. How do we encourage students to initiate dialogue when the pressure of political correctness retains the power to silence them? I propose that the solution lies in what Bruce Horner, Min-Zhan Lu, Jacqueline Jones Royster and John Trimbur call a "translingual approach" (Horner, et al 303). I argue that by teaching language as a resource, we can encourage students to view their language as a choice with consequences, rather than as a right.

Joycer Osorio

Poster | 3:00-4:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: Stochastic Approach to Maximal Output Admissible Sets and Reference Governors

Faculty Mentor: Hamid-Reza Ossareh, Electrical & Biomedical Engineering

Abstract: This paper presents a stochastic approach to Reference Governors (RG) and Maximal Output Admissible Sets (MAS) using chance constraints. In order to construct a stochastic robustly invariant MAS (SR-MAS), we extend the earlier ideas in the literature to Lyapunov stable systems with output constraints. Formal proofs for important properties such as positive invariance and finite determinism of SR-MAS are provided. It is shown that the SR-MAS is less conservative than the deterministic approach. An algorithm is provided to compute the SR-MAS in finite time. Finally, we present a stochastic RG formulation, which leverages the SR-MAS. The main results are illustrated with a numerical simulation of a DC motor model with constraints imposed over the control signal and output.

Catie Owen

Poster | 11:00-12:30 | Silver Maple Ballroom | Social Sciences

Title: Plans in the Making: The (Re)Negotiation of Agency in Planned Home and Caesarean Births

Faculty Mentor: Jeanne Shea, Anthropology

Abstract: "Whereas in some forms of Western feminism, it is perceived that a homebirth affirms the woman's sense of agency and fulfillment while a caesarean denies these aspects, the act of planning birth complicates these assumptions. The recent US and UK trend towards making plans around birth in specific, patterned ways regardless

Abstract (Owen, cont'd): of whether it takes place vaginally at home, or by caesarean section in a hospital, suggests that women actively shape important dimensions of their birthing experiences. In this sense, this study demonstrates that regardless of whether things literally go as planned, when homebirths or caesareans are experienced as planned -- that is with careful attention to respect for the wishes, feelings, and concerns of the mother leading up to and during the birth -- birthing women and their healthcare providers still interpret those births as satisfactory or even fulfilling experiences.

Kunal Palawat

Oral | 2:00-2:55 | Chittenden Bank Room | Food & Environmental Sciences/Vermont Studies

Title: Understanding the biogeochemical role of soil microbial communities in Northern VT agricultural riparian zones connected to Lake Champlain waterways

Faculty Mentor: Carol Adair, Rubenstein School for Environment & Natural Resources

Abstract: Riparian buffers are integral to managing nutrient flows and fluxes across water systems. They are especially important in controlling nutrient cycling during extreme weather events, which are predicted to increase with climate change. One consequence of extreme events is increased eutrophication and algal blooms which have negatively affected the health of Lake Champlain in recent years (Zia, et al., 2016). Soils are an important component of riparian buffers and their role in biogeochemical cycling during extreme events is not fully understood (Vidon et al. 2010). Specifically, the influence of soil microbial communities on nutrient flows and fluxes has not been thoroughly studied. We investigated the response of riparian buffer soil microbes under average and extreme rainfall conditions with a soil incubation study. We collected intact soil cores from wetland and dry locations within a riparian zone of Hungerford Brook in Swanton, VT, in order to compare how soils with different soil moisture regimes respond to extreme events. We simulated slow and fast rainfall conditions and measured the responses of the soils over seven days. Slow wetting was based on average rainfall rates in Swanton, VT while fast wetting was based on the heaviest rainfall period Swanton experienced during Hurricane Irene in 2013. We measured extracellular enzymatic activity to assess how microbial populations are affected by the treatments. To better understand how microbial responses impact nutrient fluxes, we analyzed greenhouse gas fluxes using a photo-acoustic gas analyzer and we collected leachate for nitrate, ammonium, dissolved carbon, and dissolved nitrogen analyses. Our data provides novel insights on the complexities of the characteristics of an agricultural riparian zone in Northern Vermont to better inform the VT-EPSCoR Integrated Assessment Model.

[Works Cited: 1. Zia, A., Bomblies, A., Schroth, A. W., Koliba, C., Isles, P. D., Tsai, Y., Houten, J. V. (2016). Coupled impacts of climate and land use change across a river-lake continuum: insights from an integrated assessment model of Lake Champlain's Missisquoi Basin, 2000-2040. *Environmental Research Letters*, 11(11), 114026. doi:10.1088/1748-9326/11/11/114026
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Foram Patel

Lightning | 11:00-12:30 | Sugar Maple Ballroom | Social Science

Title: Upward Bound: Introduction to College Studies

Faculty Mentor: Antonio Cepeda-Benito, Psychological Science

Abstract: Nationally, Upward Bound is a TRIO program with a mission to help students successfully complete high school and pursue post-secondary education. Numerous studies have shown that minority, low-income, and first-generation college students have lower baccalaureate attainment rates than non-minority, higher-income, or non-first-generation college student. The participants of Upward Bound in Burlington, Vermont constitute members of minority and disadvantaged groups, including refugees and first-generation college students. A Introduction to College Skills course was created and facilitated with the intention to fill a gap currently recognized by the director of Upward Bound in a lack of knowledge and preparation for the academic rigor in post-secondary education. Programs nationally incorporate courses like this into their curriculum because they contribute substantively to the core goal of preparing students to pursue and succeed in post-secondary education. There is little research on the effectiveness of these sorts of programs. Most programs utilize anecdotal evidence rather than assessing the true effectiveness.

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Halsey Payne

Oral | 4:00- 4:55 | Williams Family Room | Arts & Humanities/Food & Environmental Science/Social Science

Title: Rooting the Slade Cooperative

Faculty Mentor: Brendan Fisher, Rubenstein School for Environment & Natural Resources

Abstract: The Slade Co-op was created in 1971 as the first sustainable living community at the University of Vermont. Slade's core mission has been to support local food systems and empower its members to make their immediate and broader communities more just and sustainable. Over its forty-seven years, the co-op has developed traditions, community partnerships, and alumni (about a thousand of them) which have made wonderful changes to UVM and Vermont as a whole.

A recent change in UVM's residential policies convinced Slade's members ("Sladers") to move off of the University's campus and begin the work of making an organization of sustainable student housing cooperatives in Burlington. My research has been focused on discovering the steps that Slade needs to take to build a foundation for that coming organization. The major products will be a member handbook of history, traditions, and best practices, and an incorporated cooperative under Vermont law.

My grant was used for a cross-country trip (in a 1972 VW Westfalia) to Ann Arbor, Michigan, where the North American Students of Cooperation (NASCO) was holding its annual Institute for the training of co-op members from across the continent. The Institute laid out the plan for Slade's success and connected me with important partners that will keep Slade prospering after I graduate this May.

Orest Pazuniak

Oral | 9:00- 9:55 | Chittenden Bank Room | Professional Studies - Business/Food & Environmental Sciences/Social Sciences/Vermont Studies

Title: Social and Economic Impacts of VT's GMO Labeling Law

Faculty Mentor: Jane Kolodinsky, Community Development & Applied Economics

Abstract: Vermont is the first State in the U.S. to successfully pass a Genetically Modified Organism (GMO) labeling law. Despite that the law was short lived, it is the only domestic example available to analyze. Difference in difference (DiD) models are used to isolate the law's impact using (1) Vermont and national survey data, and (2) Vermont and Oregon grocery store scanner data. This project is ongoing, so conclusions may or may not be ready by the time of the presentation. Preliminary analysis of survey data (1) reveals that during the period that the law was passed there was a decrease in the level of opposition to GMOs in Vermont relative to the rest of the country.

Schuyler Pearman-Gillman

Oral | 2:00-2:55 | Sugar Maple Ballroom | Biological Sciences

Title: Estimating wildlife distributions using expert elicitation techniques: an assessment of harvested species in the Northeastern United States

Faculty Mentor: Jed Murdoch, Rubenstein School for Environment & Natural Resources (RSENR); Therese Donovan, RSENR

Abstract: In the Northeastern United States, population expansion, agriculture, industrial development, and urban sprawl pose serious concerns for wildlife and challenges for wildlife managers. Understanding the impacts of landscape change on species' distributions can help inform decision-making for conservation planning. Unfortunately, empirical data on distribution is limited for many species. In this study, we used expert elicitation techniques to develop species distribution models (SDMs) for harvested species in the northeast ($n = 22$). This expert-based approach provided relatively inexpensive, big picture information that would have otherwise been unattainable given the spatial extent and range of species being assessed. We elicited opinions from wildlife experts on the probability of occupancy of species using a web-based survey administered in 2017. We collected ca. 6500 occupancy estimates from over 75 experts, and used mixed-model methods to develop SDMs. We present models for two species, moose (*Alces alces*) and American black bear (*Ursus americanus*), and demonstrate their use for mapping distribution under current conditions and various scenarios of landscape change. Our results indicate the utility of expert opinion data in modeling wildlife distributions, which could be helpful for many other species, especially those that are poorly known or lack location records.

Virginia Peisch

Lightning | 11:00-12:30 | Sugar Maple Ballroom | Social Sciences

Title: The Structure and Function of Coping in Emerging Adults

Faculty Mentor: Keith Burt, Psychological Science

Abstract: Background: Coping is defined as “action regulation under stress, which includes coordination, mobilization, energizing, directing and guiding behaviors, emotion and orientation when responding to stress” (Zimmer-Gembeck et al., 2014, p. 65). This behavior is fundamental to human development (Compas et al., 2001). Surprisingly little is known about how individuals acquire coping skills (Skinner & Zimmer-Gembeck, 2016). A specific question of interest is whether coping strategies and abilities change during emerging adulthood. To address some of the shortcomings evident in coping research, Skinner et al. (2003) identified 12 coping “families.” These categories reflect a comprehensive list of potential coping responses (Zimmer-Gembeck & Skinner, 2011) that can be used for the study of coping with different types of stress that occur at different ages (Skinner, Pitzer, & Steele, 2013). Regrettably, the 12 coping families have not been studied in emerging adult samples (i.e., 18-25 year-olds).

Study Aims: My dissertation study has three aims: 1) to examine the factor structure of coping in emerging adults to determine whether there is support for the six coping families, 2) to determine whether there are developmental shifts in coping that occur during emerging adulthood, and 3) to conduct a functional analysis of the coping families to determine which coping approaches are most associated with adaptive functioning and psychological distress.

Methods: A sample of 400 emerging adults will participate via Amazon’s Mechanical Turk (MTurk). Information on key study variables (i.e., demographic information, personality, stress, coping, competence) will be completed through an online survey.

Study Implications: It is important to know whether coping processes continue to change over the course of emerging adulthood. With regards to applied work, it will be useful to identify coping strategies that are most commonly used by emerging adults and that are associated with adaptation and negative outcomes, respectively.

Olivia Peña

Oral | 10:00-10:55 | Sugar Maple Ballroom | Food & Environmental Sciences

Title: Boots on the Ground: Leveraging community voices and involvement in federal farm bill policy development

Faculty Mentor: Sarah Heiss, Community Development & Applied Economics

Abstract: This project examines community involvement and representation in food and agriculture policy related discussions. Specifically, it focuses on public participation and representation in discussions surrounding the Vermont Farm Bill. A qualitative analysis of interviews with Vermont advocacy organizations related to the Farm Bill highlights how constituents work with advocacy groups and food systems organizations to channel the communication of their needs to government officials and policymakers.

Kara Pflaster

Poster | 9:00-10:30 | Silver Maple Ballroom | Health Sciences/Biological Sciences

Title: A stratified care model for the treatment of non-specific low back pain: A pilot study

Faculty Mentor: Sharon Henry, Neurological Sciences; Allison Holm, Jeffords Institute for Quality Research

Abstract: Worldwide, non-specific low back pain causes a reduced capacity to work as well as perform certain movements and activities, subsequently leading to a lower quality of life. Historically, the treatment for non-specific low back pain has been a one-size-fits-all model since there is no specific cause; only a small percentage of patients treated with this model reported that their condition improved.

A study conducted at Keele University in Britain found a stratified care model for physical therapy treatment of non-specific low back pain resulted in significant improvements in both clinical effectiveness and cost-effectiveness (Hill et al. 2011). The purpose of this interventional study is to replicate the Keele study to see if the same results can be produced within the American healthcare system.

Patients were assigned to be part of the control group or the participating group based on physical therapy location. Enrollment was estimated to be 1,322 participants. The control group received the current best practice. The participating group was categorized into three stratified levels: low, medium, and high. Each level received a care model that was specific to the level at which the patient was assessed. Outcome measures were taken before physical therapy, after physical therapy completion, and at six months post-treatment.

Eighty-four patients have been enrolled as active participants. Eighty-four baseline questionnaires were sent out, 35 were received back. To date, forty-one 6 month questionnaires have been sent out and 9 have been received.

Over the course of data collection, treating clinicians and physical therapists began to feel the stratified care

model was best practice, and ethically, should be offered to everyone and not just to those enrolled in the study. Therefore, enrollment in the study is closed. Data collected thus far and to the six-month point will be analyzed for results.

Valeria Pinzon-Mendez

Oral | 4:00-4:55 | Jost Foundation Room | Social Science/International Research

Title: Illegal Economies in South America: A case study of the “cocaine economy” and community impacts in Colombia

Faculty Mentor: Qingbin Wang, Community Development & Applied Economics

Abstract: The purpose of this research is to study illegal economies in South America through a case study of the cocaine economy in Colombia. Recently Colombia signed a peace deal with the biggest armed group in the country, the FARC, ending a 50-year civil war. The guerrilla group, and other criminal groups in Colombia, financed itself through cocaine trafficking. This has led to the creation of a ‘cocaine economy’ in many rural towns of Colombia, which are disconnected from other markets and have to survive by supplying coca leaves to criminal groups. While the recent development in Colombia has been widely reported, there is very limited empirical research in the literature. This research will focus on how these economies have developed and the consequences that government action will have on these communities.

A literature review will be conducted to gather data for the research. Resources will be in both Spanish and English so that the information can be as wholesome and accurate as possible. Due to the nature of the research, data will be mostly qualitative. Information of the history of Colombia will be included as it relates to the creation of ‘coca economies’. The data will be analyzed using appropriate methods to address research questions and draw conclusions.

Rural communities lack representation and resources from the central government in Colombia. The current peace deal stands to destroy all coca plantations aiming to cut the amount of cocaine that is produced and trafficked. However, such activities will never stop if rural towns are not adequately connected to the legal market. This is detrimental for a country that is trying to transition into an era of peace. The study is expected to make some economic and policy recommendations for addressing the community problems related to the illegal cocaine economy in Colombia.

Amanda Pomeroy, Jordan Kelley, Jason P. Nguyen, & Katherine A. White

Oral | 4:00- 4:55 | Chittenden Bank Room | Health Sciences

Title: Vestibular Therapy or Sub-Symptom Exercise to Improve Balance for Patients with Persistent Concussion Symptoms

Faculty Mentor: Reuben Escorpizo, Rehabilitation & Movement Science; Sambit Mohapatra, Physical Therapy; Nancy Bianchi, Dana Medical Library; Suzanne D. Lawrence, Physical Therapy

Abstract: Introduction: Mild Traumatic Brain Injuries, commonly referred to as concussions, affect people of all ages. Concussions impair an individual’s quality of life and normal routine. After a concussion, one may experience symptoms of vestibular dysfunction that impact postural balance. These symptoms may persist for months or longer. Health care providers may choose to treat these symptoms with sub-symptomatic exercise or with vestibular rehabilitation treatment. Nonetheless, there is currently a lack of evidence comparing these two approaches. The objective of this review was to explore which treatment, sub-symptomatic exercise or vestibular rehabilitation therapy, is more effective to improve postural balance in patients with persistent concussion symptoms.

Methods: OVID MEDLINE, PsycInfo, Cochrane Library, PubMed, and PEDro databases were used in our search. Inclusion criteria included: peer-reviewed, human studies in the English language; and treated concussions with persistent balance deficits with either sub-symptomatic exercise or vestibular rehabilitation therapy. Additionally, studies needed an outcome measure to assess balance before and after treatment. Articles that fit the criteria were screened and data extracted.

Results: Five out of the 144 studies pulled from our search were included after abstract and full text screening. We expect to find that vestibular rehabilitation therapy is more effective than sub-symptom exercise in treating individuals with persistent, vestibular-related, concussion symptoms.

Implications: Concussions affect an individual's ability to participate in daily activities such as school, work, or sports, due to a high level of cognitive or physical demand that provokes symptoms. With an established, effective treatment approach, individuals may be able to return to activities of daily living in a more timely, safe manner.

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Leonid Povoltoskiy

Poster | 3:00-4:30 | Silver Maple Ballroom | Mathematical & Physical Sciences/Biological Sciences

Title: Synthesis of Peptide Substrates to Investigate a Structural Beta-Turn in *C. elegans* Thioredoxin Reductase

Faculty Mentor: Robert Hondal, Biochemistry

Abstract: Cells must maintain a reducing environment in order to keep vital proteins in a functional state. One of the ways cells achieve this is through use of a redox protein called thioredoxin (Trx). However, when a protein is reduced by Trx, Trx itself becomes oxidized. Trx is reduced back to its active form by the enzyme thioredoxin reductase (TR) through a thiol/disulfide exchange reaction catalyzed by a vicinal disulfide/dithiol on the C-terminus of the enzyme. The C-terminal vicinal disulfide is at the vertex of a β -turn- β structure and must be reduced by another thiol/disulfide exchange reaction catalyzed by the N-terminal redox center. We hypothesize that this motif is critical to catalysis. We disrupted the structure of the β -turn by removing a backbone amide that serves as a hydrogen bond donor and replacing it with an ester linkage using modified solid phase peptide synthesis (SPPS) techniques. Here we describe the challenges in preparing the mutant peptide substrate and the preparation of the wildtype peptide substrate for truncated *C. elegans* TR. We observed that the resulting ester linkage is unprecedentedly base labile which has complicated the disulfide formation. We hypothesize that this effect is sequence dependent and are currently working on alternative methods for disulfide formation.

Daniel Power, Nathan Kowalczyk, Christopher Heffernan, & Corey O'Connor

Oral | 2:00-2:55 | Jost Foundation Room | Health Sciences

Title: Does Surgical Repair and Subsequent Rehabilitation Halt the Progression of Fatty Infiltration of the Rotator Cuff?

