SRS 2019

Annual SUNY New Paltz
Student Research Symposium

Abstract Book

New Paltz
STATE UNIVERSITY OF NEW YORK

25th ANNUAL
SUNY NEW PALTZ
STUDENT RESEARCH SYMPOSIUM

Sponsored by:
The Research, Scholarship, and Creative Activities Program

Friday, May 3, 2019
Sojourner Truth Library
4:00 - 6:30 p.m.

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Editor: Kate McCoy, RSCA Director
Design: Amy Witkus, RSCA Secretary
Cover Photograph: Rami Abouemira ‘16
Cover Design: Kaitlin Hair

The 2019 Student Research Symposium

Once again, as the academic year comes to a close, we have this opportunity for scholarly exchange between our faculty and students. The 2019 Student Research Symposium includes 68 poster presentations of work performed by 110 students representing 16 majors, sponsored by 33 faculty mentors representing 13 departments. This is an occasion for us to share our accomplishments in a spirit of camaraderie.

The Student Research Symposium is sponsored by the Research, Scholarship and Creative Activities (RSCA) Program. The mission of the RSCA program is to encourage and support student-faculty collaboration in the active participation of scholarly and artistic activities that generate new knowledge or works.

Such activities enable students to gain knowledge, skills, and confidence to contribute as productive members of their professions and contribute to a learning environment which is challenging, student-centered and personalized.

Acknowledgments

The following people have provided generous support of this event:
Aram Agajanian (Computer Services) for support of the web-based abstract submissions;
Jeff Baker (Printshop) and the rest of the print shop for guidance with printing options;
Amy Witkus (RSCA Secretary) for abstract book preparation, poster printing and additional support.

The RSCA Advisory Board:

Inge Anema (Communication Disorders), Kara Belinsky (Biology), Kate Bellody (Library), Winiffer Conce (Student Representative), Preeti Dhar (Chemistry), Kate McCoy (RSCA Director/Department of Educational Studies & Leadership), Jun Lin (School of Business), Andrea Noel (Teaching and Learning), Corwin Senko (Psychology), Lydia Bright (Biology)

Minds @ Work

1-3:30pm – Engineering EXPO, Wooster Hall
3-5:30pm – Honors Thesis Presentations, Honors Center
3:30-5pm – Celebration of Writing, Library Lobby
4:00-6:30pm – Student Research Symposium, Library Main Room

On display at the Dorsky Museum, "Mohonk Mountain House at 150" curated by Kerry Dean Carso, with contributions from her Fall 2018 course "Art of the Hudson Valley."

Welcome to the Student Research Symposium

Student research participation is one of several "high-impact" educational practices known to produce especially deep and meaningful learning. These practices require students to devote time and effort to purposeful tasks; make frequent decisions about their work; interact with faculty and sometimes peers about their work; and receive frequent feedback about performance. Such experiences deepen understanding of the substance and methodology of a discipline, and provide opportunities to develop important intellectual capabilities.

Research participation is directly relevant to the education of all students, not just those planning to pursue graduate education. More than 80% of employers responding to recent national surveys value completion of a research project or similar endeavor that demonstrates knowledge in the major, and the ability to solve problems, communicate, and make evidence-based decisions. Recent surveys of college graduates show that those who had worked on a long-term project beyond the classroom were more likely to be engaged in the workplace and thriving in their overall well-being.

Such findings highlight why we value the Research, Scholarship, and Creative Activities (RSCA) program and other New Paltz programs that encourage student research engagement.

Successful undergraduate research programs depend on the dedication, knowledge, and scholarly expertise of faculty. I recognize the commitment of time and effort of those who mentor and advise student research and scholarly projects, and am grateful for these important contributions to the education and future of our students. I also want to take this opportunity to express my deep gratitude to Professor Kate McCoy, campus-wide RSCA coordinator, and the advisory committee for their dedication to managing our funding allocation processes, advising students, organizing events such as this symposium, and many other responsibilities.

I congratulate students and faculty both for your hard work and your success in projects this past year, and wish you continuing success and fulfillment in the future.

Donald Christian
President

As you have learned, there is much to gain from engaging in primary level research into scholarly questions. Such work helps you to further the ability to think carefully about past findings and how they fit into theoretical understandings of the world, identify areas of opportunity in developing understanding, formulate research questions and hypotheses that can be tested, gather data, analyze and interpret results, and assess the strengths and weaknesses of the research project.

The value of this work is not for you alone. You have now become part of the scholarly pursuit in your field of study and have contributed to our knowledge about some phenomenon in the world.

Thank you for being part of this program and supplementing the richness of the learning community at SUNY New Paltz in this way. I know you join me in extending my great appreciation for the support and work of your faculty mentors, the RSCA Advisory Board, and the RSCA director, Dr. Kate McCoy. Without such leadership, this program could not exist.

To actively participate in scholarly research at an undergraduate level, in a manner that goes beyond standard classroom assignments, is truly impressive. Congratulations on both your willingness to take on this work and on completing your projects. We are impressed with the commitments and accomplishments you have made.

We look forward to hearing about the many experiences and successes you have as you take the knowledge, skills, and understandings gleaned in these experiences and others into your future educational, professional, and civic lives.

Lorin Basden Arnold
Provost & Vice President for Academic Affairs

On behalf of the Research, Scholarship, and Creative Activities Program Advisory Board, I would like to welcome you to the 2019 Student Research Symposium. Today's event is the 25th consecutive celebration of student-faculty scholarship at SUNY New Paltz.

Producing scholarship through research and/or creative activities is challenging and exciting for faculty and students. These experiences foster vital skills such as critical thinking, problem-solving, and communication. We are grateful to the faculty who provide these opportunities.

Please know that these types of interactions are a particularly fulfilling part of a college professor's job. Do stay in touch after you have graduated. It brings us all great joy and inspiration to hear of your post-New Paltz adventures and successes. I hope this event brings you fulfillment in presenting the results of your work and inspiration from your fellow students' accomplishments.

Kate McCoy
RSCA Director and Associate Professor of Educational Foundations

Research, Scholarship and Creative Activities Program

Faculty student collaborators may propose projects for support funds through the Summer Undergraduate Research Experience (SURE) and Academic Year Undergraduate Research Experience (AYURE) programs. Both of these programs are competitive and are selected for support by a faculty committee. Students whose work is accepted for presentation at a professional conference are eligible for the RSCA travel awards. Congratulations to all award recipients (see pages 48-53).

SURE

The focus of the SURE program is to encourage intensive student participation in an aspect of faculty research. Each student participant is supported with a stipend for the 8-week summer project and is expected to devote 37.5 hours per week to the project. Faculty mentors direct and provide guidance to participating students as they work on a particular aspect of the faculty's research program. A goal of this program is to encourage ongoing faculty student collaboration, and thus students are encouraged to continue working on the project during subsequent semesters.

ACADEMIC YEAR FUNDS

This program (AYURE) supports student faculty collaborations on projects that span the Disciplines. Projects that generate new knowledge or works are eligible for support. Funds for supplies and support of the research, scholarship or creative activities are provided through this program.

STUDENT CONFERENCE TRAVEL AWARD

The RSCA program supports students to present the results of the collaborative work at professional conferences.

WE ARE ON FACEBOOK

SUNY New Paltz Undergraduate Research, Scholarship and Creative Activities Group
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Poster Sessions At-a-Glance

Poster Session I 4:30-5:10 pm

Complex Rankine Cycle with Supercritical fluid CO2	BENTON, Brian; RABADI, HADI; REHMA, Maritsa
Organic Rankine Cycle	BIANCO, Michael
Image Classification Using Convolutional Neural Network with MNIST Dataset	CHOI, Hyesoo; CHOI, Jinsoo
Multi-Level Thresholding Image Segmentation Implemented with Genetic Algorithm	CHOI, Jinsoo; CHOI, Hyesoo
Investigating Paramecium caudatum Susceptibility to Holospora undulata Infection	CONCE ALBERTO, Winiffer
Transcritical Vapor Compression Refrigeration: R744 and Beyond	GUERRERO, Pedro; CAPRPTTO, Nigel; LORBER, Ian
Soil Infiltrometer Study to Minimize the Impact of Irrigation on Water Quality HEGE, Arianna and to Maximize Water Conservation	HEGE, Arianna
Gender Stereotypes Reinforced throughout Children's T.V. Commercials	HILLARIS, Alexandra
Increased Looking and More Reactive Facial Expressions to Impossible Figures in Infants	KRAUSE, Christina; LONGO, Danielle; SHUWAIRI, SARAH
The Effect of Hand Proximity on Letter Identification	LUKASZEWSKI, Danielle
A pharmacokinetic model of lead absorption and calcium competitive dynamics	LUNDGREN, Steven
Multipurpose Cascade Refrigeration System	LUNDGREN, Steven; MILLER, Kyle; FERRAO, Lester
Quinone-based Pincer Complexes of Iridium	MAHONEY, James
Design of a Compost Powered Greenhouse Heat-Pump	MANDIA, Joe; CERVEN, Sean; Feigel, Bryan
How Perceptions of Racial Diversity on Campus Vary by Race	MARTINO, Alexander
Benefits of E85 on the Otto Cycle	MILCZEWSKI, Eric; TORIGIAN, Zachary; PLECHATY, Kyle

