Smith College
Smith ScholarWorks

2019

Summer Research Fellowship Project Descriptions 2019

Clark Science Center's Summer Research Fellows Program

Follow this and additional works at: https://scholarworks.smith.edu/clark_womeninscience

Part of the Life Sciences Commons, and the Physical Sciences and Mathematics Commons

2019 SURF Project Descriptions

SURF 2019-Post SURF Survey

Name	Annie Dobroth
Year of Graduation	2021

SURF Advisor	Annaliese Beery, Psychology
Advisor Department	Neuroscience
SURF Field of Study	Neuroscience
Title of Abstract/Research	Social Conditioning and Maternal Folic Acid in Prairie Voles

Please type your abstract below.

Prairie voles (Microtus ochrogaster) are unusual rodents because they form strong monogamous bonds with their mates, as well as preferences for familiar same-sex social peers. As a result, prairie voles are useful models in the study of social neuroscience. During SURF, I participated in two different projects that studied prairie vole social behavior in the lab of Professor Annaliese Beery. Previous work in the Beery lab showed that prairie voles will choose substandard bedding over better bedding in a preference test if they have been conditioned to associate the substandard bedding with their mates. However, this study was inconclusive when looking at same-sex vole pairs. My first project explores female-female social bonds by assessing whether a female vole will prefer substandard bedding associated with social interaction with a cagemate female. We compare the time that each animal spends on high quality and lower quality bedding while allowed to freely roam between the two beddings before and after the vole has been conditioned to associate lower quality bedding with a familiar female. We hypothesize that the voles will initially prefer the high quality bedding, but that their preferences will change once they associate the lower quality bedding with their cagemate. This study is ongoing, but early results suggest that they do show social conditioning toward the bedding associated with a same-sex cagemate.

The second project studied maternal folic acid levels and social interaction. Prior research has shown that deficiencies in folic acid during pregnancy can cause neural tube defects. Pregnant women are advised to take folic acid to lower the incidence of these defects, and most wheat products are supplemented with the vitamin for the same reasons. However, we do not know whether adverse effects can occur from taking too much folic acid, which is one of the main dietary sources of methyl groups for DNA methylation. Rodent studies have shown that folic acid supplementation alters widespread DNA methylation in supplemented young. This project examines whether maternal folic acid levels are linked to behavioral changes in prairie vole social behavior by feeding breeding pairs of voles diets with different quantities of folic acid, and studying the behavior of their pups. This study is ongoing, and results are not yet available.

Bowler, C. M., Cushing, B. S., & Carter, C. S. (2002). Social factors regulate female–female aggression and affiliation in prairie voles. Physiology & Behavior,76(4-5), 559-566.
Goodwin, N. L., Lopez, S. A., Lee, N. S., & Beery, A. K. (2019). Comparative role of reward in long-term peer and mate relationships in voles. Hormones and Behavior,111, 70-77.
Crider, K. S., Bailey, L. B., & Berry, R. J. (2011). Folic Acid Food Fortification— Its History, Effect, Concerns, and Future Directions. Nutrients,3(3), 370-384.

SURF 2019-Post SURF Survey

Name	Ran Yan

Year of Graduation	2021

SURF Advisor	Peter de Villiers, Psychology

Advisor Department	Psychology

SURF Field of Study	Theory of Mind; Statistical Analysis

Title of Abstract/Research	The effect of Language on Children's Development of Theory of Mind

Please type your abstract below.

It is widely known that false belief understanding serves as an important milestone in children's development theory of mind. Many theories were proposed in an attempt to explain underlying factors that contribute to such development. The current study examines the linguistic Determinism Theory proposed by J. de Villiers (2005) and Inhibitory Control Theory proposed by Carlson, Mosese and Hix (1998). The Determinism Theory argues that complement understandings facilitates children's ability to represent other people's mental states, critical in the development of false belief understanding.The Inhibitory Control theory suggests that ability to inhibit reporting on one's own reality when asked to consider other people's state of mind is required in explicit false-belief reasoning. Previous studies have yielded mixed results. Current research investigated the effects of general vocabulary, complement comprehension and inhibitory control of 258 children on their false-belief understanding. Data collection was made possible through the School Readiness Research Consortium. All children were tested at the beginning (Time1) and end (Time 3) during their pre-school year. Hierarchical multiple regression and structural equation models were used in the analyses of the data. The concurrent and longitudinal models suggested that both inhibitory control and complements play roles in children's false-belief development, with complements having a much stronger effect, when children's ages were controlled. Inhibitory control measures and complement understanding also have indirect effects through children's false-belief understanding at time 1 on children's false-belief understanding at time 3. Current model adds to the previous structural equation model proposed in Meng Chen's thesis (2013) by incorporating the mediation effect of false belief understanding at time 1 in the longitudinal relationship predicting false belief understanding at Time 3. In conclusion, the results appear to be consistent with previous literature and Meng Chen thesis (2013), that both language and inhibitory control play roles in advancing children's false belief reasoning.

SURF 2019-Post SURF Survey

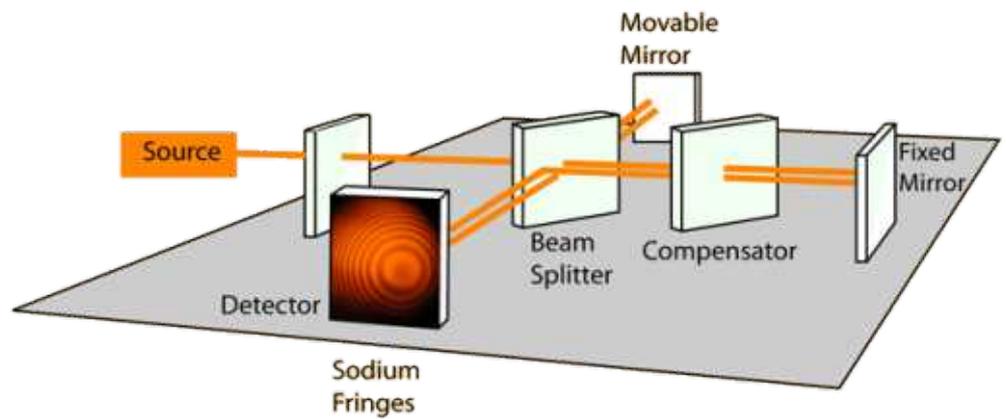|	
Name	Cynthia Lan
Year of Graduation	2021

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Doreen Weinberger
Advisor Department	Physics
SURF Field of Study	Optics
Upload image(s) in .png format; 1,100 MB max size each	CLan_Figure 1.png
Title of Abstract/Research	Make precision measurements of the refractive index of various media using a Michelson interferometer.

Please type your abstract below.

Given that light is a form of electromagnetic wave, the fundamental property of wave superposition applies to monochromatic light, meaning constructive and destructive interference patterns can be observed as a result of phase differences between two overlapping coherent beams. Such patterns can be created and observed by the use of a Michelson Interferometer, consisting of a light source, two beam splitters, a fixed mirror, and a movable mirror. Once the monochromatic light source is properly positioned, the beam splitter creates two separate beams traveling at right angles, with one beam striking the fixed mirror and the other the movable mirror. The two beams thus travel along different pathways and are brought back together by the second beamsplitter, producing a circular pattern of interference fringes on an observation screen.

The travel distance of the light beam going through the movable mirror path can be modified using a micrometer to adjust the mirror position. When rotating the micrometer dial to translate the mirror, one observes the outermost circular fringe to appear or disappear depending on the direction of micrometer rotation, while the innermost fringe (circular spot at the center) varies between light and dark. The wavelength of a monochromatic light source can therefore be determined by counting the change in number of light fringes while moving the mirror through a known measured distance, as read by the micrometer.

One important application of the Michelson Interferometer is the determination of the index of refraction of a material, as any transparent medium with a certain refractive index can be inserted between the beam splitter and the movable mirror, perpendicular to the optical path. This changes the effective travel distance of that beam, again measured by the micrometer, and causes the motion of a fixed number of interference fringes. This information can then be used to determine the index of refraction for the given medium, ranging from gases to liquids to crystalline geological samples, using an appropriate mathematical analysis.

To overcome the limitations of precision obtainable from the standard commercial Michelson Interferometer, we hand-built in the laboratory a Michelson Interferometer with all components obtained from ThorLabs. In particular, the micrometer is replaced by a motorized actuator controlled by computer programming, which significantly enhances the precision of our index measurements. Further studies on the limitations of the accuracy and precision of the refractive index measurements for solid samples will be carried out with this set-up, by considering other factors affecting the laboratory operation like precision of the optical alignment.

Figure 1. Standard set-up of the Michelson Interferometer. (http://hyperphysics.phy-astr.gsu.edu/hbase/phyopt/michel.html)

Figure 2. Interference fringe pattern produced from recombined light beams shown on the observing screen using a He-Ne laser pointer as the light source. (https://drive.google.com/file/d/1YWEz7BwIk7eUjK4SeUnyEbvDF3h_Ms3t/view?usp=sharing)

Figure 3. Set-up of the hand-built Michelson Interferometer on the optical table, with a computer-controlled motorized actuator visible on the mirror mount near the center of the table. The red laser emerges at the far end of the table and the fringes can be seen on the observation screen taped to the wall. (https://drive.google.com/file/d/1dbPGjLwxx79PrFBRy2dTygCPwrfIUUFJ/view?usp=sharing)

SURF 2019-Post SURF Survey

Name	Emily Akey
Year of Graduation	2020

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Aaron Rubin, Smith College
Advisor Department	Engineering
SURF Field of Study	Geotechnical Engineering
Please list co-authors of your abstract	Mariel Jones, Aaron Rubin
Upload image(s) in .png format; 1,100 MB max size each	

Measuring Railroad Ballast Modulus of Elasticity Using Light Weight Deflectometer

Emily Katherine Akey, Mariel Jones, Aaron Rubin

Abstract

Light Weight Deflectometers (LWDs) are used to rapidly determine the modulus of elasticity and spring constant of granular materials and pavements. The LWD can be operated by one person making it incredibly efficient to collect this important data. It is primarily used in the field to determine the properties of soils or paving materials, but also has the potential to be used on railroad ballast. However, to date, there have been minimal studies using LWDs on railroad ballast. The goal of this current study was to investigate the repeatability of LWD testing on prepared cylindrical ballast specimens. To use the LWD on ballast we conducted minimum and maximum density tests in accordance with ASTM D4254 on 12-inch interior diameter by 12-inch interior height cylinder specimens at different percentages of fouling ranging from 0 to 60%. Then the LWD measurements were taken on the top of the specimen using a 12-inch diameter plate. In total, 100 measurements were made on minimum density mixtures and 50 maximum density mixtures. The effect of density and fouling on test repeatability and procedural best practices for LWD testing on cylindrical ballast specimens is discussed.

ICTG Abstract LWD on Ballast.png

Title of Abstract/Research	Measuring Railroad Ballast Modulus of Elasticity Using Light Weight Deflectometer
Please type your abstract below.	Light Weight Deflectometers (LWDs) are used to rapidly determine the modulus of elasticity and spring constant of granular materials and pavements. The LWD can be operated by one person making it incredibly efficient to collect this important data. It is primarily used in the field to determine the properties of soils or paving materials, but also has the potential to be used on railroad ballast. However, to date, there have been minimal studies using LWDs on railroad ballast. The goal of this current study was to investigate the repeatability of LWD testing on prepared cylindrical ballast specimens. To use the LWD on ballast we conducted minimum and maximum density tests in accordance with ASTM D4254 on 12-inch interior diameter by 12-inch interior height cylinder specimens at different percentages of fouling ranging from 0 to 60%. Then the LWD measurements were taken on the top of the specimen using a 12-inch diameter plate. In total, 100 measurements were made on minimum density mixtures and 50 maximum density mixtures. The effect of density and fouling on test repeatability and procedural best practices for LWD testing on cylindrical ballast specimens is discussed.

SURF 2019-Post SURF Survey

Name	Rachel Estrera
Year of Graduation	2021

SURF Advisor	Adam Hall, Biological Sciences
Advisor Department	Neuroscience
SURF Field of Study	Neuroscience
Title of Abstract/Research	Comparison of DEET and Novel Insect Repellants

Please type your abstract below.

Mosquitoes are viewed as menaces to humans, acting as blood-borne carriers of diseases like West Nile virus, malaria, and Dengue fever. Accordingly, it's of interest to humans to identify what attracts mosquitoes and how we might intervene to prevent disease-spreading bites.

Previous research reveals that mosquito antennae house odorant receptors that bind odorants like 1-oct-3-enol and 2-methyl phenol. When activated, the receptors open to allow cation flux, or a current, resulting in excitatory action of the corresponding neurons. N,N-Diethyl-meta-toluamide i.e. DEET acts to block the receptor, dampening the signal induced by the odorants. DEET is the current golden standard of insect repellants, yet it isn't perfect. With goals of finding an insect repellant that lasts longer, acts against a greater range of bugs (e.g. arthropods like tics), and isn't toxic to humans, 17 novel insect repellants were assessed for efficacy of inhibition of the odorant-induced signal in comparison to DEET. These novel repellants fall into two chemical categories: carboxamides and acylpiperidines. This summer, I spent most of my time assisting the talented and dedicated Gariel Grant to finish screening the repellants.

Using a two-voltage electrode clamp with Xenopus laevis oocytes expressing GRPOR2/GRPOR7 and GRPOR7/GRPOR8 receptors, DEET and the novel repellents were applied. DEET and one of each of the most potent carboxamides and acylpiperidines were applied in a dose-dependent manner, and there indeed was dose dependency of inhibition of odorant currents by the repellants. Experiments confirmed that the effects of DMSO alone on odorant currents were negligible and that the odorant-induced cation currents could be blocked by NMDG. Interestingly, all the novel repellants inhibited the odorant currents more than DEET, particularly the acylpiperidines. The potential for DEET alternatives is therefore promising. However, there could still be other ways insect repellants function for which DEET is still superior, and the safety of the novel repellents for humans could still be a concern.

SURF 2019-Post SURF Survey

Name	Ginny (Virginia)Svec
Year of Graduation	2020

SURF Advisor	Sara Pruss, Geosciences
Advisor Department	Geosciences
SURF Field of Study	Geosciences

Title of Abstract/Research	SPICE and Changing Redox Environments at the Lawson Cove locality, Western Utah, USA

Please type your abstract below.

The Steptoean Positive Isotopic Carbon Excursion (SPICE) describes a large, positive carbon isotopic excursion related to a global extinction event at the end of the Cambrian Period (Saltzman et al. 1998). Measurements from south China and Kazakhstan suggest that the SPICE event is one of the largest carbon isotopic excursions in the Phanerozoic era. This coincides with a worldwide mass extinction of trilobites, with nearly 80 percent of species becoming extinct (Saltzman et al. 2000). The SPICE event has been largely studied in Utah (Saltzman et al. 2004, Saltzman et al. 2000, Saltzman et al. 1998). Large changes in sedimentation at the beginning of the SPICE excursion have been recorded in many areas including the Lawson Cove locality in Utah, my area of study (Saltzman et al. 1998). It was thought that large igneous province (LIP) volcanism may be the cause of this excursion, owing to the large presence of mercury (Hg) in the sediment of these localities, since LIPs are closely associated with Hg anomalies. The Late Cambrian Spice event, however, is a time with no known LIP. The Hg anomalies instead are thought to be linked to a changing redox environment, which is supported by the abundance of glauconite, a redox-sensitive mineral, found only in the SPICE section and not the surrounding area (Pruss et al. 2019). We want to create a basis similar to previous SPICE research from these localities to ensure our accuracy, then build on that in support of redox changes in the environment being the cause of the Hg anomalies and increasing amounts of C13 isotopes.

We traveled to Utah to the House Range and Lawson Cove locality to collect samples from the Late Cambrian SPICE event. I drilled approximately 0.1 g rock powder from each rock for carbon isotope data, and 1 gram for mercury data. The carbon isotope data is still being processed. The mercury powder was processed on a Hydra-C and the data were collected. It seems that these data were accurate, with one rock having a much higher amount of mercury that I will look into further. I created thin sections of many rocks, and powdered all rocks using a rock crusher and shatterbox. I also began creating a stratigraphic column of Lawson Cove. This semester I will be analyzing the data and thin sections from the summer and continuing my research further.

Works Cited

Pruss, S. B., Jones, D. S., Fike, D. A., Tosca, N. J., & Wignall, P. B. (2019). Marine anoxia and sedimentary mercury enrichments during the Late Cambrian SPICE event in northern Scotland. Geology, 47(5), 475–478.

Saltzman, M. R., Cowan, C. A., Runkel, A. C., Runnegar, B., Stewart, M. C., & Palmer, A. R. (2004). The Late Cambrian Spice (δ13C) Event and the Sauk II-SAUK III Regression: New Evidence from Laurentian Basins in Utah, Iowa, and Newfoundland. Journal of Sedimentary Research, 74(3), 366–377.

Saltzman, M. R., Ripperdan, R. L., Brasier, M. D., Lohmann, K. C., Robison, R. A., Chang, W. T., … Runnegar, B. (2000). A global carbon isotope excursion (SPICE) during the Late Cambrian: relation to trilobite extinctions, organic-matter burial and sea level. Palaeogeography, Palaeoclimatology, Palaeoecology, 162(3), 211–223.

Saltzman, M. R., Runnegar, B., & Lohmann, K. C. (1998). Carbon isotope stratigraphy of Upper Cambrian (Steptoean Stage) sequences of the eastern Great Basin: Record of a global oceanographic event. GSA Bulletin, 110(3), 285–297.

SURF 2019-Post SURF Survey

Name	Samikshya Dhami
Year of Graduation	2022

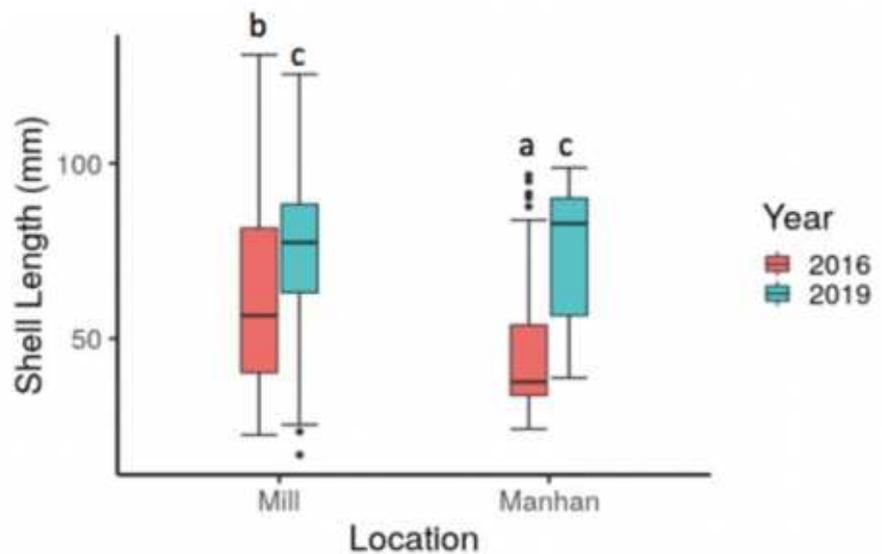|	
SURF Advisor	Marney Pratt, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Ecology and diversity
Please list co-authors of your abstract	Amy Turgeon, Samikshya Dhami
Upload image(s) in .png format; 1,100 MB max size each	

Figure 1: Relationship between the location and the shell length of only the alive freshwater mussels (*Elliptio complanata*) in the summer of 2016 and 2019 of a sample size of 482. The data were collected in the Mill and Manhan rivers located in Northampton, Massachusetts. The lower and upper limit of the box represent the 25th and 75th percentiles respectively. The middle line in the box is the median and the whiskers are 1.5 times the interquartile range from the box limits. The black dots represent outliers that are outside of the whisker limits. Different lowercase letters(a,b,c) show a significant different by pairwise post-tests using the Tukey adjustment.

S. Dhami.png

Title of Abstract/Research	Paradise Pond Project: Freshwater Mussels as Bio-indicators of Mill River Health
Please type your abstract below.	Paradise Pond is an impoundment created by a dam on the Mill River (Sinton 2002). The dam disrupts the movement of sediment causing sediment to gradually build up over time. In order to prevent Paradise Pond from completely filling with sediment Smith College moves it by flushing it downriver. To make sure the surrounding ecosystem is not affected, The Paradise Pond Sediment Management Project assesses the impact of sediment redistribution on the health of the ecosystem downriver.

Paradise Pond is an impoundment created by a dam on the Mill River (Sinton 2002). The dam disrupts the movement of sediment causing sediment to gradually build up over time. In order to prevent Paradise Pond from completely filling with sediment Smith College moves it by flushing it downriver. To make sure the surrounding ecosystem is not affected, The Paradise Pond Sediment Management Project assesses the impact of sediment redistribution on the health of the ecosystem downriver.

In this study, we are using freshwater mussels as a bio-indicator on the health of the Mill River. An increase of sediment can negatively affect the river mussels because it obstructs their ability to feed and respire (Nedeau 2008). In order to see if the sediment redistribution in 2016 had an impact on the Mill River the Before-After-Control-Impact design was used to compare freshwater mussel shell length in the Manhan river (control) and in the Mill River (Impact) in 2016 (Before) and 2019 (after) (Strayer & Smith 2003). Comparing the different distributions of shell length will help us understand the water quality of the Mill River. This is because the more distributed the shell lengths are the better the mussel population is doing.

In order to assess whether the influx of sediment had any impact on the range of mussel sizes in the rivers in 2016 and 2019, we conducted a two-way Anova test with location and year as the two factors using type III sum of squares. A significant interaction between the location and the year could suggest that the sediment redistribution had an impact on the mussels. There was a significant interaction between the location and the year ($F_{1,482} = 10.8$, $P = 0.001$). In 2016, the mussels in the Mill River were larger in size than the mussels in the Manhan. This was not the case in 2019. This could suggest that there has been better recruitment of mussels in the Mill river compared to the Manhan. The greater variety of mussel sizes in the Mill compared to the Manhan after the sediment redistribution in 2016 suggests that though sediment redistribution had an impact on the mussels, it did not have a negative impact.

Literature Cited:
Nedeau, E. J., 2008. Fresh water mussels and the Connecticut river watershed. Connecticut River Watershed Council, Greengield, Massachusetts.
Sinton, J. 2002, April. A short history of the Mill river watershed 1650-1940.
Strayer, D. L., and D. R. Smith. 2003. A guide to sampling freshwater mussel populations. American Fisheries Society, Monograph 8, Bethesda, Maryland.