Faculty Mentor: Mathew Failla, Rehabilitation & Movement Sciences; Reuben Escorpizo, Physical Therapy

Abstract: Background: Rotator cuff pathology is a prevalent health issue that manifests with a variety of symptoms, including pain, muscle weakness, and difficulty performing daily tasks. One symptom of rotator cuff tears is the presence of fatty infiltration. This accumulation of fat predicts poor outcomes after surgical repair of the rotator cuff. Evidence of the efficacy of surgical repair to alter the progression of fatty infiltration is currently unclear. The purpose of this work is to systematically review the literature to determine if surgical repair and subsequent rehabilitation halt the progression of fatty infiltration of the rotator cuff.

Methods: Searches conducted in Cochrane Library, Ovid Medline, and CINAHL, yielded 100 articles. Title and abstract screening was performed individually by members of the group and cross referenced for reliability of applying inclusion/exclusion criteria. Inclusion criteria included rotator cuff tear with surgery and rehabilitation with pre and post-operative assessment of fatty infiltration. Reviews, case studies, and surgeries other than rotator cuff repairs were excluded. The remaining titles and abstracts were screened by three of the four group members, with the fourth acting as a mediator in cases without consensus. Next, two teams of two members each will individually perform a full text screening of eligible articles and discuss disagreement. In cases of impasse, a settlement will be determined by a third party. Once the final articles are determined, they will be searched through Web of Science and hand-searching. Data will be extracted from all relevant articles with intention to perform a meta-analysis.

Results: Cochrane library did not yield a systematic literature review on our topic. Database searches yielded 100 articles. Title and abstract screening resulted in 52 articles eligible for full text screening.

Conclusion: Results from this work will determine if current treatments for rotator cuff tear are effective at stopping the degenerative process of muscle.

Joshua Powers

Oral | 1:00-1:55 | Jost Foundation Room | Mathematical & Physical Sciences

Title: Embodiment can combat catastrophic forgetting

Faculty Mentor: Joshua Bongard, Computer Science

Abstract: Catastrophic forgetting occurs when an agent improves in one training instance but in doing so becomes worse in other instances. Others have attempted to combat catastrophic forgetting using methods that attempt to freeze learned information or induce modularity in the agent's controller. Often these methods can be algorithmically complex and scale poorly as the training set grows, because new neural material is required to handle the increased training set. Here, we present a new method for reducing catastrophic forgetting: without making any changes to the controller, inducing changes in the morphology of an agent can improve and in some cases overcome catastrophic forgetting. While yet untested, focusing on the morphology of an agent could scale better than existing approaches since changing morphology does not require increased training time or neural size, at least for the simple morphologies and task considered here. By showing how different fitness functions and morphologies interact to impact catas-

trophic forgetting, we prove that morphology choice can combine with, rather than compete with, existing methods for combating catastrophic forgetting. While we do not show that our method is better than others on benchmark tests, we do show that embodiment is an important new approach to this problem.

Sean Quigley

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: Is there a link between metabolic gene methylation and insecticide resistance?

Faculty Mentor: Yolanda Chen, Plant & Soil Science; Stephanie McKay, Animal & Veterinary Sciences

Abstract: The Colorado potato beetle (*Leptinotarsa decemlineata*) is the major pest of potatoes throughout the Northern Hemisphere, and commercially economic yields can only be attained through the use of organic and conventional insecticides. The beetle is particularly notorious for its ability to adapt to insecticides. The inability of modern insecticides, both conventional and organic, to control the beetle has led to loss of crop yields to farmers all across the country, including in Vermont. Previous research has shown that there are specific metabolic genes in the beetle's genome that are associated with insecticide resistance. However, it is not fully understood how the beetle becomes resistant to the insecticides. Previous studies have shown that exposure to insecticides may cause an increase in expression of metabolic genes associated with detoxification. This would be the result of less methylation of the genes. Methylation can be thought of as turning a gene off. The purpose of this research is to better understand methylation of metabolic genes associated with insecticide resistance and detoxification as well as metabolic genes that are not associated with resistance, in the presence of different levels of the insecticide imidacloprid.

Hina Rattu

Poster | 11:00- 12:30 | Frank Livak Ballroom | Biological Sciences/Health Sciences

Title: Psychogenic stress-induced expression and regulation of VEGF receptor signaling pathways in the neural pathways to the urinary bladder

Faculty Mentor: Margaret Vizzard, Neurological Sciences

Abstract: Stress has been implicated in the exacerbation of symptoms associated with functional lower urinary tract disorders, such as interstitial cystitis (IC)/bladder pain syndrome (BPS) in humans. Current research suggests a new, potential role of vascular endothelial growth factor (VEGF) signaling in bladder dysfunction, where VEGF and associated receptors are upregulated in bladder reflex pathways in a preclinical animal model of IC/BPS. Additional research also associates increased VEGF expressions in the dorsal root ganglia (DRG) with pain modulation, following CNS or PNS injury. We have examined psychogenic stress-induced expression and regulation of VEGF/receptors in neural circuitry controlling the urinary bladder. A repeated variate stress (RVS) model was used to model psychogenic stress using mice (n=6 each for experimental and control groups). Quantitative PCR analyses were performed to determine the expression of VEGF, VEGF receptors 1 (VEGFR1) and 2 (VEGFR2), and VEGF co-receptor Neuropilin 2 (NPN2) in the bladder, lumbosacral spinal cord (L1, L2, L5, L6, S1) and DRG. In tissues from RVS mice, there is a significant ($p \leq 0.05$) decrease in VEGF and VEGFR1 transcript expression in L1 and L2 DRG, and a significant ($p \leq 0.05$) decrease in VEGFR 2 transcript expression in L2 and L5 DRG. NPN2 transcript is upregulated ($p \leq 0.05$) in the detrusor smooth muscle. No difference in VEGF/receptors transcript expression was demonstrated in the spinal cord from RVS mice. The results demonstrate that VEGF/receptor transcripts are present in neural pathways controlling urinary bladder function and in the urinary bladder. Regulation of VEGF/receptor transcript expression was observed in the bladder and DRG from RVS mice suggesting that the bladder and DRG are more responsive to RVS compared to the spinal cord. Ongoing studies are evaluating the functional contribution of VEGF/receptors signaling to bladder reflexes in mice exposed to RVS.

Cal Rawlings

Oral | 11:00-11:55 | Williams Family Room | Food & Environmental Sciences/Health Sciences

Title: Cognitive Style and Diet Success

Faculty Mentor: Jean Harvey, Nutrition & Food Sciences

Abstract: Objective: Weight loss remains a very challenging proposition for many Americans as over one-third of the adult population is consistently obese (CDC, 2015). While successful weight loss treatments exist, there is significant variability in weight loss outcomes. Matching patients to treatment may improve adherence and enhance outcomes. The aim of this study was to evaluate whether cognitive style was related to past weight loss success on a variety of diets.

Methods: Adults and undergraduate students in a northeastern community were surveyed about their cognitive

Abstract (Rawlings, cont'd): style using scales from the Myers-Briggs, past dieting attempts and weight loss success. Decision making style was characterized as “Thinking” vs. “Feeling” and diets were classified as “Rule-based” or “Number-based”.

Results: Three hundred and eighty-four individuals responded (Mean age = 30.6, Mean BMI = 26.428, 33.9% Male, 52.8% Thinkers). Almost twice as many high-scoring Thinkers had not used any diets (35.4% vs. 18.9%, $p < .05$). Because of the higher weight loss attempt rate amongst high-scoring Feelers, high-scoring Feelers were more successful across all diets compared to high-scoring Thinkers (65.6% vs. 57.3%, $p < .05$). The study found no correlation between decision-making style and success using the two different types of diets.

Discussion: Thinkers and Feelers are equally as likely to be successful with either rule-based or number-based diets. The main finding of the study is that Feelers are generally more likely to be successful when attempting to lose weight through dieting due to the fact that Feelers are more likely to attempt a weight loss diet. More research needs to be done to better match patients to different weight loss strategies.

Lauren Rayson

Poster | 3:00-4:30 | Silver Maple Ballroom | Vermont Studies/Social Sciences

Title: Vermont's Childcare Cliff

Faculty Mentor: Arthur Woolf, Economics

Abstract: Often times, when a family is reliant on government assistance, an increase in income leaves them at risk of losing some or all of the benefits they were receiving. This can cause a net economic loss, as the value of the benefits the family loses exceeds their income increase. This phenomenon, known as the benefits cliff, is important to understand, as families who are facing it may decline a job offer or work fewer hours in order to avoid it.

My research is on the benefits cliff in Vermont, specifically about the state's childcare cliff. This state-level analysis is important, as many of the credits and benefits that families receive are determined locally, not nationally. My work identifies the government assistance programs that help Vermonters access childcare, and illustrates each program's cliff. Families experiencing the childcare cliff are especially at risk, as losing benefits that make care accessible may force parents to leave the labor market to care for their children, which can have long-term negative impacts on their economic stability.

Data for this research was collected from the Current Population Survey, including information on household income, family type, and other employment trends, such as typical hours worked per week and typical weeks worked per year. This data will be analyzed to determine if those at risk of facing the cliff change their employment behavior in order to avoid it. My work also discusses the behavioral impacts the benefits cliff has on the families and individuals who are at risk of experiencing it. It includes a discussion of Vermont's actions addressing issues associated with the benefits cliff, and how other states have attempted to mitigate the cliff's impacts. It will conclude with suggestions on potential policy options Vermont could utilize to mitigate the impacts of the childcare cliff.

Natalie Redmond

Poster | 11:00-12:30 | Silver Maple Ballroom | Social Sciences

Title: Does Conservation Status Matter if You're Ugly : An Experimental Survey

Faculty Mentor: Brendan Fisher, Rubenstein School for Environment & Natural Resources (RSEN); Richard Paradis, RSEN

Abstract: My research consists of an experimental survey to answer a few questions about the connection between wildlife conservation and public support. I am interested in determining how much an animal's appearance and subsequent appeal (or lack of) plays a factor in whether an individual would decide to support this animal's conservation, either appreciatively or with their wallet. My survey consists of three treatments, each concerning a species that is endangered in the northeastern region of the United States, as well as questions whose answers attempt to register a measurement of appeal and concern towards the animal and willingness-to-pay from the individual taking the survey. Additionally, demographic questions concerning the respondent are asked for further analysis.

Eleanor Register, Peter Gurney, Jocelyn Harte, Benjamin Liebman, & Katie Zeppetelli

Oral | 11:00-11:55 | Williams Family Room | Health Sciences

Title: A Systematic Review of Optimal Dosing of Yoga for Chronic Low Back Pain

Faculty Mentor: Paula Smith, Rehabilitation & Movement Science; Reuben Escorpizo, Physical Therapy; Marianne Orest, Physical Therapy

Abstract: BACKGROUND: There are multiple approaches to treating chronic low back pain. Yoga has been sugges-

ted as a possible treatment method. This review aims to identify the ideal dosing of yoga interventions for the treatment of chronic low back pain.

DATA SOURCES: Ovid Medline, CINAHL, PEDro, PsycINFO, PubMed, Cochrane, and ERIC were searched through December 2017.

METHODS: This review included studies that compared instructor-led yoga as a primary intervention with “usual care”, with participants with low back pain lasting at least 3 months, with an explicitly stated dosing strategy, and at least one functional outcome measure.

Tilden Remerleitch

Creative | 11:00- 12:30 | Fireplace Lounge | Social Sciences

Title: Grounded: Stories of Refugee Resettlement in Vermont

Faculty Mentor: Pablo Bose, Geography

Abstract: More research needs to be done to understand the effect of federal refugee resettlement policies that place refugees in small to mid-sized cities instead of traditional gateway cities like New York and Chicago. There is a lack of research on the effect these resettlement changes have had on refugees, supporting organizations, and local communities that welcome them. I have conducted qualitative research among refugees to analyze personal stories of resettlement; exploring challenges and opportunities for integration into smaller Vermont cities. Using Chittenden County as a case study, I expanded upon research by Dr. Pablo Bose on the effects of changing government policies on refugees and host communities. The questions I hope to answer through my research include: How can the personal narratives of refugee experiences, key stakeholders in state and local organizations, and members of the general public in welcoming communities help to expand our notion of refugee resettlement? How can we better integrate refugees into communities by knowing more about their personal histories? How can we humanize/bring broader understanding to the issue of refugee resettlement through the use of storytelling and podcasting?

My research findings culminate in an oral thesis that is comprised of a series of podcast episodes. I have analyzed 16, hour long interviews along such themes as initial arrival, dependence & independence, acculturation, and citizenship which form the basis for each episode of the podcast. This podcast makes the refugee experience accessible to the public at a time of critical understanding.

Elisha Rennert

Poster | 3:00-4:30 | Silver Maple Ballroom | Social Sciences

Title: Characterizing Responses to Cigarettes with Varying Levels of Nicotine in Women Vulnerable to Smoking During Pregnancy

Faculty Mentor: Stacey Sigmon, Psychiatry

Abstract: **RATIONALE:** A national policy of reducing the nicotine content of cigarettes has the potential to reduce the prevalence of cigarette smoking and smoking-related adverse health outcomes in vulnerable populations, including women of child bearing age. This secondary analysis characterized how women of child bearing age at increased risk for smoking during pregnancy respond to cigarettes with varying nicotine levels. We also examined whether being depressed or opioid-dependent influences responses of cigarettes with varying nicotine levels among women already at risk for smoking during pregnancy.

METHOD: Eighty-nine women (18-44 years) completed four sessions where they sampled cigarettes with varying levels of nicotine (0.4, 2.4, 5.2, 15.8 mg/g). All participants had less than an associate's degree; 22 women had current or past year depression, 20 women were opioid-maintained and 47 had no additional psychosocial risk factors. Participants smoked cigarettes through a desktop smoking topography device, completed the modified Cigarette Evaluation Questionnaire (mCEQ) after smoking each cigarette and completed measures of withdrawal before and every fifteen minutes in the hour after smoking.

RESULTS: All women had significantly smaller total puff volume, mean maximum flow and total puff number when smoking 0.4 mg/g cigarettes compared to the 15.8 mg/g cigarette. All mCEQ subscale scores (e.g. Satisfaction, Psychological Reward) decreased across doses ($p < .05$). While all doses produced U-shaped withdrawal curves over time, the highest dose produced the greatest decreases immediately and one hour after smoking (dose X time, $p < .01$). Depression and opioid-dependence did not influence responses to cigarettes with varying nicotine levels. Collapsed across dose, depressed women showed significantly longer inter-puff intervals and higher nicotine withdrawal compared to controls and opioid-maintained women.

DISCUSSION: These results support that women especially vulnerable to smoking during pregnancy could benefit from a national policy to reduce nicotine content in cigarettes. Very low nicotine content cigarettes showed reduced

Abstract (Rennert, cont'd): abuse potential while also alleviating withdrawal and avoiding acute compensatory smoking.

Kenna Rewcastle

Oral | 1:00-1:55 | Chittenden Bank Room | Biological Sciences

Title: Investigating the influence of the rhizosphere on carbon dynamics in a tropical forest

Faculty Mentor: Aimee Classen, Rubenstein School of Environment & Natural Resources

Abstract: Tropical forests are highly-diverse ecosystems that contain many plants with a wide distribution of above- and below-ground traits. This ecological setting creates the opportunity for a diversity of belowground interactions in the rhizosphere where plant roots, mycorrhizal fungi, and soil microbes participate in the decomposition of soil organic matter and the uptake and assimilation of the carbon and nutrients released in this process. Here, we experimentally explored how rhizosphere interactions influenced belowground carbon dynamics including the activity of bacterial and fungal community members. We constructed rhizosphere manipulation mesocosms that excluded roots, mycorrhizae, or both of these rhizosphere components and installed the mesocosms beneath trees in a lowland tropical forest in Costa Rica. We added a ^{13}C -labeled starch or leaf substrate to the mesocosms to explore the contingency of rhizosphere influence on the complexity of carbon inputs and to trace these C substrates into the microbial community. Following an in-situ incubation period, we harvested the mesocosms and performed ^{13}C PLFA on soil samples from each mesocosm to assess whether the rhizosphere manipulation impacted the microbial assimilation of each substrate. We found that the presence of roots was negatively related to microbial assimilation of the ^{13}C -leaf substrates ($p < 0.001$) and had no effect on the assimilation of ^{13}C -starch substrates ($p = 0.25$). We did not detect an effect of the presence of mycorrhizal fungi on microbial assimilation of either substrate (leaf: $p = 0.70$, starch: $p = 0.83$). These results may indicate microbial preference for the simple sugars released by roots as root exudates, whereby microbes consume these labile sources of carbon instead of the more complex leaf substrates when available. By highlighting the relationship between roots and microbial decomposition, this research will help prioritize the incorporation of various components of the rhizosphere into the models that represent carbon dynamics.

Emilie Riddle

Poster | 3:00-4:30 | Silver Maple Ballroom | Food & Environmental Studies

Title: Prevalence and factors associated with food insecurity in higher education

Faculty Mentor: Meredith Niles, Nutrition & Food Sciences; Amy Nickerson, Nutrition & Food Sciences

Abstract: BACKGROUND: Food insecurity has serious consequences, including increased risk of chronic disease and poor mental and physical health. Comprehensive assessment of food insecurity among college students is lacking; however, some individual studies indicate food insecurity among students is significantly higher than the national average. The purpose of this study was to identify prevalence and factors associated with food insecurity among all community members in a northern New England university campus community.

METHODS: A random sample of faculty, staff, undergraduate, graduate and medical students ($n = 1,037$, 22% response rate) completed an online survey, including the validated 10-question USDA Adult Food Security Module and demographic questions. Associations between factors were assessed by cross tabulation with chi square tests of proportion and with analysis of variance.

RESULTS: The overall rate of food insecurity on campus was 18.1%. Prevalence of food insecurity was statistically different ($p < 0.001$) between undergraduate students (27%), staff (14.5%), and faculty (1.8%). Students who identified as first generation or lived off-campus were significantly more likely ($p < 0.001$) to be food insecure. Respondents identifying a race/ethnicity other than white were significantly more likely ($p < 0.05$) to be food insecure.