Is semantic categorization affected by hand proximity?	MULLIGAN, Katelynn
Transgenic Expression of GFP and Channelrhodopsin in D. melanogaster NPF Neurons	PEARL, Rebecca; LANGFIELD, Qwynn; PHILIP, Gladis
Constructing a Vibrating Probe for Measuring Minute Electric Fields	PIAQUADIO, Nicholas
Assessment of Mechanical Property Variation of Natural Bast Fibers	ROBLES, Hanami; FEIGEL, Bryan; VAKARCHA, Andrew; FOWLER, Quinn
Active Cooling for Photovoltaic Panels	TAYLOR, Jackie
Solar Panel Cooling Using Refrigeration System	TAYLOR, Jackie; MCCARY, Lina; MAHONEY, Jamie
Reconstruction of the Diet at the Iron Age Site of Cvijina Gradina, Croatia	WOODWORTH, Anna

Poster Session II 5:10-5:50 pm

Hydraulic Dredge Powered By Gas-Turbine Engine	ANGULAS, Chelsea; LEDERER, Michele; PERO, Matthew
Monitoring Avian Productivity and Survivorship in New Paltz, NY (2016-2018)	BARTH-DWYER, Callie
The Adult Play Fulfillment Index (APFI)	CAMBERDELLA, Griffen; MOSS, Alessandra
Energy and Environmental Benefits of a Geothermal Heat Pump	EVANS, Bradley; HARJES, Kevin; MCGALEY, Brendan; STEWART, Emily
Adhesion Forces in Bacterial Predator-Prey and Prey-Prey Systems	FITZMAURICE, Dylan; SAHA, Puja
Monitoring Color Banded Birds across the SUNY New Paltz Campus	GESSNER, Kristyn
Evaluation of Heracleum Maximum Extracts as Acetylcholinesterase Inhibitors	GREENOUGH, Jordan; MARINIELLO, Degen
Topography and Diversity of Tree Communities in Peterskill	HEINEMAN, Ethan
The Geothermal Heat Pump Cycle	HENDERSON, Samuel; KO, Susan; HAGUISAN, Cyra
Controlling Calcite Rhombohedrons in a Polarized Optical Trap	LEVEY, Johanna

PM 2.5 in New York	LICHTENSTEIN, Eric
Typography and Dyslexia: A Review of The Evidence	MACCABEE, Rebecca
Synthesis OF Bromo-Alcohols from Cyclic Ethers	MARINIELLO, Degan; GREENOUGH, Jordan; PEREZ-CABRERA, Erik; MORTAYA, Kevin
Investigating Reliability of Embedded Resistor in IC Chip	MCCARY, Lina
HPLC Detection of Planaria Exposed to BPA	MOODY, Troy; DEPAOLA, Nicole; FLOOD, Brianna
Examining the phase transition between garnet and spinel and assessing its impact on seismic velocities	NOLAN, Sarah
Recurrence and Transience Properties of Markov Chains in Python Simulations	O'RIORDAN, Conor
Tracking genotypic changes in Paramecium isolates between ponds and seasons in Ulster County, NY	RAJPURA, Isma; DOSBOSH, Katherine
Variability in Disinfection By-Product Formation Potential in Two Watersheds during a Storm Event	SAHA, PUJA
Dwarf Pitch Pine Survival and Plant Community Response to Wildfire at Sam's Point Preserve, NY	SCHIAFO, Rory
Assessment of Current Stop Signs in the New Paltz Village	TOTH, Jason
Tracking infection susceptibility in Paramecium hosts to Holospora bacteria from early to late infection	WEILER, Jared; CONCE-ALBERTO, Winiffer; LEE, Nicole

Poster Session III 5:50-6:30 pm

Quinoid Pincer Ligands	ARRINGTON, Ashleigh; MAHONEY, James; THACKERAY, Sachin
Rankine Heater	EISGRUBER, Rachel; MURPHY, John; BITMAN, Jacob
T Cell Signaling in Response to Atrazine	FISHER, Ashley

Four stroke Lawn mower engine	FRENCH, Brendan; LOPES, Chris; MORETTI, Richard
Analysis of Lanolin Samples	GESSNER, Kristyn
Differences in Reactions to Infidelity Based on Sex and Sexuality	GOLDSTEIN, Alec; PLANKE, Julie
Chemical Composition Analysis of Sediment from Long Pond	GOLEMBESKI, Paige
Towards the Use of Enantioselective Molecular Recognition by Synthetic Macrocycles	IBANEZ, Anthony; MADDUX, Melissa
Investigation of the Development of Holospora undulata Infection in Paramecium caudatum	LEE, Nicole; CONCE-ALBERTO, Winiffer
Quantifying BPA Absorption in Planaria	MAGRO, Asa; KIENZLE, Scott; MOODY, Troy
Acid precipitation in the Shawangunk Ridge: Publishing metadata on the Environmental Data Initiative database and analyzing precipitation trends	MORGAN, Vanessa
An Analysis of Fetal Remains from a New York Privy	MURPHY, Shayna
Repurposing the Heat Waste Produced by a Refrigerator	PEARL, Seth; WONG, Michelle; SHANNON, Bryce
Investigating the Antimicrobial Properties of Mahamarichyadi Oil	PEREZ, Erik; MORTAYA, Kevin; MARINIELLO, Degen; DUELL, Colin
Examining Gender Salience in Preschoolers Through a Category Formation Task	PLANKE, Julie
Dark Parenting: Parents Who Score as High in the Dark Triad Demonstrate Non-Authoritative Parenting Styles	PLANKE, Julie; DURSO, Genevieve; DISANTO, Jacqueline; GOLDSTEIN, Alex; AKHMADI, Ferdaus; GRIFFIN, Mariah; PRIMAVERA, Nicholas; RAUSCH, Zachary; RODRIGUEZ, Kanjira; THOMPSON, Graham; WEINTRAUB; Jeremy

Hot Stuff! The Evolutionary Psychology Behind the Attractiveness of Volunteer Firefighters	PRIMAVERA, Nicholas
Clogged Ears and Loud Mouths: A Review of The Ape That Understood The Universe	RAUSCH, Zachary; RODRIGUEZ, Kanjira; WEINTRAUB, Jeremy
Optimization of Caffeine Metabolism SNP rs762551	REYNOLDS, Hailey
Word retrieval in a bilingual speaker as measured by English and Russian language tests	SCHROEDER, Alina
Potential Wind Farm Locations in New York	THURSTON, Lindsey
Complex cell geometry when estimating glutamate transporter density in astrocytes	WILLIAMS, Cassandra
Universality of the configuration-dynamics relationship in nonlinear networks	EVANS, Simone

Abstracts

Multipurpose Cascade Refrigeration System

Steven Lundgren (Mechanical Engineering), Kyle Miller (Mechanical Engineering), Lester Ferrao (Mechanical Engineering)
Faculty Mentor: Rachmadian Wulandana (Mechanical Engineering)

The objective is to design a Multipurpose Refrigeration System with a Single Compressor that will cool vaccines in both a refrigerator and freezer in a hospital. The refrigerator will be used to keep vaccines at the target temperature of 5°C and the freezer will be used to keep the vaccines at -45°C. The target of the system will be to cool the vaccines, and well as reduce load of the hospital's boiler as much as possible with the condenser heat out in order to save the hospital money. Studies were conducted with R-717, R-410a, R-407c, R-32, R-22, and R-12 to determine the best working fluid for the system. R-717 was found to be the only working fluid to save the hospital more money on heating than it would cost to run the cooling system.

An Analysis of Fetal Remains from a New York Privy

Shayna Murphy (Anthropology/History)
Faculty Mentor: Kenneth Nystrom (Anthropology)

The remains of a thirty-six week old fetus were uncovered during the excavation of a privy on the Sargent Street site located in Cohoes, New York. Discovered in a 19th century town inhabited with textiles mill workers and their families, the skeleton was fragmentary and consisted of only four long bones. The context of these remains are unique and represents one of only three such cases in the United States, giving rise to inquiries of the circumstances that could have surrounded this abnormal burial. The recovery of these remains provides opportunity to explore 19th century attitudes towards this period of life. This archaeological context is thought to be a concealment of a fetus that resulted from illicit behavior or a burial of a miscarriage/premature birth, though possible explanations also include abortion and infanticide. Through previously published data on such themes, we will explore the different ideas of how children were valued at this point in history and analyze different explanations for the placement of these remains.

Reconstruction of the Diet at the Iron Age Site of Cvijina Gradina, Croatia

Anna Woodworth (Anthropology)
Faculty Mentor: Kenneth Nystrom (Anthropology)

Cvijina Gradina, located along the Zrmanja River in present day Croatia, was once one of the largest Liburnian settlements during the Iron Age period (6th – 1st century BC). The settlement was prominent in the region's economic and sociopolitical sphere, leaving behind significant bioarchaeological evidence of diet to be researched. Based on the fragmentary skeletal material excavated at eight grave sites, the MNI is determined to be 41. This study reconstructs the diet of the Iron Age site of Cvijina Gradina through interpretations of stable carbon and nitrogen isotopic ratios. Previous research into the diet of Iron Age settlements at nearby sites suggested that Croatian Iron Age diet was composed predominantly of C3 plants and generally low δN15 values. Researchers theorize this diet was primarily herbivorous, with little contribution from marine food sources. This research contributes to our understanding of regional variability in Iron Age diets. It also establishes a baseline for considering how Romanization during the onset of the first millennium impacted the region.