SURF 2019-Post SURF Survey

Name	Andrea Rawson
Year of Graduation	2022

SURF Advisor	Virginia Hayssen, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Biological Sciences

Title of Abstract/Research	Morphological Features and Range of Crocuta crocuta, and the Organization of the Vertebrate Biology Lab

| **Please type your abstract below.** | Crocuta crocuta, the spotted hyena, is a widespread species in Africa that has attracted a large amount of study due to the unique reproductive structure of the female. The goals of this investigation were to generate summary statistics for various morphological features of C. crocuta and to generate a map of the range of C. crocuta in order to support the writing of a Mammalian Species Account for the American Society of Mammalogists.
I reviewed published literature on C. crocuta to obtain data on their morphological features, gender, and location. Morphological features included: external body measurements and skull measurements. The data were then grouped by location and gender, and ranges and averages of morphological measurements for these groups were calculated using Rstudio. A section of the Mammalian Species Account was then written using these calculations. The range map was adapted from an IUCN map for the range of C. crocuta using information of the habitat limits for C. crocuta and publicly available data on the elevation and land cover of Africa. The IUCN map and data on elevation and land cover were imported into ArcMap, and areas where C. crocuta cannot habituate according to the literature on the species (such as lakes) were excluded from the IUCN map.
In addition to this investigation, I worked with another Smith student, Chase Ryan-Embry, to organize and update the collection of specimens in the vertebrate biology lab at Smith College. This included identifying unknown specimens, labeling all specimens in the lab, and creating a database that includes the taxonomic information of the specimens and where they are located in the lab to assist students and instructors in using this resource. |

SURF 2019-Post SURF Survey

Name	Greta Mundt
Year of Graduation	2021

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Dano Weisbord
Secondary SURF Advisor	Tim Johnson
Advisor Department	Environmental Science and Policy
SURF Field of Study	Landscape Studies
Title of Abstract/Research	Learning Landscapes: How the new Landscape Master Plan can enhance informal experiential learning at Smith College

Please type your abstract below.

Smith College is currently creating a new landscape master plan (LMP), which will inform decisions about the management, maintenance, and design of the campus landscape. One of the goals established by the LMP Committee in the LMP Request for Qualifications is to "promote the use of the landscape in teaching, learning, and scholarship." This SURF project originally focused on the methodology of landscape-based education. Formal experiential education in the landscape includes interactions such as events, classes, or research experiences, which are guided by educational outcomes derived by educators and their learning objectives. Planning is unlikely to systematically address the needs of these varied experiences. Therefore the project focus shifted towards informal experiential education opportunities based on the lived experiences of individuals experiencing the landscape without the guidance of an educator. Informal experiential education at Smith is an untapped resource for most students. While there is potential for a heightened educational experience through everyday interactions with the landscape, these interactions are not shaped by formal learning objectives. Therefore, informal experiential education in the landscape is unstructured, unguided, unpredictable, and unassessed. Research methods included assessing Smith's current landscape education offerings, interviewing landscape stakeholders at Smith, comparing Smith's offerings to other institutions, reading literature surrounding landscape, education, and interpretation, and compiling a literature review of institutional guiding documents pertinent to landscapes at Smith. Documents reviewed included the LMP Request for Qualifications, the 2017 Smith College Self Study Narrative, the 2016 Report of the Smith College Study Group on Climate Change, the 2016 Smith College Strategic Plan, and the 2019 Botanic Garden Strategic Plan.

From this research came the conclusion that outdoor informal experiential learning should include learning goals. Potential learning goals were drafted guided by institutional values. These goals aim to guide land management and operations' approach to future projects and provide an assessment metric for the educational potential of space. Incorporating educational intentions into the LMP and land management will result in increased informal educational outcomes in students, and directly impact course participation and research surrounding the landscape as students engage with their campus. This research experience also included researching accessibility in the landscape, which working with the Office of Disability Services and assessing the Smith landscape based on the principles of Universal Design. These projects will be presented to the Landscape Master Plan Committee in the fall with the hopes of starting the conversation on learning in the landscape and accessibility.

SURF 2019-Post SURF Survey

Name	Eleanor Tarno
Year of Graduation	2021
SURF Advisor	Stylianos Scordillis, Biochemistry
Advisor Department	Biochemistry
SURF Field of Study	Proteomics

Upload image(s) in .png format; 1,100 MB max size each
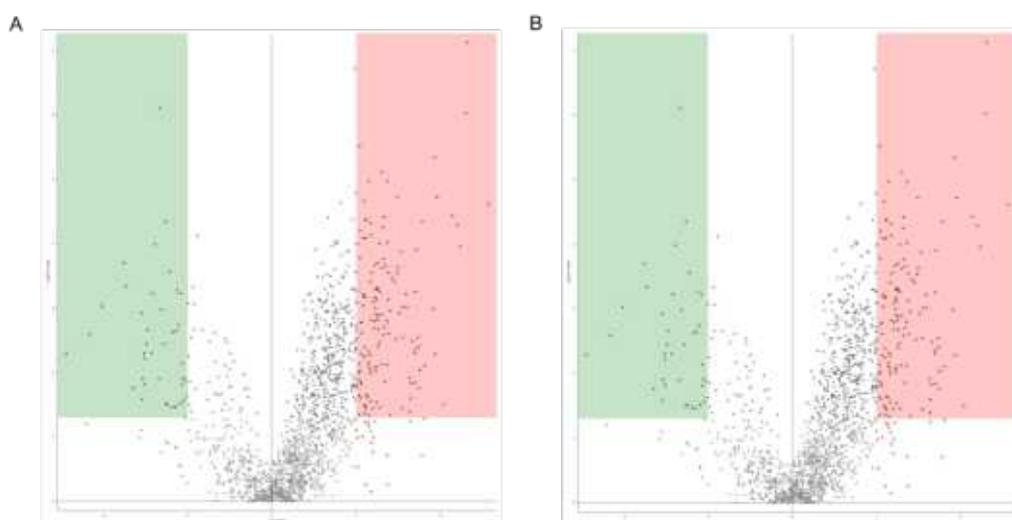
E. Tarno Figure for SURF Abstract.png

Title of Abstract/Research   Comparative Proteomes of Fast and Slow Twitch Rat Skeletal Muscles

Please type your abstract below.

Skeletal muscles govern locomotion in mammals and constitute a large portion of the body mass. They create contractile forces by harnessing protein molecular motors, myosins, and tension transducers, actins, and are controlled by the regulatory proteins, troponins and tropomyosins, that alter cytoplasmic Ca^{2+} concentrations. Mammalian skeletal muscles consist of two main cell (fiber) types, type I (slow twitch) and type II (fast twitch). Type II fibers are used for quick and explosive movements such as jumping or sprinting, whereas type I fibers are designed for endurance such as long runs and posture maintenance. Nearly all mammalian muscles are comprised of differing percentages of these two fiber types but have a dominant fiber type. This study used quantitative proteomics to ascertain the relative presence of protein isoforms found in rat soleus (slow, SOL) and medial gastrocnemius (fast, MG) muscles. High pressure liquid chromatography-coupled mass spectrometry was used to determine all the proteins (proteome) in a sample and tandem mass tagging documented their relative abundances. Muscles excised from adult rats (n=5, 6 mo) were extracted in a buffer that separates the sarcoplasmic (cytoplasmic) and sarcomeric (contractile apparatus) proteins. These fractions were then digested with trypsin and the resulting peptides were reacted with isobaric mass tags for relative abundance measurements. Nano-liquid chromatography-coupled mass spectrometry yielded 323 protein IDs for the MG and 1023 for the SOL. Initial data analysis indicates proteins involved in glycolysis are found in a higher abundance in the MG whereas oxidative phosphorylation proteins were greater in the SOL. Additionally, the myosin fast and slow twitch isoforms, were found in higher abundances in the MG and SOL, respectively. This was also true of the troponins where the MG contained exclusively fast isoforms and the SOL only slow isoforms. Parvalbumin, a calcium binding protein that is found in high abundances in fast twitch muscles, had a 4-fold higher abundance in the MG. Furthermore, the sarcoplasmic/endoplasmic reticulum calcium ATPases (SERCA) which have fast and slow twitch isoforms, were found in the MG, fast, and SOL, slow. Figure 1: Volcano plots of proteins identified in supernate (A) and pellet (B) fractions. The X axis sorts the proteins by relative abundances between the SOL and MG; proteins to the left of the Y axis are more abundant in the MG and proteins to the right of the Y axis are more abundant in the SOL. The Y axis is the negative log of the p value such that protein closer to the X axis have higher p values. The proteins that differed significantly (± 2-fold and $p < 0.05$) in the MG are in green shaded areas, whereas those in the SOL are in the pink areas.

SURF 2019-Post SURF Survey

Name	Yujia Zhou
Year of Graduation	2020

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Albert Y. Kim
Advisor Department	Statistical and Data Sciences
SURF Field of Study	Statistical and Data Sciences
Title of Abstract/Research	ModernDive and FiveThirtyEight: Open Source Data Science Projects

Please type your abstract below.

This summer, I have worked with my SURF advisor, Prof. Albert Y. Kim, to assist his with two major open-source projects that he is a co-author for: ModernDive and the fivethirtyeight package.

First, I have worked on ModernDive, an online textbook for learning statistics using data science tools, which will be published in print by CRC Press in Fall 2019. This textbook is currently being used by him in both SDS/MTH 220 Introduction to Probability and Statistics and SDS 192 Introduction to Data Science. I have edited, tested and proofread code, improved explanations and examples of theory, worked on the selection, polished the images in the book, as well as improving the data visualization examples in R code. The book is currently being proof-read by CRC Press, and the updated version is available online at http://moderndive.com.

Second, I have contributed to the fivethirtyeight package, an R package providing easy access to the code and data sets published by the data journalism website FiveThirtyEight.com. I have conducted data wrangling, evaluated data quality, conducted background research for dataset documentation purposes for package users to reproduce the analysis in FiveThirtyEight's original articles. In addition, I initiated a "How to add data to R packages" quickstart guide (https://github.com/rudeboybert/fivethirtyeight/wiki/Instructions-on-how-to-add-a-new-dataset) for open-source projects with systematic instructions. This will allow future R package contributors to quickly navigate the necessary developer tools and be able contribute to open-source projects on GitHub. At the end of my project, with the help of Prof. Kim I ran a focus group to have SDS students test the starter guide and go through the process once themselves. I incorporated focus group participant feedback and delivered a viable guide for future students who will contribute to this project.

SURF 2019-Post SURF Survey

Name	Xian (Elaine) Ye
Year of Graduation	2021

SURF Advisor	Shannon Audley, Psychology
If your SURF Advisor was not listed above you can enter their name here.	Caitlin Shepherd. Shannon Audley is not my advisor but I must fill in the blank above so I put her name in the box.
Advisor Department	Psychology
SURF Field of Study	Psychology
Title of Abstract/Research	Personality and Cognitive Factors in a Transdiagnostic Approach for Eating Disorders

Please type your abstract below.

Compared to the categorical approach of eating disorders used in DSM-5 that classifies individuals into subtypes of ED based on presence or absence of disordered eating behaviors, the transdiagnostic approach refrains from categorizations and instead studies the underlying mechanism of eating pathologies, such as the personality traits and the cognitive processes. The purpose of our project was to develop a study procedure and to finalize measurements for personality and neurocognitive factors for a pilot study to be conducted in Fall 2019. My research partner and I firstly read the existing literature that investigated the personality and cognitive factors related to the development and the maintenance of eating pathologies. Based on the research, personality traits including obsessionality, perfectionism, experiential avoidance, and impulsivity were identified as our research interests; and the cognitive factors we planned to study were decision making, set-shifting, central coherence, and inhibitory control (Martinez & Craighead, 2015; Smith et al., 2018). Previous empirical studies mostly utilized self-report questionnaires to operationalize personality factors and psychiatric symptoms and conducted the neurocognitive tasks to examine the elements of cognitive processes. We collected different self-report and behavioral measurements of those factors and selected the appropriate instruments by comparing their psychometric properties, accessibility, and feasibility of administration. Considering eating disorders may share common underlying mechanism with other associated disorders, questionnaires that measure symptoms of distress, ADHD, bipolar disorder, personality disorders, substance use, and obsessive-compulsive disorder were also included in the study.

To avoid participants' cognitive fatigue, the study will consist of two separate sessions. Participants will be required to finish the self-report questionnaires during the first session and need to return to the lab on a different day to complete the neurocognitive tasks. After the procedures were preliminarily decided, my research partner and I wrote an IRB protocol for the study. The work that we did this summer will lend itself to a lab manual for research assistants to conduct the study in the coming semester with Professor Shepherd

References
Martinez, M. A., & Craighead, L. W. (2015). Toward person (ality)-centered treatment: How consideration of personality and individual differences in anorexia nervosa may improve treatment outcome. Clinical Psychology: Science and Practice,22(3), 296-314.

Smith, K. E., Mason, T. B., Johnson, J. S., Lavender, J. M., & Wonderlich, S. A. (2018). A systematic review of reviews of neurocognitive functioning in eating disorders: The state-of-the-literature and future directions. International Journal of Eating Disorders, 51(8), 798-821.

SURF 2019-Post SURF Survey

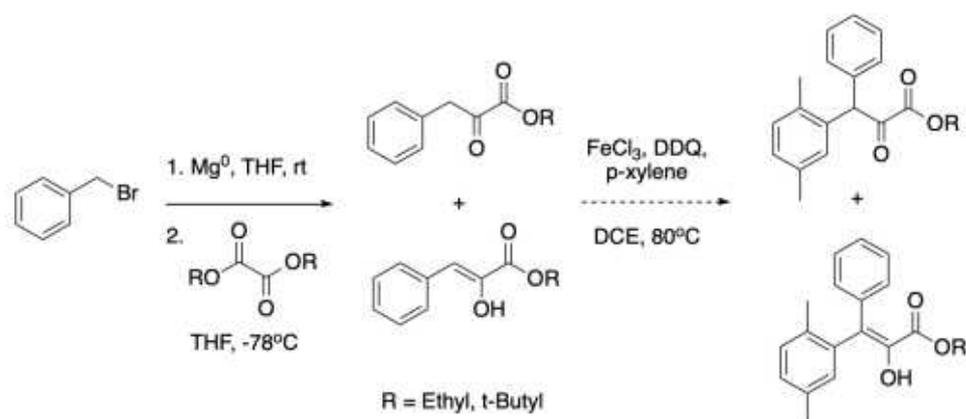|	
Name	Rebecca Miller
Year of Graduation	2020

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Allie Strom
Advisor Department	Chemistry
SURF Field of Study	Organometallic Catalysis
Upload image(s) in .png format; 1,100 MB max size each	R_Miller Abstract Image.png
Title of Abstract/Research	Iron Catalyzed Cross-Dehydrogenative Coupling

Please type your abstract below.

Transition metal catalysts have been developed as useful methods for carbon-carbon bond formation. One application of these catalysts is the alpha-arylation of carbonyl compounds, products of which are commonly found with pharmaceutical and agricultural applications. However, this method of cross coupling requires pre-activation of an otherwise unreactive arene, and the presence of base which limits the scope of reactivity. In this study, iron-mediated cross-dehydrogenative coupling of keto ester compounds will be explored without base or pre-activation of the arene. Synthesis of the ethyl keto ester substrate was confirmed by NMR, but purification of the unstable desired compound was unsuccessful due to its chemical similarity to the side products formed in formation and addition of the Grignard reagent and the starting keto ester. Cross-coupling experiments were performed using the crude substrate, however significant impurities hindered analysis and the keto ester decomposed under the high temperature of the reaction conditions. The stable t-butyl keto ester substrate was targeted because it could withstand purification and high temperatures of the cross-coupling. Purification from side products and residual starting material was still unsuccessful again due to chemical similarity. This method of cross-coupling will be studied using commercially available hydroxy ketone derivatives instead of the keto ester. Alternative routes for synthesis of the keto esters will be also pursued to further optimize the reaction and simplify purification.

SURF 2019-Post SURF Survey

Name	Will Sandke

Year of Graduation	2020

SURF Advisor	Steven Williams, Biological Sciences
If your SURF Advisor was not listed above you can enter their name here.	Samantha Torquato
Advisor Department	Biological Sciences
SURF Field of Study	Molecular Biology
Title of Abstract/Research	Perfecting Diagnostic Assays for Marine Mammal Parasites: Parafilaroides decorus and Otostrongylus circumlitis

Please type your abstract below.

Parasites are found all over the globe and in all kinds of species. Several can be harmful for example marine mammals can be infected with heartworms, lungworms, and other nematodes. Identifying these worms is difficult because morphologically they all appear very similar. To counteract this difficulty our lab employs a genetic method of detection. This summer our goal was to perfect an existing diagnostic assay for Parafilaroides decorus and prepare for Next Generation Sequencing on Otostrongylus circumlitis. Our samples came from harbor seals, elephant seals, and California sea lions. In order to perfect the P. decorus assay we isolated DNA from feces and sputum and analyzed varying DNA concentration levels using Quantitative Real-time PCR (qRT-PCR). We found that P. decorus DNA was detected in sputum dilutions at 0.5 ng/µl and in feces dilutions at the same concentration. This means our diagnostic assay can be used on faces and sputum samples (non-invasive) and detect P. decorus DNA (infection) with a concentration as low as 0.5 ng/µl of DNA. For O. circumlitis, our lab had previously created a diagnostic assay to distinguish between Pacific and Atlantic populations. We decided to create a more sensitive assay with no regard to the population area. At the end of the summer, we began to prepare for the new assay by isolating DNA from 14 potential O. circumlitis worms and then running them through 3 primer sets in PCR. We used COX1 primers, SSU primers, and ITS2 primers. We then took the sequences made in the PCRs and got the full DNA sequences back. Through alignments and BLASTing, we were able to successfully identify 11 worms as O. circumlitis. These worms will now be run through Next Generation Sequencing for further confirmation.

Reference:
Keroack, Caroline Dana. "Nematode parasites of marine mammals: phylogenetic and statistical analysis of coevolution" (2014). Theses, Dissertations, and Projects. 71. https://scholarworks.smith.edu/theses/71
Williams, Kalani. "Different Coasts and Different Hosts: Investigating Speciation in the Seal Lungworm Otostrongylus circumlitis" (2018). Theses, Dissertations, and Projects. https://drive.google.com/drive/folders/1p7Nuc3jW3NNj8AvhxySp17hWggFnzFa9
Torquato, S. D. (2018) Seal Distributions and their Parasites [PowerPoint slides]. Retrieved from https://drive.google.com/drive/folders/13LJ0E-asGF78-HRVul_psj7hBYe-93CK

SURF 2019-Post SURF Survey

Name	Ursula Miguel **Smith**
Year of Graduation	2020

SURF Advisor	Bosiljka Glumac, Geosciences
Secondary SURF Advisor	H. Allen Curran
Advisor Department	Geosciences
SURF Field of Study	Geosciences

Title of Abstract/Research	Movement of large rock boulders by storm waves on San Salvador Island, Bahamas

Please type your abstract below.	Storm waves can drastically impact coastal areas. In the Bahamas, the formation and transport of large rock boulders is one of the consequences of such wave action. Studying the movement of boulders can provide insights into intensity and effects of storms that impact Bahamian islands. In this study, two different coastal settings on San Salvador Island were surveyed: Singer Bar Point, along the low-energy north coast, and The Gulf, along the high-energy south coast. While abroad, I also attended a conference on the geology of the Bahamas and presented a poster on the use of Google Earth historical images for documenting hurricane impact.

My SURF project involved testing the use of RFID (radio frequency identification) technology for tagging and locating boulders (Figure). I spent one week in the field tagging about 100 boulders and cobbles by drilling into the rocks, placing a PIT tag inside, and sealing the hole. The boulders were described and photographed in detail, and their GPS locations were recorded. The use of RFID technology in this kind of research is in its early stages, and this project served as a way of testing its usefulness. This new technology allowed smaller cobbles to be tagged, which was not possible in the past when only GPS location and visual recognition were used and many boulders were not able to be relocated after major storm events. The movement of cobbles is especially interesting for the low-energy north coast of San Salvador, and it could provide powerful insights into the coastal dynamics of a lagoon-protected area.

I plan to continue this research as part of my special studies in 2019/20, and I also plan to return to the study sites in January 2020, after the 2019 hurricane season, to locate the tagged boulders and smaller sediment particles and document any movement caused by waves. This project will serve as a way of testing the use of new technology that can provide a much needed and improved method for boulder relocation after a storm. With this new technology, the impact of storms on these coastal systems can be better documented and communicated with all interested stakeholders - citizens, developers, and the government - in the Bahamas and elsewhere.

Figure: Ursula Miguel '20 and Abigail Beckham'19 testing the use of RFID technology in studying the movement of rock boulders by storm waves on San Salvador Island in the Bahamas.

SURF 2019-Post SURF Survey

Name	Chelsea Perez
Year of Graduation	2021

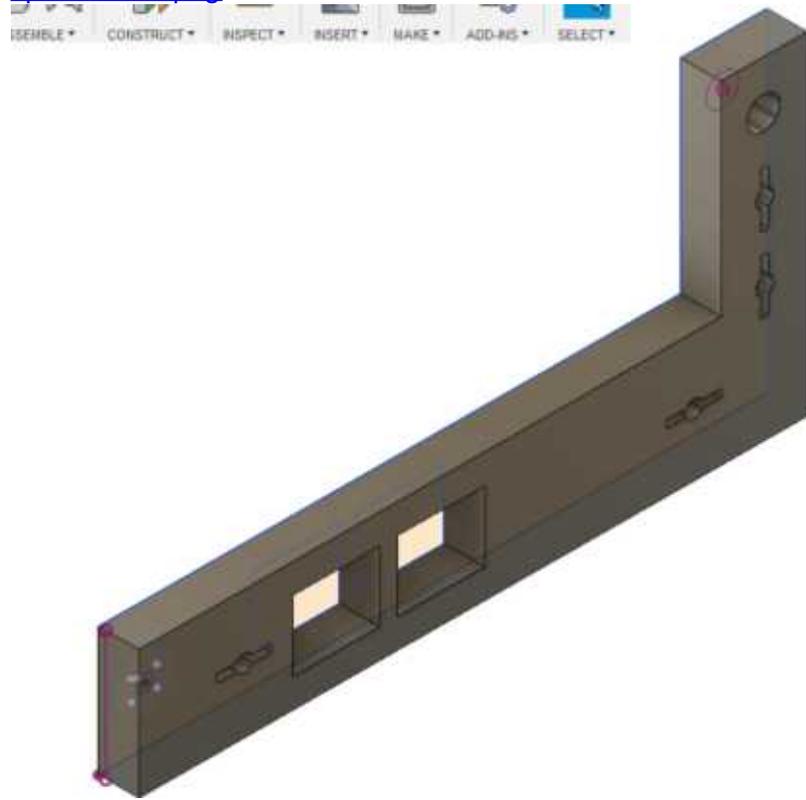|	
SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Will Williams
Advisor Department	Physics
SURF Field of Study	Atomic Physics

Upload image(s) in .png format; 1,100 MB max size each

cperez back.png

cperez front.png

Title of Abstract/Research   Ionization Spectroscopy on Neutral Beryllium-9

Please type your abstract below.