CONCLUSIONS: Findings suggest that rates of food insecurity on campus may be higher than the national average for students and staff. Future research should explore demographic and other factors that are associated with food insecurity to inform interventions to improve food security on college campuses.

Andrew Ridgeway

Oral | 4:00-4:55 | Williams Family Room | Arts & Humanities

Title: The Topography of Memory: Political Nostalgia and the Rise of Nationalism

Faculty Mentor: Jean Bessette, English

Abstract: The beginning of the 21st century has been marked by a resurgence of “new” nationalism, which includes but is not limited to right-wing populism, anti-immigrant sentiment, anti-globalization and nativism. While the

rise of neo-nationalism has been widely denounced by critics, postcolonial scholars have only begun to theorize how this emergent political landscape is marked by political nostalgia—a fugue state that invokes historical amnesia to establish new cartographies of displacement and erasure. Former U.S. presidential candidate Newt Gingrich’s 2011 claim that “Palestinians are an ‘invented’ people” and U.S. President Donald Trump’s more recent promise to “make America great again” illustrate how political nostalgia suppresses the traumatic memory of colonialism in the name of a reconstituted nationalism that effaces difference. This essay analyzes the Israeli occupation of Palestine and President Trump’s promise to build a wall on the U.S. – Mexico border through the lens of postcolonial literature to interrogate how political nostalgia “remaps” the political imaginary to strengthen geopolitical commitments to colonial knowledge-production. I will use Gabriel García Márquez’s *One Hundred Years of Solitude* and Teju Cole’s *Open City* to highlight how postcolonial literature can establish (or re-establish) “imaginative geographies” to articulate ways of knowing and remembering that call attention to the epistemological foundations of nationalism and re-center the violent history of colonialism.

Allison Robbins

Poster | 9:00–10:30 | Silver Maple Ballroom | Health Sciences

Title: Measurement of somatic mutation burden before and after field therapy for actinic keratoses

Faculty Mentor: Melanie Bui, Med-Dermatology

Abstract: The effects of sun exposure are easily identifiable in the form of discoloration, wrinkles and precancerous actinic keratoses. When patients have severe sun damage physicians often prescribe what is called field therapy with the goal of reducing the patient’s risk of developing cutaneous squamous cell carcinoma (cSCC). While standard of care, these field treatments, commonly topical fluorouracil and topical imiquimod, are very difficult for the patient to endure. Therefore it is important to determine how well these interventions work. It is our intention to compare the number of DNA mutations present before and after a standard course of field therapy. The genetic profiles from recruited participants from the UVM Dermatology Clinic will be compared and analyzed to directly quantify the DNA mutation burden within their skin and the difference in mutation load present before and after field therapy treatment. This study will also explore whether topical fluorouracil is more effective than topical imiquimod at reducing the number of DNA mutations in the skin. Results from this study are anticipated to impact a clinician’s decision to prescribe field therapies for the treatment of actinic keratoses and our understanding of the effects field therapies have on cutaneous genetic health.

Lucy Rogers

Oral | 9:00–9:55 | Chittenden Bank Room | Biological Sciences

Title: Wildlife Values of Conservation Professionals: A Case Study of the International Bear Association

Faculty Mentor: Cheryl Morse, Geography

Abstract: The study of human perceptions of wildlife is a relatively new field, yet it has critical implications for conservation efforts. Most of the existing research within this field has taken place in the United States and has focused on the general public’s perceptions of wildlife rather than those of the conservationists who design and administer wildlife conservation projects. My research begins to address these gaps by the wildlife values of biologists in the International Bear Association (IBA). The research employs multiple qualitative and quantitative methods. The analysis includes cross-cultural comparisons of IBA members, as well as comparisons between IBA members’ and the public’s perceptions of wildlife.

Sandra Romero

Poster | 1:00–2:30 | Livak Ballroom | Mathematical & Physical Sciences

Title: In-Situ Visualization of Crystal Nucleation and Growth Behaviors of Polymers Under High Pressure Gases

Faculty Mentor: Chang Dong Lee, Mechanical Engineering

Abstract: This study investigates the crystallization behaviors of polylactic-acid (PLA) and polypropylene (PP) under various gas pressures using a high-pressure differential scanning calorimeter and a novel custom-made sliding plate chamber. It was found that the crystallization rate followed the Avrami equation. However, results showed that the dissolution of CO₂ increases the crystallization rate in the crystal-growth-controlled region (self-diffusion controlled region) and depresses in the nucleation-controlled region.

Milad Roohi Ghareshiran

Poster | 11:00-12:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: Post-earthquake Safety Evaluation of Instrumented Buildings

Faculty Mentor: Eric Hernandez, Civil & Env Engineering; David V. Rosowsky, Office of the Provost

Abstract: Vibration measurements from an instrumented building during an earthquake can be used to evaluate if the building can be reoccupied or resist possible future earthquakes. These measurements provide useful information for structural engineers in the variety of applications including post-earthquake condition assessment and code validation of structures. However, the number of instruments are regularly utilized to record the seismic response of buildings is not enough to acquire all quantities of interest and some quantities still would remain unmeasurable. This study presents an extended model-based state estimator capable of reconstructing nonlinear time-history seismic response of realistic and minimally instrumented building structures. This includes displacements, velocity, acceleration and internal forces in all structural members. The estimator combines sparse velocity measurements and a detailed nonlinear structural model of the building. The methodology is illustrated using data recorded as part of the NEESWood Capstone building shake test conducted at the E-Defense facility in Japan.

Daniel Russell

Oral | 11:00-11:55 | Jost Foundation Room | Mathematical & Physical Sciences

Title: Numerical Modeling of a Magnetic Gyroscope for Cube-Satellite Attitude Control

Faculty Mentor: Darren Hitt, Mechanical Engineering; Ryan McDevitt, Mechanical Engineering

Abstract: The cost per pound of putting a satellite into space has forced the growth of small, light, and cost-effective satellites known as cubesats. The satellites have many different functions and systems on board, one of which is a miniaturized attitude control device, which provides the satellite with the ability to change its orientation in space. Because of restraints on weight and mass of this system, the solution of a spinning spherical permanent magnet as a gyroscope has been proposed. A similar design using a sphere and ferrofluid has been previously shown to produce angular momentum. The focus of this project is to develop a computational model for the spinning magnet in two dimensions for a given time-dependent magnetic field. The analysis and simulation of the sphere's dynamics based on the changing magnetic fields allows for the estimation of its performance and optimization. It was found that the dynamics of the magnet can be accurately simulated, and that the rotation of the magnet can be controlled by pulsing solenoids.

Sophia Ryan

Poster | 9:00-10:30 | Frank Livak Ballroom | Food & Environmental Studies

Title: Quantifying stream phosphorous dynamics and total suspended sediment export in forested watersheds in Vermont

Faculty Mentor: Beverley Coghill-Wemple, Geography; Donald Ross, Plant & Soil Sciences

Abstract: Globally the quantity of reactive phosphorus (P) in soils, streams and groundwater has greatly increased throughout the 20th and early 21st centuries. This phenomenon is problematic in Vermont, evidenced by the repeated cyanobacteria blooms in shallow bays in Lake Champlain. While many studies have focused on P dynamics in agricultural watersheds, there is limited information on P dynamics in forested watersheds. Current remediation plans under the Lake Champlain TMDL call for substantial reductions in P loadings from forested areas of the basin. However, the lack of information and knowledge regarding forest P dynamics limits management and remediation plans. This study was conducted in three small forested watersheds, ranging in size from 2.5 to 8.3 square kilometers that have been managed under varying practices, including logging and maple sugaring. All three of the watersheds drain into Missisquoi Bay, a shallow bay in Lake Champlain that consistently has seasonal algal blooms. Streams were instrumented with pressure transducers to measure stage and a stream discharge rating curve was developed. Water samples were collected from May through November using ISCO Automated Samplers. A total of twenty storm events were captured, along with periodic baseflow sampling, and used to characterize P concentrations and calculate seasonal P loadings. Preliminary results indicate that there is a strong positive correlation between sediment concentration and total phosphorus concentrations (r^2 ranging from .69 to .90). The ultimate goal of this project is to gain a better understanding of the variability of P and total suspended sediment outputs within forested catchments of Lake Champlain tributaries.

The Student Research Conference would like to thank our generous sponsors:



Tessie Sakai

Oral | 9:00-9:55 | Williams Family Room | Arts & Humanities

Title: Moving Mountains: Pathetic Fallacy in Theocritus and Virgil

Faculty Mentor: Angeline Chiu, Classics

Abstract: Scholars have often dismissed the pathetic fallacy as a signpost of the pastoral genre and a reminder that the pastoral countryside is highly contrived and often idealized. Previous scholarship on the pathetic fallacy has primarily focused on how the literary device has developed, in terms of a linear progression, throughout ancient Greek and Latin poetry. Many scholars have concluded that Virgil uses pathetic fallacy with more sophistication than Theocritus, the “father” of pastoral poetry, but do not further analyze the significance of the device and its contributions to the poetry as a whole. This paper compares how Theocritus and Virgil use the pathetic fallacy in their pastoral Idylls and Eclogues, respectively, to explore how literary herdsmen conceptualize both pastoral and non-pastoral space and their place within it. As a result of land reallocation and displacement, Virgil’s herdsmen conceptualize space and song differently than do Theocritus’ herdsmen, who instead agonize over eros, love. As a result, pathetic fallacy conveys a sense of belonging and the power of song among Virgil’s herdsmen in a way that is not necessary among Theocritus’ herdsmen. Analysis of this literary device allows for a deeper understanding of the relationship between ancient Greek and Roman literary traditions and the relationship between identity, space, and belonging.

Priyanka Santhanakrishnan

Poster | 3:00-4:30 | Silver Maple Ballroom | Food & Environmental Studies

Title: The Impact of Labeling on the Activation of Health Halos

Faculty Mentor: Elizabeth Pope, Nutrition & Food Sciences

Abstract: BACKGROUND: Highlighting the inclusion of a vegetable or a whole grain on a food’s label may encourage consumers to choose that food by activating a “health halo” where a consumer thinks a food is healthy because one of its ingredients is healthy. Little is known about when health halos may be activated and when they may promote consumer food selection.

OBJECTIVES: To determine the impact on food selection of highlighting the vegetable content of lasagna and the quinoa content of chocolate chip cookies on the foods’ labels. To examine what factors significantly impact food selection including health halos.

METHODS: Participants (N=212) engaged in a 3-part study, first choosing their preferred lasagna after looking at three identical pictures of lasagna with the labels Lasagna, Spinach Lasagna, and Bone Builder Lasagna. Participants then chose between two actual cookies labeled chocolate chip cookie and quinoa chocolate chip cookie. Finally, participants answered questions on a data form examining why they chose the foods they did, and what their health and taste impressions of the various foods were.

RESULTS: Participants who thought Spinach Lasagna was more nutritious were less likely to choose the Spinach Lasagna. Whether a participant thought the quinoa cookie was more nutritious or healthier did not impact cookie choice. Those who thought the Spinach Lasagna or Quinoa Chocolate Chip Cookie would taste better were more likely to choose those options.

CONCLUSION: Highlighting how healthy a food is may not be an effective strategy to nudge consumer selection. Although consumers rated spinach and quinoa containing foods as more healthy, this did not translate into greater selection of these foods indicating that any health halo activation did not drive food selection. Promoting the taste of healthy foods, instead of the health of the food, may more effectively persuade consumers to purchase healthy foods.

Anish Sarkar

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: Inflammation of the taste system: Cyclophosphamide and Amifostine

Faculty Mentor: Eugene Delay, Biology

Abstract: Chemotherapeutics are used extensively to treat cancer patients, and often induce adverse effects, including taste dysfunctions. Disturbances in taste are detrimental to the overall well-being of cancer patients, causing malnutrition and weight loss that aggravate their condition even further. To improve the quality of lives of these patients, it is important to address their taste-related concerns. Our research is studying molecular, cellular and behavioral aspects of the gustatory system affected by chemotherapy drugs such as cyclophosphamide (CYP). CYP is a pro-drug and once it is metabolized by the P450 enzyme complex, its primary metabolite functions as an alkylating agent. This research is examining potential drug-induced inflammation and changes in taste progenitor cell popula-

Abstract (Sarkar, cont'd): suggests CYP-induced cell loss in taste buds and non-taste epithelium of the tongue peaks about 8 hours after CYP administration (75 mg/kg, IP) and abates after 18-24 hours. In this study, Ki67 labelling indicated that CYP reduced the number of proliferating cells within 24 hour of injection. Fluorescent labelling indicated there is an increase in the expression of the cytokine TNF-alpha within the first 24 hours after CYP injection. Pretreatment with Amifostine (100 mg/kg, SC), a cytoprotective agent, appeared to protect taste cells by negating CYP-induced effects on proliferation and inflammation.

Madeline Schumacher

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences

Title: A diet analysis of juvenile lake trout in Lake Champlain

Faculty Mentor: Ellen Marsden, Rubenstein School of Environment and Natural Resources

Abstract: Lake trout disappeared from Lake Champlain by 1900, and have been stocked as age-0 and yearlings since 1972; until recently, however, little to no natural recruitment has occurred. Stocked lake trout are sampled at spawning sites, but juveniles are not regularly sampled. In 2015 we began focused bottom trawling for juvenile lake trout, and found 23% of age-0 to age-3 were wild (i.e., progeny of stocked fish). The proportion increased to 33% in 2016, and 50% in 2017, with increasing numbers of young-of-the-year lake trout each year. Our goal is to understand what factors are involved in this sudden successful recruitment of wild lake trout. Potential prey of age-0 lake trout may have become more available, or competition with stocked lake trout may have altered. We analyzed diet and condition factor of 622 wild lake trout and 870 stocked lake trout between 50 and 400 mm total length collected in May to November 2015-2017. Stocked fish were, on average, the size of wild fish one year older. Average Fulton's condition factor was slightly higher overall for stocked fish (0.90) than wild fish (0.83), and higher in spring and fall than mid-summer. Mysis comprised 90-100% of the diet (by number) of age-0 wild lake trout, 90% of the diet of wild spring yearlings, and 45-54% of the diet in summer and fall of age-1 fish. In contrast, only 15-60% of the diet of age-0 stocked fish, seasonally, was Mysis. By age 1, the diet of stocked fish was very similar to that of the wild age-2 lake trout, consisting of small smelt, sculpin, alewife, and Mysis. The low diet overlap of age-0 wild and stocked fish suggests competition is not likely to be a limiting factor; instead, recruitment may depend on availability and abundance of Mysis. Changes in distribution, local abundance, or spatial overlap of Mysis with age-0 lake trout may potentially explain increased survival of young lake trout beginning in 2015.

Aaron Schwartz

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: Exposure to Urban Parks Improves Mood and Reduces Negativity Bias on Twitter

Faculty Mentor: Taylor Ricketts, Rubenstein School of Environment & Natural Resources; Christopher Danforth, Mathematics & Statistics; Peter Dodds, Mathematics & Statistics

Abstract: Our increasingly urban, indoor, and sedentary lifestyles are correlated with rising rates of mental health disease. Time in nature has been shown to improve mood and reduce stress. Here, we analyze geo-located Tweets to investigate the effects of urban nature exposure on mental health. Using sentiment analysis, which estimates the happiness of text based on the relative frequency of happy and sad words, we construct a time series of happiness for individuals who tweeted in a San Francisco park during the summer of 2016. Tweets in parks are significantly happier than tweets before park visits, and the increase in happiness lasts for several hours following park visitation. We investigate specific word frequencies in relation to park exposure to understand the mechanisms driving the mental benefits of nature exposure. Word patterns indicate that park exposure results in a shift away from negative thinking as well as a shift from individual to collective thinking. Within park categories, Regional Parks have the greatest positive impact on sentiment, which indicates that larger parks with greater amounts of nature are more effective than paved urban plazas for improving mental health outcomes. Understanding the greenspace - mental health link can enhance park design and reduce the growing cost of mental health diseases.

Anna Senft Miller

Poster | 9:00-10:30 | Silver Maple Ballroom | Health Sciences

Title: Lifetime Estrogen Exposure, Cumulative Lifetime Stress, and Cognition in Later Life

Faculty Mentor: Julie Dumas, Psychiatry

Abstract: Women's health is greatly impacted by cumulative life stress as well as lifetime estrogen exposure. In the future, it may be possible to slow the decline in cognition associated with normal aging, optimizing cognitive functioning until the end of life. First, we must understand how different factors interact to influence cognitive chan-

ges in aging. In this study we will examine how stressful experiences affect memory and attention in older women. In addition, we will examine how the hormone estrogen influences the relationship between stress and memory. In this pilot study we will begin the investigation of cognition, stress, and hormones by having 15 women aged 60 and older complete stress and hormone questionnaires and perform two memory tasks. High levels of stress are bad for health in general as well as brain functioning in particular. Studies have shown that estrogen may be able to decrease the negative effects of stress as well as improve memory. No study has examined the combined effects of both estrogen and stress on cognition.

Megna Senthilnathan

Poster | 11:00-12:30 | Frank Livak Ballroom | Biological Sciences/Health Sciences

Title: Does Formation of the Virological Synapse Lead to Ezrin Phosphorylation?

Faculty Mentor: Markus Thali, Microbiology & Molecular Genetics

Abstract: One mode of Human Immunodeficiency Virus 1 (HIV-1) spread is cell-cell transfer between HIV-infected (producers) T cells and CD4⁺ (targets). Cell-cell transfer of virus particles requires the formation of a virological synapse (VS), which forms between the producer and target cell upon viral envelope glycoprotein (Env) to CD4 receptor and coreceptor binding, respectively. Establishment of the VS can result in fusion of the two cells, forming a multinucleated infected cell (syncytium). To prevent syncytia formation, there are many host factors that act as cell-cell fusion repressors. One such repressor is phosphorylated ezrin, an F-actin-binding protein that accumulates at the VS. Phosphorylation of an ezrin threonine residue (T567) activates ezrin at the VS, however the phosphorylation mechanism is currently unknown. Developing tools to characterize this mechanism will be the focus of my work this summer.