Monitoring Color Banded Birds across the SUNY New Paltz Campus

Kristyn Gessner (Biology)
Faculty Mentor: Kara Belinsky (Biology)

As humans' urban and suburban areas expand and natural landscapes diminish, native bird species progressively must adapt their behaviors to better suit the environmental conditions they face. In order to better understand the movement and habitat preferences of native bird species on the suburban SUNY New Paltz campus, we studied three native species: House Finches, American Goldfinches, and Black-Capped Chickadees. Over the Summers of 2017 and 2018, we color banded two hundred birds with a unique combination of three colors to signify banding location and gender. We then monitored their use of the campus feeder network throughout Spring, Summer, and Fall of 2018 using Wingscapes video cameras. Although the sighting and identification of individual birds was relatively low, r it was clear that the resights were higher in the season that the birds were banded than the following seasons, especially for the two finch species, which are known to move regionally. Chickadees had the highest resight rate because they tend to stay in the same areas year-round, they also have a tendency to visit feeders in groups, regardless of feeder location. In the future, we intend to use radio-frequency identification chips to better monitor the movement and return of individual Downy Woodpeckers,a larger, sedentary species that can carry RFID chips more easily.

Monitoring Avian Productivity and Survivorship in New Paltz, NY (2016-2018)

Callie Barth-Dwyer (Biology)
Faculty Mentor: Kara Belinsky (Biology)

Birds can be a great indicator of ecological health as they are easy to observe and sensitive to environmental change. Students at SUNY New Paltz have been using birds to compare the health of two different forest fragments in New Paltz, New York using the Monitoring Avian Productivity and Survivorship (MAPS) protocol. MAPS is a continent-wide, collaborative bird-banding effort with the goal of assisting in conservation of bird species and their habitats. MAPS data has been collected during the summers from 2016 to 2018 at two locations; one in the SUNY New Paltz campus forest, and the other in Mohonk Preserve. By collecting this data throughout the years, our goal is to observe and compare any differences between the smaller SUNY New Paltz forest fragment in a semi-urban landscape and the larger Mohonk Preserve forest surrounded by undeveloped preserve land. To do so, we have captured and released birds using mist nets and the MAPS protocol. Throughout the last three years, we have observed a higher diversity of bird species and long distance migrants in Mohonk Preserve than SUNY New Paltz, however the survivorship between the two is opposite - overall greater numbers of juveniles and recaptured birds have been caught and banded at the SUNY New Paltz forest. This data may indicate that while Mohonk Preserve seems to be more ideal for long distance migrants, the SUNY New Paltz campus forest may have better survivorship and productivity rates.

Investigating Paramecium caudatum Susceptibility to Holospora undulata Infection

Winiffer Conce Alberto (Biology)
Faculty Mentor: Lydia Bright (Biology)

Paramecium caudatum is a single-celled ciliate that has been shown to be susceptible to infection by the parasitic bacterium *Holospora undulata*. *Holospora* infects *Paramecium* by entering the cell via the oral apparatus and translocating to the micronucleus where it takes either its reproductive or its infectious form depending on resources available within the *Paramecium* cell. Previous work has shown that different *Paramecium* strains have varying susceptibility to *Holospora* but the factors that determine these differences are yet unknown. In order to determine the genes that factor into the infectious process, we would like to determine which *Paramecium caudatum* strains isolated from around the world and representing three syngens, and whose genomes are sequenced, are more susceptible to infection than others. We have developed a protocol to effectively infect naive strains of *Paramecium caudatum* and to track infection phenotypes over a week time course. We have successfully been testing the susceptibility or resistance of the respective strains and will continue to do so to then combine the infection phenotypes of these strains with comparative genomics and studies focusing on gene expression during the different infection stages. This will help us to determine the cellular factors that contribute to the symbiosis, and then to track how they have evolved to produce resistance or susceptibility.

Tracking Infection Susceptibility in Paramecium Hosts to Holospora Bacteria from Early to Late Infection

Jared Weiler (Biochemistry & Biology), Winiffer Conce Alberto (Biology), Nicole Lee (Biology)
Faculty Mentor: Lydia Bright (Biology)

Paramecium caudatum is a single-celled ciliate that sweeps food into its oral groove to acquire nutrients. The cells become infected through this feeding apparatus by *Holospora undulata*, an endosymbiont that occupies the micronucleus of the *Paramecium* in two morphologically distinct forms, the infectious and reproductive form. Once the *Paramecium* cells begin to starve, and the reproductive forms consume most of the food in the micronuclei, the bacteria differentiate into infectious forms and break out of the cell to seek other hosts to infect. In order to better understand how the infectious process unfolds, we have been tracking the general susceptibility of naïve *Paramecia* to the *Holospora* infection. We have found that some strains are more susceptible than others to the bacterium; however, the mechanism by which the loss of infection occurs has not been characterized. By infecting naïve strains, tracking each infection hourly and isolating the mRNA at these times, we will hopefully be able to determine the proteins that are linked to the infection. Eventually, after identifying the proteins activated at different stages, we plan to do gene knockdowns to determine which genes lead to resistance.

Investigation of the Development of Holospora undulata Infection in Paramecium caudatum

Nicole Lee (Biology), Winiffer Conce Alberto (Biology)
Faculty Mentor: Lydia Bright (Biology)

Paramecium caudatum is a multi-nuclear, single-celled ciliate that is susceptible to micronuclear infection by parasitic symbionts. The micronuclei are infected by *Holospora undulata*, a gram-negative bacterium that is engulfed by the *Paramecium* cell through the oral apparatus during the normal course of feeding. *Holospora* then breaks out of the acidified food vacuoles and utilizes host actin to move across the cell to gain entry to the micronucleus. *Holospora* have two developmental forms during their life cycle, reproductive and infectious, depending on the degree of starvation stress the host cell is experiencing. Previous studies have uncovered differential susceptibilities to *Holospora* infection across different strains of Paramecium. We are infecting six strains of *Paramecium* from two closely related species and tracking *Holospora* infection phenotypes in each strain over time. We are using immobilization, fixation, and staining techniques to determine the time course for infection development for each susceptible strain. Research has shown that it takes approximately 10 minutes for *Holospora* to gain entry into the cell, 30 minutes to begin hijacking actin mechanisms, and 24 hours to reach the micronucleus for a highly susceptible strain. We are currently imaging the six strains at these early infection timepoints to evaluate whether their infection responses align with those of other highly susceptible strains of *Paramecium*.

Tracking Genotypic Changes in Paramecium Isolates between Ponds and Seasons in Ulster County, NY, USA

Katherine Dobosh (Biology)
Faculty Mentor: Lydia Bright (Biology)

The numerous species of *Paramecia* can vary morphologically, functionally, and genetically. Previous biogeographical studies of *Paramecium* suggest that the cells follow the 'everything is everywhere' hypothesis and that local ecology determines the particular strains found in any given location. However, there has not been much research done on strain and species changes from season to season over short geographical distances as well as if or how *Paramecia* overwinter under ice. Over seven consecutive seasons, we have sampled five local ponds for *Paramecium* cells. We isolated single cells, created lines of culture and allowed them to grow to high density from each collected sample. We then extracted DNA, amplified specific genes by polymerase chain reaction (PCR), and sequenced them by Sanger sequencing. To determine the species, we compared the new sequences to sequences of known *Paramecium* species. We found species diversity within ponds as well as between ponds, and shared genotypes between the ponds, indicating that there has been recent migration between them. There are also preliminary indications that the abundance of certain species changes from summer to fall, hinting at possible adaptive differences between the species. Out of five ponds sampled in the winter, we were able to isolate *Paramecia* from one pond, suggesting that *Paramecia* may overwinter in this region. We are currently analyzing the specific haplotypes of the different species and further sampling to more clearly determine the patterns of strain and species changes over different seasons.

Transgenic Expression of GFP and Channelrhodopsin in D. melanogaster NPF Neurons

Rebecca Pearl (Biology), Qwynn Langfield (Biology), Gladis Philip (Biology)
Faculty Mentor: Aaron T. Haselton (Biology)

Optogenetics is a widely used scientific tool that allows for the manipulation and exploration of neurological activity of Drosophila melanogaster. Spatiotemporal activation of specific neural circuits can subsequently be used to describe phenotypic behaviours such as aggression. Over the course of this research, we used the yeast bipartite UAS-GAL4 expression system to create a transgenic line that expressed jellyfish green fluorescent protein (GFP) in neuropeptide-F (NPF) secreting neurons and conducted immunohistochemistry and fluorescence microscopy to confirm targeted expression. In utilizing optogenetics, we are beginning to create another transgenic line expressing algal channelrhodopsin protein to specifically activate NPF cells with light. Behavioral bioassays will then be performed to corroborate light inducible transgenic expression of channelrhodopsin. Behavioral changes can then be studied in the future to investigate the inherent endocrinological mechanisms within transgenic populations of D. melanogaster and understand the neural circuits that dictate such physiological behavior.