My summer project was to help the Williams' lab prepare for ionization spectroscopy on neutral beryllium-9. To do this, we did three projects. The first was designing and building a circuit to monitor the humidity inside one of the lasers. After we designed the circuit, I spent time in the electronics classroom learning how to solder before building and debugging the circuit. This project was completed and successfully implemented into the lab. I plan to add a digital display to the circuit as part of the electronics course I am taking in the fall.

The second project was to test the wavelength tuning range of two 930 nm laser diodes in an external cavity diode laser (ECDL). The ECDL was built by a senior thesis student last year. To measure the wavelength tuning range, we first install a diode into the laser and aligned all of the internal optics in order to get the laser to lase in a controlled manner. The output light was then sent to an optical fiber that was connected to a spectrometer. The spectrometer allowed us to, in real time, monitor what wavelength the laser was lasing. The range of the first diode we tested was found to be 914 nm to 934.8 nm. Unfortunately we could not get the laser to tune to our goal wavelength of 935 nm. We then tested a second diode and found the wavelength tuning range to be 917 nm to 935 nm, which will work for the ionization spectroscopy project. This project was successful and completed.

Finally, we redesigned a mirror mount inside the ECDL to better improve the performance of the laser. The mirror mount was designed in AutoCAD, 3D printed, and then built out of aluminum in the Center for Design and Fabrication. While the mirror mount is built, the new ECDL design has not yet been tested.

SURF 2019-Post SURF Survey

Name	Umeyma Ibrahim
Year of Graduation	2022

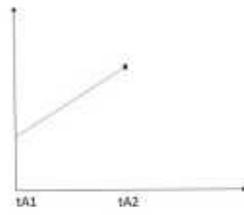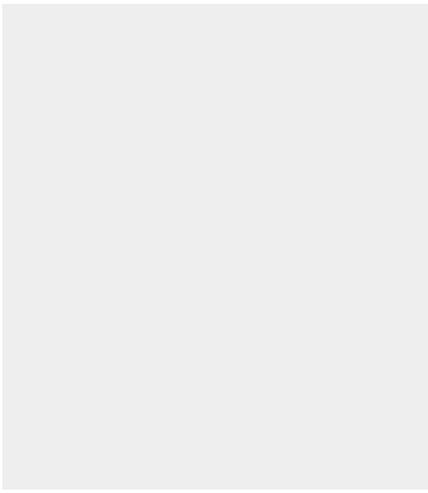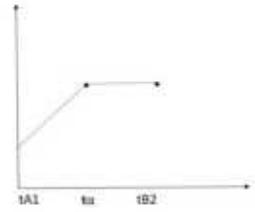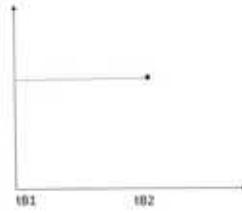|	
SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Alicia Grubb, a Smith Advisor
Advisor Department	Computer Science
SURF Field of Study	Web Tool
Please list co-authors of your abstract	Lucy Wang
Upload image(s) in .png format; 1,100 MB max size each	

Model A

Model AB

Model B

| **Title of Abstract/Research** | Towards Merging Models over Different Time Intervals |

Please type your abstract below.

BloomingLeaf is an analysis and modeling tool that allows stakeholders to model goals and intentions. The tool helps users understand model evolution and tradeoffs by evaluating how intentions change over time. Prior work looked at creating models piecemeal, by constructing models of individual actors over different time periods and then merging them together. Grubb proposed an algorithm for merging goal models and showed a potential application; but, did not implement the proposed semi-automated algorithm. In this project, we explored the problem domain of this merge algorithm and developed underlying tooling. To fully implement the algorithm, we needed to merge both the visual syntax and underlying semantics of both un-timed and evolving goal models. We worked on the merging of timed functions. In this project, all functions are step-wise atomic functions over disjoint neighboring intervals, where the atomic functions are constant, increase, decrease, and stochastic. Consider the functions in Figure 1, Model A is an increasing function over the interval [tA1, tA2) and Model B is a constant function over the interval [tB1, tB2). The purpose of our algorithm is to specify Model AB. Specifying the resulting Model AB depends on the underlying timeline over which each model is defined. For example, in Figure 1, if tA2 < tB1 then there exists an unspecified gap in the function. If tA2 > tB1 then there exists an overlap in the function which may result in a conflict. Finally, if tA2 = tB1 then the two functions align. In Figure 1, Model AB assumes the case where tA2 = tB1 with the new interval [tA1, tB2). We focused on the tA2 = tB1 case in this research project. With this timeline, we investigated how the two functions should be merged. We found that Model A and Model B can be merged into either an increase function followed by a constant function, or an increase function with a single time point specified. We proved (by contradiction) the soundness of our assertion. We implemented the first case of the merge algorithm (tA2 = tB1). Future work will finish the implementation for the two other cases and create a web interface for the merge algorithm.

SURF 2019-Post SURF Survey

Name	Juliet Jarrell
Year of Graduation	2021

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Byron L. Zamboanga (Smith advisor but not listed on the drop down)
Advisor Department	Psychology
SURF Field of Study	Psychology
Title of Abstract/Research	Double Whammy: Playing Drinking Games as a Form of Prepartying in a Sample of Young Adults
Please type your abstract below.	Young adults age 18-25 are more at risk for heavy alcohol consumption than other age groups, because they participate in a number of hazardous drinking practices such as pregaming and playing drinking games. There are many types of drinking games, and different kinds of games can affect participants in distinct ways. The present study set out to examine how playing drinking games as a form of pregaming compares to other pregaming styles, and if certain types of drinking games are riskier than others. 482 participants ages 18-25 completed a survey about their pregaming and drinking game behaviors, and the results from this data indicate that those who played drinking games as a form of pregaming consumed approximately one more drink than those who engaged in alternative pregaming styles. Furthermore, those who played Card Games consumed significantly more drinks than participants who played other types of games, and more women than men played Verbal Games. The results of this study can help to improve alcohol intervention efforts by providing more information about types of drinking games and the people who play them.

SURF 2019-Post SURF Survey

Name	Jiwoo Seo
Year of Graduation	2021
SURF Advisor	Denise McKahn, Engineering
Advisor Department	Engineering
SURF Field of Study	Engineering
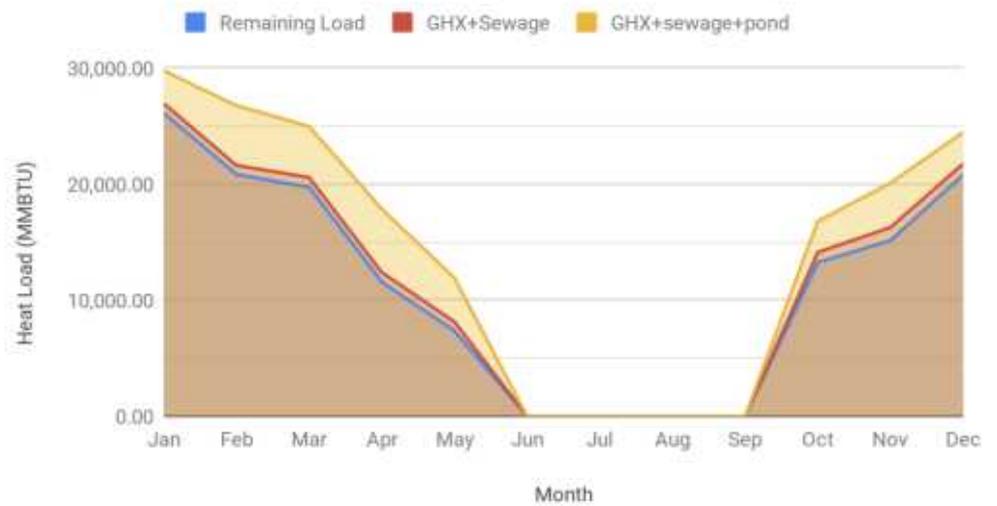
Upload image(s) in .png format; 1,100 MB max size each	
	Screen Shot 2019-09-01 at 2.46.14 PM.png
Title of Abstract/Research	Investigating the Feasibility of Wastewater Heat Recovery on Smith Campus

Please type your abstract below.

Wastewater heat recovery (WWHR) recycles unused heat from wastewater and uses it to pre-heat clean water that will go through the building pipes. The sewage line and the clean water line (or the refrigerant line) goes through a heat exchanger. The sewage line of the city is a sink, which is a large body of mass that can absorb heat without experiencing any change in temperature. From it, high-temperature sewage is removed and is used to provide heat to clean water which is distributed throughout the buildings in a pipeline. After use, the low-temperature sewage is dumped back into the sewage line. This cycle repeats itself, and with this system, energy will not easily go to waste. Although this system is helpful for Smith's plan for carbon neutralization by 2030, it is rather unclear if the heat the system provides is actually useful compared to the total heating load. This research was conducted to determine if the wastewater heat recovery system is feasible for Smith, using values found in various case studies.

Using the averages of monthly gas consumption values from the steam plant of Smith College over the past 4 years, the energy provided by sewage was calculated to be rather constant throughout, which means that the WWHR system can be depended on as a constant heat source throughout the year. In the months of June, July, August, and September, the percentage of the heat load from sewage was over the initial rough assumption of 20%, going up to 42%.

Other than the WWHR system, there has been recent discussion about using Paradise Pond as a heat source. Values such as water flow and average temperature of the pond were measured for calculations. It was assumed that 25% of the pond water will be used to generate electricity. From the graph provided, the heat load from the pond is significantly larger than the heat load from the WWHR system, which gives hope that the pond could be a reliable heat source for the College.

SURF 2019-Post SURF Survey

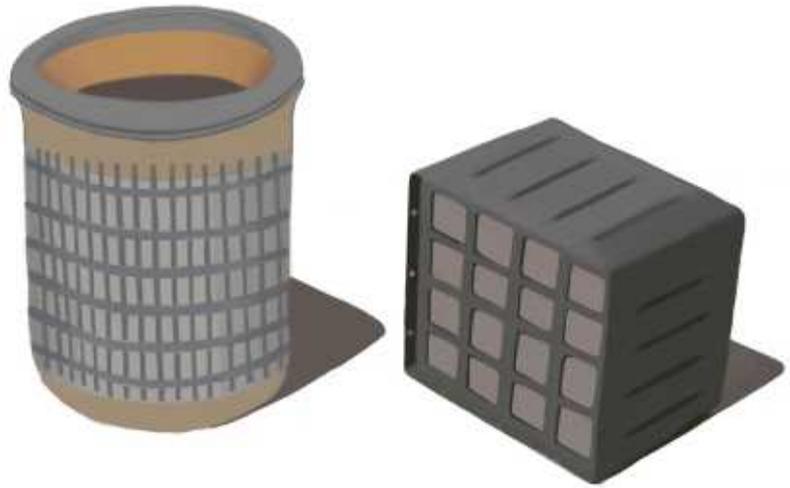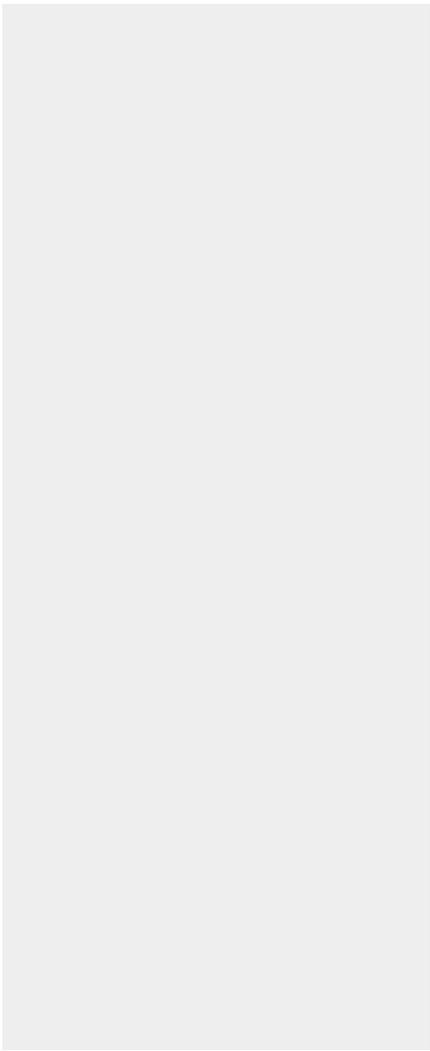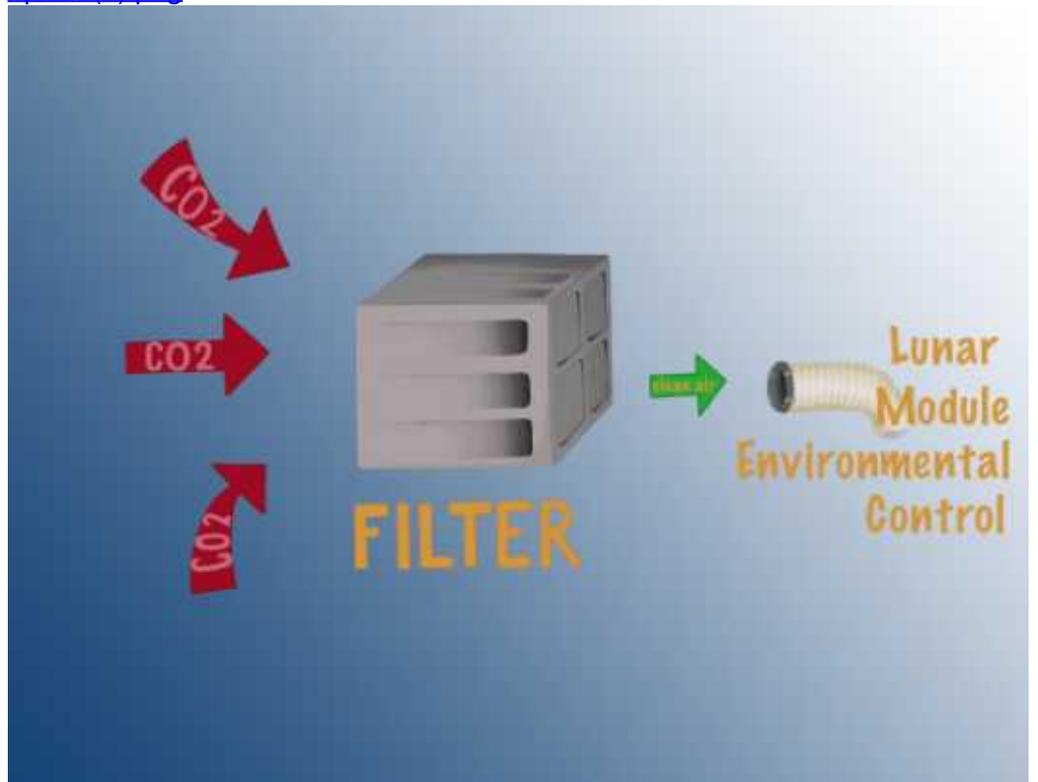|	
Name	Diane Alvarez Benitez
Year of Graduation	2022
Are you in a Graduate program?	no
SURF Advisor	Glenn Ellis, Engineering
Advisor Department	Engineering
SURF Field of Study	engineering
Upload image(s) in .png format; 1,100 MB max size each	

apollo (2).png

apollo13 (2).png

Title of Abstract/Research	Transforming Engineering Education for Middle Schools (TEEMS)
Please type your abstract below.	Over the course of the summer I have been involved in a variety of tasks all in order to incorporate Imaginative Education (IE) to the Next Generation Science Standard (NGSS)-aligned curriculum used in middle school classrooms. Imaginative Education includes storylines such as mystery, fantasy, extremes of reality or association with heroes and heroines. Using such storylines creates an environment where students are encouraged to actively engage in classroom activities. Examples of classroom activities could include inquiries, hands-on activities, design thinking, experimentation, discourse and knowledge building. The first part of the summer, we worked on finding creative ways to teach two science units. One of the units was to teach about the different gravitational pull on Earth and on the Moon. By using a storyline of a real life hero and a task at the end of the lesson for students to use what they have learned is an approach for IE. Having prior experience with Photoshop, I was able to help create diagrams and models important for students to visualize the challenge. Aside from providing visuals, I also assisted in finding any resources needed to create the lesson plans. I would help organize the materials needed to build kits for science projects and find online resources to gather more information on the topic. I also attended meetings on the future steps of the research group and how we can ensure that students are able to think critically. This research gave me the opportunity to learn about the efforts to increase engineering learning in secondary education.

SURF 2019-Post SURF Survey

Name	Christina Hung
Year of Graduation	2022

SURF Advisor	Annaliese Beery, Psychology
Advisor Department	Neuroscience
SURF Field of Study	Neuroscience
Upload image(s) in .png format; 1,100 MB max size each	c_hung_surf_abstract_diagram.png
Title of Abstract/Research	Volcanic Heart: The effects of nervous system autonomic blockade on the formation and expression of same-sex partner preference in female meadow voles

Please type your abstract below.

Meadow voles (Microtus pennsylvanicus) exhibit seasonally-based social behaviors, forming same-sex partner bonds with other meadow voles in the winter and becoming territorial in the summer. These social interactions may be impacted by cardiac parameters. For example, peripheral oxytocin decreases the heart rate (1), and there is a positive correlation between peripheral oxytocin levels and positive social interactions (2). On the other hand, cortisol is associated with the opposite effect, with salivary cortisol levels and heart rate both increasing during stressful social interactions (3).

In this project, female meadow voles housed in winter conditions were used to test how pharmacological agents that affected their heart rates would affect the voles' partner preference. The pharmacological agents were Saline (used as the control), ATR (increases heart rate), and ATN (decreases heart rate). Partner preference tests (PPTs) were run to evaluate the effect of these pharmacological agents on female meadow vole social behavior, as they showed whether a free focal vole preferred to spend time huddling with a tethered partner vole or a tethered stranger vole.

The study has two phases: the formation phase and the expression phase. In the formation phase, pharmacological agents were injected before the voles were paired to cohabitate for twenty-four hours, after which PPTs were run. This tested how pharmacological agents affected the formation of the partner preference bond. In the expression phase, the voles were first paired to cohabitate for twenty-four hours, then injected with pharmacological agents immediately before running PPTs. This tested how pharmacological agents affected the expression of the pre-existing partner preference bond.

In the expression phase, three PPTs have been run. In the formation phase, eighteen PPTs have been run, though four will be excluded due to the voles being too stressed to express preferences. Testing is ongoing.

References

1. Gutkowska, J., Jankowski, M., & Antunes-Rodrigues, J. (2014). The role of oxytocin in cardiovascular regulation. Brazilian journal of medical and biological research = Revista brasileira de pesquisas medicas e biologicas, 47(3), 206–214.
doi:10.1590/1414-431X20133309
2. Barraza, J. A. and Zak, P. J. (2009), Empathy toward Strangers Triggers Oxytocin Release and Subsequent Generosity. Annals of the New York Academy of Sciences, 1167: 182-189. doi:10.1111/j.1749-6632.2009.04504.x
3. Kelly, J. , Mangos, G. , Williamson, P. and Whitworth, J. (1998), CORTISOL AND
HYPERTENSION. Clinical and Experimental Pharmacology and Physiology, 25: S51-S56. doi:10.1111/j.1440-1681.1998.tb02301.x

SURF 2019-Post SURF Survey

Name	Wayne Ndlovu
Year of Graduation	2022

SURF Advisor	Amy Rhodes, Geosciences
Advisor Department	Geosciences
SURF Field of Study	Aqueous geochemistry
Title of Abstract/Research	Effects of road salt on water and soil geochemistry of wetlands in Western Massachusetts

Please type your abstract below.

During winter, large volumes of road salt (NaCl) are added to major routes to melt and prevent the formation of ice on these roads. Road salt can lead to Na and Cl contamination of nearby soils and water bodies through surface runoff and groundwater. Peatlands and wetlands adjacent to roadways may experience varying levels of road salt contamination depending on differences in salt application to roadways and hydrologic flow paths from road to wetland. Organic-rich soils may retain dissolved salt in pore water and by absorption on soil surfaces, which can result in the build up of Na and Cl concentrations in wetlands over time. We studied the effects of road salt on the surface water, mud, peat, and shallow pore water chemistry of seven wetlands in Western Massachusetts. Three types of wetlands (bogs, fens, and marshes) were identified in relationship to different road ways using a Geographic Information System (GIS). We used an inventory of non-forested peatlands in Massachusetts provided by the Massachusetts Natural Heritage and Endangered Species Program (MA NHESP) and aerial photography. Water, peat and mud samples were collected from Arcadia Bog, Mill Valley Road Bog (MVRB), East Templeton Pond (ETP), Fitzgerald Lake (FL), Quag Bog (QB) and Trout Brook Wetland (TBW). The inventory of Massachusetts peatlands performed by the Massachusetts Natural Heritage Endangered Species Program (MA NHESP) classifies TBW, MVRB, Arcadia Bog and QB as bogs, which are rainfed peatlands with little to no groundwater input. As would be expected for bogs, our results show that these bogs all have pH values less than 5.5 and low ANC values ranging approximately from 56 to 55 ueq/L. Wetlands with slightly positive ANC values, TBT and QB, potentially could receive some input from groundwater. All bogs are far from major routes, but QB has high chloride concentration of ~4600 µmol/L. By comparison, TBW, MVRB and Arcadia bogs have chloride concentrations ranging approximately from 40-800 µmol/L and further studies will investigate the sources and hydrologic flow paths that may be delivering chloride to different regions of each wetland. Nitrate and sulfate have the lowest anion concentrations which range approximately from 1-45 µmol/L and 1-40 µmol/L respectively. Additionally, the bogs measured in this study had the higher total exchangeable acidity compared to the other wetlands, where results ranged approximately from 3-25 meq/100g. Exchangeable H+ values ranged approximately from 1-41 meq/100g. ETP is identified in the MA NHESP inventory as a fen; our sampling revealed it as wetland with silty organic mud without thick peat. Although FL, another muddy wetland, is not identified as a fen in the inventory of Massachusetts peatlands, its water and soil geochemistry is similar to that of ETP. Both have high air equilibrated pH values of 7.0 and 7.5 and ANC values range from approximately 250-700 µeq/L. The high ANC values suggest groundwater is seeping into the wetlands. ETP is next to a highway, Rt 2A, therefore has the highest chloride concentration of ~11400 µmol/L whilst FL, which is next to a small road but receives stream runoff from a rural watershed, has a concentration of 1000 µmol/L. Both wetlands have equal concentrations of sulfate ~60 µmol/L and nitrate ~9 µmol/L. Unlike the peatlands, these wetlands have lower total exchangeable acidity, which may be due to greater groundwater input and the absence of peat soil. The presence of groundwater lowers the total acidity in both wetlands, typically <3.0 meq/100g. The exchangeable H+ values ranged from 1-7 meq/100g. Our data show wetlands close to major roads have higher chloride concentrations. We are yet to run the samples on the Inductively Coupled Plasma Mass Spectrometry (ICP-MS) for exchangeable base cations which will show the concentration of sodium absorbed by soil. Further study will also determine the impurities found in the road salt. This information will enable us to determine the effect of road salt on the water and soil chemistry of wetlands.