Leslie Sepaniac

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences

Title: Different mechanisms of micronucleus formation and impact to genomic stability

Faculty Mentor: Jason Stumpff, Molecular Physiology & Biophysics

Abstract: Micronuclei contain chromosomes excluded from the main nucleus and are used clinically to evaluate genomic instability. Cells that enter cell division with a micronucleus can incur severe, localized DNA rearrangements to the micronucleated chromosome, which has been identified as an early event in tumorigenesis. Furthermore, loss of micronuclear envelope integrity, which exposes the chromosome to the damaging environment of the cell's cytoplasm, also leads to genomic instability. However, it is not understood if all micronuclei have the same impact on cellular fitness. Micronuclei can result from localized DNA breaks, improper attachments between chromosomes and the mitotic spindle, and from defects in chromosome alignment during cell division.

To test whether the impact of micronuclei on genomic stability varies as a function of 1) how they form, or 2) whether cells have activity of key tumor suppressor, p53, we induced micronuclei in three ways and used quantitative fluorescence microscopy to assess whether cells that form micronuclei continue to divide and prevalence of micronuclear envelope rupture. Micronuclei were induced in human retinal pigmented epithelial cells by promoting division with improper attachments via siRNA knockdown of MAD2 (mitotic arrest deficient 2, essential spindle checkpoint protein); promoting division with unaligned chromosomes via knockout of Kif18A, a kinesin protein; or exposing cells to a sub-lethal dose of radiation. Conditions were performed with and without siRNA knockdown of p53.

Our data show that micronucleated cells from unaligned chromosomes undergo cell cycle arrest (division reduced by 67% compared to non-micronucleated cells). However, the rate of micronucleated divisions doubles without p53, suggesting the DNA damage checkpoint prevents micronucleated cells from dividing. Micronuclei that form due to improper attachments are more likely to rupture (29%), compared to those that form due to unaligned chromosomes, (15%), indicating the fate of micronuclei differs between mechanisms ($p < 0.05$).

Mona Sharafi & Joseph P. Campbell

Poster | 11:00-12:30 | Silver Maple Ballroom | Mathematical & Physical Sciences

Title: Crystal-Packing-Driven Enrichment of Atropoisomers

Faculty Mentor: Severin Schneebeli, Chemistry

Abstract: Crystal-packing forces can have a significant impact on the relative stabilities of different molecules and their conformations. The magnitude of such effects is, however, not yet well understood. Herein we show, that crystal packing can completely overrule the relative stabilities of different stereo-isomers in solution. Heating of atropoisomers (i.e. "frozen-out" conformational isomers) in solution leads to complex mixtures. In contrast, solid-state heating

Abstract (Sharafi, et al., cont'd): selectively amplifies minor (< 25 mole %) components of these solution-phase mixtures. We show that this heating strategy is successful for compounds with up to four rotationally hindered s bonds, for which a single stereoisomer out of seven can be amplified selectively. Our results demonstrate that common supra-molecular interactions—for example, [methyl...p] coordination and [CH...O] hydrogen bonding—can readily invert the relative thermodynamic stabilities of different molecular conformations. These findings open up potential new avenues to control the folding of macromolecules.

Rebecca Shedd

Oral | 12:00-12:55 | Jost Foundation Room | Food & Environmental Sciences/Vermont Studies

Title: Measurement of real-world vehicle operation and associated tailpipe emissions using personal vehicle data loggers in low-density rural areas

Faculty Mentor: Britt Holmen, Civil & Environmental Engineering

Abstract: The regulatory community currently has models for predicting driving characteristics for different vehicle types in varying regions, seasons and times of day, lacking insight into what is occurring while the vehicle is in motion. Many of the studies creating these models were done in urban, highly populated regions, but how do the predicted data compare to real-world data for low-density rural areas? For this study, on-board data loggers equipped with GPS were used in personal vehicles in Northern Vermont and New England to collect real world driving data in rural areas to compare with regulatory rural and urban driving. Over 1,200 hours of real-world driving data were collected at 1 Hz temporal resolution with HEMData (J1939) data loggers to record various vehicle operating variables (vehicle speed, engine RPM, air flow rate, intake air temperature, idle time and fuel consumption) in addition to GPS data on vehicle location. The data were validated through a series of measures designed to ensure completeness and correctness of each trip by maintaining precision of each variable as it was originally recorded by the logger, ensuring basic vehicle criteria were internally consistent and verifying the logger and vehicle computer system were working correctly. With the collected data, vehicle specific power (VSP) was calculated using speed, acceleration and an assumed road grade. U.S. EPA's MOVES model was used to estimate tailpipe emissions as a function of speed, VSP, vehicle type, fuel type and time of year. GIS was used to locate the second-by-second VSP to pin point regions of varying VSP, that potentially indicate special roadway characteristics associated with rural regions, such as steep grades, versus high density regions with heavy, stop and go traffic.

Yuxiang Shen

Poster | 9:00- 10:30 | Frank Livak Ballroom | Food & Environmental Sciences/Mathematical & Physical Sciences

Title: Detection and Characterization of Aqueous Nanoparticles by Hyperspectral Imaging with Darkfield Microscopy

Faculty Mentor: Appala Raju Badireddy, Civil & Environmental Engineering

Abstract: Hyperspectral imaging with darkfield microscopy is a novel development in environmental engineering that enables detection, characterization and analysis of nanoparticles in aqueous samples. Under a darkfield microscope, continuum spectra (400-1000nm) were taken over regions of interest to analyze engineered nanoparticles dispersed in ultrapure water. We applied this technique to study the adsorption of organic molecules to carbon nanotubes and graphene oxide. By isolating unique spectral characteristics of the analyte with spectral angle mapping, we identified the spatial distribution of organic molecules on both absorbents.

Casey Sherwin, John Lippitt, Alicia James, & Sarah Williams

Oral | 2:00-2:55 | Jost Foundation Room | Health Sciences

Title: Coordination and Neural Correlates after Stroke: Tapping our way to stroke recovery

Faculty Mentor: Denise Peters, Rehabilitation & Movement Sciences

Abstract: Stroke is a leading cause of long-term disability and is associated with significant functional limitations and reduced independence in activities of daily living. Previous research has associated motor outcomes with lesion location and size of the infarct. More recently, studies have found correlations between changes in cortical structural connectivity and motor deficits following stroke. Neuroimaging techniques have been used to link cortical connectivity to gross motor impairments. More research is needed, however, to examine the relationship between structural connectivity damage and fine motor deficits such as coordination impairments post-stroke. The purpose of this study is to examine the relationship between structural connectivity within key brain motor areas and upper/lower extremity (UE/LE) coordination in persons with chronic stroke. Specifically, we will examine differences in motor network structural connectivity relative to different coordination tasks, as well as compared to general motor weakness. The current study is a retrospective analysis of data collected from 43 participants (16 female; mean age 59.7 ± 11.2 years;

time post-stroke 64.4 ± 58.8 months). Participants underwent MRI and a comprehensive behavioral assessment that included UE/LE dexterity tasks (e.g., unilateral index finger tapping, unilateral coordination, and bilateral coordination of the extremities) as well as measures of gross motor strength. MRI data was collected to examine the impact of stroke on white matter tracts that connect brain regions important for motor control and coordination. Inter-rater reliability of finger/foot tapping counts will be assessed, and regression analyses will be conducted to examine the relationship between structural connectivity of our defined motor network and measures of UE/LE coordination.

Sylvia Signorelli

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: Genome-Wide Analysis of Bromodomain Histone Di-Acetyllysine Ligands

Faculty Mentor: Seth Fretze, Medical Laboratory & Radiation Sciences

Abstract: Combinatorial patterns of epigenetic modifications on core histone proteins serve in the marking of genomic elements for the recruitment of regulatory proteins to effect critical biological functions. The recognition of acetylated histone lysine residues by bromodomain chromatin readers appears to be an essential cellular mechanism that regulates protein-protein interactions, chromatin remodeling, and gene expression. However, the functional relevance of the association of bromodomain chromatin readers and their genome-wide association with various combinations of histone acetylations remains poorly understood. ATAD2 is a bromodomain-containing protein highly overexpressed in solid tumors, and has been correlated to an increased risk of cancer metastasis and recurrence. ATAD2B (KIAA1240) is a poorly studied paralog of the ATAD2 gene, and although ATAD2 and ATAD2B are highly conserved, there is little known about the function of ATAD2B. In vitro binding assays demonstrate ATAD2 and ATAD2B bromodomains selectively recognize H4K5/H4K12 and H4K5/H4K8 di-acetyllysine marks, respectively. To study the genome-wide patterns of ATAD2/2B histone ligands, we used a Chromatin Immunoprecipitation followed by high-throughput sequencing (ChIP-seq) assay to characterize the genomic distribution of H4 tail lysine acetylation patterns in MCF7 breast cancer cells. We performed replicate H4K5, H4K8, H4K12 ChIP-seq assays as well as H4K5/K8 or H4K5/K12 sequential ChIP-seq assays. We provide a high-resolution map of combinations of histone tail acetylation in MCF7 cells. Our results reveal unique patterns of chromatin states, genes and putative transcription factor binding sites associated with different combinations of di-acetyllysine residues. Ongoing work seeks to define the recruitment of ATAD2/B, as well as other chromatin effector proteins, and to understand the functional relevance of histone ligand recognition on breast cancer cell gene expression programs.

Harry Silbaugh

Poster | 9:00-10:30 | Frank Livak Ballroom | Food & Environmental Studies/Biological Sciences

Title: The influence of climatic variation on *Pinus strobus* radial growth at a low-elevation, temperate site.

Faculty Mentor: Shelly Rayback, Geography

Abstract: The response of temperate conifers to various climate stresses remains poorly understood in the scientific community. Previous studies have focused on the climate sensitivity of *P. strobus* in the Great Lakes region, however little research has been carried out in the temperate Northeast. Evaluating the response of *P. strobus* in Vermont to climatic variation is important for developing a stronger spatial link between the warmer mid-Atlantic region, temperate Great Lakes region, and the North American Boreal forest. This study examines the response of Eastern White Pine to several environmental variables over the 20th and 21st centuries. Increment cores were collected from dominant Eastern White Pine in a Limestone Bluff Cedar-Pine stand at a low-elevation site in Vermont's Champlain Valley. Increment cores were collected and prepared using standard dendrochronological techniques, and crossdated using the List Method and the software program COFECHA. Raw ring widths were converted to Basal Area Increment (BAI) to examine stand-level growth trends. The chronology was correlated with temperature, precipitation, drought indices, and pollutant loading at multiple timescales.

Further examination of the relative influence climatic variables have on radial growth in *P. strobus* will be performed using DendroClim. Spatial analysis of *P. strobus*' environmental response in Vermont will be done using Climate Explorer. Based on studies from the Great Lakes region, and examination of other temperate conifers at the site, *P. strobus* will likely show positive correlations with summer precipitation, and negative correlations with summer maximum temperature. The occurrence of false rings in *P. strobus* due to moisture stress may also be present in this chronology, which has been observed in other high-latitude stands with little soil. Eastern White Pine has shown positive correlation with PDSI at other sites. Impacts of pollutant loading are likely minimal, as low-elevation sites in Vermont have shown little exceedance damage.

Sarah Sims, Phoebe Tucker, & Kyle Weatherhogg

Oral | 12:00-12:55 | Chittenden Bank Room | Food & Environmental Sciences/Social Sciences

Title: Linking Adaptive Management to Climate Change Impacts on Diversified Vegetable and Berry Farms in Northern New England

Faculty Mentor: V. Ernesto Mendez, Plant & Soil Science

Abstract: Climate models for the Northeast United States forecast an increase in frequency and intensity of both drought and extreme precipitation in the coming decades. The success and viability of farms is dependent on favorable weather conditions. The purpose of this project is to support farmers and agricultural advisors in adapting farm management practices to greater respond to increases in extreme drought and precipitation. This two-year project [currently in its first year] is based on the premise that farmers are actively adapting to the changing environment. As part of an undergraduate research team, we facilitated in the process of generating survey responses from approximately 250 vegetable and fruit growers across the Northeast. This project draws upon the expertise of vegetable and berry growers to identify what

information is critical to disseminate, and what barriers still exist in climate adaptation management. Interviews were also conducted with Extension agents throughout Northern New England to understand information flow dynamics and varying adaptation strategies. The second year of the project will be dedicated to sharing first-year research through farmer-to-farmer lead focus groups across participating states. The goal of these focus groups is to understand what support and information is needed by farmers to help the agricultural community adapt to extreme weather risks. This project is led by Graduate student Alissa White, under the faculty advising of Ernesto Mendez. Funding for the project has come from Northeast SARE and the USDA Northeast Climate Hub.

Julia Sjoquist

Poster | 9:00- 10:30 | Silver Maple Ballroom | Biological Sciences

Title: Bovine Brain Atlas & Comparative Neuroanatomy: A Study in Emotional Memory

Faculty Mentor: Nathan Jebbett, Biology; Stephanie McKay, Animal & Veterinary Sciences

Abstract: With selective breeding, humans have bred tameness into originally wild animals, notably agricultural species, causing shrinkage of the telencephalon and changes in the underlying morphological and genetic processes that govern behavior. The telencephalon includes regions responsible for memory and emotional processing, subsequently affecting behavior; total shrinkage would decrease the proportional size and connections between all of these structures. Tameness is also thought to affect aggression and the interplay between emotional memory and reactive behavior. We analyzed how emotional memory structures (prefrontal cortex, entorhinal cortex and the basolateral amygdala) of *Bos taurus*, domesticated cattle, compared against published brain atlases. To determine if domestication played a role in limbic structure shrinkage, individual limbic structure volume relative to total brain volume were compared between domesticated sheep, *Ovis aries*, non-domesticated, dolphin, *Tursiops truncatus*, which shares the same taxonomic order of *Bos taurus*, and *Bos taurus*. In order to augment this, a sectioned, thio-nine stained *Bos taurus* brain atlas was developed, and then used for volumetric comparisons by summation of 2-D areas across multiple sectioned slides, ~300 μ m apart, to create a 3-D representation of that structure's volume. If domestication truly decreased total telencephalon size, then the sizes of the prefrontal cortex, entorhinal cortex and basolateral amygdala will be smaller than the wild dolphin. We hypothesize that in selecting for tameness, it limited the growth of structures implicated in emotional memory that would otherwise divert animals from close contact with humans. Tameness may derive from the decreased volume of limbic structures because they are responsible for emotional memory and reactions. This project highlights the effect of domestication on brain size and perhaps the implications of decreased limbic structures in tameness, in relation to cattle.

Holden Sparacino

Oral | 3:00-4:30 | Sugar Maple Ballroom | Food & Environmental Sciences/Social Science/Vermont Studies

Title: Winter Road Maintenance: Identifying and Lowering Private Contractors' Barriers to Adopting Best Management Practices

Faculty Mentor: Kris Stepenuck, Rubenstein School for Environment & Natural Resources

Abstract: Winter road maintenance keeps roads free of snow and ice, but can also negatively impact surface water quality, pose risks to aquatic life, and may contaminate groundwater, increasing risks of contamination for private wells or public drinking supplies sourced from groundwater. As environmental impacts have grown and materials costs have risen, many municipalities have adopted preventative measures (best management practices) to reduce salt use, helping to minimize environmental impacts, save money, and continue to provide a similar level of service.

However, it is largely unknown if private contractors who maintain private roadways, commercial parking lots and sidewalks have adopted these practices, and what their motivations and barriers are to doing so. In this talk, an ongoing mixed-methods study in the Lake Champlain Basin will be discussed. That study seeks to identify the current practices of private contractors, and use findings to identify barriers to best management practice adoption, and to develop outreach and learning opportunities for contractors. Ultimately the study and outreach aim to increase private contractors' awareness of environmental and economic outcomes of their practices, and lower barriers to adopting new, lower salt practices. Inter-rater reliability of finger/foot tapping counts will be assessed, and regression analyses will be conducted to examine the relationship between structural connectivity of our defined motor network and measures of UE/LE coordination.

Anthony Spinella

Poster | 3:00-4:30 | Frank Livak Ballroom | Biological Sciences/Health Sciences

Title: In Vivo characterization of hippocampal electrophysiological processes in the heterozygous Pten knockout model of autism

Faculty Mentor: Jeremy Barry, Neurological Sciences; Jom Hammack, Psychological Science; Matthew Weston, Neurological Sciences

Abstract: While cognitive deficits have been described in the heterozygous Pten (+/-) knockout mouse model of autism, little work has been done to demonstrate how corresponding in vitro physiological alterations in this model may underpin these cognitive deficits in vivo. We attempt to bridge this gap between cognitive and physiological dysfunction by measuring the efficacy of hippocampal networks through the in vivo recording of CA1 place cells. As Pten (+/-) is known to alter electrophysiological characteristics of neurons in vitro, this study measures the in vivo electrophysiological characteristics of CA1 interneurons, pyramidal cells, and place cells which may underlie the spatial cognitive deficits seen in the model. Four transgenic conditional heterozygous Pten^{+/loxPloxP};Gfap-cre mice (HetPten) targeting granule cells in the dentate gyrus, neurons in CA2 and CA3, but not astrocytes, and four homozygous Pten (+/+) litter mate control mice were used in this study. In vivo local field potentials and single cell recordings were made in CA1 of each mouse during an open field foraging task in two distinct cylindrical arenas. HetPten mice were found to have increased interneuron and pyramidal cell firing rates, places cells with abnormal place field properties such increased out-of-field firing rates, an increased number of fields, trends towards larger field sizes, and abnormal field stabilities compared to controls. Additionally, HetPten mice had slower CA1 high gamma oscillations, more variable speed/theta oscillation correlations across animals, and trends towards decreased motor output compared to controls. These data suggest that the electrophysiological alterations due to Pten (+/-) in mouse hippocampal neurons lead to hyperactivation of CA1 interneurons, pyramidal cells, and place cells. Rectifying these abnormal network conditions may represent a possible avenue for therapeutic intervention in the Pten (+/-) model as correcting for the underlying biology may rescue the deficits in the spatial component of autistic cognitive impairments.