Acid Precipitation in the Shawangunk Ridge: Publishing Metadata on the Environmental Data Initiative Database and Analyzing Precipitation Trends

Vanessa Morgan (Biology), Natalie Feldsine (The Mohonk Preserve), Elizabeth Long (The Mohonk Preserve), Megan Napoli (The Mohonk Preserve)
Faculty Mentor: David Richardson (Biology)

Background/Question/Methods: The Mohonk Preserve sits on the Shawangunk Ridge, New York State; the local aquatic and terrestrial ecosystems have been managed and preserved for over 40 years. However, the Shawangunk Ridge ecosystem is not isolated from anthropogenic effects. For example, given the location of the Ridge downwind of fossil fuel emissions, acid precipitation has been a problem for both aquatic and terrestrial ecosystems over the past 50 years. The Smiley family has owned and operated the Mohonk Mountain House, a hotel on the Shawangunk Ridge. The Smiley family started a legacy of natural history and observation which has resulted in one of the oldest and most comprehensive phenological records combined with more than a century of daily weather data and observations of acid precipitation and aquatic ecosystems. Our first objective is to demonstrate the possibility for data curation and publication through the Environmental Data Initiative, an NSF-funded project accelerating curation and archive of environmental data. Our second objective is to examine trends in acid precipitation over the past 40 years on the Shawangunk Ridge. Results/Conclusions: The Environmental Data Initiative is committed to enable FAIR data with “FAIR” defined as Findable, Accessible, Interoperable, and Reusable in the Guiding Principles of the Global Open FAIR Initiative. EDI operates a secure data repository and promotes data management best practices and stewardship. With their assistance, we published our long-term dataset by quality checking the data and ensuring the data presentation was conducive to analyses. We built metadata through the EML Assembly Line R code package that constructs an ecological metadata language (EML). The EML Assembly Line was used to publish the Mohonk Preserve’s acid precipitation data, making it accessible to the public. Prior to Dec 1991, the precipitation was acidic with a median pH of 4.0. From Dec 1991 to Dec 2015, the median pH was 4.6 ± 0.4 (± quartiles). Over that time, there was an increase in precipitation pH with an increasing slope of 0.56 ± 0.005 pH units decade-1 ± SE. Across this region and around the world, the rate of recovery from acid precipitation can affect the return of acid-sensitive freshwater and terrestrial ecological communities. Publishing publically accessible datasets will facilitate regional and global understanding of ecological issues.

T Cell Signaling in Response to Atrazine

Ashley Fisher (Biology)
Faculty Mentor: Maureen Morrow (Biology)

Little is known about the effect of atrazine (ATR) on T cells, an important component of the immune system. Although ATR is an herbicide that is widely used in the U.S., reports of its detrimental effect on the endocrine and reproductive systems call its safety into question. A few reports have demonstrated that T cell activation is inhibited by ATR, in contrast, we have found that T cells are activated by ATR. In other studies, when Jurkat T cells are activated with Phytohaemagglutinin P (PHA), cell clumping and increased F-actin reorganization is seen. Our work has demonstrated that ATR, at concentrations lower than published papers also induces cell clumping and increases actin production. T cell activation is mediated by signaling pathways. To understand which pathways are activated by ATR, Jurkat cells are treated with ATR in the presence of known signaling pathway inhibitors and cell clumping is quantified to determine the amount of activation. Initial results indicate that ATR depends on JNK and mTOR for cell activation. The structural differences between ATR and PHA lead us to hypothesize that atrazine acts through different T cell activation pathways than PHA, which will be tested through Western Blotting.

Tracking Genotypic Changes in Paramecium Isolates between Ponds and Seasons in Ulster County, NY

Isma Rajpura (Biology), Katherine Dobosh (Biology)
Faculty Mentor: Lydia Bright (Biology)

There are many species of Paramecium, which evolved many millions of years ago, and, many of which can be found in ponds right in our local regions. Past studies on the distribution of Paramecia support the "everything is everywhere" hypothesis, meaning that the presence of a certain Paramecium haplotype in a given area can be attributed to that environment's specific characteristics. We studied the distribution of different Paramecium haplotypes in the ponds of the surrounding region by collecting samples from these ponds and growing single cell lines from them. Then we extracted their DNA through Chelex preparations, and then chose specific conserved genes to amplify through polymerase chain reaction (PCR). The amplified genes were then sent to be sequenced. The sequences were then taken and compared to known sequences of Paramecium haplotypes. We found that there is indeed diversity between the ponds and within the ponds from season to season. From this point, we have taken an interest in the global distribution of Paramecia, and thus plan to obtain pond samples from labs overseas to determine how Paramecia have distributed themselves globally.

Optimization of Caffeine Metabolism SNP rs762551

Hailey Reynolds (Biology)
Faculty Mentor: Jeffrey Reinking (Biology)

Human genotyping has become a popular practice used in the field of biology to learn and study the human genome. Biological assays used for genotyping are specifically useful when trying to study Single Nucleotide Polymorphisms (SNP's). Previously, research has been done to suggest a SNP, rs762551 (CYP1A2*1F -163C>A), was connected to the rate of caffeine metabolism in humans, with the A allele having higher rate than the C allele. Previously developed PCR-RFLP based assays correctly identify SNPs, but their interpretation is complicated by non-specific amplification. Here, we present our attempts to reduce the non-specific bands, making the results easier to be interpreted by non-experts in pedagogical settings.

Evaluation of Heracleum Maximum Extracts as Acetylcholinesterase Inhibitors

Jordan Greenough (Chemistry), Degen Mariniello (Chemistry)
Faculty Mentor: Preeti Dhar (Chemistry)

Heracleum maximum (HM), commonly known as cow parsnip, is a plant native to North America. Historically, it has been used for medicinal purposes by indigenous peoples to treat a plethora of ailments including topical application to sores and bruises and upset stomach. HM is rich in furanocoumarins, a class of compounds well known for having a myriad of biochemical properties. These properties include stimulation of melanogenesis, inhibition of cytochrome P450 enzymes, toxicity and phototoxicity. The purpose of this study was to extract the seeds of HM with different solvents and evaluate these extracts for inhibition of acetylcholinesterase, since this enzyme has been linked to the progression of diseases like Alzheimer's and cancer. The cholinesterase activity in these extracts was evaluated using Ellman's assay which is the most commonly used method to examine the cholinesterase activity. Results of this study will be presented.

Synthesis of Bromo-Alcohols from Cyclic Ethers

Degen Mariniello (Chemistry), Jordan Greenough (Chemistry), Erik Perez-Cabrera (Chemistry)
Faculty Mentors: Kevin Mortaya (Chemistry) & Preeti Dhar (Chemistry)

Bromo-alcohols find use as starting materials in organic synthesis. Unfortunately, these compounds are frequently unavailable from chemical manufacturers or are cost prohibitive due to limited stability and shelf life. Prior findings in our lab have shown that cyclic ethers can be opened to corresponding iodo-alcohols using sodium borohydride and iodine. We have extended the methodology to include the synthesis of bromo-alcohols using bromine instead of iodine due to the fact that bromo-alcohols are more stable than their iodo counterparts. Some of the ethers used were tetrahydrofuran, 2-methyl tetrahydrofuran, and tetrahydropyran. They successfully produced 4-bromo-1-butanol, 5-bromo-2-pentanol, and 5-bromo-1-pentanol respectively as the major products. The opening of asymmetric 2-methyltetrahydrofuran was regioselective, giving the major product with bromine at the less substituted carbon and the minor product with bromine at the more substituted carbon.

Investigating the Antimicrobial Properties of Mahamarichyadi Oil

Erik Perez (Biochemistry), Kevin Morataya (Biochemistry), Degen Mariniello (Chemistry), Colin Duell (Chemistry)
Faculty Mentors: Preeti Dhar (Chemistry) & Hon Ho (Biology)

The oil, Mahamarichyadi Tel, is used in India as a topical remedy for many skin diseases, such as inflammation, eczema, and leprosy. The oil is also claimed to have strong antifungal properties and is used to cure ringworm infections. Extensive qualitative research on each of the oil's components has shown that several of these are fungicidal, but no studies on the oil itself were found. Mahamarichyadi Tel, was evaluated for its antifungal potential against plant pathogenic fungi (e.g. *Rhizopus stolonifer, Fussarium oxysporum, Penicillium expansum, Botryosphaera obtuse, Monilinia fruticola, Phytophthora capsici, and Botrytis cinerea*) and one human-pathogenic fungus (*Candida albicans*) using the disc diffusion bioassay. The oil was also evaluated for its antibacterial potential against several strains of human-pathogenic bacteria (e.g. *Bacillus subtilis, Escherichia coli, Staphylococcus epidermidis, and Geotrichum candidum*) using disc diffusion bioassay and the broth dilution method. The bioassays did not show the oil to have antimicrobial activity against any of the microorganisms evaluated, suggesting that the oil is probably not antimicrobial against the microbes chosen. All microorganisms used in the experiment, with the exception of *Bacillus subtilis*, showed more growth in the presence of the oil indicating that the microbes might be using it as a carbon source.