SURF 2019-Post SURF Survey

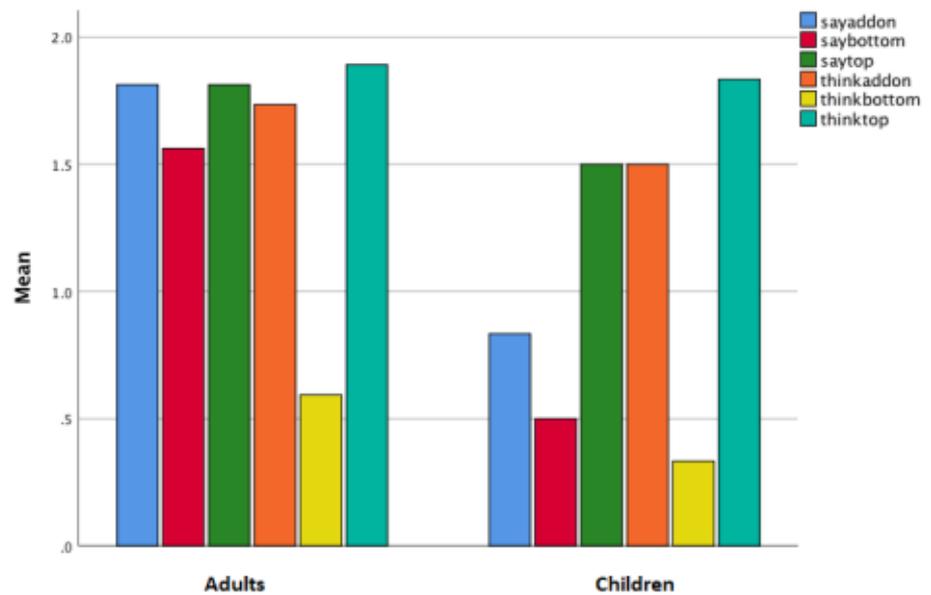|	
Name	Lydia Quevedo
Year of Graduation	2021

SURF Advisor	Jill de Villiers, Psychology
Secondary SURF Advisor	Peter de Villiers, Psychology
Advisor Department	Psychology
SURF Field of Study	Psycholiguistics
Upload image(s) in .png format; 1,100 MB max size each

Neg Raising Graph Summer 2019.png |
| **Title of Abstract/Research** | Syntactic Complexity and Complement Structures: How Language Helps Children Succeed |

Please type your abstract below.

The study of psycholinguistics asks, to what extent does language frame and facilitate thought? For child language acquisition, the question becomes: what is necessary for children to accurately learn a language, and what linguistic factors can predict their later success in school? During the summer, my work in the de Villiers' lab approached this question mainly through two different projects.

The first, conducted under Peter de Villiers, asked whether the degree of Hispanic mothers' English-Spanish mixing impacted their children's linguistic skill at the start of school. This was an extension of previous work in the lab, which focused on African American mothers. To be free of linguistic bias, we created a new system to measure the complexity of the mothers' language, based on the Index of Productive Syntax (Scarborough 1990). We then scored 61 transcripts of Hispanic mothers' speech (27 English, 12 Spanish, and 22 mixing English and Spanish to varying degrees). Currently, the data is being reformatted for statistical analysis, but we anticipate that a linear regression analysis will show that the syntactic complexity of the mothers' speech best predicts their children's future linguistic success, not the degree of mixing or number of utterances. The next step to complete the study is to finish transcribing Spanish-only tapes and the last Mixed tapes so there is a more even number of each; this work will continue in the fall.

The second project, involving all members of the lab, was with Jill de Villiers. We asked how children's understanding of two- and three-clause complement structures are related to the development of Theory of Mind, an important psychological concept. We believe the mastery of these structures, used to express belief and presuppositions, to lay critical groundwork for Theory of Mind. As a team, our lab developed methodology to evaluate children's understanding of all three linguistic structures and Theory of Mind. By the end of the summer, we had tested 17 children ages 3;0 to 5;0 and 65 adults. While our results are tentative, the current data clearly shows that children are not treating Neg-Raised statements the same as adults are (see graph). This suggests that the current syntactic model of Neg-Raising is not a complete account of the phenomenon. Depending on whether the results show a relationship between mastery of these linguistic structures and Theory of Mind, our study may also inform future language intervention protocol.

SURF 2019-Post SURF Survey

Name	Lily Berlstein
Year of Graduation	2020

SURF Advisor	Jill de Villiers, Psychology
Advisor Department	Psychology
SURF Field of Study	Psychology
Title of Abstract/Research	Children's Theory of Mind Ability, Complement Knowledge, and Parental Mind-Mindedness

Please type your abstract below.

Building on previous work by de Villiers, this study aimed to examine the relationship between children (aged three to five's knowledge of sentences containing tensed complement clauses and their ability to succeed on false belief tasks.

Eleven children from the Smith College Center for Early Childhood Education at Fort Hill, and four children from Nonotuck Community School were tested in this study. Each child completed a total of four tasks. They answered two-clause questions and three-clause questions, completed a task designed to examine how children understand potentially ambiguous negated sentences, and completed false belief tasks. The two-clause stories and the false belief tasks were taken or adapted from previous studies. The three-clause stories and the negation stories along with their corresponding pictures were created by the researchers specifically for this study. The negation stories were partially based on a study by Lewis et al. (2012 that argued children's misinterpretations of negated sentences using the word "think" were because they incorrectly interpreted the relevance of belief in the sentence instead of the concept itself. Like in Lewis's study, in the current study children performed truth-value judgments. The researchers have not found evidence that corroborates Lewis et al.'s claim at this point in the study.

There was also a project examining correlations between mind-mindedness in parental speech and childrens' performance on theory of mind tasks. The parental speech was taken from interviews from a large longitudinal study conducted by the School Readiness Research Consortium. There were two interviews for each parent, one in which the parent was asked to describe their child, and the second in which the parent was shown a video of their child completing a task in the study and then prompted to describe their child. These interviews were transcribed and their statements about their children were qualitatively coded based on Meins et al. (2003's mind-mindedness coding system. The system was adapted to include seven categories: cognitive, behavioral, desire, emotion, intention, physical, and general. It was also noted when the speech contained a sentence with a tensed complement. Fifty-three children were added to the existing data set this summer, yielding a total of 101 children for whom we have theory of mind scores and coded parental speech. Preliminary statistical analysis shows a correlation between the parental speech in the desire category and the child's theory of mind desire scores, as well as between the parental speech categorized as emotion and the theory of mind desire scores.

Citations:
Lewis, S., Hacquard, V., & Lidz, J. (2012). The semantics and pragmatics of belief reports in preschoolers. In Proceedings of SALT, 22, 247– 267.
Meins, E., Fernyhough, C., Wainwright, R., Clark-Carter, C., Gupta, M. D., Fradley, E. et al. (2003). Pathways to understanding mind: Construct validity and predictive validity of maternal mind-mindedness. Child Development, 74, 1194– 1211.

SURF 2019-Post SURF Survey

Name	Jordan Moody
Year of Graduation	2020

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Katherine M Kinnaird
Advisor Department	Computer Science
SURF Field of Study	Computer Science
Upload image(s) in .png format; 1,100 MB max size each	figure4.PNG
Title of Abstract/Research	Aligned Hierarchies
Please type your abstract below.	Aligned Hierarchies (ah) is a Python package for finding and encoding repeated structures within musical data. The methods used were originally created by Katherine M Kinnaird in MATLAB before the creation of the Python implementation. Aligned hierarchies takes digitized musical scores or song recordings and finds repeated structures within the chosen song. Then, through segmentation and comparison, the structural components of the song are organized in a hierarchy and combined into a single 'aligned hierarchies' composition. Thus, all possible repeated structures are sorted hierarchically and aligned along a common axis denoting time. As seen in the accompanying figure, smaller repeats are towards the top and longer repeats are towards the bottom (Figure from Aligned Hierarchies: A Multi-Scale Structure-Based Representation for Music-Based Data Streams by Katherine M Kinnaird). The current ah package contains four modules: utilities functions, search functions, transformation functions, and assembly functions. An example module is also found within the package, and this example utilizes functions from all four modules to create a full aligned hierarchies implementation.

SURF 2019-Post SURF Survey

Name	Ayla Say

Year of Graduation	2021

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Robin Sleith, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Pitcher plant microbiomes

Upload image(s) in .png format; 1,100 MB max size each	
	ayla say fake pitcher.png
	ayla say hawley bog sample.png
Title of Abstract/Research	The source of SAR communities in pitcher plants

Please type your abstract below.

I spent my summer studying stramenopile, alveolate, and rhizaria (SAR communities) in pitcher plants. Pitcher plants are carnivorous plants with a tube-like pitcher area filled with water and enzymes used to digest prey (Jaffe et al., 1992). The pitchers digest insects in order to obtain nutrients such as nitrogen, which they cannot get from the nutrient-poor soil where they grow (Gaume & Forterre, 2007; Schulze et al., 1997; Ellison & Gotelli, 2002; Gaume et al., 2002). It is known that SAR communities exist in these plants; however, little is known about how exactly the SAR communities get inside the pitchers in the first place, and where they originate from (Xin-Yue Chan et al., 2016; Ellison & Gotelli, 2002). To test this, I designed an experiment in which I created fake pitcher plants (Falcon tubes) filled with different types of water in order to determine which condition produced the SAR community most similar to those of the greenhouse pitchers (Nepenthes maxima, Nepenthes reinwardtiana, Nepenthes truncata). I also sampled from pitcher plants in the field (at Hawley Bog and Harvard Forest) with the rest of the pitcher plant team so that I had a lot of different real pitcher communities to compare with my fake ones. In order to sample, I swabbed the inside of the pitcher (real or fake) and then pipetted the liquid into a Falcon tube. Back in the lab, I then filtered this liquid and carried out both DNA and RNA extractions. After doing the extractions, I would then do polymerase chain reaction, with the intention of eventually sending off a plate for sequencing. Due to time constraints, I was not able to prepare my samples to send off in time, but I will continue preparations this coming semester. I also found that I will likely need to leave the experiment running for a longer period of time, as the samples from my fake pitchers did not appear to run positive at all (so it is possible that there was not enough time for a SAR community to be established). In the fall, I would like to build on this experiment by analysing the possible factors that could differ between real pitcher and fake pitchers, leading to differences in SAR communities (eg. pH).

SURF 2019-Post SURF Survey

Name	Jessie Chen
Year of Graduation	2020

SURF Advisor	Annaliese Beery, Psychology
Advisor Department	Psychology
SURF Field of Study	Psychology
Upload image(s) in .png format; 1,100 MB max size each	SingleChoice_Social.png
Title of Abstract/Research	Role of Dopamine in Mediating Social Motivation in Prairie Voles in a Lever-Pressing Paradigm

Please type your abstract below.

Prairie voles (Microtus ochrogaster, a species of socially monogamous rodents, share a pair bond between mates that is not found in various traditional animal models including lab rats and mice. The existing behavioral test to evaluate pair bond, the classic partner preference test (PPT, involves a three-chamber apparatus, where the focal animal released into the central chamber is allowed to explore a stranger animal and the partner animal each tethered to a side chamber. However, because in a PPT, the focal animal can freely approach either subject, the motivational component of social behavior cannot be clearly distinguished from the reward element.

To better clarify social motivation, my SURF project adopted an operant conditioning paradigm. Specifically, in a two-box experimental apparatus, the focal vole in one chamber is allowed to lever press in order to gain access to its mate, tethered in the other chamber. During a standard 30-minute single-choice social test, the focal vole lever pressed at a progressive ratio (SCPR-1 and the door to the social chamber remained open for one minute for each reward. The single-choice social test is valuable for yielding two measures for quantifying social behavior. First, the number of lever presses and the number of door-opening rewards were recorded during session. Second, each testing session was video-taped, allowing interactions in the social chamber to be behaviorally coded.

Past research indicated that an interaction of oxytocin and dopaminergic signaling pathways plays a critical role in mediating pair bond in prairie voles. The research goal of my SURF project was to further investigate such a neurobiological mechanism using pharmacological manipulations in a lever-pressing paradigm. The focal animals used for this study had been previously trained to lever press (n=7, 5 females, 2 males, age 111-138 days), and all seven pairs of prairie voles were co-housed in long-day lighting cycle throughout the study. Following one habituation day for establishing baseline, the focal subject was intraperitoneally injected with either the dopamine-receptor blockade haloperidol on experimental days or the vehicle solution tartaric acid on control days (dosage 20µl/40g). The single-choice social tests were started 30-60 minutes post-injection, and lasted 30 minutes on SCPR-1 protocol. For preliminary result analysis, the number of lever presses for each subject were compared across time and conditions. As a part of my on-going senior thesis, behavioral data, particularly the length of a characteristic prosocial behavior called huddling, will be later analyzed.

SURF 2019-Post SURF Survey

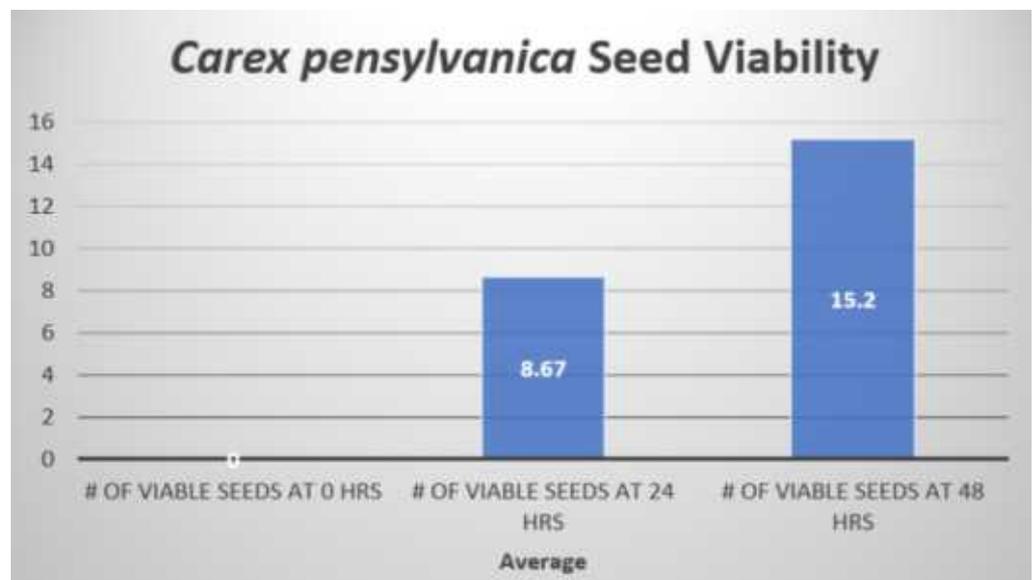|	
Name	Allison Shoebottom
Year of Graduation	2021

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Tim Johnson
Advisor Department	Biological Sciences
SURF Field of Study	Biological Sciences
Upload image(s) in .png format; 1,100 MB max size each	Carex Penn Graph.png
Title of Abstract/Research	Dormancy Exploration on Four Massachusetts Native Species

Please type your abstract below.

Carex pensylvanica, Arctostaphylos uva-ursi, Trillium, and Comptonia peregrina are four Massachusetts native species, which have high horticultural or ornamental potential and complex dormancy requirements. These dormancy requirements make it difficult for these plants to be propagated by seed, leading to slow output and high cost to the consumer by plant producers. This study aimed to review previous research done on the dormancy requirements of these species, which informed further protocols of solving those dormancies. The first species tested in this study was Carex pensylvanica, a sedge with a high capacity as a lawn alternative. The first step was to gather information from previous studies concerning germination protocols and dormancy experiments. The next step was to do tetrazolium testing on the seeds to determine the viability of the seed populations. Tetrazolium is a chemical that reacts with respiring tissue, where the embryo stains red in viable seeds. This allows the germination protocols to be completed with the overall viability of the seed sets in mind. In Carex pensylvanica, the seeds were bisected through the embryo before the tetrazolium treatment began, due to the hard seed coat of this species. After the bisection, the seeds were left in treatments of 0 hours, 24 hours, and 48 hours of the tetrazolium staining. Each time duration had five groups of thirty seeds. The results of this experiment showed that the control seeds, stained for 0 hours, read as 0% viable. The seed set treated for 24 hours read as 30% viable and the seed set treated for 48 hours read as 51% viable. This implies that the Carex pensylvanica seeds may respire slowly, which could have caused a higher readable viability with sustained exposure to the tetrazolium. Further research and experimentation are necessary to determine the exact cause of this effect. Due to time constraints, the viability testing of the Carex pensylvanica seeds was the only experiment that was completed. Going forward, the viability will be determined for the other three species, and germination tests will be done on all four species with that viability data.

SURF 2019-Post SURF Survey

Name	Juliette Saux
Year of Graduation	2020

SURF Advisor	John Loveless, Geosciences
Advisor Department	Geosciences
SURF Field of Study	Geosciences
Upload image(s) in .png format; 1,100 MB max size each	J_SAUX_Fig2.pngJ_Saux_Fig1.png
Title of Abstract/Research	Role of slow slip events on vertical deformation in the Cascadia forearc

Please type your abstract below.

Slow slip events (SSEs), characterized by aseismic slip spanning several weeks, have been detected on the Cascadia subduction zone. Understanding SSE processes is important to understanding stress accumulation along the subduction interface and the seismic threat it poses for the Pacific Northwest. Occurrence of SSEs at depth implies the presence of accumulated stress below the seismogenic zone. However, it is not fully understood if SSEs fully release the stress imposed on the subduction interface downdip of the seismogenic zone, and what effect they have on landscape evolution of the overlying forearc. We calculate inter-SSE velocities from Pacific Northwest Geodetic Array GPS position time series after removing the offsets from 31 SSEs between 1996 and 2017, by using a MIDAS robust trend estimator that adjusts for seasonal variation. Using inter-SSE velocities separates the effect of the slow slip events from the interseismic strain accumulation process and permits models to extend slip deficit on the deep portion of the plate interface.

Our results show two distinct zones of coupling: one that is likely coincident with the seismogenic zone and deeper region hosting periodic events of slow slip. These zones of high coupling are separated by a band of low coupling around 30 km depth that could potentially define the lower limit of a future rupture event. Studies simulating coseismic slip show a maximum downdip rupture limit that coincides with our modeled band of low coupling and a range of coseismic slip consistent with our cumulative modeled slip deficit.

Our models predict a vertical deformation signature from SSEs that, spatially, resembles the long-term geologic uplift observed on the Olympic peninsula. While inter-SSE interseismic slip deficit predicts subsidence across the Olympic Peninsula and uplift further inland, adding the SSEs' uplift signature effectively shifts westward the boundary between uplift and subsidence. The resultant uplift pattern is more consistent with observed interseismic coastal uplift but contains a secondary uplift maximum from SSEs that is not seen in tide and leveling data. This inconsistency could be explained by time-variable coupling throughout the interseismic period.

SURF 2019-Post SURF Survey

Name	Samantha Nunziata
Year of Graduation	2020

SURF Advisor	Paulette Peckol, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	marine ecology
Please list co-authors of your abstract	Chaia Yodaiken
Upload image(s) in .png format; 1,100 MB max size each	2019-08-26.png
Title of Abstract/Research	Intriguing Introductions: Littorina littorea Grazing Preferences for Native vs. Introduced Macroalgae

Please type your abstract below.

The introduced European gastropod, Littorina littorea, is a dominant, generalist grazer along the northwestern Atlantic coastline. L. littorea has a strong preference for native Ulva spp. in New England; however, when Ulva spp. abundances decline, L. littorea grazes on other macroalgae. When Ulva spp. is unavailable, we found L. littorea grazes on annual macroalgae Leathesia marina, Polysiphonia subtilissima, Cladophora ruchinegeri and Chorda filum in similar amounts, showing no strong preference. This suggests L. littorea contributes to the decline of annual macroalgae as summer progresses. We then investigated grazing preferences of L. littorea for introduced vs. native macroalgae from a non-eutrophic site (Jamestown, RI and a eutrophic site (East Greenwich, RI. All introduced macroalgae in our study originated from Asia. We asked whether L. littorea's grazing preferences may affect abundance patterns of these macroalgae.

We measured L. littorea's herbivory on invasives, Bryopsis maxima and Grateloupia turuturu, and natives, Gymnogongrus griffithsiae, Chondrus crispus, Champia parvula and Fucus vesiculosus, from the non-eutrophic site. L. littorea didn't consume B. maxima in a preference experiment (Table 1. Natives (e.g. C. crispus were strongly (t-test, P = 0.002 preferred over B. maxima, suggesting this algal species' abundance won't be controlled by L. littorea. Becerro et al. (2001 states B. maxima produces a defensive compound that deters grazers. Similarly, L. littorea didn't consume invasive G. turuturu in our experiments, and Jones & Thornber (2010 found G. turuturu produces herbivore deterrent compounds. We observed tidepools filled with G. turuturu, suggesting a release from herbivory that could result in it outcompeting other macroalgae.

At the eutrophic site, L. littorea preferred natives, Ulva rigida and Agardhiella subulata, over invasive Gracilaria vermiculophylla (Table 2. When offered introduced species, G. vermiculophylla and Codium fragile, L. littorea strongly preferred C. fragile. C. fragile produces the same chemical compound (dimethylsulfoniopropionate as Ulva spp. (Lyons et al. 2007, which deters some herbivores; however, dimethylsulfoniopropionate doesn't deter L. littorea (Peckol & Putnam 2017. G. vermiculophylla produces herbivore deterrents (Nylund et al. 2011; Rempt et al. 2012 that may release this species from herbivory. We observed thick mats of G. vermiculophylla at the eutrophic site.

Introduced macroalgal species have become a dominant feature along coastlines. At our study sites L. littorea consistently preferred native over introduced macroalgae. The lack of grazers has led invasive red macroalgae, G. turuturu and G. vermiculophylla, to flourish. Without future herbivory or intervention, these invasives may outcompete natives, disrupting local ecosystems.

SURF 2019-Post SURF Survey

Name	Milagros De Pasquale
Year of Graduation	2020

SURF Advisor	Cristina Suarez, Chemistry
Secondary SURF Advisor	Elizabeth Jamieson
Advisor Department	Chemistry
SURF Field of Study	Chemistry/Biochemistry
Please list co-authors of your abstract	Laurie Brutus, Ruby Wu
Upload image(s) in .png format; 1,100 MB max size each	RW MD LB Join Surf abstract 2019.png
Title of Abstract/Research	Investigation of the Spiroiminodihydantoin Lesion's Structural and Dynamic Effects on an 11-mer Deoxyribonucleotide Duplex

Please type your abstract below.