Knowles Spofford

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences

Title: On the Association between Street Design and Walkability

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: There is a growing body of work dedicated to studying the seldomly quantified concept of "walkability". A key component of walkability is pedestrian safety, and this is a goal all transportation planners strive for, especially in urban areas. Past work has analyzed walkability both qualitatively and quantitatively, but there is no one accepted method for studying the concept. Recently, a push has been made by Lee and Moudon, Harvey et al., and others to develop quantitative street design variables in cities such as Boston, the focus of this study. These variables quantify, at the street block level, street design attributes such as average building height, streetscape width, tree canopy coverage, streetscape building continuity, and more. One design variable that has been infrequently studied in association with walkability is street curb-to-curb width. Data on curb-to-curb width is available in Boston, and a key focus of this thesis will be to analyze its relationship with walkability and other street design variables. Walkability will be measured quantitatively using available crowd-sourced data from Place Pulse, an MIT study in which participants rate the safety of images of street blocks in Boston. A GIS database of 450 images of blocks across the city with StreetScore data and street design variables will be used to draw conclusions on how certain variables play a role in improving walkability, with close attention being paid to the sparsely studied variable of curb-to-curb width. This thesis aims to contribute to the growing quantitative research focused on improving walkability in cities, and

Abstract (Spofford, cont'd): hopes to spark an impetus in urban planners in less pedestrian-friendly cities to work to reduce the need for personal vehicles and encourage more sustainable mode choices.

Rose Steinberg

Oral | 11:00-11:55 | Jost Foundation Room | Mathematical & Physical Sciences

Title: Enumerating Curves Over a Finite Field

Faculty Mentor: Christelle Vincent, Mathematics & Statistics

Abstract: This project concerns itself with enumerating curves defined over finite fields for certain genera and field cardinalities within a manageable range, which will depend on how fast we are able to perform the computation. In particular, we expect to be able to list all curves of genus two for fields of cardinality less than or equal to eleven, which will give us a complete list of curves of genus two defined over a finite field with the property that the curve has no rational point.

Madeline Suender

Poster | 3:00-4:30 | Silver Maple Ballroom | Vermont Studies/Social Sciences

Title: An Aging Driver Population's Effect on Crashes

Faculty Mentor: Lisa Aultman-Hall, Civil & Environmental Engineering

Abstract: This is a study of the propensity of drivers 65 years and older to be at fault in traffic crashes in the state of Vermont. Due to the aging population, this topic is increasing in importance with each passing year. The Federal Highway Administration actively monitors older drivers and has acknowledged a 26 percent increase in people over the age of 65 years between 2005 and 2014. The relationship between age and relative crash fault was evaluated in this study. Vermont Crash Data from police reports between 2007-2016 was used for the analysis. The relative ratios of drivers over the age of 65 causing both single and 2-vehicle crashes was calculated for the following circumstances: Road lighting, angle of impact, crash severity. Statistical significance was modeled using binary logistic regression.

Alexandra Sullivan & Renee Benoit

Poster | 3:00-4:30 | Silver Maple Ballroom | Social Sciences

Title: Does Parenting Mediate the Relationship Between Cumulative SES Risk and Child Outcomes? A Structural Equation Modeling Approach

Faculty Mentor: Rex Forehand, Psychological Science

Abstract: INTRODUCTION: Peer victimization, including victimization that is physical (e.g., punching) and relational (e.g., gossiping) in form, is a critical problem associated with a wide range of persistent negative outcomes. Some findings indicate that social adversity (e.g., parental abuse) is related to children's biased processing of anger; however, little work has examined emotion recognition biases among peer-victimized children. Thus, in a sample of 57 children ages 9 to 12 years ($M_{age} = 10.57$; 51% boys) and one of their parents (91.2% mothers), I investigated whether a history of peer victimization predicted differences in reaction time, accuracy, and response biases to neutral faces in the identification of angry and neutral faces relative to happy faces. I also investigated whether there were differing patterns of effects in emotion recognition biases across victimization subtypes (i.e., relational versus physical), as well as whether gender moderated the association between victimization subtypes and bias.

METHOD & RESULTS: Parent-reports of child physical and relational peer victimization were collected. Emotion recognition biases were assessed using an interpersonal emotion stimuli paradigm.

Data were analyzed using mixed models in SPSS to account for the nesting of condition within individual, and significant interactions were probed using simple slopes. Results indicated a 3-way interaction between relational victimization, gender, and condition in predicting accuracy. Results also indicated a 3-way interaction between gender, physical victimization, and condition in predicting reaction time. Lastly, results indicated a 3-way interaction between gender, relational victimization, and condition in the prediction of response biases toward neutral faces.

DISCUSSION: Findings indicate that social adversity, in particular peer victimization, is related to emotion recognition biases. Implications and future directions will be discussed.

The Student Research Conference would like to thank our generous sponsors:



John Suozzo

Oral | 10:00-10:55 | Williams Family Room | Arts & Humanities/Social Sciences

Title: Carl Schurz, Ulysses S. Grant, and Andrew Johnson: Reconstruction Policy and Comparing Reports on the Post-Civil War South

Faculty Mentor: Nicole Phelps, History

Abstract: Following the end of the Civil War in 1865, President Andrew Johnson sent both Carl Schurz and Ulysses S. Grant to report on the condition of the former Confederate States, and the effectiveness of Reconstruction policies in the region. As Johnson had ascended to the presidency following the assassination of Abraham Lincoln five days after the Confederate surrender at Appomattox, many problems had ensued from his Reconstruction policies. His policies were very lenient toward the southern states, which reflected Johnson's personal identity as a Southerner. Criticism came primarily from the Radical Republicans, who argued in support of more punitive measures towards the former Confederacy to ensure that rights were upheld in the South for African-Americans.

One of the most public rebukes of Johnson's Reconstruction policy came from Carl Schurz, a German immigrant and former major general in the Union Army, who would later serve as a Senator from Missouri. Schurz – a Radical Republican – embarked on a three month journey throughout the South, and published a critical report of how Johnson's policies were affecting the South negatively. In response, Johnson sent the renowned General Ulysses S. Grant to report on the South as well, in an attempt to overshadow the issues raised by Schurz by affirming Johnson's plans. In this paper, I contrast the reports written by Schurz and Grant, and argue that the focus and intentions of these reports were vastly different. This paper also addresses Johnson's motivations for sending both Schurz and Grant to compose a report on the South, and the significance between the differences of their reports as it relates to race, class, and political affiliations.

Abishag Suresh

Poster | 1:00-2:30 | Silver Maple Ballroom | Health Sciences/Professional Studies – Education

Title: Developing and Studying the Effectiveness of a Multi-modal Mental Status Module in Learning the Mental Status Examination in Undergraduate Medical Education

Faculty Mentor: Judith Lewis, Psychiatry

Abstract: The mental status exam is the backbone of the psychiatric examination (Snyderman et al, 2009). Currently, there are no modules available for widespread use to teach the mental status exam (MSE). We have been redesigning a module used here in the Neuroscience course and Psychiatry Clerkship at the University of Vermont Larner College of Medicine curriculum. This module would supplement classroom instruction for students to learn the basics of the necessary clinical skills needed in a psychiatric examination on their own time. In order to assess the effectiveness of the module we have, we administered the module versus a standardized reading to two groups of first year medical students.

We found out that over 95% of the students in the module group agreed or strongly agreed that it was easy to navigate (61 students took the surveys out of 119 in the class). Similarly, over 88% thought the multimedia used in the module was relevant and useful and over 70% thought that overall the module was effective. A two-tailed t-test and a Mann-Whitney test between the two groups on the length of time it took to complete resulted in a statistically significant difference ($p=0.04$ and 0.018 respectively) with the reading actually taking less time. It is possible that this difference is due to some students skimming the reading material as suggested by the comments in the survey. Statistical testing (t-test and Mann-Whitney test) of a knowledge portion of the assessments, however, was not statistically significant ($p=0.43$ and 0.34 respectively), thus illustrating that the module resulted in equivalent knowledge acquisition as the standard reading. In addition, our data suggests a trend towards the effectiveness of the module. Finally, the qualitative responses from the survey demonstrated that this module, possibly with a beginner and advanced version, will likely be a good tool for students to study the MSE nationally.

Josh Taylor

Oral | 9:00-9:55 | Chittenden Bank Room | Professional Studies – Education/Food & Environmental Sciences/Vermont Studies

Title: Universal Free School Meals Programs in Vermont Show Multi-domain Benefits

Faculty Mentor: Bernice Garnett, Education; Joshua Farley, Community Development & Applied Economics

Abstract: 14% of Vermont children live in a household that is food insecure, meaning that children in these homes experience hunger or reduced food consumption due to a lack of family financial resources. School meals for low-in-

Abstract (Taylor, cont'd): roughly 43% of Vermont youth receive free or reduced price meals in school. For eligible districts recently available federally funded universal free school meals programs provide all children meals regardless of income. The following paper draws on analysis from 2017 research that surveyed staff at 57 K-12 schools in Vermont which have implemented universal free meals programs. This project partners closely with Hunger Free Vermont to examine the influence of universal free school meals on multiple domains of child development to further strengthen Vermont school food and policy initiatives aimed at reducing hunger and improving childhood development, especially for Vermont's most vulnerable children. The specific research questions guiding this project include:

1. How has the implementation of universal free school meals influenced the school climate?
2. How has the implementation of universal free school meals influenced student academics and student behavior within each school?
3. What are the implications of implementation of universal free school meals on school finances and school food programs?

Results consistently showed positive impacts for schools in Vermont that implement universal free meals programs. Respondents confirmed that universal meals programs correlate with increased readiness to learn, reduced food-insecurity, better school meal program finances, and improved social climate in participating schools. This study offers unique data and analysis relevant to policy makers and other researchers as it represents one of the first and only statewide studies of K-12 universal school meal programs in the United States.

Justin Tedeschi

Oral | 3:00-3:55 | Chittenden Bank Room | Biological Sciences/Health Sciences

Title: Perspective of a Patient: A Comparative Analysis of Duchenne and Emery-Dreifuss Muscular Dystrophies

Faculty Mentor: Andrew Mead, Biology

Abstract: Duchenne and Emery-Dreifuss muscular dystrophies are caused by dysfunctional protein components that are crucially important for withstanding the force from contracting muscle cells, and cytoskeletal tension. Force is transduced across the cell, and nuclear membranes by protein complexes that contain structurally similar proteins, dystrophin and nesprin. Duchenne Muscular Dystrophy (DMD) patients have a mutated dystrophin gene, and the resulting absence of the dystrophin protein leads to the loss of plasma membrane integrity, and necrosis, in muscle cells. Cytoskeletal tension is transduced across the nuclear membrane by the LINC complex, via a nesprin. Patients with Emery-Dreifuss Muscular Dystrophy (EDMD) are unable to utilize this mechanism and thus exhibit impaired nuclear membrane. Both proteins have a similarly constructed rod domain, composed of numerous spectrin repeats, that chains together the actin and membrane bound domains. The striking similarities between dystrophin and nesprin proteins suggest a functional relation between their distinctly similar structure and their respective pathologies that has yet to be explored in the literature.

Biswash Thakuri

Oral | 12:00-12:55 | Williams Family Room | Mathematical & Physical Sciences

Title: Spectroscopic investigation of heme binding by MhuD

Faculty Mentor: Matthew Liptak, Chemistry

Abstract: Mycobacterium heme utilization Degrader (MhuD) from Mycobacterium tuberculosis is a non-canonical heme oxygenase (HO), which degrades heme to mycobilin and non-heme iron. A unique property of MhuD is its ability to bind two hemes per monomer. Recent studies have reported that the cytosolic concentration of labile heme is 20-40 nM, and the equilibrium constant for dissociation of the first heme from MhuD (K_{d1}) is $8.3 \pm 2.2 \mu\text{M}$, which suggests that MhuD may be an inefficient HO in vivo. However, the K_{d1} for MhuD was previously measured for a micromolar concentration sample, more recent data indicates that the K_{d1} for similar non-canonical HOs is nanomolar, and it is nearly impossible to measure an accurate nanomolar dissociation constant at micromolar constants. Therefore, the dissociation equilibrium constants for MhuD were re-investigated. Titration of heme into MhuD was monitored using fluorescence and UV-Vis absorption (Abs) spectroscopy to calculate K_{d1} and the equilibrium constant for dissociation of the second heme from MhuD (K_{d2}), respectively. Analysis of the fluorescence-detected heme titration resulted in a K_{d1} of $7.8 \pm 0.8 \text{ nM}$. Next, a cubic polynomial equation was derived for K_{d1} and K_{d2} , where the only approximation was that K_{d1} was unchanged by binding of second heme, and K_{d2} was extracted from fits of Abs-detected heme titration. The fit gave K_{d2} of $3.3 \pm 1.1 \mu\text{M}$, which is similar with a previous literature report. Simulated titration curves for K_{d1} and K_{d2} values one order of magnitude higher and lower than the best fit value were compared to the experimental data in order to assess the goodness of fit. These data suggest that the previously reported K_{d1} is actually

an upper limit, and MhuD is likely a competent HO in vivo. Moreover, the micromolar Kd2 suggests that it is highly unlikely MhuD binds two hemes in vivo in the absence a partner protein.

Kantima Thanavaro

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: Brain Volumetric Differences Between the Bos Taurus and Ovis Aries

Faculty Mentor: Stephanie McKay, Animal & Veterinary Sciences; Nathan Jebbett, Biology

Abstract: With technological advancements, the domestication of animals has become increasingly complex, requiring better understanding of domesticated animals. Docility measures an animal's temperament, ultimately determining its health in captivity, performance, and quality of meat. The limbic system is an area in the brain that regulates emotional response, including stress. The amygdala is a specific structure within the limbic system that has shown to be modulated by stress – regulating fear response, aggression, and violence. It was hypothesized, that in comparison to the Ovis aries (sheep), the Bos taurus bovine will possess a difference in amygdala volume:total brain volume ratio, due to its known temperament. To catalog the anatomy of the Bos taurus bovine brain, a male, Holstein steer cow brain was fixed through the use of the paraformaldehyde perfusion fixative. After the brain was fully fixed with paraformaldehyde, it was transferred to Neuroscience Associates, a lab located in Knoxville, TN, where the brain was sectioned into 60 micrometer coronal sections using a large cryostat. Every sixth section was mounted to a 3x5 inch glass slide, left to dry, and subsequently stained using a Nissl Thionine stain. Comparative neuroanatomy techniques were employed in order to visualize and label distinct brain structures and nuclei. Calculations determining amygdala volume and total brain volume were obtained so that a ratio between the two could be calculated. The amygdala:total brain ratio using a sheep brain atlas was also obtained. The two volumes were obtained and were compared and analyzed for statistical significance. On results, it was seen that the Bos taurus bovine had a larger amygdala volume:total brain volume ratio compared to the Ovis aries. This information is useful in further understanding complex reasoning and emotional processing in the Bos taurus bovine.

Ethan Thibault

Oral | 12:00-12:55 | Chittenden Bank Room | Biological Sciences

Title: Chilling requirements for bud flush in Populus balsamifera genotypes from across its native species range

Faculty Mentor: Stephen Keller, Plant Biology

Abstract: A rapidly changing climate has researchers seeking ways to model not only future conditions, but how organisms will respond to those changes. Trees rely on temperature and photoperiod as cues for when to stop growth, set bud, and enter dormancy for the winter and when to initiate growth and open their buds in the spring (these are known as phenological traits). With late bud set and early bud flush, trees can maximize their growing season and gain a fitness advantage; however, this exposes the tree to potential damage from early fall and late spring frosts. Attempts to create models that can detect exactly how temperature will impact phenology are underway to predict how future changes in climate will affect tree health, survival, and forest carbon sequestration levels (determined by growing season length). It is known that for buds to open in the spring, a certain amount of chilling degree days are required followed by a certain amount of warm days. The relevant literature is calling for more information regarding chilling requirements, how they link fall, winter, and spring phenology traits, specifically bud flush. We have set up an experiment that will look at a range of chilling degree days and their impact on days until bud flush across genotypes of Populus balsamifera that span the latitudinal gradient of its natural population. We show that as you increase the chilling degree days, time to bud flush decreases across all genotypes. We see that once a certain amount of chilling has been reached, more chilling will no longer decrease the days until bud flush. Finally, we also see differences across the genotypes of P. balsamifera. Valuable data such as this will help create more accurate models that can predict the response of organisms to future climate change.

Alex Thompson

Poster | 9:00- 10:30 | Silver Maple Ballroom | Biological Sciences

Title: Effects of post-translational modification on the mitotic kinesin Eg5

Faculty Mentor: Jason Stumpff, Molecular Physiology & Biophysics

Abstract: Kinesins are enzymes containing a motor domain where ATP is hydrolyzed in order to generate a mechanical force. Eg5 is a kinesin that crosslinks and slides microtubules during the formation of the mitotic spindle, a bipolar structure necessary for cell division. Kinesins undergo post-translational modifications, which are hypothesized to tune motors for specific cellular functions. Eg5, particularly, is subject to a number of

Abstract (Thompson, cont'd): post-translational modifications, including the acetylation of lysine 146. This amino acid is found in the motor domain of Eg5, and acetylation of lysine 146 prevents the formation of a salt bridge.

In order to determine what functional effect this structural change has on Eg5, we have assessed the activity of a mutant Eg5 motor (K146Q) that mimics acetylation. In single molecule assays, Eg5 K146Q dimers are more likely than wild type (WT) dimers to stall rather than dissociate from the microtubule under load. Based on these results, acetylated Eg5 motors would be predicted to act as brakes on microtubule sliding during spindle formation, slowing pole separation. To test this prediction, fluorescently tagged Eg5 WT and K146Q motors were expressed at low levels in HeLa cells. Both WT and K146Q Eg5 localized to the mitotic spindle with similar distributions. Additionally, cells expressing WT or K146Q Eg5 formed mitotic spindles of similar final length. However, spindle pole separation occurred at a significantly slower velocity in cells expressing Eg5 K146Q than in cells expressing Eg5 WT. This velocity difference is consistent with Eg5 acetylated at lysine 146 stalling rather than dissociating from the microtubule, and acting as a brake during pole separation. This acetylation has been observed in cells derived from human glioma patients, and represents a reversible way for cells to re-purpose a molecular motor to serve the cellular function of slowing pole separation.