Adhesion Forces in Bacterial Predator-Prey and Prey-Prey Systems

Dylan Fitzmaurice (Biochemistry/Chemistry), Puja Saha (EGS/Chemistry)
Faculty Mentor: Megan Ferguson (Chemistry)

Bdellovibrio bacteriovorus is a Gram-negative bacterium that preys on most other Gram-negative bacteria. Our goal was to use atomic force microscopy (AFM) force curves to explore how the adhesion forces between B. bacteriovorus and their prey differ from typical cell-cell interactions and see if these adhesion forces can be impacted by external compounds. When B. bacteriovorus interacts with a prey cell, there are specific predator-prey attractions. Slides and tipless AFM cantilevers were coated with E. coli or B. bacteriovorus cells. We then used AFM to collect forces curves with E.coli-coated cantilevers on glass, E.coli-coated glass, and B. bacteriovorus-coated glass. While E. coli-E. coli interactions are stronger than E. coli-B. bacteriovorus interactions after 1 s contact time, adhesion force significantly increased after 5 and 8 min contact time. Treatment of cell-coated surfaces with a mannose analog, which blocks Type I pili and has been previously shown to reduce adhesion for this type of E. coli, resulted in smaller prey-prey interactions, but the large predator-prey adhesion was maintained. In contrast, cranberry juice, which is reported to block various types of pili beyond Type I pili, had an immediate and clear negative effect on adhesion.

Chemical Composition Analysis of Sediment from Long Pond

Paige Golembeski (Environmental Geochemical Science)
Faculty Mentor: Megan Ferguson (Chemistry)

Long Pond, located in northeastern New York in the Willsboro Quadrangle, underwent a drastic transition from a large drainage basin, with access to the ocean, to a small isolated basin approximately 10,901 ± 76 years before present (based on 14C analysis). In this study, a sediment core from Long Pond was analyzed for Mg, Ca, and Fe using FAAS and ICP-AES; additional elements were analyzed with the latter instrument. Both instruments yield very similar core profiles. Through these analyses, the geological transition can be observed in the chemical compositions. The average transition depth was 670.4cm. The concentrations of Ca and Mg were higher before the transition, while Fe concentrations increased after the transition from the large basin to the small, isolated basin. The change from glaciolacustrine clay to silty sand layers is also visible in the core. These shifts reveal the approximate depth of the transition in the sediment core and can be utilized to get the geological age of the small basin.

Analysis of Lanolin Samples

Kristyn Gessner (Chemistry)
Faculty Mentor: Frantz Folmer-Andersen (Chemistry)

Lanolin, or “wool wax” is the secretion of the sebaceous glands of sheep, which is deposited onto wool fibers, where it softens the fleece and protects against the elements. It has been long used as a moisturizer and cosmetic ingredient. Chemically, lanolin is reported to be comprised of thousands of different esters formed from the combination of smaller sets of alcohols and carboxylic acids. The major carboxylic acid components of lanolin are fatty acids ranging from ca. 8–36 C atoms, with methyl and hydroxyl groups residing at various positions along the chain of some components. The alcohol fraction of lanolin is primary comprised of sterols (mostly cholesterol and lanosterol), along with smaller amounts long-chain aliphatic alcohols. Additionally, trace quantities of ketosterols have been reported, although there is some controversy as to whether these compounds are actually produced by the sheep, or as products of autooxidation on the fleece after secretion. We have performed IR and NMR analyses of three commercial lanolin samples: a crude sample, a mid-grade, and a highly refined cosmetic-grade sample and have found evidence of ketosterols in all but the cosmetic-grade sample. We are currently investigated saponification protocols to enable the analysis of carboxylic acid and alcohol fractions.

Towards the Use of Enantioselective Molecular Recognition by Synthetic Macrocycles

Anthony Ibanez (Chemistry), Melissa Maddux (Chemistry)
Faculty Mentor: Frantz Folmer-Andersen (Chemistry)

Our laboratory has a longstanding interest in the development of synthetic receptor molecules that can differentially bind enantiomeric substrates. In order to better investigate this function, we have initiated efforts to use chiral stationary phase high-performance liquid chromatography (CSP-HPLC) for the measurement of enantiomeric ratios of chemical samples. So far, we have employed a variety of chiral stationary phases including a leucine-Pirkle column, which uses a 2,5-dinitrobenzoyl leucine chiral modifier and which we operate under "normal" phase (ethyl acetate/hexanes as eluents), a ligand-exchange column, which uses a non-covalently bound penicillamine selector under "reverse" phase (aqueous CuSO4/alcohols as eluents), and a modified cellulose column. We have successfully separated the enantiomers of several compounds, and plan to apply the technique to explore the efficacy of our receptor molecules as enantioselective liquid-liquid extraction agents. Additionally, we have investigated a potentially enantioselective Henry reaction which may be catalyzed by some of our receptor molecules, and have made progress on the synthesis of some new receptor molecules receptor.

HPLC Detection of Planaria Exposed to BPA

Troy Moody (Biochemistry), Nicole DePaola (Biochemistry), Brianna Flood (Biochemistry)
Faculty Mentors: Pamela St. John (Chemistry) & Spencer Mass (Biology)

Bisphenol A (BPA) is a xeno-estrogen and exposure to humans is virtually unavoidable due to its presence in common industrial and household products including plastics, pharmaceuticals, cleaning items, and cosmetic/health products. Previously, we have studied the detrimental effects of BPA exposure on planaria and found that it hinders cellular regeneration. Prior experiments to detect BPA using HPLC (high performance liquid chromatography) showed that amino acids tryptophan, tyrosine, and phenylalanine co-elute with the compound and fluoresce in the same region of the UV spectrum and thus may interfere with BPA signal detection. Current methods involve incubating planaria in media containing either BPA or deuterated BPA (d8-BPA) followed by extraction of the compound from planaria tissue using a 50:50 chloroform:methanol solution. HPLC with fluorescence detection was used to estimate the concentration of BPA and d8-BPA present in the extract. We expect to distinguish absorbed d8-BPA via experimental exposure versus BPA retained via supply chain contamination using gas chromatography/mass spectroscopy. Our ultimate goal is to correlate BPA concentration in planaria tissue with BPA exposure time. We will further investigate methods of efficiently extracting BPA from planaria tissue and will be using d8-BPA in more experiments to avoid signal disruptions.

Quantifying BPA Absorption in Planaria

Asa Magro (Chemistry), Scott Kienzle (Chemistry & Physics), Troy Moody (Biochemistry)
Faculty Mentors: Pamela St. John (Chemistry) & Spencer Mass (Biology)

Bisphenol-A (BPA) is an organic compound that has been recognized as a probable endocrine disruptor, and is found in certain plastics, epoxies, and various other products. BPA binds to estrogen receptors and can therefore disrupt the careful balance of hormones in humans. Planaria, a type of flatworm, were used to study BPA's effects on the worm's regeneration cycle. GC/MS was used to estimate the amount of BPA absorbed by planaria after several days of incubation in solutions containing micromolar concentrations of the compound. Following extraction of BPA from planaria, the samples were derivatized using N,O-Bis(trimethylsilyl)-trifluoroacetamide (BSTFA) which replaced active hydrogens in hydroxyl groups with trimethylsilyl groups. This yielded a more volatile, and therefore more GC/MS-suitable form of the compound which improved gas chromatography retention and improved peak shapes. A known concentration of 2-phenylphenol was used as an internal standard in each solution to quantify the amount of BPA in each sample. Samples extracted from the planaria that had incubated in BPA solutions were found to contain notably higher levels of the endocrine-disrupting compound compared to control samples. Using mass spectrometry, deuterated BPA allowed us to distinguish between BPA from the solution and BPA from the environment.

Quinone-Based Pincer Complexes of Iridium

James Mahoney (Chemistry)
Faculty Mentor: Miles Wilklow-Marnell (Chemistry)

Iridium pincer complexes can be used for the catalytic dehydrogenation of alkanes. However, efficient catalysis requires the use of a sacrificial hydrogen acceptor. Para-benzoquinones can be hydrogenated easily and the hydroquinone formed as a result can be dehydrogenated through electrochemical means in a catalytic redox cycle. We've decided to incorporate quinone moieties into pincer ligand frameworks, to possibly create iridium complexes with metal-ligand cooperativity which voids the need for a hydrogen acceptor. The expectation with the quinone moieties is for them to accept hydrogen from iridium and dehydrogenate the substrate followed by the electrochemical oxidation of quinone to return the catalyst to its original state. We are making a series of ligands to examine and compare their effects on the reactivity of the metal complexes. Furthermore, the effects of electronic and steric modifications will be investigated by employing either carbon or oxygen atoms in the sidearm portion of the pincer ligand as well as using naphthoquinone and anthraquinone scaffolds in the backbone of the iridium pincer complexes. The synthesis, characterization, and reactivity of the complexes will be discussed. The initial substrates of study will include primary and secondary alcohols as well as simple alkanes.