Guanine, which has the lowest redox potential of nucleobases, is easily oxidized by reactive oxygen species (ROS produced exo- and endogenously through environmental pollutants or cellular metabolic processes. Hyper-oxidation of this base produces the spiroiminodihydantoin (Sp lesion which leads to cell death and cancer if left unrepaired (Wenke et al., 2013 (Fig. 1, 2. Nuclear Magnetic Resonance Spectroscopy (NMR is a technique that examines the way the Sp lesion may potentially change the structure of DNA. It can be used to measure the rate of exchange of nucleobase imino protons with water, which can provide information on the dynamic properties of the DNA helix. Differences in the breathing of the control versus lesioned helix can help determine how base excision repair (BER glycosylases function to recognize the lesion for insertion of the proper base (Crenshaw et al., 2011.

This summer, base pair opening kinetics were investigated by titrating ammonium chloride base into an 11-mer control DNA in order to ensure exchange during base pair opening. The exchange rates (kex of the imino protons were measured through magnetization transfer with surrounding water, and the rate constants obtained were graphed against increasing base concentration (Fig. 3, 4. From this linear relationship, we hope to extract the rate of base pair opening (kop for each imino proton and compare it with values obtained from titration experiments on DNA with both stereoisomers of the Sp lesion. Differences in base pair kinetics between the control and Sp duplexes can provide insight into the dynamic effect the lesion may have on DNA. In the future, we plan to perform kinetic titration studies on both stereoisomers of the Sp lesion to evaluate any possible differences in the damage done to the helical structure.

References

Wenke, B.B.; Huiting, L.N.; Frankel, E.B.; Lane, B.F.; Nunez, M.E. Base Pair Opening in a Deoxynucleotide Duplex Containing a cis-syn Thymine Cyclobutane Dimer Lesion. Biochemistry 2013, 52, 9275–9285

Crenshaw, C. M.; Wade, J. E.; Arthanari, H.; Frueh, D.; Lane, B. F.; Núñez, M. E. Hidden in Plain Sight: Subtle Effects of the 8-Oxoguanine Lesion on the Structure, Dynamics, and Thermodynamics of a 15-Base-Pair Oligodeoxynucleotide Duplex. Biochemistry 2011, 50 (39), 8463–8477.

SURF 2019-Post SURF Survey

Name	Chaia Yodaiken
Year of Graduation	2021

SURF Advisor	Paulette Peckol, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Marine Ecology
Please list co-authors of your abstract	Samantha Nunziata
Upload image(s) in .png format; 1,100 MB max size each	C.Yodaiken1.pngCYodaiken2.png
Title of Abstract/Research	Intriguing Introductions: Littorina littorea Grazing Preferences for Native vs. Introduced Macroalgae

Please type your abstract below.

The introduced European gastropod, Littorina littorea, is a dominant, generalist grazer along the northwestern Atlantic coastline. L. littorea has a strong preference for native Ulva spp. in New England; however, when Ulva spp. abundances decline, L. littorea grazes on other macroalgae. When Ulva spp. is unavailable, we found L. littorea grazes on annual macroalgae Leathesia marina, Polysiphonia subtilissima, Cladophora ruchinegeri and Chorda filum in similar amounts, showing no strong preference. This suggests L. littorea contributes to the decline of annual macroalgae as summer progresses. We then investigated grazing preferences of L. littorea for introduced vs. native macroalgae from a non-eutrophic site (Jamestown, RI and a eutrophic site (East Greenwich, RI. All introduced macroalgae in our study originated from Asia. We asked whether L. littorea's grazing preferences may affect abundance patterns of these macroalgae.

We measured L. littorea's herbivory on invasives, Bryopsis maxima and Grateloupia turuturu, and natives, Gymnogongrus griffithsiae, Chondrus crispus, Champia parvula and Fucus vesiculosus, from the non-eutrophic site. L. littorea didn't consume B. maxima in a preference experiment (Table 1. Natives (e.g. C. crispus were strongly (t-test, P = 0.002 preferred over B. maxima, suggesting this algal species' abundance won't be controlled by L. littorea. Becerro et al. (2001 states B. maxima produces a defensive compound that deters grazers. Similarly, L. littorea didn't consume invasive G. turuturu in our experiments, and Jones & Thornber (2010 found G. turuturu produces herbivore deterrent compounds. We observed tidepools filled with G. turuturu, suggesting a release from herbivory that could result in it outcompeting other macroalgae.

At the eutrophic site, L. littorea preferred natives, Ulva rigida and Agardhiella subulata, over invasive Gracilaria vermiculophylla (Table 2. When offered introduced species, G. vermiculophylla and Codium fragile, L. littorea strongly preferred C. fragile. C. fragile produces the same chemical compound (dimethylsulfoniopropionate as Ulva spp. (Lyons et al. 2007, which deters some herbivores; however, dimethylsulfoniopropionate doesn't deter L. littorea (Peckol & Putnam 2017. G. vermiculophylla produces herbivore deterrents (Nylund et al. 2011; Rempt et al. 2012 that may release this species from herbivory. We observed thick mats of G. vermiculophylla at the eutrophic site. Introduced macroalgal species have become a dominant feature along coastlines. At our study sites L. littorea consistently preferred native over introduced macroalgae. The lack of grazers has led invasive red macroalgae, G. turuturu and G. vermiculophylla, to flourish. Without future herbivory or intervention, these invasives may outcompete natives, disrupting local ecosystems.

SURF 2019-Post SURF Survey

Name	Grace Nevil
Year of Graduation	2020

SURF Advisor	Michael Baressi, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Biology/Biochemistry
Upload image(s) in .png format; 1,100 MB max size each	Grace_Nevil_Figure_1.pngGrace_Nevil_Figure_2.png
Title of Abstract/Research	Defining the role of Reelin signaling during zebrafish brain development

Please type your abstract below.

Defects in Reelin signaling are associated with the neurodevelopment of Autism Spectrum Disorders (ASD in humans. Reelin acts through the Very Low Density Lipoprotein receptor (Vldlr and Apolipoprotein E receptor-2 (ApoER2, which then transduce downstream signals via the cytoplasmic adaptor protein Disabled1 (Dab1. Reelin signaling has been shown to influence neuronal migration via its modulation of the cytoskeleton. However, how Reelin signaling regulates the patterns of neuronal migration through the central nervous system during development, and how these patterns influence later stage behaviors lacks clarity. Previous members of the Barresi Lab have generated loss of function mutations in each of the key Reelin pathway members. I am currently working to define both the individual and combinatorial roles these genes play during neuronal differentiation and positioning from the spinal cord to forebrain (my Honors Thesis. Firstly, we found through in situ hybridization that reelin expression is significantly reduced in subsets of neurons in both our reelin and vldlr mutants (Figure 1. I will continue to work on characterizing the number and positions of distinct progenitor and differentiated cell types – oligodendroglia progenitor cells and glutaminergic neurons, specifically – throughout the CNS. Interestingly, I found that reelin expression is both increased and expanded in our apoER2 mutants (Figure 1. The expression of apoER2 is decreased in our reelin and vldlr mutants; however, expression appears normal in the apoER2 mutants (Figure 2. These data suggest that feedback regulation is involved in the expression of the key players of the Reelin signaling pathway. I hypothesize that reelin upregulates vldlr and downregulates apoER2 while apoER2 upregulates both reelin and vldlr. In addition, I believe apoER2 may act as a repressor of its own expression. I am also interested in quantifying these expression patterns. As such, I designed gene-specific primers for reelin, vldlr, and apoER2 to conduct qRT-PCR on each of our mutants (experiments this fall. I believe that establishing a full assembly of Reelin signaling pathway mutants and understanding their expression patterns will provide a power system to dissect their role during development and later stage behaviors and to investigate how the pathway may contribute to the development of ASD. I was fortunate to present this work at the annual meeting for the Society of Developmental Biology this past July. Stay tuned for more information as my Honors Thesis develops!

SURF 2019-Post SURF Survey

Name	Amelia Turgeon
Year of Graduation	2021

SURF Advisor	Marney Pratt, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Biological Sciences
Please list co-authors of your abstract	Samikshya Dhami
Upload image(s) in .png format; 1,100 MB max size each	Abstract2.png
Title of Abstract/Research	Paradise Pond Project: Freshwater Mussels as Bio-indicators of Mill River Health

Please type your abstract below.

Paradise Pond is an impoundment created by a dam on the Mill River (Sinton 2002. The dam disrupts the movement of sediment causing sediment to gradually build up over time. In order to prevent Paradise Pond from completely filling with sediment Smith College moves it by flushing it downriver. To make sure the surrounding ecosystem is not affected, The Paradise Pond Sediment Management Project assesses the impact of sediment redistribution on the health of the ecosystem downriver.

In this study, we are using freshwater mussels as a bio-indicator on the health of the
Mill River. An increase of sediment can negatively affect the river mussels because it
obstructs their ability to feed and respire (Nedeau 2008. In order to see if the sediment redistribution in 2016 had an impact on the Mill River the Before-After-Control-Impact design was used to compare freshwater mussel shell length in the Manhan river (control and in the Mill River (Impact in 2016 (Before and 2019 (after (Strayer & Smith 2003. Comparing the different distributions of shell length will help us understand the water quality of the Mill River. This is because the more distributed the shell lengths are the better the mussel population is doing.

In order to assess whether the influx of sediment had any impact on the range of mussel sizes in the rivers in 2016 and 2019, we conducted a two-way Anova test with location and year as the two factors using type III sum of squares. A significant interaction between the location and the year could suggest that the sediment redistribution had an impact on the mussels. There was a significant interaction between the location and the year (F1,482 = 10.8, P = 0.001. In 2016, the mussels in the Mill River were larger in size than the mussels in the Manhan. This was not the case in 2019. This could suggest that there has been better recruitment of mussels in the Mill river compared to the Manhan. The greater variety of mussel sizes in the Mill compared to the Manhan after the sediment redistribution in 2016 suggests that though sediment redistribution had an impact on the mussels, it did not have a negative impact.

Literature Cited:
Nedeau, E. J., 2008. Fresh water mussels and the Connecticut river watershed. Connecticut River Watershed Council, Greengield, Massachusetts.
Sinton, J. 2002, April. A short history of the Mill river watershed 1650-1940.
Strayer, D. L., and D. R. Smith. 2003. A guide to sampling freshwater mussel populations. American Fisheries Society, Monograph 8, Bethesda, Maryland.

SURF 2019-Post SURF Survey

Name	Christian Madrigal
Year of Graduation	2021

SURF Advisor	Nessy Tania, Mathematics and Statistics
If your SURF Advisor was not listed above you can enter their name here.	Jennifer Beichman
Secondary SURF Advisor	Nessy Tania
Advisor Department	Mathematics and Statistics
SURF Field of Study	Computing Change with PDE
Please list co-authors of your abstract	Victoria Camarena, Sasha Shrouder
Title of Abstract/Research	STABILITY OF STRIP FOR 2D INCOMPRESSIBLE FLUID
Please type your abstract below.	Vortices in 2-Dimensional incompressible fluids modeled by Euler equations with simple shapes such as circles and ellipses are typically stable. Similarly, Beichman and Denisov (2017 showed that a rectangular strip is stable in the periodic domain 0 to $2 pi$. We will alter the boundary of the strip in the periodic domain, and we will share observations as to how the stability of the vortex changes. We will also observe whether alterations to the strip return to the steady-state strip.

SURF 2019-Post SURF Survey

Name	Alina Siminiouk
Year of Graduation	2020

SURF Advisor	Andrew Guswa, Engineering
Advisor Department	Engineering
SURF Field of Study	Engineering
Title of Abstract/Research	The Thermosphere Test Probe

Please type your abstract below.

Cubesats are small satellites that offer a unique platform for scientific investigation in space. The TechEdSat series of cubesats, based at the NASA Ames Research Center, focuses on rapidly developing technologies such as the Exo-Brake drag sail, a passive "space parachute" which rapidly de-orbits the cubesat. This technology has applications in sample return from the International Space Station (ISS. The Thermosphere Test Probe (TTP is a drag sphere, or "space balloon", that can allow for the density of the upper thermosphere to be deduced, for automation of the Exo-Brake. It will be integrated within TechEdSat-11 for a late 2020 launch.

For my SURF project in the summer of 2019, I led a team of five other Smith College students to further develop the TTP as a continuation of our work throughout the school year. Our preliminary questions were what material will the balloon consist of, how will we assemble it into a sphere, how will the sphere inflate, and how exactly are we going to deduce density.

We initially expected that the balloon would be made of Mylar, given the flight heritage of other drag spheres. After vacuum testing, we determined that Mylar would not be an option due to leaks. We are currently investigating Teflon FEP film and Kapton film as possible alternatives.

Additionally, an assembly method was developed and optimized for Mylar to develop a sphere. We could not fully test the method's viability, however we are also working with Thin Red Line Aerospace to explore commercial solutions.

Regarding inflation, the TechEdSat team has flight heritage using water vapor for inflatables in space. After we completed H-generator cell testing, we determined that our best approach would be to use vapor as the primary source of inflation and H-generator cells as a secondary supplement.

We will track the TTP using a COTS GPS from jettison at 400km above the earth's surface until re-entry at 100km above the earth's surface to determine density. A plot of altitude over time will be generated using GPS data and will be compared to a predicted plot generated using an orbit propagating tool. The orbit propagator's atmospheric inputs would be iteratively modified per data point until the trajectories of both match, allowing density to be known at each altitude.

At the end of the summer, students represented Smith College and NASA at the 33rd Annual Conference on Small Satellites in Logan, Utah.

SURF 2019-Post SURF Survey

Name	Gariel Grant
Year of Graduation	2019

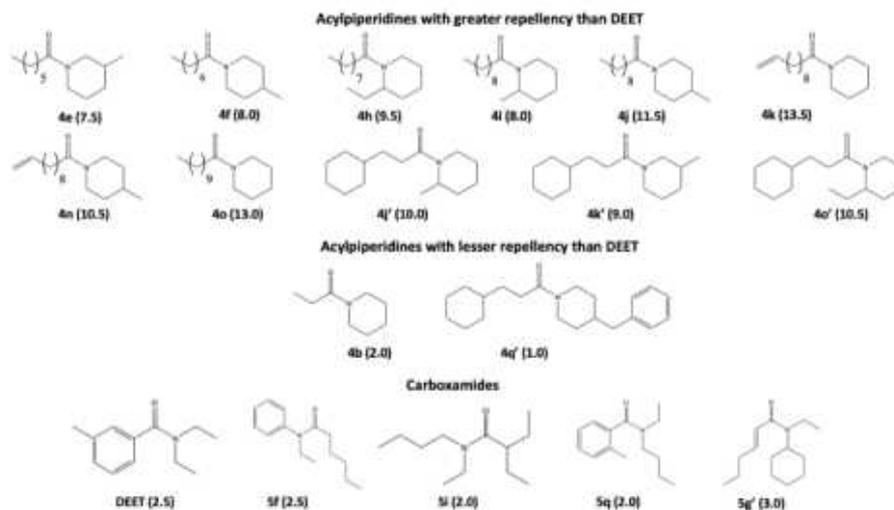|	
SURF Advisor	Adam Hall, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Biological Sciences
Upload image(s) in .png format; 1,100 MB max size each

Figure 1: Molecular structures of the novel repellents and DEET, as well as their respective repellent activity noted in parentheses

GGrant SURF 2019.png |
| **Title of Abstract/Research** | Actions of N-N-Diethyl-meta-toluamide (DEET) and Novel Repellents on Human and Mosquito Receptors |

Please type your abstract below.

The carboxamide, DEET is the most effective and widely used insect repellent today. However, drawbacks concerning the efficacy and the safety of the repellent have led to efforts to design new classes of insect repellents. Through quantitative structure-activity relationships, chemists have discovered two chemical groups of novel repellents: the acylpiperidines and the carboxamides, (Fig. 1 with the acylpiperidines generally more potent in biological assays. Although the exact mechanism of action of DEET and other repellents has not yet been thoroughly elucidated, previous research shows that the activity of insect odorant receptors are inhibited in the presence of repellents. Firstly, the present electrophysiological study employed two-electrode voltage clamp with Xenopus laevis oocytes expressing GPROR2/GPROR7 and GPROR8/GPROR7 receptors to assess the effects of the novel repellents on Anopheles gambiae mosquito odorant receptors. Regarding the safety of DEET, reports have linked DEET-containing products to the initiation of seizure activity in users, particularly young children. Despite these claims, there is a lack of evidence of potential mechanisms by which DEET can cause convulsions. Therefore, we employed two-electrode voltage clamp with Xenopus laevis oocytes expressing mammalian GABAA and glycine receptors to explore the actions of DEET at two inhibitory neurotransmitter receptors, both frequent targets of convulsant drugs. Additionally, the actions of the novel repellents (acylpiperidines and carboxamides) were explored relative to that of DEET.

From our investigation of the action of the repellents on mosquito odorant receptors, we found that DEET and all the novel repellents inhibited GPROR2/GPROR7 and GPROR8/GPROR7 receptor currents. Furthermore, we found a strong correlation between the percentage inhibition of GPROR2/GPROR7 receptor currents and the protection time of the repellents, indicating that repellency is linked to the ability to disrupt the insect olfactory system. From our investigation of the action of the repellents on human GABAA and glycine receptors, we found that DEET directly activated GABAA receptor currents and inhibited glycine receptor currents, similarly to the actions of the convulsant strychnine (albeit less potently). With regard to the novel repellents, we found stark differences between the actions of the novel acylpiperidines and the carboxamides (including DEET). The carboxamides, which were generally weaker repellents, showed greater relative toxicity by way of GABAA and glycine receptors while the acylpiperidines with their enhanced repellent activity and possibly lesser relative toxicity by way of GABAA and glycine receptors present an interesting lead in the development of novel insect repellents.

SURF 2019-Post SURF Survey

Name	Caira Anderson
Year of Graduation	2020

SURF Advisor	Nessy Tania, Mathematics and Statistics
Secondary SURF Advisor	Jennifer Beichman
Advisor Department	Mathematics and Statistics
SURF Field of Study	Mathematics
Please list co-authors of your abstract	Issa Susa
Upload image(s) in .png format; 1,100 MB max size each	CAnderson.png
Title of Abstract/Research	Modeling Population Distributions of Animal Groups with Producer-Scrounger Behavior
Please type your abstract below.	Among many animal species, groups form for protection, hunting, and foraging. Patterns emerge from social interactions between the different animals within these groups. In animal groups, some individuals, known as "producers", search for food (prey) on their own, while others, known as "scroungers", exploit the producers. This "producer-scrounger" behavior is common in patchy environments where resources are limited. This interaction results in scroungers not receiving as much food as the producers. We built a mathematical model consisting of ordinary differential equations that tracks the population sizes of the producers, scroungers, and their prey. We study the long-term population distributions due to birth, death, and competition.

SURF 2019-Post SURF Survey

Name	Mariel Jones
Year of Graduation	2020

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Aaron Rubin
Advisor Department	Engineering
SURF Field of Study	Geotechnical and Transportation Engineering
Please list co-authors of your abstract	Emily Katherine Akey
Upload image(s) in .png format; 1,100 MB max size each	BoxTestsFeaturingE.Akey_TakenbyM.Jones.png
Title of Abstract/Research	Repeatability of Minimum and Maximum Density Testing on Clean and Fouled Ballast

Please type your abstract below.

Ballast material is a critical part of the safety of railways, padding tracks to prevent dynamic vibrations from causing trains to derail. The effectiveness of this material is closely tied to the percentage of fouling that is intermixed with the material. Generally, ballast is placed as compact as practical, but overtime, fouling of the ballast changes the composition of the placed material. Relative density could provide insight into the relative compactness and strength of the material. Unfortunately, the results of minimum or maximum density tests are not well documented in the existing literature. Further, ASTM D4254 and D4253 do provide guidelines for minimum and maximum density testing of large particle diameters, there is minimal discussion in the literature regarding the anticipated error when testing with ballast and fouling. Tests to attempt to characterize this behavior, minimum and maximum density tests were run using Connecticut Granite with granite stone dust used as a fouling material. The samples contained fouling at intervals of 0, 15, 30, 45, and 60% and were placed in a 12-inch interior diameter cylinder mold in accordance with the ASTM standards. For each fouling condition, two operators each conducted 10 minimum density and 5 maximum density tests for a total of 200 minimum density tests and 50 maximum density tests. The effect of fouling, density, and operator, on the repeatability of the tests on ballast is discussed.

SURF 2019-Post SURF Survey

Name	Katherine Fairbank
Year of Graduation	2021

SURF Advisor	Susan Voss, Engineering
Advisor Department	Engineering
SURF Field of Study	Engineering and Audiology
Upload image(s) in .png format; 1,100 MB max size each	SURF_2019.png
Title of Abstract/Research	Mathematically Describing Ear Canal Cross-Sectional to Improve Absorbance Measurements

Please type your abstract below.

Wideband acoustic immittance (WAI measures are a noninvasive auditory diagnostic tool currently under development to aid in the detection and identification of middle ear hearing problems.The two most widely used WAI measures, reflectance and absorbance, require an estimate of the ear canal's cross-sectional area at the measurement location. Previous work I had done in the lab determined that ear-canal area assumptions made by FDA approved devices, HearID and Titan, does not represent a large range of ears measured, leading to significant effects on actual reflectance and absorbance measurements.

This summer, I aimed to quantify the behavior of cross-sectional area in order to minimize error in acoustic measures. Area was examined as a function of age, sex, height, weight, and depth into the canal. Silicone ear molds were examined from 165 subjects, including 31 subjects from Montclair State University, with ages ranging from 18 to 75 years and roughly equal male and females. The molds were digitized and measured for cross-sectional area 12mm into the canal using two universal markers: the intertragic notch, an indentation separating the tragus and antitragus near the entrance of the canal, and the indentation from the tragus, the external cartilage partially covering the canal's entrance. After locating the 12mm insertion point, area was measured in increments of 0.6mm along the canal, ranging from 4.8 to 13.2mm in depth. Our lab collaborated with Nick Horton, a statistician at Amherst College, to mathematically analyze the relationship between area and the factors mentioned prior.

Statistical analysis of the data led to the creation of polynomial function with five degrees of freedom, using the 12mm area measures in each decade of life, that allows for estimation of cross-sectional area at a given age. Based on this function, an increase in estimated cross-sectional can be seen across each decade. It was also found that, when accounting for age, other factors such as weight, height, and sex had no significant impact on canal area.

During the Fall 2019 semester, the writing of the paper for this project will be underway. In addition, I will be starting two new projects: describing ear canal length as a function of age as well as developing a probe to measure cross-sectional area of the middle ear in a clinical setting.

SURF 2019-Post SURF Survey

Name	Clara Malekshahi
Year of Graduation	2021

SURF Advisor	Steven Williams, Biological Sciences
If your SURF Advisor was not listed above you can enter their name here.	Samantha Torquato
Advisor Department	Biological Sciences
SURF Field of Study	Genetics, Parasitology, Marine Biology
Upload image(s) in .png format; 1,100 MB max size each	californiasealion-001.png
Title of Abstract/Research	Developing and Perfecting Diagnostic Assays for Parasites that Infect Pinnipeds

Please type your abstract below.