Daniella Thorsdottir

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences

Title: BDNF Downregulates Adrenergic β -Receptor-Mediated Hypotensive Mechanisms in the Paraventricular Nucleus of the Hypothalamus (PVN)

Faculty Mentor: Benedek Erdos, Pharmacology

Abstract: Brain derived neurotrophic factor (BDNF) is a modulator of neuronal function, capable of mediating long-term changes in neuronal signaling in the central nervous system. Increased expression of BDNF in the PVN has been associated with elevated blood pressure (BP), and heart rate (HR). However, the mechanism mediating this effect of BDNF is unclear. BDNF is also a modulator of catecholaminergic (CA-ergic) neuronal function in the CNS and could potentially influence CA-ergic input to the PVN. The majority of CA-ergic projections to the PVN come from the nucleus of the solitary tract (NTS), and these projections have been shown to be hypotensive. Here, we tested the hypothesis that increased BDNF expression in the PVN elevates BP in part by diminishing the inhibitory input from NTS CA-ergic neurons projecting to the PVN by downregulating β -receptors in the PVN. Sprague-Dawley (SD) rats received bilateral PVN injections of AAV2 viral vectors expressing green fluorescent protein (GFP) or BDNF and bilateral NTS injections of phosphate-buffered saline (PBS) or anti-dopamine- β -hydroxylase-conjugated saporin (DSAP). BP and HR were significantly elevated in BDNF-PBS rats compared to GFP-PBS rats. DSAP injection significantly increased MAP within the GFP group but had no additional hypertensive effect in BDNF rats. To test if BDNF may act on β -receptors, a separate group of SD rats received bilateral PVN injections of AAV2 viral vectors expressing GFP or BDNF. Cardiovascular responses to an injection of isoprenaline, a non-selective β -adrenergic agonist, into the PVN were then recorded under alpha chloralosed-urethane anesthesia. BP was significantly lowered in response to an isoprenaline injection in the GFP group compared to the BDNF group which showed a smaller attenuation of BP. Our findings indicate that increased BDNF expression in the PVN may disrupt CA-ergic signaling between the NTS and PVN by downregulating β -receptors in the PVN.

Sarah Tichonuk, Emily Barbour, Caroline Aubry

Oral | 10:00- 10:55 | Sugar Maple Ballroom | Food & Environmental Sciences

Title: Learning through Food and Communication in a Study Abroad Context: A Case Study in Cuba

Faculty Mentor: Sarah Heiss, Community Development & Applied Economics

Abstract: In addition to visiting new locations, travel study programs encourage students to step out of their tourist comfort zone and challenge them to participate in cross-cultural learning. This study examines how food and its provision facilitate cross-cultural exchanges and student learning on study abroad trips. Researchers conducted interviews with eleven students enrolled in a class who participated in a week-long study aboard trip affiliated with a class that examined the interconnections of Cuban marine ecology, conservation biology, agroecology, and sustainable development. Results focus on what it means to be a conscious consumer in a cross-cultural learning experience, and in what ways being a conscious consumer of food while on cross-cultural study trips enables or constrains the student learning.

Berke Tinaz

Oral | 12:00-12:55 | Chittenden Bank Room | Biological Sciences

Title: Evolution of the LATD/NIP gene root and nodule meristem function

Faculty Mentor: Jeanne Harris, Plant Biology

Abstract: Legumes can form two types of root lateral organs; lateral roots and nodules. Nodules are an important source of fixed nitrogen for legumes as a result of the symbiotic relationship with nitrogen-fixing bacteria. *Medicago truncatula* LATERAL ROOT ORGAN DEFECTIVE/ NUMEROUS INFECTIONS and POLYPHENOLICS (LATD/NIP) (MtNPF1.7) is a nitrate transporter. The *Medicago truncatula* latd mutant is defective in primary and lateral root meristems, as well the formation of symbiotic nodules, and these defects are due to a meristem defect.

Our phylogenetic analysis indicates that the LATD/NIP gene originated in the angiosperms at the base of the eudicots. The evolutionary history of LATD/NIP is known; however, the evolution of gene function is not. Interestingly, the origin of the LATD/NIP gene predates the origin of root nodulation, but it functions in nodule development in *M. truncatula*. So, it is unknown if the root and the nodule meristem functions are a single function or separate functions. Furthermore, if they are separate functions, they could be acquired at once or sequentially.

To address these questions, we will test the ability of LATD/NIP orthologs from different species to rescue the *Medicago truncatula* latd mutant. We will be cloning these genes into *Medicago truncatula* latd mutant roots and observing primary and lateral root elongation and development of nodules.

Functional complementation of mutant lines with orthologs should provide a clearer evolutionary understanding of the gene's function. In this way we hope to understand at what point the LATD/NIP gene gained its ability to control root and nodule development in *Medicago truncatula*.

Yacin Tmimi

Poster | 9:00-10:30 | Frank Livak Ballroom | Professional Studies - Business

Title: Merger Announcements and Their Effect on Implied Volatility

Faculty Mentor: Michael Tomas III, Grossman School of Business

Abstract: My study uses event study methodology to examine the effects that a merger announcement has on both the target and the acquirer's implied volatility. The sample for this study consisted of US firms, which merged between 2013 and 2016. Daily stock and option contract data was gathered for each company one year prior to the merger and 15 days after the announcement was made. Using the Black Scholes option pricing model, implied volatilities were calculated for all at-the-money options contracts. Although event study methodology usually measures stock returns, it was applied here to calculate the abnormal volatility, cumulative abnormal volatility, and t-statistics following the merger announcement. The results of the experiment are consistent with previous literature on the subject. The acquiring firms experienced no significant changes in implied volatility, while target firms did see a reduction in implied volatility.

Allison Unger

Poster | 9:00-10:30 | Silver Maple Ballroom | Health Sciences

Title: Dietary Fat Quality Plays a Sex-Specific Role in Attenuating Metabolic Risk Factors in Aging CD-1 Mice

Faculty Mentor: Jana Kraft, Animal & Veterinary Sciences

Abstract: Diet quality (e.g., dietary fat type) and aging play an important role in the development of type 2 diabetes, however, is not known if long-term consumption of diets with differing fatty acid profiles can modulate metabolic risk factors in an aging population. Accordingly, we aimed to examine how different sources of fatty acids added to a western-style diet might improve metabolic risk factors during aging. Eighty-one male and female outbred CD-1 mice (n = 10/group) were fed isoenergetic high-fat diets (40% kcal fat) containing either (1) U.S. American diet fat blend (100%) (Control, CON), (2) CON fat (70%) + 30% butter oil (BO), (3) CON fat (70%) + 30% echium oil (EO), or (4) CON fat (70%) + 30% fish oil (FO) for a total of 14 months. Standard physiological measurements and glucose homeostatic assays (i.e., intraperitoneal insulin and glucose tolerance tests) were performed at regular intervals (3, 6, 9, and 12 months of dietary intervention). Despite CON males having a consistently lower feed intake and weight gain

($P < 0.05$), they exhibited a markedly reduced glucose tolerance by 9 months compared to FO and EO males, which persisted through 12 months ($P < 0.05$). Although BO males showed transiently reduced glucose tolerance at 9 months compared to FO and EO males ($P < 0.05$), this phenotype dissipated by 12 months. EO males exhibited a trend of overall improved insulin sensitivity compared to BO males ($P = 0.05$). While females displayed no differences in feed intake, weight gain, glucose tolerance, or insulin sensitivity among the diet groups at 3, 6, and 9 months, unexpectedly, by 12 months, all groups displayed improved glucose tolerance and insulin sensitivity compared to earlier

Abstract (Unger, cont'd): time points ($P < 0.05$). Our study provides evidence that dietary fat quality impacts metabolic risk factors in a sex-specific manner.

Although event study methodology usually measures stock returns, it was applied here to calculate the abnormal volatility, cumulative abnormal volatility, and t-statistics following the merger announcement. The results of the experiment are consistent with previous literature on the subject. The acquiring firms experienced no significant changes in implied volatility, while target firms did see a reduction in implied volatility.

Kristina Ushakova, Katrina Kunker, Casey Little, & Jillian Varin

Poster | 9:00- 10:30 | Frank Livak Ballroom | Professional Studies – Education/Health Sciences

Title: An Innovative Strategy to Improve Classroom Engagement in a University Anatomical Science Class

Faculty Mentor: Karen Westervelt, Rehabilitation & Movement Science

Abstract: Introduction: Instructional methods which attempt to enhance student engagement and appeal to multiple learning styles have shown significant benefits in student information retention and understanding. However, it can be difficult to facilitate student engagement in the foundational science classes, such as clinical kinesiology, which require significant rote memorization. Little research has been conducted in health science education to explore the effect of different teaching styles on students' engagement in anatomy and kinesiology classrooms, where classes are typically large and heterogeneous in learning preferences. The purpose of this study was to examine the effects of an embodied teaching style on student engagement and learning in an applied kinesiology class.

Methods: Students currently enrolled in Applied Kinesiology were randomly assigned to two groups. A cross-over design was employed. All students completed pre- and post-participation surveys on their experience and engagement in the class, including the Stroop color-word test to examine selective attention. Each group was assigned to participate in a didactic or embodied learning class on shoulder anatomy, and the opposite style for the wrist and hand anatomy lesson. Student examination grades were also analyzed for evidence of learning.

Results: After the first week of data collection, results indicated the embodied learning class facilitated student engagement significantly more than the didactic class and also improved enjoyment. The embodied class also showed more involvement, participation, and movement though the didactic group reported trying harder to do well and listening significantly more. Data analysis of the second week is in progress.

Conclusion: The greater enjoyment and participation in class reported by students in the embodied learning classroom reflected improved student satisfaction and may facilitate greater engagement and long-term retention of course material. Interestingly, students experiencing a didactic lecture may perceive the need to work harder than their peers to attain adequate learning results.

Alisha Utter

Lightning | 11:00-12:30 | Sugar Maple Ballroom | Food & Environmental Sciences

Title: Growing Veganic: Exploring Plant-Based Agriculture in the United States

Faculty Mentor: V. Ernesto Mendez, Plant & Soil Science

Abstract: Industrial chemical-based agriculture is one of the most destructive human activities on the planet, linked to harmful effects on biodiversity, environmental quality, and farmworker health. Alternative agricultural paradigms avoid chemical inputs yet often rely on animal byproducts sourced from industrial agriculture, such as blood meal and manure. These byproducts are tied to a spectrum of issues, such as potential environmental contamination from veterinary pharmaceuticals and the presence of animal pathogens transmittable to consumers (e.g., E. coli). How do we avoid these problems and grow healthy vegetables, grains, and other plant foods that do not financially or symbolically support industrial agriculture and animal exploitation? Veganic agriculture represents a way forward.

As the ethical, environmental, and personal health arguments for plant-based diets become increasingly recognized, the demand for food produced without animal inputs is expected to rise. In addition to offering truly plant-based food options to vegans, veganic agriculture has the potential to provide regenerative and agroecological solutions to leading food system issues, including resource depletion, environmental destruction, and foodborne illness related to animal byproducts.

There is currently no systematic, peer-reviewed research examining veganic farming experiences in the US. This research will set an empirical foundation for veganics research in the US and build knowledge on veganic farmer needs and best practices. At the time of the student research conference, we will be in the process of conducting interviews with veganic farmers across the United States to better understand farmer motivations/experiences; farmer-identified best practices; and farmer needs, including resources essential to growing the veganic agriculture movement.

Brittany Verrico

Poster | 9:00-10:30 | Chittenden Bank Room | Biological Sciences/Vermont Studies

Title: Using generalized dissimilarity modeling (GDM) to analyze forest community change along an elevational gradient on Camels Hump, Vermont.

Faculty Mentor: Stephen Keller, Plant Biology

Abstract: Understanding the influence of environmental and climatic processes that contribute to geographical variation in forest trees is important because trees are foundational organisms structuring habitat and emergent ecosystem properties. High elevation forests in the northeastern United States are prime examples of forest ecosystems that are distributed across steep climatic gradients and the location of the transition (boreal-deciduous ecotone (BDE)) between forest types has been shown to be sensitive to climate change. Red spruce (*Picea rubens* Sarg.) is a dominant tree species in this ecosystem and has demonstrated sensitivity to acid deposition and winter freezing injury. Consequently, a contemporary decline and recovery has been documented in the region. In this study, we model changes in community composition across an elevational gradient on Camels Hump, Vermont using permanent vegetation plots (9 censuses from years 1964-2015) and generalized dissimilarity modeling (GDM). Specifically, we aim to model turnover in species composition with elevation and determine the influence of climate change (e.g. temperature, precipitation) and other abiotic environmental variables (e.g. acid deposition) on turnover in species composition and red spruce size class distributions. We detect a significant shift in the BDE along the elevational gradient, and less compositional dissimilarity is explained by elevation in the most recent census years. Ongoing work will incorporate climate and environmental variables into the GDM to help predict community turnover in response to climate change.

Joseph Waksman

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: A Volumetric Analysis of Fear Mediating Limbic Structures in Predator vs. Prey Species

Faculty Mentor: Nathan Jebbett, Biology; Stephanie McKay, Animal & Veterinary Sciences

Abstract: Prey species, as opposed to predators, rely heavily on fear for survival, a biological response mediated by a complex network of brain structures primarily located in the limbic system. A sectioned and thionine stained *Bos taurus* brain was obtained and a comprehensive brain atlas was developed by comparing neuroanatomy and cytoarchitecture to that of related species in established literature. Subsequently, a comparative volumetric analysis of 3 fear mediating limbic structures, the basolateral amygdala (BLA), the ventral medial prefrontal cortex (vmPFC) and the ventral hippocampus (vHPC), was conducted between 3 predator species: *Felis silvestris catus* (domestic cat), *Crocuta crocuta* (spotted hyena), *Ursus maritimus* (polar bear), and 3 prey species: *Bos taurus* (cow), *Sus scrofa domestica* (domestic pig) and *Ovis aries* (sheep). Volumetric measurements were obtained by summing 2-D areas across multiple slides to construct polyhedron approximations of true brain region volumes. It was hypothesized that prey species show a significant enlargement in these 3 fear mediating limbic structures as a ratio of total brain volume. This suggests two interpretations. First, because a heightened fear response in prey species is well accepted, the results support the notion that these structures play an important role in the cognitive mechanisms behind a fear response. More broadly, it points to the high level of variance in brain architecture across different species, even among closely related species, validating the need for species specific brain atlases in maximizing the biological relevance of future research.

Jonathan Walsh

Oral | 10:00-10:55 | Chittenden Bank Room | Social Sciences/Vermont Studies

Title: Effects of Feeding Management Factors on Profitability for Vermont Organic Dairy Farms

Faculty Mentor: David Conner, Community Development & Applied Economics

Abstract: The total number of operating dairy farms in the US decreased from 155,339 in 1992 to just 41,809 in 2016. Most of these farms stopped production due to low profitability. One strategy for dairy farmers seeking to stay in business has been to transition from conventional to organic or 100% grass-fed dairy production. Since 2008, UVM extension has collected panel data on organic dairy farms in Vermont to help meet a growing need for accurate financial information on alternative production strategies. While several studies have been completed on the factors influencing organic dairy profitability in Vermont, almost no research has been done into the emerging 100% grass-fed dairy market, and available data on this type of farm is still limited. This paper analyzes 10 years of financial panel data collected through expert interviews and a review of tax records from a group of ~ 40 organic and 100% grass-fed dairy farmers in Vermont. This analysis will consist of a multivariate regression model assessing the effects

Abstract (Walsh, cont'd): over time of various feeding management strategies (including 100% grass-fed) on farm profitability as measured by Return on Assets. Independent variables related to feeding management will be the primary focus of this model, particularly income over feed cost, ratio of stored to purchased feeds, ratio of grain-non grain forages utilized, and planting and harvest costs for stored grain feeds. Non-feed variables including farm size, received milk price, and debt-asset ratio will also be included. This analysis will likely find a statistically significant relationship between feeding management practices and farm profitability. Previous research has suggested that organic dairy farmers who maximize grain supplementation tend to be more profitable. This work will help to determine whether reducing or eliminating grain might serve as another viable option for Vermont dairy farmers.

Jesse Ware IV

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences/Biological Sciences

Title: Nanosphere Fabrication of Drug Delivery Systems by Emulsions and Associated Fluid Mechanics

Faculty Mentor: Rachael Oldinski, Mechanical Engineering

Abstract: Bio-Compatible Materials have been extensively investigated for their applications in drug delivery systems. Sodium Alginate, a salt formed from Alginic acid and Sodium, is derived from brown seaweed. In solution alginate polymers can be crosslinked by using simple diffusion setting, which involves a free +2 cation, most commonly CaCl₂. Alginate when crosslinked forms a hydrogel with is a polymer structure capable of absorbing a large amount of water and therefore will not break down when within the human body. This characteristic of the material has made it a popular choice for drugloading and tissue engineering studies. In this study the material is being investigated for drug delivery systems and its ability to form submicron spherical structures which would be used for intracellular drug delivery. This work outlines an investigation of techniques for the manurfactorization of submicron particals. Emulsions are the simplest of the techniqes as it involves the mixture of two immiscible fluids. This study investigated the variations of rotar speed, viscociy and HRB value on partical formation an degradation based on SEM imagry. At submicron scales the Navire Stokes Equation breaks down and simplifies to Stokes law as the Reynolds Number is less than one. At this scale viscous forces are dominant and partical interia must be taken into account. High viscous shear forces can result in the degredation of particle geometry and lead to polymer breakdown. Particle collsions also play a role as with higher rotar speeds the vorticity of the flow has increased leading to a higher likely hood of partical colli-sions and recombination into larger particles which is undesireable. This study investigates the results of Stokes Law effects on the formation of nanospheres while under immiscible conditions.

Alex Warshaw

Poster | 9:00-10:30 | Silver Maple Ballroom | Health Sciences

Title: The Movement Competency Screening Tool's Ability to Predict Injury in United States Naval Academy Midshipmen

Faculty Mentor: Sharon Henry, Neurological Sciences

Abstract: The movement competency screening (MCS) tool was used to assess the fundamental movement patterns of 41 United States Naval Academy (USNA) midshipmen. Each midshipmans' physical readiness test scores as well as medical waivers due to injury were recorded each semester for their full four years in school at the USNA. This project will look at the relationship between the initial MCS score and its ability to predict injury rates and physical readiness scores.

Jennifer Way

Creative | 1:00-2:30 | Fireplace Lounge | Professional Studies - Education

Title: Vulnerability in Teaching and Learning

Faculty Mentor: Robert Nash, Leadership & Development Sciences

Abstract: Few words have the power to make people both cringe in fear and lean forward, fascinated to know more. This thesis focuses on one such word: vulnerability. Through the Scholarly Personal Narrative writing format, I explore what vulnerability means to me and how my understanding changed. I examine how vulnerability in my life helped refine me into a wiser, more compassionate, teacher.