Quinoid Pincer Ligands

Ashleigh Arrington (Chemistry), James Mahoney (Chemistry), Sachin Thackeray (Chemistry)
Faculty Mentor: Miles Wilklow-Marnell (Chemistry)

Pincer-based iridium complexes are used as catalysts in dehydrogenation reactions of alkanes in conjunction with olefinic hydrogen acceptors. However, current applications are limited by the relatively high cost of these hydrogen acceptors compared to the alkenes produced via this reaction, and relatively large amount of waste produced. Due to the redox chemistry of quinones, a quinoid-based pincer-ligand may act as a hydrogen acceptor for the the reaction. In theory, the quinoid region of the ligand will accept the hydrogen from the iridium center and expel it in the form of hydrogen gas at the cathode of an electrochemical cell, or hydrogen peroxide in the presence of oxygen. This method may reduce costs of production of alkenes by replacing the costly starting materials involved. In this interest, a series of quinoid-based pincer ligands are being synthesized with anthraquinone and naphthaquinone backbones. These will be used to form complexes with iridium and their characterization/reactivity will be discussed.

Typography and Dyslexia: A Review of the Evidence

Rebecca Maccabee (Communication Disorders)
Faculty Mentor: Dana Arthur (Communication Disorders)

Dyslexia is one of the most common learning disabilities, affecting about 15-20% of the world's population (IDA, 2007). It affects one's phonological awareness and is characterized by various reading difficulties, such as trouble with word recognition, poor spelling, and decoding difficulties. Dyslexia is a lifelong disability, and there is currently no cure other than early intervention, which only helps to manage the symptoms (IDA, 2007). In 2008, Christian Boer, a graphic designer from the Netherlands, created the "dyslexie" font, a font specifically designed for people with dyslexia. This and various other efforts to lessen the impact of dyslexia by using typography, have received much attention from the media. The media states that these fonts and other aspects of typography can be beneficial for individuals with dyslexia, but these statements are not based on reliable research evidence (Shallow, 2014). We conducted a narrative review of research articles, to determine if typography has an impact on the reading ability of people with dyslexia. In order to be included in the review the articles had to be peer reviewed, about an alphabetic language, and about fonts or aspects of typography and their relationship with dyslexia. Sixteen articles were included in the study (eight were about english speakers, and eight were about speakers of alphabetic languages other than english). The articles were reviewed and separated into categories based on its topic and the findings.

Word Retrieval in a Bilingual Speaker as Measured by English and Russian Language Tests

Alina Schroeder (Communication Disorders and French)
Faculty Mentor: Inge Anema (Communication Disorders)

Word retrieval difficulties are a common deficit for persons who suffered a stroke and acquired aphasia (i.e. language disorder). Bilingual speakers who are aphasic may also have word retrieval difficulties, however, what type of difficulties in what language cannot be predicted. In addition, when bilingual persons with aphasia receive language therapy, the effects of therapy language on the languages of bilingual persons with aphasia can produce different results. Several research studies have reported clear cross-language generalization, whereas others have reported limited or non-existent change in the untreated language. Factors that appear to play a role in cross-language generalization are language-proficiency and linguistic distance (i.e., how far the languages are different measured by a variety of linguistic features, such as morphology, or phonology). The purpose of this study is to investigate word retrieval in an English-Russian bilingual person with aphasia with mild to moderate word finding difficulties in both languages. The participant has had very few opportunities to speak Russian since she was a young adult, however, she has an extensive expressive vocabulary in Russian. The participant is receiving traditional language therapy in English in the town where she resides. Measurements were taken before and will be taken after 2.5 months of therapy. Based on the research investigating word retrieval in bilingual speakers, we hypothesize that the participant will demonstrate increased word finding in both languages based on supralinguistic skills which are more developed in bilingual speakers.

Image Classification Using Convolutional Neural Network with MNIST Dataset

Hyesoo (Heh-Soo) Choi (Computer Science), Jinsoo Choi (Computer Science)
Faculty Mentor: Min Chen (Computer Science)

This paper presents the experiment and the implementation of the image classification in the area of machine learning artificial intelligence using artificial convolutional neural networks algorithm. Image classification is a simple concept but is complex to achieve for a machine because of its limitations of recognition of an object. Using a convolutional neural network algorithm, which is a more advanced method based on the simple neural network algorithm, a machine can learn and struct the way of recognizing each object in the complex image. This research used MNIST handwritten digit dataset as the input data to show how the machine accurately classify the digits from 0 to 9 out of various handwritten digits. In order to build the convolutional neural networks, Keras library and Tensorflow backend that were supported by Python3 were used. ReLu function and SoftMax function were used for the activation functions and the building process was conducted through four major steps: convolution, pooling, flattening, and full connection. As a result, the program outputs the accuracy of the training and validation datasets for each epoch along with the classification error rate. Although the algorithm is not completely optimized, the research achieved a low rate of error and the high rate of validation accuracy.

Multi-Level Thresholding Image Segmentation Implemented with Genetic Algorithm

Jinsoo Choi (Computer Science), Hyesoo Choi (Computer Science)
Faculty Mentor: Min Chen (Computer Science)

Image segmentation based on binary image regions has been a major area of studies in image processing due to its simplicity and efficiency. Using a bi-level threshold is one way of obtaining such binary image by separating distinct two different regions or objects in a grayscale image based on a selected threshold. Multi-level thresholding technique extends the idea by segmenting images consisting of multiple objects and complex backgrounds into multiple regions based on the grayscale level. Classical iterative search algorithms have shown inefficiency as the time consumption increased with increased number of thresholds. Genetic Algorithm, on the other hand, transforms the search problem into optimization problem. Genetic Algorithm is an optimization algorithm whose goal is to find the possible optimal set of solutions by imitating the natural selection of the genes in biological studies, but its result is not an absolute answer. Borrowing from and modifying the classical iterative search method, the Otsu's method, application of Genetic Algorithm to this problem optimizes the threshold values by maximizing the inter-class variance of different objects in the given image using randomly selected thresholds. Comparing the resulting threshold values of Otsu's method and Genetic Algorithm shows the high accuracy of threshold values of the proposed method.

A Pharmacokinetic Model of Lead Absorption and Calcium Competitive Dynamics

Steven Lundgren (Mechanical Engineering)
Faculty Mentor: Anca Râdulescu (Department of Mathematics)

Lead is a naturally-occurring element. It has been known to man for a long time, and it is one of the longest established poisons. The current consensus is that no level of lead exposure should be deemed ``safe.'' New evidence regarding the blood levels at which morbidities occur has prompted the CDC to reduce the screening guideline of 10 μg/dl to 2 μg/dl. Measurable cognitive decline (reduced IQ, academic deficits) have been found to occur at levels below 10mg/dl. Knowledge of lead pharmacology allows us to better understand its absorption and metabolization, mechanisms that produce its medical consequences. Based upon an original and very simplified compartmental model of Rabinowitz (1973) with only three major compartments (blood, bone and soft tissue), extensive biophysical models sprouted over the following two decades. However, none of these models have been specifically designed to use new knowledge of lead molecular dynamics to understand its deleterious effects on the brain. We build and analyze a compartmental model of lead pharmacokinetics, focused specifically on addressing neurotoxicity. We use traditional phase space methods, parameter sensitivity analysis and bifurcation theory to study the transitions in the system's behavior in response to various physiological parameters. We conclude that modeling the complex interaction of lead and calcium along their dynamic trajectory may successfully explain counter-intuitive effects on systemic function and neural behavior which could not be addressed by existing linear models. Our results encourage further efforts towards using nonlinear phenomenology in conjunction with empirically driven system parameters, to obtain a biophysical model able to provide clinical assessments and predictions.

Assessment of Mechanical Property Variation of Natural Bast Fibers

Hanami Robles (Mechanical Engineering), Bryan Feigel (Mechanical Engineering), Andrew Vakarcha (Mechanical Engineering), Quinn Fowler (Undeclared)
Faculty Mentors: Jared Nelson (Div of Engineering Programs) & Lydia Bright (Biology)

Hemp, flax, and kenaf are natural bast fibers with promising material characteristics to sustainably displace synthetic fibers used in composites; however, their use has been hindered by high variability within their measured material properties. More widespread adoption and application of these fibers is contingent on the reduction of this variability. Efforts were made to assess variability in these fibers and methods were found to reduce variability in four areas: cross-sectional area approximation; physical defects; color and stem diameter; and fiber composition. In calculating stress, different geometric approximations of cross-sectional areas were found to influence the variability of the tested fibers. Mean elliptical cross-sectional area resulted in the lowest variability across all fiber types. Next, by removing fibers exhibiting physical defects, maximum variation in tested flax fibers was reduced from 66% to 49% for ultimate tensile strength and 74% to 36% for elastic modulus. These defects included kinks, inconsistencies and fraying. In addition, transient data due to grip failure or unexplained loss of load carrying capability were removed. Fibers were then organized according to color, which is believed to relate to degree of retting. Fibers of darker color were found to have lower variation than lighter or spotted fibers. Structurally, fibers with smaller stem diameters were found to be stronger than fibers from large stem diameters. Final considerations included inspection of the lignin-to-cellulose ratio of the natural fibers. Contrary to previous findings with other lignocellulosics, trends between the lignin content in a fiber and its mechanical properties could not be clearly established. Future work will seek to refine the process of determining fiber composition, more clearly establishing trends between lignin content, mechanical properties, and variability.