For the vast array of marine mammal species that populate the Atlantic and Pacific Oceans, there is an equally vast collection of marine mammal parasites. This collection of parasites includes lungworms, heartworms, and other kinds of nematodes. Lungworms, especially, can be fatal if in another organ (the heart, for example), if the infection is in an accidental host, or if the parasite is present in juveniles. Identifying different lungworms can be extremely complicated, and is therefore best accomplished through genetic methods such as a diagnostic assay. This summer, the objective was to develop and perfect diagnostic assays for Parafilaroides decorus and Otostrongylus circumlitis, two lungworms regularly found in the California sea lion and the harbor seal, respectively.

The diagnostic assay for P. decorus had already been developed. However, to ensure that the assay was sensitive, varying concentrations of P. decorus DNA isolated from noninvasive samples (feces and sputum) were analyzed by Quantitative Real-time PCR (qRT-PCR). The DNA from P. decorus was regularly picked up in sputum dilutions at 0.5 ng/µl. The same DNA was also regularly picked up in feces dilutions at 0.5 ng/µl. This diagnostic assay can therefore be used on samples obtained through noninvasive methods and is sensitive enough to detect a P. decorus infection in as little as 0.5 ng/µl of DNA.

A diagnostic assay had previously been developed for O. circumlitis that aimed to distinguish between Pacific and Atlantic populations of the parasite. However, as the original assay was not sensitive enough, we were interested in developing a new assay that detected infection. In order to unequivocally identify O. circumlitis worms for use in assay development, potential parasite DNA needed to be sequenced with three primer sets used in phylogenetic analyses. Thus, DNA was isolated from 14 potential O. circumlitis worms. This DNA was then run through PCR, purified or gel isolated, and submitted for Sanger sequencing for each of the three primer sets (COX1, SSU, and ITS2). A total of 11 worms were identified as O. circumlitis (five Atlantic worms and six Pacific worms). The next steps for this project include: next-generation sequencing (NGS) these 11 worms and analyzing the NGS data for cluster repeats.

Reference:
Keroack, Caroline Dana. "Nematode parasites of marine mammals: phylogenetic and statistical analysis of coevolution" (2014). Theses, Dissertations, and Projects. 71. https://scholarworks.smith.edu/theses/71
Williams, Kalani. "Different Coasts and Different Hosts: Investigating Speciation in the Seal Lungworm Otostrongylus circumlitis" (2018). Theses, Dissertations, and Projects.
https://drive.google.com/drive/folders/1p7Nuc3jW3NNj8AvhxySp17hWggFnzFa

SURF 2019-Post SURF Survey

Name	Léo Young
Year of Graduation	2021

SURF Advisor	David Gorin, Chemistry
Advisor Department	Chemistry
SURF Field of Study	Chemistry
Title of Abstract/Research	Synthesis of DNA-Catalyst Conjugates for Site Selective Chemistry in Biological Systems

Please type your abstract below.

Performing chemistry in biological systems has posed many issues for scientists. Although chemists are able to perform transformations on one type of functional group relatively easily, it is much harder to perform a transformation on one instance of the functional group. In order to overcome this, our group has engineered DNA-Catalyst conjugates (DCats), which perform in a similar way to enzymes. By using a DNA aptamer that specifically binds to the target molecule with high affinity and attaching it to a small molecule catalyst that performs the desired reaction on the target. Both the aptamer and catalyst are interchangeable in order to perform a wide scope of target specific reactions in biological mixtures. We hypothesize that the DNA aptamer binds the target, holding the catalyst in close proximity and increasing the effective concentration, which also increases the rate of catalysis. While we have previous data that confirms our hypothesis, we have only been assessing our DCats on esters that have some amount of background hydrolysis.

This summer I worked on synthesizing new, more nucleophilic DCats with the hope that they would have the ability to hydrolyze stronger esters, that do not hydrolyze on their own. My work specifically focused on using a cholic acid DNA aptamer and attaching thiol and thiophenol catalysts. Thiols were chosen because of their relevance in biology, specifically in the amino acid cysteine which is found in many catalytic proteins. Besides this I performed some work towards adding multiple catalysts to one DNA aptamer, as there has been evidence previously that the addition of more than one catalyst to an aptamer can have significant rate enhancement. Once DCats were synthesized, I did work on purifying them and testing them for hydrolysis rates in comparison to free catalyst. I found that the thiolated DCats formed disulfide bonds with one another, inhibiting their ability to perform any reaction.

This coming semester, I hope to find an effective solution to reducing the disulfide bonds between catalysts. Besides this I hope to synthesize new DCats with stronger nucleophiles such as DMAP to be tested on stronger esters, which are more resistant to spontaneous hydrolysis.
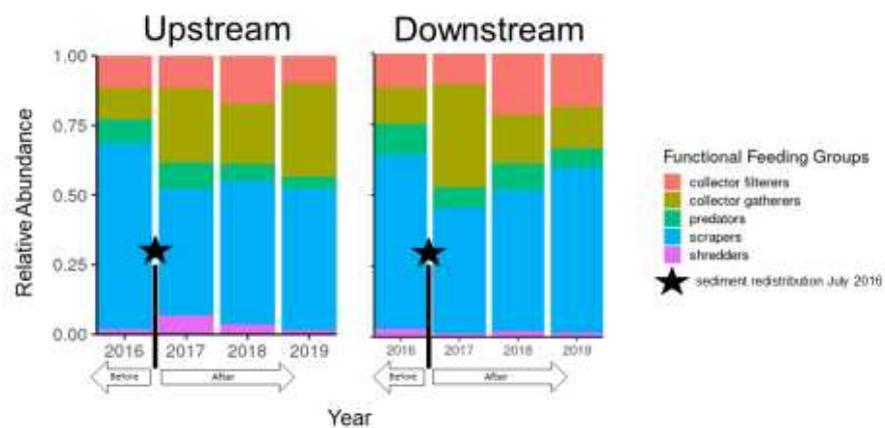
SURF 2019-Post SURF Survey

Name	Sasha Clapp
Year of Graduation	2019

SURF Advisor	Marney Pratt, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Biology/ Ecology
Upload image(s) in .png format; 1,100 MB max size each	Graph for 2019 abstract mill river Clapp,S.png
Title of Abstract/Research	Itsy Bitsy Teenie Weenie Macroinvertebrates Are Feeding: Assessing the Ecological Impact of Sediment Redistribution in Paradise Pond

Please type your abstract below.

Paradise Pond, a precious landmark and an important educational resource Smith College, is an impoundment created by a dam on the Mill River (Sinton 2002). Because dams fundamentally disrupt the movement of both water and sediment, state regulations require that Smith College implement a sediment management protocol to minimize and monitor the ecological impact on the Mill River, while simultaneously preventing Paradise Pond from completely filling with the inevitably accumulating deposition (Wells et al. 2007).The Paradise Pond Sediment Management Project can therefore best be described as a continual assessment of the balance between preserving the iconic Paradise Pond and ensuring the ecological health of the Mill River while doing so. To assess Smith College's impact on the Mill River, the Before-After-Control-Impact (BACI) design was utilized to compare diversity indices of macroinvertebrates upriver (control) and downriver (impact) of Paradise Pond before and after the July 2016 sediment redistribution (Strayer & Smith 2003). The relative ease with which freshwater invertebrates can be surveyed makes them ideal for determining how sediment management in Paradise Pond might influence the river. Additionally, macroinvertebrates function as an indication of stream health because many are intolerant of environmental variability, and their functional feeding groups provide insight into the ecological roles of taxonomic groups. Comparisons of macroinvertebrate communities in upriver and downriver sites illuminate whether or not sediment redistribution in July 2016 had any impact on the river. Using kicknet sampling, macroinvertebrates were collected each June between 2016 and 2019 at upriver and downriver riffle sites, and were identified to the lowest taxonomic level possible (usually to genus). Relative abundance of functional feeding groups was then calculated. Results show that sediment redistribution had some initial impact on some functional feeding groups in the Mill River. The most significant impact was the decrease in the relative abundance of scrapers downstream and the corresponding increase in collector-gatherers. However, the river recovered fairly quickly once river discharge increased enough to wash away the excess sediment. This suggests that the current sediment management protocol for Paradise Pond does not have long-lasting ecological consequences. However, continued ecological monitoring will be essential as we continue to contend with ever-accumulating sediment and attempt to minimize the human impacts on local aquatic ecosystems.

Literature Cited:
Sinton, J. 2002, April. A Short History of the Mill River Watershed 1650-1940.
Strayer, D. L., and D. R. Smith. 2003. A guide to sampling freshwater mussel populations. American Fisheries Society, Monograph 8, Bethesda, Maryland.
Wells, R. R., E. J. Langendoen, and A. Simon. 2007. Modeling Pre- and Post-Dam Removal Sediment Dynamics: The Kalamazoo River, Michigan1. JAWRA Journal of the American Water Resources Association 43:773–785.

SURF 2019-Post SURF Survey

Name	Ruth Penberthy
Year of Graduation	2021

SURF Advisor	Gaby Immerman, Biological Sciences
Secondary SURF Advisor	Reid Bertone-Johnson
Advisor Department	Engineering
SURF Field of Study	Landscape Studies, Spacial Analysis
Upload image(s) in .png format; 1,100 MB max size each	RPenberthy_surf.png
Title of Abstract/Research	Mapping Capen Garden: A Digital Mapping Experiment for the Botanic Garden of Smith College

Please type your abstract below.

Creating maps that are easy to adjust, update, or used to redesign a space are crucial for the changing landscape around us. At Smith, the landscape design of the campus and various gardens plays a large part in the aesthetic and beauty of the college. For years now, the Botanic Garden has wanted to further develop their online maps. While comprehensive data mapping individual plants existed, there was little data of the surrounding garden's landscape. There was a general satellite image, but it only offered a vague idea of campus locations. Trees and buildings often hide important landscape features.

It was proposed in early January of 2019 to create a digital 2D map using AutoCAD drafting software for Capen Garden with the hopes that it would speed up the process of redesigning the space. When the project started in the summer, parts of the garden had already been mapped in CAD with the help of previously obtained GIS data. It was then decided that even if a CAD map were to be created for the Botanic Garden, it would also have to be compatible and implemented within the online ArcMap system currently used.

To create the CAD map, some data was able to be taken from a previously existing GIS map and most of the garden was measured and sketched by hand and then drafted electronically. The map is composed of several layers each representing a component of the garden. It allows for the map's user to customize the map to their personal needs. Once the map was finished in CAD, it was exported into ArcGIS.

The map was edited in ArcGIS desktop to reorganize the currently existing CAD layers to ensure the user could continue to view the map in any way they desire. It was then published online to the Botanic Garden's Online ArcGIS server.

The map is now accessible to all members of the Botanic Garden and can be edited as Capen Garden will continue to change and grow.

SURF 2019-Post SURF Survey

Name	Zihan Diao
Year of Graduation	2022

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Alicia Grubb
Advisor Department	Computer Science
SURF Field of Study	Computer Science
Please list co-authors of your abstract	Naomi Cebula, Alicia Grubb
Upload image(s) in .png format; 1,100 MB max size each	model.png
Title of Abstract/Research	A Preliminary Study of the Utility of Goal Model Construction

Please type your abstract below.

Goal-oriented requirements engineering (GORE) is a subset of requirements engineering, which focuses on the elicitation and analysis of stakeholders' intentions [1]. Grubb proposed several studies aimed at investigating what utility stakeholders derive from constructing and analyzing goal models [2]. In this project, we designed and conducted an empirical study that explored the construction stage of goal modeling, asking whether stakeholders benefit from manually drawing their model (on paper or in a tool) for the purpose of understanding and generating project scenarios. Specifically, we compared reviewing auto-generated models with manually created ones for the purpose of helping students answer their own self-directed questions, the results of which have implications for goal model adoption and automation.

In order to compare subjects' self-created models with auto-generated models, we asked subjects to discuss a decision they were considering through an online pre-study questionnaire. We manually constructed a goal model from the pre-study. In a one-hour in-person session, participants first answered questions about a training video to measure their understanding. Participants then constructed a model of their decision while talking out loud. Half of the participants in this study used BloomingLeaf (a web-based goal modeling tool), while the remaining participants drew goal models by hand. We prompted participants with a list of prepared questions to help them add new elements and links. After the participants finished their model, we asked them to compare their model to the one we created from their pre-study questionnaire. We then asked them to extend their preferred model with new insights generated. Finally, we asked participants questions to explicate what utility (if any) they experienced in making their decision.

We recruited eight qualified participants at Smith College in the summer of 2019. Each participant was randomly assigned to either the Paper group or the Tool group. They completed an in-person training session and were asked to construct a goal model either on paper or with Bloomingleaf. We used open coding to find themes and categories for qualitative responses. Early analysis showed participants preferred their own model to the researcher generated one. The analysis is ongoing, and we hope to present results later this year.

References:
[1] J. Horkoff, et al.. Goal-oriented Requirements Engineering: An Extended Systematic Mapping Study. Requir. Eng., 24(2):133–160, 2019.
[2] A.M. Grubb. Reflection on Evolutionary Decision Making with Goal Modeling Via Empirical Studies. In Proc. of RE'18, pages 376–381, 2018.

SURF 2019-Post SURF Survey

Name	Naomi Cebula
Year of Graduation	2022

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Alicia M. Grubb
Advisor Department	Computer Science
SURF Field of Study	Computer Science
Please list co-authors of your abstract	Lily Diao, Alicia M. Grubb
Upload image(s) in .png format; 1,100 MB max size each	ncebula_surf2.png
Title of Abstract/Research	A Preliminary Study of the Utility of Goal Model Construction

Please type your abstract below.

Goal-oriented requirements engineering (GORE) is a subset of requirements engineering, which focuses on the elicitation and analysis of stakeholders' intentions [1]. Grubb proposed several studies aimed at investigating what utility stakeholders derive from constructing and analyzing goal models [2]. In this project, we designed and conducted an empirical study that explored the construction stage of goal modeling, asking whether stakeholders benefit from manually drawing their model (on paper or in a tool) for the purpose of understanding and generating project scenarios. Specifically, we compared reviewing auto-generated models with manually created ones for the purpose of helping students answer their own self-directed questions, the results of which have implications for goal model adoption and automation.

In order to compare subjects' self-created models with auto-generated models, we asked subjects to discuss a decision they were considering through an online pre-study questionnaire. We manually constructed a goal model from the pre-study. In a one-hour in-person session, participants first answered questions about a training video to measure their understanding. Participants then constructed a model of their decision while talking out loud. Half of the participants in this study used BloomingLeaf (a web-based goal modeling tool), while the remaining participants drew goal models by hand. We prompted participants with a list of prepared questions to help them add new elements and links. After the participants finished their model, we asked them to compare their model to the one we created from their pre-study questionnaire. We then asked them to extend their preferred model with new insights generated. Finally, we asked participants questions to explicate what utility (if any) they experienced in making their decision.

We recruited eight qualified participants at Smith College in the summer of 2019. Each participant was randomly assigned to either the Paper group or the Tool group. They completed an in-person training session and were asked to construct a goal model either on paper or with Bloomingleaf. We used open coding to find themes and categories for qualitative responses. Early analysis showed participants preferred their own model to the researcher generated one. The analysis is ongoing, and we hope to present results later this year.

References:
[1] J. Horkoff, et al.. Goal-oriented Requirements Engineering: An Extended Systematic Mapping Study. Requir. Eng., 24(2):133–160, 2019.
[2] A.M. Grubb. Reflection on Evolutionary Decision Making with Goal Modeling Via Empirical Studies. In Proc. of RE'18, pages 376–381, 2018.

SURF 2019-Post SURF Survey

Name	Kathie Li
Year of Graduation	2020

SURF Advisor	Non-Smith Advisor
If your SURF Advisor was not listed above you can enter their name here.	Caitlin Shepherd (Psychology)
Advisor Department	Psychology
SURF Field of Study	Clinical Psychology
Title of Abstract/Research	A Literature Review of Food and Alcohol Disturbance

Please type your abstract below.

A recent field of psychological research examines the interplay between eating disorders and alcohol use, beyond the comorbidity and co-occurrence of the two, rather focusing on the motivations of disordered eating behaviors and their relation to alcohol use. The media has used the term "drunkorexia" to colloquially refer to the phenomenon where compensatory behaviors—such as restricting caloric intake, engaging in physical activity of various levels, and using stimulants, laxatives, or diuretics, and purging—are used for either 1) weight control and offsetting the calories gained from alcohol consumption or 2) for increasing the effects of alcohol intoxication, as metabolically caloric restriction leads to alcohol entering the body at a faster rate causing greater blood alcohol levels (Burke, Cremeens, Vail-Smith and Woolsey, 2010). Researchers have attempted to define and operationalize "drunkorexia" in both theoretical and empirical papers and have used the terms alcoholimia, weight-conscious drinking, and food and alcohol disturbance (FAD).

This summer my research partner and I conducted a literature search in the existing drunkorexia and food and alcohol disturbance studies ranging from 2002 to 2019, and we drafted the methods section for a narrative literature review paper. We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses ("PRISMA") Statement guidelines to structure our review and began by searching for articles through the electronic databases, PsycINFO, Web of Science, and PubMed. Our initial database search included 177 articles. Then, we removed the duplicate articles and reviewed the remaining 91 articles. In addition to the 91 articles, we conducted another literature search using a snowballing method with the cited reference lists from our retrieved database articles and found 11 articles. In total we reviewed 102 articles for their full-text eligibility. The future directions for this project are that my research partner and I hope to co-author this narrative literature review with Professor Shepherd and submit it for publication to a targeted academic, peer-reviewed journal.

References
Burke, S. C., Cremeens, J., Vail-Smith, K., & Woolsey, C. (2010). Drunkorexia: calorie restriction prior to alcohol consumption among college freshman. Journal of alcohol and drug education, 54(2), 17-34.

Choquette, E. M., Rancourt, D., & Kevin Thompson, J. (2018). From fad to FAD: A theoretical formulation and proposed name change for "drunkorexia" to food and alcohol disturbance (FAD). International Journal of Eating Disorders, 51(8), 831-834.

Thompson-Memmer, C., Glassman, T., & Diehr, A. (2018). Drunkorexia: a new term and diagnostic criteria. Journal of American College Health, 1-7.

SURF 2019-Post SURF Survey

Name	Quinton Celuzza
Year of Graduation	2021

SURF Advisor	Michael Baressi, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Developmental Biology - Bioelectrics
Title of Abstract/Research	Testing Bioelectrics: The Role of Bioelectric Patterning on Axis Formation
Please type your abstract below.	In order to go from a single celled zygote to an entire organism, the cells must divide. As they do so, they develop different functions and properties. This process, known as cell differentiation, begins early in embryonic development, as the embryo moves through gastrulation and into segmentation. It's currently believed that cell differentiation is controlled by exposure to morphogens (chemical signals), which regulate gene expression to ultimately determine phenotype - but what if there was something else, working alongside morphogen signaling?

Bioelectrics is the study of the patterns and effects of ion distribution (membrane potential) across an organism. While the exact role of bioelectrics is not well understood, it appears to play a role in controlling regular development across entire organisms. In this context, we are exploring the role bioelectrics plays in early embryonic development, using zebrafish (Danio rerio) as a model organism (specifically the connection between patterns of cell membrane resting potential and normal organism axis formation).

Research this summer has focused on the development of two transgenic reporter lines, prerequisite literature research on morphogen-signaling pathways with known roles in axis formation, and the creation of introductory documentation summarizing research aims and basic protocols. Completion of these smaller projects will guide further research as we look into connections between bioelectric state and organism patterning.

SURF 2019-Post SURF Survey

Name	Kayleigh Boos
Year of Graduation	2021

SURF Advisor	Stylianos Scordillis, Biochemistry
Advisor Department	Biochemistry
SURF Field of Study	Proteomics
Upload image(s) in .png format; 1,100 MB max size each	**Table 1. Potential Phosphorylation Sites of the Three Creatine Kinase Proteoforms** Screen Shot 2019-07-31 at 10.59.22 AM.png
Title of Abstract/Research	Creatine Kinase: Regulation and Post-Translational Modification

Table 1. Potential Phosphorylation Sites of the Three Creatine Kinase Proteoforms

CK Proteoforms	Phosphorylation Sites		
CK-M	S128	T133	S136
CK-B	S136	T133	S170
CK-Mt2	S162	T167	S170

Please type your abstract below.

The goal of this project was to determine how creatine kinase (CK) is regulated by phosphorylation, the covalent addition of a phosphate to an amino acid side chain, during skeletal muscle myogenesis in C2C12 cells, that is the development of skeletal muscle from mono-nucleate proliferating cells to multinucleate quiescent cells that spontaneously contract in cell culture. The Scordilis lab has shown the presence of CK proteoforms in immunoblots of whole cell extracts electrophoresced on SDS-PAGE gels. There has not been much research on the phosphorylation state of these proteoforms during myogenesis. Protocols are being established to allow for the separation of these proteoforms by two-dimensional gel electrophoresis as well as by their level of phosphorylation.

The CKs have multiple possible phosphorylation sites, however there are few papers focused on identifying them in the three CK proteoforms: CK-M (43,045 Da), the most prevalent skeletal muscle proteoform, CK-B (42,714 Da), the non-muscle cytoplasmic one, and CK-Mt2 (47,474 Da), the mitochondrial one. The three most common phosphorylation sites for each proteoform were found through compiling those papers that identified potential phosphorylation sites; in Table 1 below are the potential phosphorylation sites narrowed down based on the abundance of papers referencing those sites.

In addition to identifying and comparing potential phosphorylation sites of the three CK proteoforms, ProteinBlast runs were used to compare the amino acid sequences to determine unique peptide differences for future mass spectrometry identifications where the proteoforms differ: CK-M and CK-B share 79.00% sequence identity and the same regions of ATP binding, positions 128-132 and 320-325; CK-M and CK-Mt2 share 67.59% sequence identity but no ATP binding identities; and, similarly, CK-B and CK-Mt2 share 67.31% sequence identity but no regions of ATP binding identity.

During this coming year I plan on continuing this research in the Scordilis lab with the hope to add to the available literature of energy homeostasis sources for exercise in skeletal muscle, especially in terms of myogenesis and repair of muscle following moderate injury.