Teaching requires vulnerability, a willingness to risk failure and accept mistakes for what they really are: lessons to create a connection among other humans. This thesis portrays how I understand and accept vulnerability as a major component of my teaching practice.

I illustrated my journey of vulnerability, using the pattern, "From there, to here, now where?" First, I share stories of my past, to examine my first experiences of potential vulnerability as an adult. These sections describe how those

uncomfortable situations led me to question the more traditional, lecture-style teaching I absorbed through formal education.

In the “to here” chapter, I share stories of how I developed a greater understanding of vulnerability through the graduate courses I chose. These sections demonstrate my evolving need for communication and connection—two vital aspects of vulnerable teaching.

Lastly, I convey what I expect to take with me into my future career, emphasizing “Now where,” by looking forward. I shared my idea for a new, creative organization, highlights from my job search, and how my mindset has changed by accepting vulnerability. In closing, I offer a collection of universalizable statements I learned through this process.

This thesis chronicles my journey to accept vulnerability both personally and professionally. I found that teaching and vulnerability are intrinsically linked, and without the strength to be vulnerable, I am not an effective teacher. However, by being open to vulnerability, I may change the world for someone.

Rachel Webb

Poster | 3:00-4:30 | Silver Maple Ballroom | Social Sciences

Title: Relational Victimization and Rejection Sensitivity: The Moderating Role of Friendship Quality

Faculty Mentor: Dianna Murray-Close, Psychological Science

Abstract: Adverse social experiences may serve as a risk factor for the development of rejection sensitivity (Boivin et al., 2001; McDonald et al., 2010). Although most research in this area has focused on experiences with parents, children who are victimized by peers may begin to expect that they will be rejected and become hypersensitive and over-reactive to any signs of rejection (Zimmer-Gembeck & Nesdale, 2013). However, having a high quality friendship may buffer relationally victimized children from developing high rejection sensitivity by providing a relationship that enhances the child’s feeling of belonging and acceptance (Malcolm et al., 2006; Saarento et al., 2013). The goal of the present study was to assess whether friendship quality moderated the association between relational victimization and rejection sensitivity.

Participants were 100 children ages 9-12 years ($M = 10.76$, 51% male) and one of their parents (73.8% mothers). Participants reported on levels of help and guidance ($\alpha = 0.78$), conflict resolution ($\alpha = 0.72$), friend’s intimacy towards the participant ($\alpha = 0.90$), validation and caring ($\alpha = 0.78$), and companionship ($\alpha = 0.83$) with their best friend (Crick & Grotpeter, 1996). Participants also reported their anxious ($\alpha = .74$) and angry ($\alpha = .83$) rejection-sensitivity (Ayduk et al. 2000).

Regression analyses indicated that relational victimization was positively related to both anxious and angry rejection sensitivity. In addition, friendship conflict resolution, validation and caring, and companionship and recreation moderated the association between relational victimization and angry rejection sensitivity. Across models, the interaction between relational victimization and friendship quality was not significant in the prediction of anxious rejection sensitivity. Findings could help with the development of intervention and support programs that more effectively support victimized children and counteract the consequences of victimization for children’s responses to and expectations of rejection.

Lara Weed

Presentation #1: Oral | 2:00-2:55 | Jost Foundation Room | Health Sciences

Title: Step Identification in Wearable Sensor Data from Irregular Gait in Stroke Patients

Faculty Mentor: Ryan McGinnis, Electrical & Biomedical Engineering; Lisa Goodwin, Physical Therapy

Abstract: Stroke is a neurological disease caused by interruption of blood flow to the brain that often yields mobility impairment amongst other debilitating symptoms. Many of those who have experienced a stroke require months of physical therapy, often in in-patient facilities, to regain their functional independence. There is interest in quantifying the activity patterns of these patients to better track and optimize their rehabilitation. One approach is to measure the number and timing of steps taken each day. However, people who have suffered from a stroke often have slow, irregular gait which cannot be reliably or accurately determined by traditional pedometers or activity tracking devices such as Fitbits. To answer this unmet need, we have developed a wearable sensor system that pairs the commercially-available BioStampRC wearable device with new algorithms for tracking steps in those recovering from stroke and a simple user interface for processing these data and displaying the results. This presentation will describe the processing methodology and user interface, and will highlight some pour observations of activity patterns in patients recovering from stroke in this ongoing study.

Lara Weed**Presentation #2:** Oral | 3:00–3:55 | Chittenden Bank Room | Health Sciences**Title:** Genetic Algorithm to Predict Insertion Sites of the Cardiac Conduction System based Upon Electrocardiogram Morphology**Faculty Mentor:** Peter Spector, Cardiology

Abstract: The spread of electrical activity through the heart generates a measurable potential field at the body surface (the electrocardiogram (EKG)) which can be used to detect many cardiac disorders. The inverse, determining exactly how electricity spreads through the heart based upon the EKG, is not straight forward. This, "inverse solution," is non-unique (i.e. many different current distributions can potentially produce the same EKG pattern). We set out to create a computer model for studying the EKG. To this end we sought to identify the locations at which the cardiac conduction system insert into the ventricles, and to determine the sequence of activation that produces a specific EKG morphology. In this study, a 3D computer model of the ventricles of the heart was created from a CT scan. A genetic algorithm was used to generate initial excitation sites (insertion sites of the conduction system). Activation followed the voltage trajectory of a cardiac action potential. Excited cells activated their neighbors until all cells were excited. A 12 lead EKG was calculated based upon this activation sequence and compared with a real EKG. The fitness was measured as the root mean square difference between the calculated and the real EKG.

Data from conduction via the normal conduction system, right and left bundle branch block, and an accessory atrio-ventricular pathway were used for cross checking our results. This model is important because it allows us to visualize and better understand the relationship between cardiac excitation sequence and EKG morphologies. In the future, this model will be used as an educational tool.

Scott Weiner

Poster | 3:00–4:30 | Frank Livak Ballroom | Biological Sciences

Title: RNA Isolation of Mouse Liver, Adipose, and Muscle Tissue in Diabetes Dairy Fat Study**Faculty Mentor:** Jana Kraft, Animal & Veterinary Sciences

Abstract: In a previous study, four-week-old male and female mice were fed one of four 40% fat (kcal%) diets: i) A negative control diet (CO) designed to represent the typical American's FA intake ii) a diet containing 70% CO and 30% fish oil (FO) iii) a diet containing 70% CO and 30% butter oil (BO) iv) a diet containing 70% CO and 30% echium oil (EO) until 14 months of age. CD-1 IGS mice, an outbred stock, were chosen as a model for representing a genetically human diverse population. The purpose of the experiment was to study the effect of dietary fat quality, sex, and aging on glucose tolerance, insulin sensitivity, T2D development, beta-cell function, as well as gene and protein expression of key tissues.

My objective during my research based internship was to isolate mRNA from liver, adipose, and muscle tissue samples of the mice in the study. Once isolated, the RNA would be used for qPCR analysis of mRNA expression and regulation differences between the cohorts of mice. The bulk of the work entailed troubleshooting the mRNA isolation protocol to get the desired purity and concentrations of mRNA from the liver, adipose, and muscle tissues, which was measured using a NanoDrop spectrophotometer. Through reading literature and undergoing the process of trial and error, I worked to finely tune the RNA isolation protocol, and gained valuable research experience.

Alexander Weingart

Oral | 11:00–11:55 | Chittenden Bank Room | Biological Sciences/Health Sciences

Title: Effects of Acrolein and Cigarette Smoke on Inflammasome Signaling in Lung and in Cultured Endothelial Cells**Faculty Mentor:** Jom Hammack, Psychological Science

Abstract: Previous work from the Rounds Laboratory has demonstrated that acrolein, a highly reactive aldehyde present in cigarette smoke, increases lung vascular endothelial permeability in vivo in mouse lungs and in cultured endothelial cells (Rounds, 2017). In mouse models, intra-tracheal acrolein causes lung edema and inflammation, increasing the severity of acute lung injury (ALI). In cultured lung endothelial cells, acrolein increased monolayer permeability and decreased adherens junction formation, as assessed by b-catenin expression. In coronary artery endothelial cells, others have demonstrated that inflammasome activation is associated with loss of inter-cellular junction proteins and increased monolayer permeability (Deswaerte, Ruwanpura, & Jenkins, 2017). The underlying mechanisms are poorly understood. Activation of the lung inflammatory signaling mechanisms regulated by the inflammasome Nlrp3, initiate a signaling cascade. The Nlrp3 protein forms a complex cleaving pro-caspase-1 to its active form, caspase-1, which proteolytically processes interleukin 1 beta (IL-1b), a potent pro-inflammatory cytokine. IL-1b is an

important mediator of the inflammatory response and is involved in a variety of cellular activities, including cell proliferation, differentiation, and apoptosis. In this study we assessed the effects of cigarette smoke extract and acrolein on expression and activation of Nlrp3, caspase-1, and IL-1b in lung tissue and cultured endothelial cells. We hypothesized that cigarette smoke and acrolein might enhance lung endothelial cell inflammasome formation. Our results, however, suggest that acrolein seems to suppress lung inflammasome signaling. In contrast to what we hypothesized, increased release of cytokines may not be involved in acrolein-induced endothelial barrier dysfunction and lung injury. Modulating inflammasome activation may be a novel approach to prevent and treat acrolein-associated lung injury.

Adam Weinheimer

Poster | 9:00-10:30 | Silver Maple Ballroom | Health Sciences/Biological Sciences

Title: Investigating RUNX1's Role in the Human Breast Cancer Stem Cell Population using CRISPR and shRNA Genome Editing

Faculty Mentor: Janet Stein, Biochemistry

Abstract: Breast cancer remains the leading cause of cancer-related death in women worldwide (1). Current research suggests that a particular transcription factor known as RUNX1 behaves as a regulator and tumor suppressor in breast cancer progression. It has been demonstrated that RUNX1 decreases in activity as breast cancer aggression increases (2). Yet it is the how of this regulation that remains unclear. The significance of this project is to further the depth of knowledge on the interplay between the RUNX1 transcription factor, breast cancer stem cell (BCSC) growth, and the differentially expressed genes that influence human breast cancer progression. The project hypothesizes that RUNX1 plays a role in the suppression of the BCSC population, which are those cells that are the most dangerous and most essential to eradicate if the cancer is to be cured. Cancer stem cells (CSCs) are known to evade current cancer treatment options such as chemotherapy and radiation and are therefore a crucial facilitator in patient relapses and overall aggression of the cancer. To test this hypothesis, RUNX1 will be knocked down in the MCF10AT1 breast cancer cell line using inducible CRISPR interference and shRNA-mediated knockdown. Western blotting and qPCR will confirm successful knockdown. Flow cytometry will then be utilized to analyze the proportion of CSCs using CD24-/CD44+ BCSC markers. Investigating RUNX1's behavior as a suppressor of the CSC population adds a new level of knowledge to the field of breast cancer research, notably since RUNX1 is the most dominant RUNX family member expressed in normal mammary epithelial cells (3). Solving RUNX1's role in breast cancer will allow us to develop a safer, more targeted, and more effective plan of action to eradicate one of the most deadly diseases that exists today.

Hannah Weiss

Oral | 10:00-10:55 | Chittenden Bank Room | Food & Environmental Sciences/Vermont Studies

Title: Feasibility of over-summer snow storage at the Craftsbury Outdoors Center in Craftsbury, VT

Faculty Mentor: Paul Bierman, Geology; Yves Dubief, Mechanical Engineering; Scott Hamshaw, Gund Institute

Abstract: Surface air temperatures in New England have increased since the 20th century. Because of this warming, snowfall at low and moderate elevations has decreased, impacting climatic-sensitive tourism operations like ski centers. Many centers have turned to snowmaking, which is energy intensive and requires below-freezing overnight temperatures. Another option, used at higher latitudes and altitudes, is storing the previous winter's snow over the summer under insulating layers (ie. wood chips).

The Craftsbury Outdoor Center in Craftsbury, Vermont supports cross-country skiing and is interested in over-summer snow storage. The University of Vermont Geology and Engineering Department and the Spatial Analysis Lab have collaborated to 1) collect data on variables that affects snow melt (ie. soil/air temperature, humidity, solar radiation, precipitation), 2) create computer models that incorporate these data to test insulation methods. In summer 2018, we will calculate melt-rate by monitoring volume change of two snow piles emplaced in later winter and use these field data to adjust models and improve insulation methods for the following summer.

In support of this effort, we have gathered soil temperature and topographic data. Using data loggers, we have continuous records from soil temperature at four depths from two sites since June 2017. Soil temperature varies significantly less than air temperature and soil temperature variability decreases as depth increases. This relationship allows us to calculate the thermal diffusivity of the soils at both sites, an important parameter in the snow melt models. Using ground-based LiDAR (Light Detection and Ranging), we have scanned both study locations and produced Digital Elevation Models of site topography. These models will be used to calculate change in snow pile volume over summer 2018. If our data and models show that over-summer snow storage is feasible, other ski centers could adopt this practice, allowing both for earlier opening and reduced energy use.

Julia Weisz

Poster | 11:00-12:30 | Frank Livak Ballroom | Biological Sciences

Title: Effect of cytokeratin-18 inhibition on proliferation of cervical cancer cells**Faculty Mentor:** David Townson, Animal & Veterinary Sciences

Abstract: Cervical cancer is one of the most common causes of cancer-related death for women worldwide, with roughly 528,000 cases reported in 2012. Cervical cancer is the unregulated proliferation of cervical cells, often caused by the human papillomavirus (HPV). This study investigated some of the inner workings of a cervical cancer cell to elucidate potential mechanistic targets for treatment. In the current set of experiments, the goal was to determine the importance of cytokeratin intermediate filaments, specifically keratin 8/18 filaments, in cell proliferation. The cervical cancer cell line, SiHa, was manipulated with short-hairpin RNA to keratin 18 (shRNA-K18; via an adenoviral vector) to impair the expression of keratin 8/18 filaments. Proper dosage of adenovirus for infection of the shRNA-K18 was determined via a dose-response experiment in which the expression of green fluorescence protein (GFP) was evaluated and will be verified by immunoblotting. Following inhibition of keratin 18, the proliferation rate of control and shRNA-K18-inhibited cells was determined using 7-day growth curves. The results suggest that keratin 18, and by extension keratin 8/18 filaments, is critical to maintain exponential proliferation of cervical cells in culture ($p=0.003$, $n=3$ independent experiments). Cytokeratin intermediate filaments have long been thought only as structural proteins; however, these results suggest they have a larger regulatory role in cell metastasis, which warrants further investigation.

Michael Werner

Poster | 3:00-4:30 | Silver Maple Ballroom | Social Sciences

Title: Thwarted belongingness and perceived burdensomeness as predictors of desire to be dead and suicidal ideation among Bhutanese refugees**Faculty Mentor:** Jonah Meyerhoff, Psychological Science; Kelly Rohan, Psychological Science

Abstract: Bhutanese refugees resettled in the United States face a myriad of difficulties as a community including a suicide rate roughly 1.5 times higher than the general US rate (Ao, 2012) (Curtin et al, 2016). Typical US evaluations of suicidality, measuring suicidal ideation, have proven ineffective for screening Bhutanese refugees (Ao, 2012) (Nock et al., 2008). The purpose of the present research is to identify risk factors for suicidal behavior among Bhutanese refugees in the US, with the hope to contribute to the development of a culturally responsive screen for suicidal behavior among Bhutanese refugees. Specifically, this study examines the relationship between the endorsement of desire to be dead and suicidal ideation with the endorsement of thwarted belongingness and perceived burdensomeness in Bhutanese refugees.

44 adults aged 18-65 were recruited from the local Bhutanese refugee community. Participants engaged in a 2-hour face-to-face interview assessing basic demographic information, participants' desire to be dead (WDS; Lester, 2013), suicide ideation (Beck & Steer, 1991), Thwarted Belongingness, and Perceived Burdensomeness (INQ; Van Orden, Witte, Gordon, Bender, and Joiner 2008). Interviews were conducted in participants' language of choice, though most often interviews were conducted via a Nepali interpreter.

For analysis we dichotomized our outcome variables (desire to be dead and suicide ideation) into present or absent. We then conducted a series of logistic regressions to determine the extent thwarted belongingness and perceived burdensomeness predicted endorsement of either outcome variable.

Thwarted belongingness, but not perceived burdensomeness, is significantly predictive of the desire to be dead ($OR=3.17$; $p<.05$). Conversely, perceived burdensomeness, but not thwarted belongingness, is significantly predictive of suicidal ideation ($OR=9.87$; $p<.05$). These relationships occur when holding perceived burdensomeness and thwarted belongingness constant, respectively. These results suggest that perceived burdensomeness and thwarted belongingness may serve as measureable constructs that predict suicide risk among Bhutanese refugees. In cultured endothelial cells (Rounds, 2017). In mouse models, intra-tracheal acrolein causes lung edema and inflammation, increasing the severity of acute lung injury (ALI). In cultured lung endothelial cells, acrolein increased monolayer permeability and decreased adherens junction formation, as assessed by b-catenin expression. In coronary artery endothelial cells, others have demonstrated that inflammasome activation is associated with loss of inter-cellular junction proteins and increased monolayer permeability (Deswaerte, Ruwanpura, & Jenkins, 2017). The underlying mechanisms are poorly understood. Activation of the lung inflammatory signaling mechanisms regulated by the inflammasome Nlrp3, initiate a signaling cascade. The Nlrp3 protein forms a complex cleaving pro-caspase-1 to its active form, caspase-1, which proteolytically processes interleukin 1 beta (IL-1 β), a potent pro-inflammatory cytokine. IL-1 β is an important mediator of the inflammatory response and is involved in a variety of cellular activities, including cell proliferation, differentiation, and apoptosis. In this study we assessed the effects of cigarette smoke extract and acrolein on

expression and activation of Nlrp3, caspase-1, and IL-1b in lung tissue and cultured endothelial cells. We hypothesized that cigarette smoke and acrolein might enhance lung endothelial cell inflammasome formation. Our results, however, suggest that acrolein seems to suppress lung inflammasome signaling. In contrast to what we hypothesized, increased release of cytokines may not be involved in acrolein-induced endothelial barrier dysfunction and lung injury. Modulating inflammasome activation may be a novel approach to prevent and treat acrolein-associated lung injury.