Complex Rankine Cycle with Supercritical Fluid CO2

Maritsa Rehma (Mechanical Engineering), Hadi Rabadi (Mechanical Engineering), Brian Brenton (Mechanical Engineering)
Faculty Mentor: Rachmadian Wulandana (Engineering Programs)

The effects of increasing the maximum pressure above the critical point on the power output, power required and the thermal efficiency of the Complex Rankine Cycle with Open and Closed Feedwater Heaters for the supercritical fluid CO2 were analyzed and compared to the Simple Rankine Cycle in this project. The Complex Rankine Cycle will look to generate power for communities using CO2, an abundant environmentally sufficient working fluid which help develop and sustain communities at an affordable cost. The purpose behind this study aims to accomplish Affordable and Clean Energy, Sustainable Communities, and Climate Action which are three Sustainable Development Goals set by the United Nations. Utilizing Engineering Equation Solver (EES), a equation solving program that can solve for fluid properties a parametric study was performed on the maximum pressure from 7,500 kPa to 11,000 kPa. The results from analysis of the parametric study show that the thermal efficiency of the Complex Rankine Cycle increases as the max pressure is increased hitting a max efficiency of 17.2% at around 10,350 kPa compared to the Simple Rankine Cycle which theoretically can reach efficiencies of 32% at 11,000 kPa.

Assessment of Current Stop Signs in the New Paltz Village

Jason Toth (Geography)
Faculty Mentor: Huicheng Chien (Geography)

The traffic signs in New Paltz are aging. The objective of this project is to collect locations of stop signs and assess their condition in the New Paltz. Thus is vital because the system already implemented consists of large binders filled with handwritten notes about every stop sign in the village and town of New Paltz. With this method, it takes more time to locate the information needed to create an analysis or inference about the stop signs. While using a program called Diamond maps, created by Ben Hill, I will be collecting GPS coordinates, pictures of existing sign, and expanding my knowledge on the legalities of stop signs. With these specifics I can then make inferences and conclusions that can further the understanding of stop signs in the village workplace. Not only will I will be constructing the layout of how these features will be labeled but how I will be able to differentiate and identify which signs need more attention than others. When referring to attention, it's the action of possible replacements, repairs, or even minor adjustments. With this information there can be future plans implemented to fabricate a standardization for stop signs under the village jurisdiction.

Potential Wind Farm Locations in New York

Lindsey Thurston (EGS)
Faculty Mentor: Huicheng Chien (Geography)

The purpose of this project is to determine potential wind farm locations in New York State. In 2019, approximately 3% of electricity generated in New York is derived from wind, but there is potential for a substantial increase. The clean energy standard initiative includes plans for doubling wind and solar capacity and aims to provide 50% of electricity from renewable sources by 2030. This project visualizes optimal locations for wind farms through multi-criteria spatial analysis. Using the weight linear combination method, the different criteria are ranked based on utility and necessity. For this project, a suitable location for a new wind farm is one near electric transmission lines, a large population, and within a zone of high generating capacity.

PM 2.5 in New York

Eric Lichtenstein (Geography)
Faculty Mentor: Huicheng Chien (Geography)

Particulate matter also known as PM is classified by the EPA as "is a complex mixture of extremely small particles and liquid droplets." Particulate matter pollution consists of inhalable coarse particles that are found near roadways and dusty industries. Particulate matter becomes a concern when they are 10 micrometers in diameter or less. PM 2.5 are focused on polluting activities such as forest fires, or they can form when gases emitted from power plants, industries and automobiles as they react in the air. As the CDC worries about the increasing health problems across the country New York and California continue to be the leading states in air pollution. In this map, it will be illustrated the concentrations of PM 2.5 in the state of New York, using the data from The United States EPA.

Examining the Phase Transition between Garnet and Spinel and Assessing its Impact on Seismic Velocities

Sarah Nolan (Physics)
Faculty Mentor: Gordana Garapic (Geology)

Understanding the composition and properties of the oceanic lithosphere and asthenosphere are key to understanding plate tectonics. Recently a number of ocean bottom seismic deployments in the Pacific have allowed the construction of high-resolution models of the sound velocities of the oceanic upper mantle. The purpose of this project was to forward model potential compositions of rock representative of the oceanic upper mantle. Perple_X, a collection of Fortran programs, was used to calculate phase transitions and shear velocities for mineral assemblages at relevant pressures and temperatures. After accounting for anelasticity, the velocities were compared with observed seismic velocities from an area with no melt. The aim is to determine whether observed seismic velocities can be explained without melt and to investigate mineral solution models for garnet and spinel that include chromium. Chromium substantially affects the depth of the phase transition and coexistence of spinel and garnet. This phase transition can lead to a distinct increase in seismic velocities. In this project, we compare models of multiple mineral assemblages, representing fertile and depleted compositions, to observed seismic velocities in the oceanic upper mantle.

Soil Infiltrometer Study to Minimize the Impact of Irrigation on Water Quality and to Maximize Water Conservation

Arianna Hege (Environmental Geochemical Science)
Faculty Mentor: Shafiul Chowdhury (Geology/Environmental Geochemical Science)

With increasing concern regarding climate change and its impacts on natural resources comes the need for examining our uses of water and the effects of those uses. Irrigation is the leading use of freshwater supply worldwide and the second in the United States. Moving forward, improvements of traditional agricultural practices are necessary to ensure long term sustainability and water quality protection. The purpose of this study is to analyze different farming methods to maximize water conservation and determine the level of adverse effects of irrigation. Using Soil Infiltrometers developed by Cornell University on various agricultural plots at the Hudson Valley Farm Hub located near Kingston, New York, on-site tests are conducted to determine equilibrium infiltration capacity of soils as well as the turbidity of runoff. These values are used to find the amount of water needed to saturate the top, root-bearing land and quantitatively compare the difference in erosion rates for tilled versus non-tilled plots of land. Runoff from tilled land is found to have approximately 17.5 times the amount of turbidity of runoff from non-tilled land, meaning that the rate of erosion for these plots is 17.5 times greater. Grain size analysis is conducted for different soil samples collected from different plots using a sieve shaker to find the relative composition of sand, silt, and clay particles. All plots tested, including tilled and non-tilled for corn, broccoli, and beans contain clay-loam soil. The average equilibrium infiltration capacity for land cover is 59.5 cm3/min which indicates that the maximum rate of irrigation should be in that range. The findings of this study, if implemented on a large scale, would have long-term beneficial impacts on water quality and conservation.

Recurrence and Transience Properties of Markov Chains in Python Simulations

Conor O'Riordan (Mathematics)
Faculty Mentor: Hyunchul Park (Mathematics)

Stochastic processes are often used in various fields within mathematics and probability theory. In particular, Markov chains are powerful tools due to their *memorylessness*. This property allows one to predict the future based solely on the present state. Through this condition, it is possible to determine if a state is recurrent or transient in a given state-space; either the chain returns to the state *ad infinitum* or the chain will never return to the state after finitely many steps. Not only will we provide a formal written proof utilizing the Markov property for the characterizations of these properties, we have also developed computer simulations using Python to illustrate recurrence and transience in real-life scenarios. These examples include Gambler's Ruin and symmetric random walks on d-dimensional integer lattices. This simulation helps us to classify recurrence further into either a null recurrence, the expected number of steps to return to where the chain started is infinite, or a positive recurrence, the expected number of steps is finite. We show by an example that in the null recurrence case, the chain returns to the starting point but the number of steps can be very large.

Hydraulic Dredge Powered By Gas-Turbine Engine

Chelsea Angulas (Mechanical Engineering), Michele Lederer (Mechanical Engineering), Matthew Pero (Mechanical Engineering)
Faculty Mentor: Kevin Shanley (Mechanical Engineering)

The preliminary concern of this project was polychlorinated biphenyls, or PCBs, which are toxins that threaten the purity of the Hudson River. In 1977, PCB production was outlawed, and approximately 1.3 million pounds were deposited into the Hudson causing detrimental effects on human health through the consumption of contaminated fish and vegetation. Hydraulic dredging is the process of removing contaminated sediment from waterway channels. A vacuum was used to pump the water-sediment mixture into a carbon filter system that purified the water, removed the toxic sediment, and returned the water back to the river. Using a gas-turbine engine modeled from the Brayton cycle amplified the rate the pump draws water, cleaning the river faster than traditional methods. Through this project, the effects of the fuel type, turbine inlet temperature, and high pressure of the cycle on the efficiency of the system were analyzed. This project aimed to find an efficient long term solution for the decontamination of the water and monitor the progress of the ecosystem in the Hudson River.

The Geothermal Heat Pump Cycle

Samuel Henderson (Mechanical Engineering), Susan Ko (Mechanical Engineering),
Cyra Haguisan (Mechanical Engineering)
Faculty Mentor: Kevin Shanley (Mechanical Engineering)

A cycle incorporating a geothermal heat pump that could be used for space heating and cooling of a residence was designed. Each component used to build the cycle had to be considered carefully to minimize the impact on the environment without sacrificing too much in terms of cycle performance. Excel, MATLAB, and EES were used to predict the effects of properties, such as the working fluid used, on the cycle performance and on the environment. Parametric studies involving different ground loop systems were considered in order to determine the effectiveness of the system to its cost. Other studies with hybrid systems such as solar and hydro were also considered to observe the effectiveness of the geothermal heat pump when the system works in conjunction with other environment friendly devices.