SURF 2019-Post SURF Survey

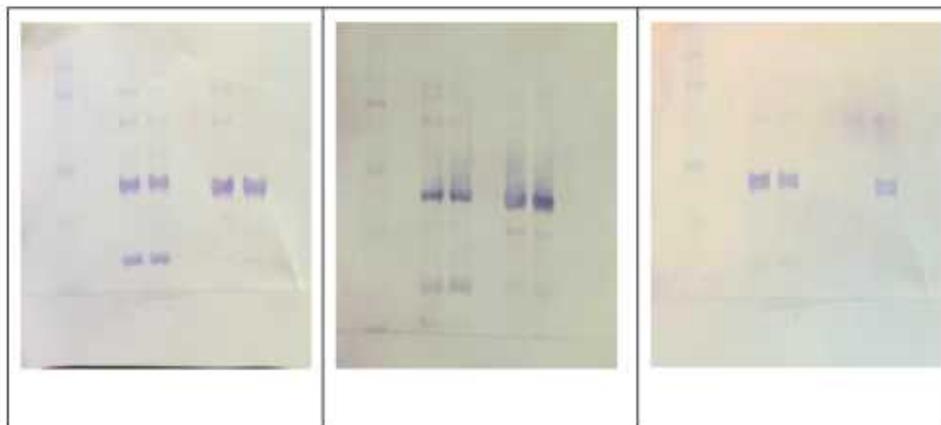|	
Name	Ahlenne Abreu
Year of Graduation	2022

SURF Advisor	Stylianos Scordillis, Biochemistry
Advisor Department	Biochemistry
SURF Field of Study	Proteomics
Upload image(s) in .png format; 1,100 MB max size each

Figure 1. The first blot demonstrates the presence of CK-M in two adult rat soleus supernatant and medial gastrocnemius, respectively. The second blot indicates the presence of CK-B in two adult rat soleus supernatant and medial gastrocnemius, respectively. The last blot highlights the presence of CK-MT2 in two adult rat soleus supernatant and one medial gastrocnemius, respectively.

AAbreu Immunoblots.png |
| **Title of Abstract/Research** | Creatine Kinase Isoforms: An Immunoblotting Study |

Please type your abstract below.

Creatine kinase (CK) is an enzyme that is involved in energy homeostasis. It has three common isoforms that are found in different cell types and organelles. The most common cytoplasmic isoform in adult skeletal muscle is CK-M (43,045 Da); in non-skeletal and cardiac muscle the CK-B isoform (42,726 Da) is expressed; and CK-MT2 (47,386 Da) is expressed in the matrix of mitochondria. Using extracts from the soleus and medial gastrocnemius in rats, the distribution of all three isoforms was determined by quantitative immunoblotting.

The extraction technique for the muscles produced sarcomeric (extract pellet, primarily containing the contractile proteins and their regulatory proteins) and sarcoplasmic fractions (extract supernate, primarily the more general housekeeping proteins). Protein extract concentrations were carried out by the Lowry assay. To determine the relative concentrations of the three CK isoforms in the fractions of the two muscles single dimension SDS gel electrophoresis was employed. This technique separates all the proteins in a sample (extract) according to their apparent molecular weight and visualizes the protein bands by use of Coomassie Brilliant Blue R250 dye. An identical gel was also run but not stained; this gel was transferred to a matrix called PVDF which binds all of the proteins (called a blot) and allows for detection of specific proteins by using a specific antibody to a protein. Using such specific antibodies to CK-M, CK-B and CK-MT2 all three proteins were detected in the extracts (Figure 1). These blots demonstrate that all three isoforms are found in the two adult skeletal muscles and that they are differentially distributed in the sarcomeric versus the sarcoplasmic compartments.

I plan on continuing this work during the coming year as a Posse student in the Scordilis lab.

SURF 2019-Post SURF Survey

Name	Katelyn Smalley
Year of Graduation	2021

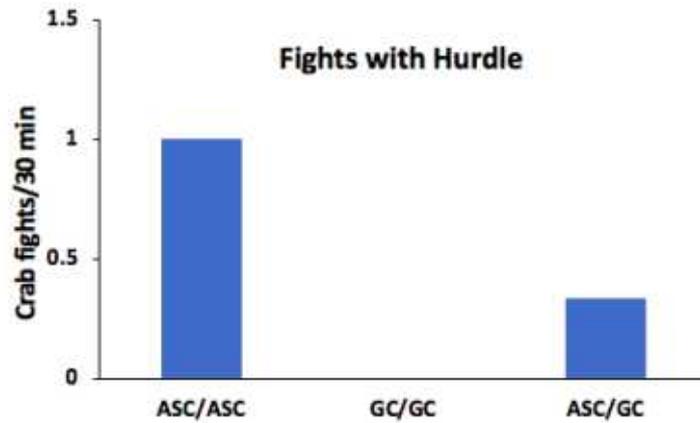|	
SURF Advisor	Paulette Peckol, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Marine Biology
Please list co-authors of your abstract	Victoria Bajtay

Figure 1. Mean (SEs were 0) number of crab fights/30 min for intra- and interspecific interactions between *Hemigrapsus sanguineus*, Asian Shore Crab (ASC), and *Carcinus maenas*, European Green Crab (GC), in the presence of a rocky barrier between crabs. No fights occurred between conspecific green crabs.
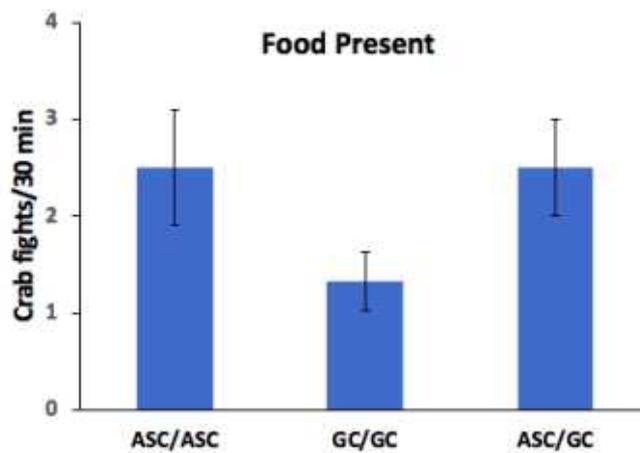
Screen Shot 2019-07-27 at 4.42.32 PM.png

Figure 2. Mean ($\pm$ SE) number of crab fights/30 min for intra- and interspecific interactions between *Hemigrapsus sanguineus*, Asian Shore Crab (ASC), and *Carcinus maenas*, European Green Crab (GC), in the presence of food (crushed mussels).

Screen Shot 2019-07-27 at 4.42.52 PM.png

Title of Abstract/Research Clashing Crabs: Interactions Between Invasive Species, Hemigrapsus sanguineus and Carcinus maenas

Please type your abstract below.

Both competitive and trophic level interactions shape the behavior and activities of marine organisms occurring in intertidal habitats. Hemigrapsus sanguineus, Asian Shore Crab, and Carcinus maenas, European Green Crab, are invasive species along western Atlantic shorelines. Green Crabs have been present in New England habitats for over 100 years, while the Asian Shore Crab is a more recent introduction. These species have similar food and habitat preferences, and scientists have suggested that the Asian Shore Crab has largely replaced Green Crabs in southern New England. In this study, we investigated whether competition between H. sanguineus and C. maenas might impact their habitat choice and food acquisition, thus affecting their abundance patterns in southern New England.

For our experimental set up (n = 3 for all treatment conditions), we used rectangular (25 cm L x 18 cm W x 17 cm H) aquaria and created suitable habitat with a layer of sand, small pebbles and shells (~3 cm thick). For some treatments we added small rocks as barriers and hiding places. Most experiments were conducted under submerged conditions, with the crabs covered with 5 cm of seawater. Prior to each experiment, we acclimated the crabs for 10 min in opaque containers that allowed for aeration. We then lifted the containers, freeing the crabs to interact during the 30 min experimental period. Most observations were made in a dimly lit room. We first determined that Mytilus edulis, an abundant intertidal mussel species, was the preferred food of both crab species. Both H. sanguineus and C. maenas preferred foraging while submerged (simulating high tide), and were inactive, burrowing during daytime (lighted), intertidal (low tide) conditions. Thus, they displayed no intra- or interspecific interactions during daytime "low tides". Notably, burrowing techniques differed between species, and were indicative of their habitat preferences. H. sanguineus would tuck its carapace beneath a rock while using circular pushing motions with its claws to wedge itself beneath the rock and deeper into the sediment. In contrast, C. maenas used a movement generated with its hind legs, which propelled the crab vertically downward into the substrata, where it could move laterally while still being buried. These tactics of burrowing reflect their locations in their natural environment: H. sanguineus is usually found tucked underneath rocks while C. maenas can be located patrolling the sediment flats.

We studied intra- and interspecific interactions in the presence and absence of food and complex habitat structure (rocky barriers). In the absence of food and rocky habitat, we observed fights only between conspecific H. sanguineus (a mean of ~4 fights per 30 min). Under conditions of a rocky barrier (without food), we recorded numerous fights between conspecific H. sanguineus (ASC-ASC), as well as interspecific fights with C. maenas (Fig. 1). C. maenas showed no intraspecific interactions under this treatment condition. However, when food present, there were fights in all three treatments (Fig. 2). C. maenas became aggressive, sometimes stealing food from H. sanguineus. Thus, although they have unique approaches, both species have found a strategy that allows them to effectively feed and survive along rocky coastlines. We conclude that the more aggressive behaviors of H. sanguineus has resulted in a habitat shift by C. maenas to shallow subtidal habitats.

SURF 2019-Post SURF Survey

Name	Auden Balouch
Year of Graduation	2021

SURF Advisor	Susan Voss, Engineering
Advisor Department	Engineering
SURF Field of Study	Engineering
Please list co-authors of your abstract	Sylvie Rosenstein
Title of Abstract/Research	Analysis of Wideband Acoustic Immittance from Artificial and Real Ears

Please type your abstract below.

The Mimosa Acoustics HearID and the Interacoustics Titan are two FDA approved noninvasive auditory diagnostic tools. The data taken with these instruments have the potential to diagnose factors of conductive hearing loss in young children and adults. The two instruments are used to collect Wideband Acoustic Immittance (WAI) measurements including acoustic impedance, reflectance, and absorbance. The measurements from these devices should be comparable when recorded on the same subject in the same environment, yet yield notably different results. The Titan and HearID instruments have different probe insertion depths in the ear canal. The HearID system is able to be inserted further into the ear canal since the probe tip is foam whereas the Titan probe tip is rubber. The different probe insertion depths is hypothesized to be a significant cause of variation in WAI measurements between the systems.

WAI measurements were made using both the Mimosa Acoustics HearID and Interacoustics Titan inserted into a Larson Davis artificial ear. An artificial ear was used to mimic the behavior of a normal human ear. To investigate the effect of insertion depth on WAI measurements, data was taken at different predetermined locations in the artificial ear canal. Methods were developed to assure that the probes of the two instruments were at the same locations during their measurements. With data collected at various locations, the canal length can be determined based on where the probe sits in the ear canal. These measurements are actively being used in the Voss lab to further study the relative insertion depth in the ear canal between HearID and Titan probes on human subjects. We will continue to contribute to this work in the fall of 2019.

This summer we had the opportunity to visit Massachusetts Eye and Ear as well as Boystown National Research Hospital to discuss research with colleagues of the Voss lab. It was valuable being able to experience the applications and contributions of others in the auditory research field outside of Smith.

SURF 2019-Post SURF Survey

Name	Sylvie Rosenstein
Year of Graduation	2021

SURF Advisor	Susan Voss, Engineering
Advisor Department	Engineering
SURF Field of Study	Engineering
Please list co-authors of your abstract	Auden Balouch
Title of Abstract/Research	Analysis of Wideband Acoustic Immittance from Artificial and Real Ears

Please type your abstract below.

The Mimosa Acoustics HearID and the Interacoustics Titan are two FDA approved noninvasive auditory diagnostic tools. The data taken with these instruments have the potential to diagnose factors of conductive hearing loss in young children and adults. The two instruments are used to collect Wideband Acoustic Immittance (WAI) measurements including acoustic impedance, reflectance, and absorbance. The measurements from these devices should be comparable when recorded on the same subject in the same environment, yet yield notably different results. The Titan and HearID instruments have different probe insertion depths in the ear canal. The HearID system is able to be inserted further into the ear canal since the probe tip is foam whereas the Titan probe tip is rubber. The different probe insertion depths is hypothesized to be a significant cause of variation in WAI measurements between the systems.

WAI measurements were made using both the Mimosa Acoustics HearID and Interacoustics Titan inserted into a Larson Davis artificial ear. An artificial ear was used to mimic the behavior of a normal human ear. To investigate the effect of insertion depth on WAI measurements, data was taken at different predetermined locations in the artificial ear canal. Methods were developed to assure that the probes of the two instruments were at the same locations during their measurements. With data collected at various locations, the canal length can be determined based on where the probe sits in the ear canal. These measurements are actively being used in the Voss lab to further study the relative insertion depth in the ear canal between HearID and Titan probes on human subjects. We will continue to contribute to this work in the fall of 2019.

This summer we had the opportunity to visit Massachusetts Eye and Ear as well as Boystown National Research Hospital to discuss research with colleagues of the Voss lab. It was valuable being able to experience the applications and contributions of others in the auditory research field outside of Smith.

SURF 2019-Post SURF Survey

Name	Isabel Ahlstrom
Year of Graduation	2021
SURF Advisor	Robert Newton, Geosciences
Advisor Department	Geosciences
SURF Field of Study	Geoscience
Please list co-authors of your abstract	Clara Brill-Carlat
Upload image(s) in .png format; 1,100 MB max size each	CBrillCarlat_IAhlstrom_Figure1.PNGCBrillCarlat_IAhlstrom_Figure2.PNG
Title of Abstract/Research	Bathymetry and Sediment Deposition in Paradise Pond

Please type your abstract below.

Paradise Pond is a small, man-made feature along the Mill River on the Smith College campus. Sediment build-up has been a maintenance issue in the pond; sediment is deposited when the water velocity of the Mill River decreases as it enters the pond. Instead of dredging the pond and depositing the sediment in a local landfill, the college has proposed to remove sediment by flushing it downstream through a sluice gate in the dam during high discharge events. To determine how much flushing is necessary, the amount of sediment entering the pond was evaluated using bathymetry mapping.

This summer, bathymetry data was collected using a RiverRay Acoustic Doppler Current Profiler (ADCP) device in deeper water, as well as an Arrow Gold RTK GPS unit and a Leica Total Station in shallower areas. The bathymetric map was constructed in ArcMap (figure 1). The amount of sediment accumulation in the past year, 4,900 cubic meters, was determined by subtracting a summer 2018 bathymetric map from the more recent 2019 map.

A significant portion of the recent sediment accumulation occurred during a December 21, 2018 storm that deposited 2.45 inches of rain. The peak discharge values from the storm are among the top 15 recorded along the Mill River since the 1930s. Using turbidity data, the quantities of suspended sediment entering and exiting the pond during the storm were calculated. The difference between the two quantities, 80 metric tons (560 cubic meters), is the amount of suspended sediment deposited in the pond on December 21 and 22, 2018. The storm also moved heavier bedload sand into the sandbars in the northwestern region of the pond, where the river first enters the pond (figure 2).

Bathymetry maps helped to determine the amount of sediment in Paradise Pond. This evaluation will help the college qualify for the permits necessary to flush the sediment through the dam and downriver.

SURF 2019-Post SURF Survey

Name	Clara Brill-Carlat
Year of Graduation	2021

SURF Advisor	Robert Newton, Geosciences
Advisor Department	Geosciences
SURF Field of Study	Geosciences
Please list co-authors of your abstract	Isabel Ahlstrom
Upload image(s) in .png format; 1,100 MB max size each	CBrillCarlat_IAhlstrom_Figure1.PNGCBrillCarlat_IAhlstrom_Figure2.PNG
Title of Abstract/Research	Bathymetry and Sediment Deposition in Paradise Pond

Please type your abstract below.

Paradise Pond is a small, man-made feature along the Mill River on the Smith College campus. Sediment build-up has been a maintenance issue in the pond; sediment is deposited when the water velocity of the Mill River decreases as it enters the pond. Instead of dredging the pond and depositing the sediment in a local landfill, the college has proposed to remove sediment by flushing it downstream through a sluice gate in the dam during high discharge events. To determine how much flushing is necessary, the amount of sediment entering the pond was evaluated using bathymetry mapping.

This summer, bathymetry data was collected using a RiverRay Acoustic Doppler Current Profiler (ADCP) device in deeper water, as well as an Arrow Gold RTK GPS unit and a Leica Total Station in shallower areas. The bathymetric map was constructed in ArcMap (figure 1). The amount of sediment accumulation in the past year, 4,900 cubic meters, was determined by subtracting a summer 2018 bathymetric map from the more recent 2019 map.

A significant portion of the recent sediment accumulation occurred during a December 21, 2018 storm that deposited 2.45 inches of rain. The peak discharge values from the storm are among the top 15 recorded along the Mill River since the 1930s. Using turbidity data, the quantities of suspended sediment entering and exiting the pond during the storm were calculated. The difference between the two quantities, 80 metric tons (560 cubic meters), is the amount of suspended sediment deposited in the pond on December 21 and 22, 2018. The storm also moved heavier bedload sand into the sandbars in the northwestern region of the pond, where the river first enters the pond (figure 2).

Bathymetry maps helped to determine the amount of sediment in Paradise Pond. This evaluation will help the college qualify for the permits necessary to flush the sediment through the dam and downriver.

SURF 2019-Post SURF Survey

Name	Cody (Rebecca) Bloomfield
Year of Graduation	2021

SURF Advisor	Steven Williams, Biological Sciences
If your SURF Advisor was not listed above you can enter their name here.	Samantha Torquato
Advisor Department	Biological Sciences
SURF Field of Study	Marine Mammal Parasitology
Upload image(s) in .png format; 1,100 MB max size each	SURF.PNG
Title of Abstract/Research	Development of quantitative real-time PCR-based diagnostic assays for marine mammal lungworms Otostrongylus circumlitis and Parafilaroides decorus

Please type your abstract below.

Parasitic infections exacerbate the challenges of marine mammal conservation (Harvell 2002). As climate change progresses, the prevalence and severity of zoological parasitic infections is projected to increase (Harvell 2002). Thus, identifying and mitigating parasitic infections is an important component of conservation for threatened marine mammal populations (Dailey 2005). Sea lion lungworm (Parafilaroides decorus) and harbor seal lungworm (Otostronglyus circumlitis) are two parasitic nematodes identified as pathogens of concern by partner marine mammal rescue facilities. Previous diagnosis relied on morphological identification, which requires years of experience and often overlooks low-level infections (van Lieshout & Roestenberg 2015). We aim to develop quantitative real-time (qRT)-PCR-based diagnostic assays that are species-specific and sensitive. Previous research identified and sequenced Parafilaroides spp. and O. circumlitis field samples. Over the summer, we sought to optimize and verify the assays. First, we optimized primer annealing temperatures and template DNA concentrations. We tested the assays against a variety of species to confirm specificity. We performed dilution series to estimate the limit of detection. To ensure that our tests would be useful to marine mammal rescue facilities, we tested the assay on noninvasively collected sputum and fecal samples. Our data indicate the Parafilaroides assay can be used on several types of noninvasively collected samples. We tentatively established that Parafilaroides DNA can be detected in sputum field samples. This provides confirmatory evidence for the hypothesized pulmonary-gastrointestinal migration of Parafilaroides within pinnipeds (Dailey, 2005). Originally, the O. circumlitis assays were designed for separate oceans, but we found that one assay performed better on samples from both oceans. We attempted to optimize the O. circumlitis assay but found we may need to redesign the assay. Future work will involve a field trial for the Parafilaroides assay and a redesign of the O. circumlitis assay. We hope that development of these diagnostic assays facilitates conservation efforts of marine mammal populations.

SURF 2019-Post SURF Survey

Name	Mel Regan
Year of Graduation	2021

SURF Advisor	Adam Hall, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Biological Sciences/Neuroscience
Please list co-authors of your abstract	N/A
Upload image(s) in .png format; 1,100 MB max size each	DirectActivatioOR2-7---MR.png
Title of Abstract/Research	Characterization and Comparison of Natural Insect Repellents on Mosquito Odorant Receptors

Please type your abstract below.

Mosquitos (anopheles) are carriers of deadly insect borne diseases such as Yellow Fever, West Nile virus, and Zika virus (Deletre et al, 2015). Plant based repellents have been used for thousands of years to ward off the disease carrying insects (Maia et al, 2011). The molecular mechanisms for repellency have not been explored until recently [1]. This study aims to screen 11 plant based compounds using electrophysiological methods to measure the mosquito odorant receptor current inhibitions caused by the application of natural repellents. The odorant receptors are heterodimers composed of an essential OR7 subunit and a different subunit. This study uses the OR2/ OR7 combination. Odorant ligands naturally emitted by humans allow for the flow of cations through the receptor with the OR2/ OR7 combination activated by 2-methyl phenol. mRNA of the odorant receptors were injected into Xenopus Laevis oocytes and their currents recorded using the two-electrode voltage clamp method. The screening was conducted by co-applying 10uM of the odorant, 2-methyl phenol and 300uM of the natural repellent and measuring the resulting currents. Citronellal, geraniol, limonene and cuminaldehyde have inhibitions that are 20% or greater (see Figure 1) of the odorant current. These natural repellents will be studied further by using other subunit combinations for future characterization of receptor inhibition that might underlie their repellent activity.

Figure 1: Screening of the 11 natural repellents (300 uM) on the OR2/ OR7 receptor combination for their percent inhibition of the receptor current when co-applied with odorant, 2-methyl phenol (10 uM).