Emily Whitaker

Poster | 11:00-12:30 | Frank Livak Ballroom | Biological Sciences

Title: EW1-2 inhibits cell-cell fusion during transmission of HIV-1 particles at the virological synapse.

Faculty Mentor: Markus Thali, Microbiology & Molecular Genetics

Abstract: Cell-to-cell transfer of viral particles through the virological synapse (VS) is an efficient mode of HIV-1 transmission. VS formation is mediated by HIV-1 envelope glycoprotein (Env) on the surface of an infected cell binding CD4 on an uninfected T cell. Given that Env is fusogenic at neutral pH, it would seem likely that Env-CD4 binding between producer and target cells, respectively, would frequently result in cell-cell fusion, forming a multinucleated infected cell (syncytium). However, the majority of VS mediated contacts result in complete cell separation and generation of a new infected cell. Independent studies revealed that the VS is a tightly regulated junction where cell-cell fusion is prevented by viral (e.g. Gag trapping of Env) and host factors (including tetraspanins and ezrin).

Although both tetraspanins and ezrin are involved in inhibiting HIV-1 induced cell-cell fusion, it remains unclear how these functions are coordinated to prevent syncytium formation, though it likely involves additional cellular factors. A potential fusion-inhibitory host factor, and interacting partner of tetraspanins and ezrin, is EW1-2 (IGSF8/PGRL). This integral membrane protein is implicated in various processes, including α -actinin accumulation at the T cell immunological synapse and regulation of HIV-1 particle production. In myoblasts, EW1-F (CD9P-1/FPRP, a tetraspanin partner similar to EW1-2 but which is not expressed in T cells) is required to mediate the fusion-inhibitory functions of CD9 and CD81 (PMID 23575678). We therefore investigated whether EW1-2 is also implicated in regulating fusion, potentially coordinating the fusion inhibitory functions of tetraspanins and ezrin at the VS.

We show that EW1-2, while overall downregulated from the surface of infected cells, is enriched at the VS. Further, using HeLa-TZM-bl fusion assays, we demonstrate that EW1-2 is a cell-cell fusion inhibitor. We now seek to determine whether EW1-2 coordinates the functions of tetraspanins and ezrin to efficiently inhibit HIV-1-induced cell-cell fusion.

Alissa White

Poster | 9:00- 10:30 | Frank Livak Ballroom | Food & Environmental Studies

Title: Linking Adaptive Management to Climate Impacts on New England Farms

Faculty Mentor: Joshua Faulkner, Extension - Sustainable Agriculture Center; V. Ernesto Mendez, Plant & Soil Science

Abstract: *What information do farmers and outreach professionals need to best support vegetable and berry growers in adapting to the impacts of climate change?*

Seasoned New England farmers are accustomed to the variable and unpredictable, seasonal weather characteristic of this region. However, the regional climatic forecasts for the next century and coming decades will exacerbate the familiar challenges of variable and extreme weather to a level which significantly threatens the viability of most farms in the region.

This project recognizes 1) that farmers are on the front lines of extreme weather and have been actively adapting to the impacts climate change, and 2) that communicating about climatic change is wrought with many challenges. In order to identify information critical to supporting climate change adaptation and overcome the climate information usability gap, this project focuses on usable, context specific information about the increased incidence of extreme weather.

A survey which draws upon the expertise of 250 vegetable and berry farmers identifies: 1) practices already in use to manage for drought and extreme precipitation, 2) promising strategies for managing drought and extreme precipitation at multiple scales, 3) perceived barriers and tradeoffs associated with these strategies, and 4) preferred networks for learning about innovative management strategies.

Results of the study highlight the value of peer networks and knowledge exchange in supporting transitions towards sustainable agriculture and climate resilience. Notable trends in farmers' concerns about site specific vulnerability and uncertainty about climate impacts are matched by the identification of valued resources and critical information gaps.

Claire Wilcox

Poster | 1:00-2:30 | Silver Maple Ballroom | Biological Sciences

Title: Characterization of Histidyl-tRNA Synthetase Function in Zebrafish Eye Development

Faculty Mentor: Alicia Ebert, Biology

Abstract: Histidyl-tRNA synthetase (HARS) is an enzyme vital to protein production that is associated with a human deafness-blindness disorder. When HARS expression in zebrafish is knocked down using a morpholino anti-sense oligonucleotide, the embryo develops significantly smaller eyes. Quantification of retinal cells reveals a decreased number of cells in morphant retinas than in control retinas. To determine whether this decrease in cell number was due to decreased cell proliferation, increased cell death, or both, we performed immunohistochemistry of proliferating and apoptotic cells with phospho-histone H3 and cleaved-caspase 3 antibodies respectively. Labeled cells were then quantified and analyzed. Preliminary trends show both decreased percentage of proliferating cells and increased percentage of apoptotic cells in morphant retinas. The results of this project will aid in characterizing the function of HARS in eye and ear development as well as suggest possible mechanisms for the HARS-related deafness-blindness disorder.

Landon Williamson

Poster | 11:00-12:30 | Silver Maple Ballroom | Vermont Studies/Food & Environmental Studies

Title: Effects of grain size on Pb bioavailability in Burlington soils

Faculty Mentor: Nicolas Perdrial, Geology

Abstract: Listed as #2 on the ATSDR's (Agency for Toxic Substances and Disease Registry) priority list, lead (Pb) is a prevalent health concern. However, no unified sustainable remediation methods exist for soil Pb. Since bioavailable Pb is capable of poisoning children if ingested, understanding Pb bioavailability is crucial to develop soil remediation methods. Previous research in Burlington soils has shown that the relationship between levels of bioavailable Pb and total Pb is not linear as generally assumed. While this observation can, in part, be explained by the difference in bioavailability between Pb species, the data reveal that a "threshold" Pb value of $\sim 1000\text{mg kg}^{-1}$ differentiate higher bioavailability (62%) in less contaminated samples from lower bioavailability (47%) in higher samples. We hypothesize that this difference in bioavailability is a function of grain size, in which case smaller Pb grains would contribute relatively more bioavailable Pb than larger grains.

To test this hypothesis, Burlington Pb topsoil samples of varying Pb concentrations were sieved into 5 grain sizes (0-150 μm , 150-350 μm , 350-710 μm , 710 μm -1mm, and 1mm-2mm) before being individually tested for bioavailable Pb by simulating gastrointestinal conditions.

For technical reasons, the results of this experiment are not available at the time of redaction. If our hypothesis is verified, this will imply that, in addition to total Pb analyzes of soils, grain size analyzes should be performed when assessing the levels of contamination and impact of specific soils for remediation. It also implies that typical biokinetics models of blood lead level prediction should include this parameter. If our hypothesis is however not verified, further tests will be needed to understand the reason for the non-linearity of the total-bioavailable Pb relationship.

Conner Winkeljohn

Poster | 3:00-4:30 | Frank Livak Ballroom | Biological Sciences/Mathematical & Physical Sciences

Title: A Comparison of Atomistic and Coarse-Grain MD Simulations Through Local Stress Analysis of Lipid Bilayers

Faculty Mentor: Juan Vanegas, Physics

Abstract: With advances in computer processing abilities, molecular dynamic (MD) simulations have become more accessible to materials research. However, there are a variety of force fields used in MD simulators like GROMACS, that can each produce drastically different local pressure tensors depending on their treatment of the molecules. POPC and DPPC are phospholipids commonly found in studies of MD simulations because of their ability to form a bilayer that has planar geometry, which greatly simplifies the calculation of pressure profiles. GROMACS-LS was used to calculate the pressure profiles of POPC and DPPC simulated with several GROMACS coarse-grained and atomistic forcefields, as well as the force fields' contributions to the pressure profile. The atomistic force fields, CHARMM36 and GROMOS 43A1-S3 and the coarse grained force fields Martini, Polar Martini, Dry-Martini, and BMW-Martini are the focus of this poster. Knowing how these different force fields contribute to lateral pressure is key to properly analyzing the internal forces that give rise to the lipid bilayer's mechanical properties. This analysis allows us to see what is preserved and lost in coarse grain models in order to accommodate the simulation of larger systems like a protein embedded in a lipid membrane. Lateral pressure profiles may be used to obtain elas-

tic constants such as the monolayer spontaneous curvature and the gaussian modulus through the first and second moments, and therefore it is important to characterize how different parametrizations of interatomic potentials affect the shape of these pressure profiles.

Julia Wood

Poster | 9:00-10:30 | Frank Livak Ballroom | Professional Studies - Education/Social Sciences

Title: Exploring the Decline in Male Share of Higher Education Enrollment: What It Says About Masculinity

Faculty Mentor: Stephanie Seguino, Economics; Emily Beam, Economics

Abstract: In the past, women faced restricted access to higher education, and thus the male share of college enrollment was high. But since the 1980's, female enrollment growth has surpassed male enrollment growth in higher education. This phenomenon that has occurred within the context of changes in marriage patterns, fewer employment opportunities for middle skill labor, and overall lower performance of males in school. This is a particularly acute problem since access to work and earnings in the United States economy (as well as in other industrialized economies) increasingly is linked to a college degree.

Nevertheless, the falling male share of enrollments in higher education continues to be poorly understood. A better understanding of causes of the decline in male enrollments, in both absolute and relative terms, within the current education system and society will be helpful as a precursor to developing policies to encourage all individuals to pursue higher education. In an effort to expand our understanding of this phenomenon, my research focuses on the determinants of the decline in male share of enrollment in higher education to answer the question "Why are males turning away from a college education?"

This study will assess the role of demographic variables and macro-level data in order to assess the role of labor market conditions on male share of college enrollment. By integrating these additional factors, my study will provide a broader perspective on the causes of the declining male share of enrollment than previous studies and further contribute to economic and higher educational research. The methodology is econometric analysis using Ordinary Least Squares (OLS), where the dependent variable is male enrollment divided by total enrollment. Independent variables include characteristics of institutions of higher education, labor market conditions, and demographic/sociological factors that may influence male shares of enrollment.

Lisa Wood

Oral | 10:00- 10:55 | Jost Foundation Room | Biological Sciences

Title: A Targeted Approach to Triple Negative Breast Cancer

Faculty Mentor: Jason Stumpff, Molecular Physiology & Biophysics

Abstract: Research done in the last decade has led to an increase in our understanding of breast cancer. Breast cancer should now be thought of as multiple subtypes with each type having different molecular targets, therapies, and prognoses. The most aggressive subtype of breast cancer is triple negative breast cancer (TNBC), for which therapeutic options are extremely limited. Thus, there is a strong need to develop new therapeutic options for this subtype. TNBC is defined by what it is not. It is a type of breast cancer that does not display any specific targets for therapies. Current treatment options for TNBC are limited to cytotoxic drugs that kill both tumor and normal cells. One of the reasons that there are so few therapies for TNBC is that it is actually broken down into 4 different subtypes and each of these subtypes have different molecular characteristics. 2 of these types, Basal-like 1 (cell line MDA-MB-468) and Basal-like 2 (cell line HCC1806), have been shown to be more aggressive. They display similar characteristics to the subtype Mesenchymal stem cell-like (cell line MDA-MB-231), which the Stumpff lab has studied extensively already. Kif18A is a kinesin-like molecular motor protein that is responsible for chromosome alignment during cell division and the Stumpff lab has shown that inhibition of Kif18A increases multipolar spindles in MDA-MB-231 cells. My hypothesis is that the inhibition of Kif18A will cause spindle defects and have a negative effect on the proliferation Basal-like 2 TNBC cells when compared to normal breast cells.

Christian Wurzberger

Poster | 1:00-2:30 | Frank Livak Ballroom | Mathematical & Physical Sciences/Food & Environmental Sciences

Title: Dissolution Rates of Apatite: The Role of Habitus and Chemistry

Faculty Mentor: Nicolas Perdrial, Geology

Abstract: Apatite is the most abundant phosphate mineral on Earth and forms the foundation of the global phosphorus cycle (Filippelli, 2008). Its atomic arrangement and variable composition yield properties that result in a wide

Abstract (Wurzberger, cont'd): range of applications in diverse fields: mineralogy, economic geology, biology, medicine, dentistry, geochronology, environmental remediation, to name a few (Herwartz et al., 2013; Hughes and Rako- van, 2015; Jeffrey et al., 2015). This project was designed to investigate the micro to macroscale dissolution of various forms of apatite. It was hypothesized that because of the different chemical compositions and different molecu- lar shape, these different apatite minerals will weather at different rates. The hypothesis stated above was tested through the use of an original, 3D printed, pending-patent stir flow reactor (provided by Dr. Marc Michel, Virgi- nia Institute of Technology). Results were compared with experiments carried out in column flow-through systems. A nitric acid solution at constant pH of 3 was used as the weathering agent in both the reactor and column experi- ments. The reactor and column experiments were systematically sampled at set time intervals and the samples were then analyzed in a ICP for phosphorus concentrations. Phosphorus being directly proportional to the amount apatite weathered, from this the dissolution rate of the apatite in question can be determined. The results from this project insert into a larger project aiming at studying apatite dissolution at the nanoscale and, in particular, aiming at trans- lating the effects of crystal chemistry on weathering of phosphate across scales and systems.

Colleen Yancey

Poster | 9:00-10:30 | Silver Maple Ballroom | Biological Sciences

Title: Hubbard Brook Ice Storm Experiment: Understanding the Effects of Extreme Ice Storm Events on the Symbiotic Relationship Between Mycorrhizal Fungi and their Respective Tree Species

Faculty Mentor: Carol Adair, Rubenstein School for Environment & Natural Resources

Abstract: New England Forests endure various weather events that shape the productivity and functioning of these ecosystems. Extreme weather events have been notably increased as the Earth facing climate change and global warming (IPCC, 2007). In order to study the effects of one such extreme event, ice storms, an Ice Storm Simu- lation Experiment was being conducted at Hubbard Brook Experimental Forest in North Woodstock, New Hampshire to understand how these extreme events impact Northern forest health. One interaction being studied, which is crucial to the sustainability of North American hardwood forest health, is the symbiotic relationship between mycor- rhizal fungi and their tree species symbionts. This relationship was studied by performing hyphal bag implanta- tion and analysis, soil core collection, and a series of analyses to quantify both ectomycorrhizal and arbuscular fungi colonization of tree roots. It was hypothesized that as the intensity and frequency of ice storms increase in Northern forests, there will be an increase in mutualistic relationships between mycorrhizal fungi and their respective tree species due to an increased need for nutrients by the tree to aid in growth and recovery.

Geneva Yawger

Poster | 11:00-12:30 | Silver Maple Ballroom | Social Sciences

Title: The Far-Reaching Effects of “No One Understands Me”: Correlational Evidence for the Unique Negative Conse- quences of Existential Isolation

Faculty Mentor: Elizabeth Pinel, Psychological Science

Abstract: Across two correlational studies, we present evidence for the unique personal and interperso- nal consequences of a specific form of social isolation called existential isolation (EI; feeling alone in one’s expe- riences, like one cannot understand or be understood by others; Yalom, 1980; Pinel, Long, Murdoch, & Helm, 2017). This research contributes to the building literature on EI’s uniqueness from interpersonal isolation (feeling alone in regard to one’s relationships with and proximity to others) by testing EI’s effects while controlling for a measure of interpersonal isolation previously unstudied in this area: social support. Study 1 (N = 352) examined EI’s unique asso- ciations with a number of psychological well-being variables and found that, above and beyond the effects of inter- personal isolation, EI significantly predicted high levels of depression ($p < .001$, $R^2 = .040$), anxiety ($p = .018$, $R^2 = .014$), and stress ($p < .001$, $R^2 = .046$), as well as low levels of self-control ($p < .001$, $R^2 = .047$) and self-esteem ($p < .001$, $R^2 = .066$). Study 2 (N = 172) extended these findings to show that high EI also predicts high levels of a particu- larly potent interpersonal well-being variable: aggression. Together, interpersonal and existential isolation account- ed for 24.8% of the variance in trait levels of aggression ($p < .001$); of that, 11.2% was attributable solely to existential isolation ($p < .001$). These findings support previous research on the negative individual and interpersonal correlates of existential isolation, from physical health symptoms and social anxiety (Costello & Long, 2014) to social dominance orientation and various measures of prejudice (Yawger & Long, 2015; Yawger, Pinel, & Long, 2016). This research makes an important contribution to the literature devoted to disentangling the two forms of social isolation and carries great implications for our understanding of the interplay between social processes, personality, psychological well-being, and interpersonal harmony.

Sonia Zaccheo

Poster | 11:00-12:30 | Silver Maple Ballroom | Vermont Studies/Professional Studies - Education/Social Sciences

Title: Mapping the Food and Nutrition Resources for Resettled Refugees in Chittenden County, Vermont

Faculty Mentor: Jeanne Shea, Anthropology; Deborah Blom, Anthropology; Pablo Bose, Geography

Abstract: This paper examines the nutrition and food landscape on offer for resettled refugees in Chittenden County, Vermont by analyzing how providers of related programs perceive the nutrition needs of resettled refugees and how they believe their services are helping to meet those needs. This inquiry is significant in relation to extending our knowledge of the interactions between food and nutrition programs and our attempts to welcome refugees into our communities.

This research is an ethnographic survey comprised of interviews with a selection of service providers in various sectors. I transcribed these interviews and performed qualitative analysis to identify patterns in the data. Using Geographic Information Systems (GIS) technology, I produced a physical map of these services, which is intended as a tool for service providers in the county.

Based on my research, the nutrition and food programs on offer for refugees resettled in Chittenden County can be categorized as follows: clinical resources, nutrition education and food assistance programs, free communal meal services, agricultural programs, and commercial grocers and restaurants supporting these resources. To some degree, service providers' perceptions of resettled refugees' nutrition needs largely depends on which of these categories their work falls in and their roles within their respective organizations. However, there is further complexity beyond that. Further, programs tend to experience similar successes and struggle with similar issues as other programs in their sector. The path a newly resettled refugee may take through this network of nutrition resources is initially clear, but past primary contacts becomes increasingly subject to individual variations.

Looking to the future, organizations will need to work as a tighter network in order to close the gaps in service provisions, overcome uncertainties of funding, and strategize to maximize service offerings for resettled refugees while minimizing burden on individual organizations and service duplication.

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