References:
Deletre, E., Chandre, F., Williams, L., Duménil, C., Menut, C., & Martin, T. (2015) Electrophysiological and behavioral characterization of bioactive compounds of the Thymus vulgaris, Cymbopogon winterianus, Cuminum cyminum and Cinnamomum zeylanicum essential oils against Anopheles gambiae and prospects for their use as bednet treatments. Parasites & Vectors, vol 8, Article number: 316.
Maia, M. F., & Moore, S. J. (2011). Plant-based insect repellents: a review of their
efficacy, development and testing. Malaria journal, 10 Suppl 1, S11. doi:10.1186/1475-2875-10-S1-S11

SURF 2019-Post SURF Survey

Name	Anna Pearson
Year of Graduation	2021

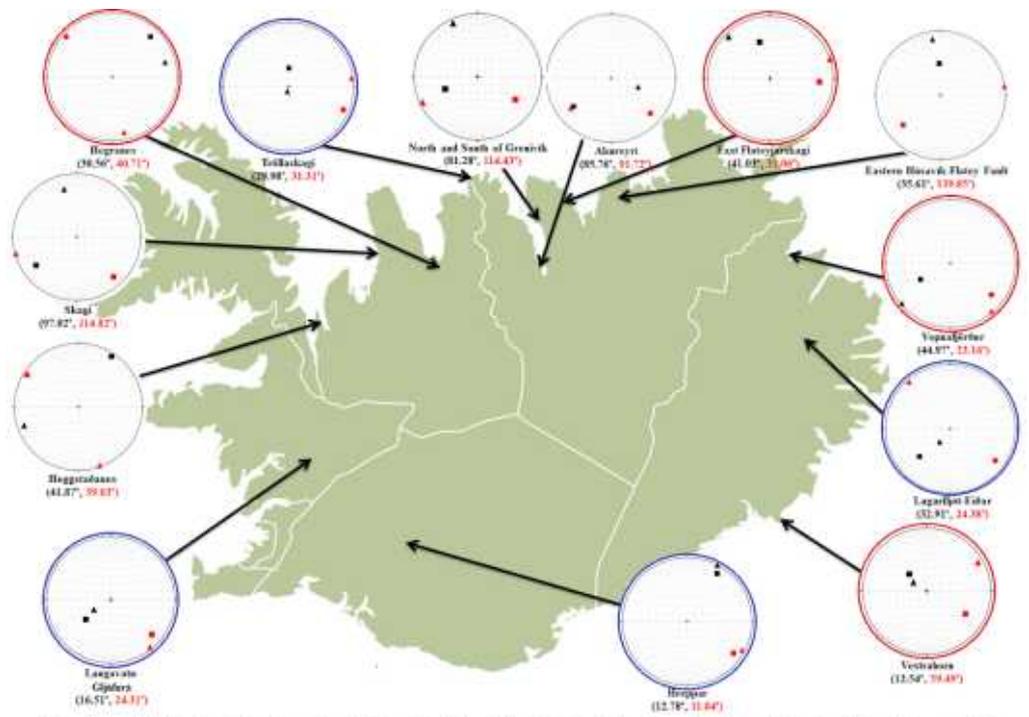|	
SURF Advisor	John Loveless, Geosciences
Advisor Department	Geosciences
SURF Field of Study	Geosciences

Upload image(s) in .png format; 1,100 MB max size each
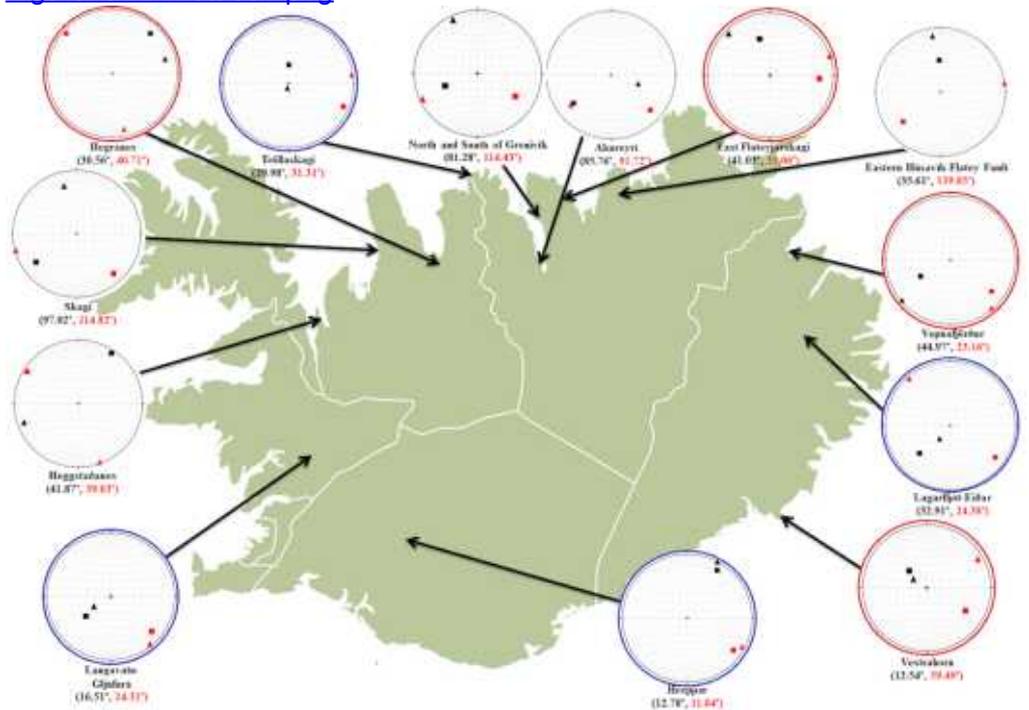

Figure. Map of Iceland, including stereonets with P-axes in black and T-axes in red for the Karson data (triangles) and model results (squares) for each region considered in the analysis using the stress tensor derived from GPS velocities and 10 mm of hotspot inflation. The angular difference for each of the pairs of axes is written in black for the P-axes and red for the T-axes. Stereonets circled in blue have both angular differences less than 35° and stereonets circled in red have one of the P- or T-axis angular differences less than 35°.

Figure for A. Pearson.png

Figure. Map of Iceland, including stereonets with P-axes in black and T-axes in red for the Karson data (triangles) and model results (squares) for each region considered in the analysis using the stress tensor derived from GPS velocities and 10 mm of hotspot inflation. The angular difference for each of the pairs of axes is written in black for the P-axes and red for the T-axes. Stereonets circled in blue have both angular differences less than 35° and stereonets circled in red have one of the P- or T-axis angular differences less than 35°.

Figure for A. Pearson_1753.png

Title of Abstract/Research

Understanding the Physical Mechanisms Behind Faulting Styles in Iceland

Please type your abstract below.

Karson et al.'s 2018 paper, "Rift-parallel strike-slip faulting near the Iceland plate boundary zone", analyzed an unexpected preponderance of strike-slip faulting in Iceland, suggesting rift propagation away from the Icelandic hotspot as the primary cause. This project tested whether the observed faulting styles in Iceland found in the paper could be explained by a model only considering the primary faults and stress imposed by relative tectonic plate motion and the Icelandic hotspot.

The model was developed by combining a geologic map of Iceland and areas of strike-slip faulting identified in the original paper with a sphere representing the hotspot. The impact of the plate motion between the North American and European Plates in Iceland was modeled using a remote stress tensor, calculated in two different ways: (1) using the angle of relative plate motion and (2) using the spatial gradient of a GPS velocity field. All faults were run through an elastic boundary element program to calculate the slip required to relieve the stress imposed on them. To characterize the modeled faulting styles, P- and T-axes were calculated. The average of the angular difference between the P-axes and T-axes for the model and a set of field data was used for evaluation.

A series of models were first run using the remote stress tensor calculated from GPS velocities and varying an additional impact from the hotspot. Models with 0 to 30 mm of inflation of the hotspot resulted in an average angular misfit of less than 50°. Using the remote stress tensor calculated as uniaxial stress along an azimuth of relative plate motion and the hotspot with 10 mm of inflation, a series of models was also run varying that azimuth in 5° increments from 5° to 180°. Models run at an azimuth of 110° and 120-140° had an average angular difference of less than 50°.

These findings suggest a strong consistency between models using stress based on the GPS velocity field, which should inherently include some impact from the hotspot along with plate motion, and models using stress along a single azimuth as well as the hotspot. Although some areas in northwest Iceland failed to produce results consistent with field data, as a whole these models suggest that very simple boundary conditions, which include the impact of tectonic plate motion and the Icelandic hotspot, agree well with what has been observed in the field.

SURF 2019-Post SURF Survey

Name	Jasmine Pacheco-Ramos
Year of Graduation	2019

SURF Advisor	Denise Lello, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Biological Sciences
Please list co-authors of your abstract	Jasmine Pacheco-Ramos' 19, Emily Hitchcock '19, Yeiny Moreno '20, Giovanna Sabini-Leite '21, Glenda Perez '21, Renee Revolorio Keith '21
Title of Abstract/Research	Coral Reef Ed-Ventures Summer 2019

Please type your abstract below.

Summer 2019 was the twentieth year of the Smith College collaboration with Hol Chan Marine Reserve on Ambergris Caye, Belize. The goals of Coral Reef Ed-Ventures are to conduct research on coastal ecosystems and communities and to offer an environmental education and conservation experience for the children of San Pedro Town on Ambergris Caye. The research focused on coral mounds at Mexico Rocks, mangroves propagules located in lagoons near the Grand Belizean Estates development, and interviews assessing the eco-cultural identity of local people who work with the natural environment or who have completed a Coral Reef Ed-Ventures camp in the past. We later incorporated many of these research techniques into our teaching activities in two free Coral Ed camps for the island schoolchildren.

Smith students conducted three research projects with professors David Smith (BIO), Denise Lello (BIO), Allen Curran (GSC), and Shannon Audley (EDC). The first project was part of a long-term survey of the health of coral mounds inside the barrier reef at the large Mexico Rocks site that was recently accorded protection as the newest part of Hol Chan Marine Reserve. These surveys assessed the percentages of live coral cover and soft coral abundance, plus diversity, in order to track significant changes over time. Previously, several mounds towards the center of Mexico Rocks and several towards the south end had been sampled with quadrat and transect methods using SCUBA, snorkel, and underwater cameras. These mounds were resampled this year, and two new mounds from a different area were also surveyed.

The second project tracked mangrove survival in the lagoons in the interior of the island in the vicinity of disturbed areas associated with development. Previous research has indicated that several biotic and abiotic factors can impact the persistence of mangrove propagules. We collected data for each propagule (previously mapped), including taking underwater images of organisms associated with the propagules and visual assessment of damage and herbivory. For the third project, students interviewed people who live in San Pedro and work in eco-tourism and/or attended a Coral Reef Ed-Ventures camp as a child. The goal was to elicit stories that reveal ecocultural identity. We interviewed dive masters and scuba instructors, staff from Hol Chan Marine Reserve, and some alums from the Coral Reef Ed-Ventures program. The questions probed how the person viewed interconnections between themselves and nature; experiences that changed their perspectives about the natural environment; and their thoughts on the future of the natural environment, with a focus on how their relationship with nature and life will be affected.

This year's theme for youth camp was 'My Roots in the Sea.' Our student-teacher team created activities focused on seven topics: eco-cultural identity, mangroves, coral reefs, relationships, challenges/threats to the ecosystem, health of humans and ecosystems, and advocacy. Interactive activities (e.g., a beach clean-up, an edible coral polyp activity) were paired with short lectures and videos. This variety of topics allowed campers to make connections between the ocean ecosystems and inhabitants and land-based human activities, as well as gain more awareness about how they can best protect their local environments.

Older children attended an upper level R.E.E.F (Research in Ecology and the Environment is Fun) Program. This year's theme for the R.E.E.F. program was 'Human Relationships with the Reef, Research, and Advocacy.' Campers were introduced to various research methods, including how to calculate percent live coral cover on coral mounds. They also learned about advocacy and threats to the environment. For example, the campers were presented with information about how macro and micro-plastics affect the entire food chain. Two guests from the community were asked to come in and talk about their particular work in the environment in order to give the kids a firm idea of environmental efforts occurring in their community. Chris Summers from ACES (American Crocodile Education Sanctuary) taught about the cultural and ecological importance of mangroves and biological aspects of the crocodiles that live in Ambergris Caye. Mariela Archer, the environmental educator from Hol Chan Marine Reserve, spoke about overfishing and the importance of marine protected areas. We took REEF camp participants on a snorkeling trip to Hol Chan and Shark and Ray Alley so that they could observe the marine protected area and the underwater life that they were learning about. With a greater understanding of the local environment and how research is conducted, campers were able to make meaningful connections between coastal ecosystems and their home on Ambergris Caye.

In summary, our research advanced understanding of changes in coral and mangrove habitats and the education program exposed children on the island to specific environmental changes that impact their everyday lives. This summer of Coral Reef Ed-Ventures was full of new experiences and learning opportunities that we hope to expand upon in coming years.

SURF 2019-Post SURF Survey

Name	Athena Zhang
Year of Graduation	2020

SURF Advisor	Elizabeth Jamieson, Chemistry and Biochemistry
Advisor Department	Chemistry
SURF Field of Study	Chemistry and Biochemistry
Upload image(s) in .png format; 1,100 MB max size each	Presentation1.png
Title of Abstract/Research	Nucleosomal DNA Repair SURF Abstract

Please type your abstract below.

DNA base lesions, such as 8-oxoguanine (8-oxoG) and spiroiminodihydantoin (Sp), can be formed when DNA is oxidized, causing mutations that result in human disease. The Base Excision Repair (BER) pathway, initiated by DNA glycosylases, can mitigate this damage, but is challenged by the packaging of genomic DNA into chromatin. The effect of this packaging on the repair of the Sp DNA lesion has not yet been examined. Following the procedures of Burrows et al.[1]and Delaney et al.[2], the ability of the DNA glycosylase, Fpg, to repair the 8-oxoG lesion in DNA was investigated during this summer work. Eventually, this project will expand to provide the first experimental data that examines the impact of genomic DNA packaging on the repair of Sp lesions.

DNA repair assays were successfully conducted with 30-mer Cy5-labeled oligonucleotides and Fpg to examine the ability of Fpg to repair 8oxoG:C lesions versus a G:C control. Analysis of substrate and product band intensities on polyacrylamide gels generated an average reaction rate constant (k_2) of approximately 3 min-1 which was comparable to the published results.[1] A sample repair assay gel was attached to this report.

With the success of the 30-mer assays, similar experiments were carried out with 146-mer Cy5-labeled oligonucleotides and Fpg to demonstrate the ability of this enzyme to repair the 8-oxoG lesion in longer DNA duplexes that are able to be made into nucleosome core particles. Sample preparation and gel running conditions were modified somewhat with these longer DNA duplexes. As with the 30-mer, Fpg was able to successfully excise the 8-oxoG lesion in the 146-mer duplexes.

Moving forward, repair assays will be conducted to examine the ability of Fpg to excise the 8-oxoG lesion in nucleosome particles formed by the 146-mer wrapped around a histone octamer core. Repair assays with nucleosomes containing the Sp lesion and Fpg will also be conducted. These experiments will ultimately allow us to examine the ability of a variety of different DNA glycosylases to excise the Sp lesion from nucleosomes, providing important information about how this kind of DNA damage is repaired in cells.

References:
1. Olmon, D.E.; Delaney, S. ACS Chemical Biology 2017 12 (3), 692-701
2. Krishnamurthy, N.; Muller, G.J.; Burrows, J.C.; David, S.S. Biochemistry 2007 46 (33), 9355-9365

SURF 2019-Post SURF Survey

Submission Date	2019-07-18 12:54:55
Name	Glendalis Perez
Smith ID#	991234209
Year of Graduation	2019
Smith E-mail	gperez@smith,edu
Are you a January graduate?	no
Are you an Ada Comstock scholar?	no
Are you in a Graduate program?	no
SURF Advisor	L.David Smith, Biological Sciences
Secondary SURF Advisor	Denise Lello
Advisor Department	Environmental Science and Policy
SURF Field of Study	Environmental Science and Policy
Please list co-authors of your abstract	Glenda Perez '21, Emily Hitchcock '19, Jasmine Pacheco-Ramos '19, Yeiny Moreno '20, Giovanna Sabini-Leite '21, Renee Revolorio Keith '21
Title of Abstract/Research	Coral Reef Ed-Ventures Summer 2019

Please type your abstract below.

Summer 2019 was the twentieth year of the Smith College collaboration with Hol Chan Marine Reserve on Ambergris Caye, Belize. The goals of Coral Reef Ed-Ventures are to conduct research on coastal ecosystems and communities and to offer an environmental education and conservation experience for the children of San Pedro Town on Ambergris Caye. The research focused on coral mounds at Mexico Rocks, mangroves propagules located in lagoons near the Grand Belizean Estates development, and interviews assessing the eco-cultural identity of local people who work with the natural environment or who had completed a Coral Reef Ed-Ventures camp in the past. We later incorporated many of these research techniques into our teaching activities in two free camps for the island schoolchildren.

Smith students conducted three research projects with professors David Smith (BIO), Denise Lello (BIO), Allen Curran (GSC), and Shannon Audley (EDC). The first project was part of a long-term survey of the health of coral mounds inside the barrier reef at a site called Mexico Rocks that was recently accorded protection as part of the Hol Chan Marine Reserve. These surveys assess the amount of live coral cover and soft coral abundance and diversity, and track significant changes over time. Previously, several mounds towards the center of Mexico Rocks and several towards the south end had been sampled with quadrat and transect methods using SCUBA, snorkel, and underwater cameras. These were resampled this year and two new mounds from a different area were also surveyed. The second project tracked mangrove survival in the mangrove lagoons in the interior of the island in the vicinity of fill associated with development. Previous research has indicated that several biotic and abiotic factors can impact the persistence of mangrove propagules. Students collected data for each propagule (previously mapped) using underwater images of organisms associated with the propagules and visual assessment of damage and herbivory. For the third project, students interviewed people who live in San Pedro and work in eco-tourism and/or have attended Coral Reef Ed-Ventures camp as a child. The goal was to elicit stories that reveal ecocultural identity. We interviewed dive masters and scuba instructors, staff from Hol Chan Marine Reserve, and some alums from the Coral Reef Ed-Ventures program. The questions probed how the person viewed interconnections between themselves and nature; experiences that changed their perspectives about the natural environment; and their thoughts on the future of the natural environment with a focus on how their relationship with nature and life will be affected.

This year's theme for youth camp was 'My Roots in the Sea'. The Smith students created activities focused on seven topics: eco-cultural identity, mangroves, coral reefs, relationships, challenges/threats to the ecosystem, health of humans and ecosystems, and advocacy. Interactive activities (e.g., a beach clean-up, an edible coral polyp activity) were paired with short lectures and videos. This variety of topics allowed campers to make connections between the ocean ecosystems and inhabitants and land-based human activities, as well as gain more awareness about how they can best protect the ocean.

Older children attended an upper level R.E.E.F (Research in Ecology and the Environment is Fun) Program. This year's theme for the R.E.E.F. program was 'Human Relationships with the Reef, Research, and Advocacy'. Campers were introduced to various research methods, including how to calculate percent live coral cover on coral mounds. They also learned about advocacy and threats to the environment. For example, the campers were presented with information about how macro and micro-plastics affect the entire food chain. Two guests from the community were asked to come in and talk about their particular work in the environment in order to give the kids a firm idea of environmental efforts occurring in their own community. Chris Summers from ACES (American Crocodile Education Sanctuary) taught about the cultural and ecological importance of mangroves and biological aspects of the crocodiles that live in Ambergris Caye. Mariela Archer, the environmental educator from Hol Chan Marine Reserve, spoke about overfishing and the importance of marine protected areas. We took REEF camp participants on a snorkeling trip to Hol Chan and Shark and Ray Alley so that they could observe the marine protected area and the underwater life that they were learning about. With a greater understanding of the local environment and how research is conducted, campers were able to make meaningful connections between coastal ecosystems and their home on Ambergris Caye.

In summary, our research advanced understanding of changes in coral and mangrove habitats and the education program exposed children on the island to specific environmental changes that impact their everyday lives. This summer of Coral Reef Ed-Ventures was full of new experiences and learning opportunities that we hope to expand upon in coming years.

SURF 2019-Post SURF Survey

Name	Giovanna Sabini-Leite
Year of Graduation	2021

SURF Advisor	L.David Smith, Biological Sciences
Advisor Department	Biological Sciences
SURF Field of Study	Environmental Science
Please list co-authors of your abstract	Glenda Perez '21, Emily Hitchcock '19, Jasmine Pacheco-Ramos '19, Yeiny Moreno '20, Giovanna Sabini-Leite '21, Renee Revolorio Keith '21
Title of Abstract/Research	Coral Reef Ed-Ventures Summer 2019

Please type your abstract below.

Summer 2019 was the twentieth year of the Smith College collaboration with Hol Chan Marine Reserve on Ambergris Caye, Belize. The goals of Coral Reef Ed-Ventures are to conduct research on coastal ecosystems and communities and to offer an environmental education and conservation experience for the children of San Pedro Town on Ambergris Caye. The research focused on coral mounds at Mexico Rocks, mangroves propagules located in lagoons near the Grand Belizean Estates development, and interviews assessing the eco-cultural identity of local people who work with the natural environment or who had completed a Coral Reef Ed-Ventures camp in the past. We later incorporated many of these research techniques into our teaching activities in two free camps for the island schoolchildren.

Smith students conducted three research projects with professors David Smith (BIO), Denise Lello (BIO), Allen Curran (GSC), and Shannon Audley (EDC). The first project was part of a long-term survey of the health of coral mounds inside the barrier reef at a site called Mexico Rocks that was recently accorded protection as part of the Hol Chan Marine Reserve. These surveys assess the amount of live coral cover and soft coral abundance and diversity, and track significant changes over time. Previously, several mounds towards the center of Mexico Rocks and several towards the south end had been sampled with quadrat and transect methods using SCUBA, snorkel, and underwater cameras. These were resampled this year and two new mounds from a different area were also surveyed. The second project tracked mangrove survival in the mangrove lagoons in the interior of the island in the vicinity of fill associated with development. Previous research has indicated that several biotic and abiotic factors can impact the persistence of mangrove propagules. Students collected data for each propagule (previously mapped) using underwater images of organisms associated with the propagules and visual assessment of damage and herbivory. For the third project, students interviewed people who live in San Pedro and work in eco-tourism and/or have attended Coral Reef Ed-Ventures camp as a child. The goal was to elicit stories that reveal ecocultural identity. We interviewed dive masters and scuba instructors, staff from Hol Chan Marine Reserve, and some alums from the Coral Reef Ed-Ventures program. The questions probed how the person viewed interconnections between themselves and nature; experiences that changed their perspectives about the natural environment; and their thoughts on the future of the natural environment with a focus on how their relationship with nature and life will be affected.

This year's theme for youth camp was 'My Roots in the Sea'. The Smith students created activities focused on seven topics: eco-cultural identity, mangroves, coral reefs, relationships, challenges/threats to the ecosystem, health of humans and ecosystems, and advocacy. Interactive activities (e.g., a beach clean-up, an edible coral polyp activity) were paired with short lectures and videos. This variety of topics allowed campers to make connections between the ocean ecosystems and inhabitants and land-based human activities, as well as gain more awareness about how they can best protect the ocean.

Older children attended an upper level R.E.E.F (Research in Ecology and the Environment is Fun) Program. This year's theme for the R.E.E.F. program was 'Human Relationships with the Reef, Research, and Advocacy'. Campers were introduced to various research methods, including how to calculate percent live coral cover on coral mounds. They also learned about advocacy and threats to the environment. For example, the campers were presented with information about how macro and micro-plastics affect the entire food chain. Two guests from the community were asked to come in and talk about their particular work in the environment in order to give the kids a firm idea of environmental efforts occurring in their own community. Chris Summers from ACES (American Crocodile Education Sanctuary) taught about the cultural and ecological importance of mangroves and biological aspects of the crocodiles that live in Ambergris Caye. Mariela Archer, the environmental educator from Hol Chan Marine Reserve, spoke about overfishing and the importance of marine protected areas. We took REEF camp participants on a snorkeling trip to Hol Chan and Shark and Ray Alley so that they could observe the marine protected area and the underwater life that they were learning about. With a greater understanding of the local environment and how research is conducted, campers were able to make meaningful connections between coastal ecosystems and their home on Ambergris Caye.

In summary, our research advanced understanding of changes in coral and mangrove habitats and the education program exposed children on the island to specific environmental changes that impact their everyday lives. This summer of Coral Reef Ed-Ventures was full of new experiences and learning opportunities that we hope to expand upon in coming years.