Energy and Environmental Benefits of a Geothermal Heat Pump

Bradley Evans (Mechanical Engineering), Kevin Harjes (Mechanical Engineering),
Brendan McGaley (Mechanical Engineering), Emily Stewart (Mechanical Engineering)
Faculty Mentor: Kevin Shanley (Mechanical Engineering)

The following study was performed to analyze the effectiveness and environmental benefits of a geothermal heat pump in comparison with those of conventional heat pump designs. Coefficient of performance values were calculated for heat pumps that run on oil, natural gas, and electricity. These values were then compared with the coefficient of performance for geothermal heat pumps operating under similar conditions for the high and low temperature reservoirs. Parametric studies were designed to compare the effects on the coefficient of performance for a range of compressor inlet temperatures, the possible temperatures attained for a geothermal heat pump based on ground depth, and heating times required for different types of ground pipe layouts. Finally, costs of manufacturing a geothermal heat pump for the proposed design was compared to those of common conventional heat pumps found on the current market in order to determine if geothermal heat pumps are a feasible alternative. Overall analysis led to the conclusion that geothermal heat pumps have a greater average energy savings and a resemblant coefficient of performance for both cooling and heating, significantly lower CO₂ emissions, no carbon monoxide hazards, and are cost-effective compared to conventional heat pump designs.

Rankine Heater

Rachel Eisgruber (Mechanical Engineering), John Murphy (Mechanical Engineering),
Jacob Bitman (Mechanical Engineering)
Faculty Mentor: Kevin Shanley (Mechanical Engineering)

A simple rankine cycle was created that would increase the temperature of a swimming pool. To accomplish this, the rankine cycle was designed with the ability to move excess heat from solar panels to the pool, with the bonus of power generation. Solar panels were chosen as a heat source due to their inefficiency when at high temperatures. The design process consisted of estimating the the operating conditions of all the components, initial modeling, design comparison and parametric studies. Initially, the maximum possible heated temperature of the pool was calculated as a function of the desired temperature increase of the pool. The cycles were then analyzed utilizing EES as well as the CoolProp add-in for Excel and Matlab. The results of interest are the change in temperature of the panels and the pool, the net cost to manufacture and operate the cycle, the power generation vs consumption, as well as the thermal efficiency of the cycle.

Active Cooling for Photovoltaic Panels

Jackie Taylor (Mechanical Engineering)
Faculty Mentor: Rachmadian Wulandana (Mechanical Engineering)

Photovoltaic solar technology has becoming an attractive renewable energy supplier due to its superiority in effectiveness compared to other modes that has been shown in the last ten years. However, in places with warmer climates, the efficiency of solar panels experience declines when excessive heat is accumulated in the cells. The long-term purpose of our project is to investigate possible designs for active and passive cooling systems that can dissipate such heat from solar panels. The current project aims to study the effects of heat convection by pumped liquid, such as water and coolant. We studied the heat transfer and pressure loss of various pipe network to be installed on the back of the solar panel. Three different pipe networks were studied with the idea of using copper tube with ⅜'' inner diameter. All of the designs were calculated for pressure loss and drafted in Solidworks in order to run fluid simulations. The challenge of minimum contact surface between the pipe wall and solar panel wall is overcome by designing various conducting blocks and molds. These molds could be manufactured with metal which has high thermal conductivity, such as aluminum. The heat transfer between the solar panel surface and the mold is affected by the geometry of the mold. In order to optimize the heat transfer between the pipe and the solar panel, different shapes are being created and tested in Solidworks in order to find the most efficient geometry.

Solar Panel Cooling Using Refrigeration System

Jackie Taylor (Mechanical Engineering), Lina McCary (Mechanical Engineering),
Jamie Mahoney (Mechanical Engineering)
Faculty Mentor: Rachmadian Wulandana (Mechanical Engineering)

The use of Solar Energy has increased dramatically over the past 20 years. However, in regions with warmer climates such as the Middle East, North Africa, and South Asia, the use of Photovoltaic cells is not as widely used. This is due to the negative impact high temperatures have on solar panel efficiency. A sustainable and efficient means of combating this issue is key in the development of versatile and functional solar panels. The proposed design concepts feature a Simple Vapor Compression cycle working in conjunction with a Rankine cycle to convert heat to work. Excess heat will be absorbed from the back of the solar panel and transferred into the ground, where ambient temperatures are comparatively low. This heat transfer will be facilitated via strategic pipe configuration in order to optimize the necessary thermodynamic processes. Three possible pipe configurations were designed and analyzed. Working fluids were selected to be water and R410a within the Vapor Compression and Rankine cycles, respectively. Design decisions were analyzed and verified via parametric studies in EES and CoolProps using Excel

Investigating Reliability of Embedded Resistor in IC Chip

Lina McCary (Mechanical Engineering)
Faculty Mentor: Ping-Chuan Wang (Mechanical Engineering)

Localized Joule heating within integrated circuit (IC) chips is the leading cause of non-uniform temperature distribution within the circuit structure of the chips. Such variation in temperature enhances the biased diffusion of metal atoms along current carrying interconnects, a phenomenon called "electromigration," which leads to formation of voids (i.e. open circuit) within interconnects and is a major failure mechanism in IC products. In this study, analysis on localized Joule heating around a novel resistor structure will be conducted. Reliability of the resistor structure will then be assessed by electrical stressing until failure occurs, followed by microscopy investigation to determine plausible failure mechanism. Based on the findings, a reliability model will be attempted to predict resistor lifetime.

Organic Rankine Cycle

Michael Bianco (Mechanical Engineering)
Faculty Mentor: Kevin Shanley (Mechanical Engineering)

In this experiment, the benefits of the organic rankine cycle (ORC) over its traditional counterpart were analyzed. The main distinction between these two cycles is their respective heating elements; the organic rankine cycle incorporates concentrated solar panels (CSPs), which indirectly heats up the working fluid in the rankine Cycle thus making it organic, or more efficient. CSPs use mirrors to concentrate energy from sunlight to warm a tank containing oil. The oil passes through an evaporator which absorbs its thermal energy and transfers it to the steam powering the rankine cycle. Using this type of solar panel will allow for a less harsh carbon footprint on the environment. Other typical types of fuel used in the traditional rankine cycle include coal, oil, or fossil fuels which produce toxic fumes which have been proven harmful for the environment. The average power demand of a junior senior high school was analyzed due to the limiting power output of the ORC designed.

Four Stroke Lawn Mower Engine

Richard Moretti (Mechanical Engineering), Brendan French (Mechanical Engineering), Chris Lopes (Mechanical Engineering)
Faculty Mentor: Kevin Shanley (Engineering Programs)

The main objective to manipulate the Otto Cycle for a four-stroke engine is to power an environmentally friendly lawn mower. After conducting research regarding sustainable fuel sources, compression ratios a series of analyses were performed to determine optimal design conditions and parameters. EES and CoolProp for MatLab were implemented in order to run parametric studies, so as to obtain the cleanest combustion possible, while also offering high performance and fuel economy. Technological advances have allowed for innovation and re-evaluation of two-stroke engines for larger applications. With the four-stroke engine being very simple, cost-effective, and having high power to weight and power to volume ratios, the proposed design will supersede the four-stroke engine.

Repurposing the Heat Waste Produced by a Refrigerator

Seth Pearl (Mechanical Engineering), Michelle Wong (Mechanical Engineering), Bryce Shannon (Mechanical Engineering)
Faculty Mentor: Kevin Shanley (Mechanical Engineering)

For this project, we designed a refrigerator for a restaurant that can serve two purposes while operating under one device. Its refrigeration space keeps food at the required temperature, while simultaneously rejecting its wasted heat to an attached passive dish drying unit that will repurpose any waste from the refrigerator into a useful byproduct. The designed refrigerator was modeled based on the simple vapor-compression refrigeration cycle studied in Thermo System Design and is made up of a compressor, condenser, evaporator, and an expansion valve. To increase usable space inside the refrigerator, we were able to align our cycle vertically, allowing the condenser to be placed towards the top of the refrigeration unit. Since the condenser is the device within the refrigeration cycle responsible for rejecting heat into the environment, we attached our dish drying unit at the top of the refrigeration unit, allowing for minimal heat to be lost between the transfer process from the condenser to the dish drying unit. To accomplish this process R600a refrigerant was used due to its ability to keep the refrigerated space at a cool temperature while keeping the dish drying space at a warm temperature.

Transcritical Vapor Compression Refrigeration: R744 and Beyond

Pedro Guerrero (Mechanical Engineering), Nigel Caprotti (Mechanical Engineering), Ian Lorber (Mechanical Engineering)
Faculty Mentor: Rachmadian Wulandana (Mechanical Engineering)

This heuristic review considers the thermodynamic performance of carbon dioxide, R744, during transcritical vapor compression refrigeration. The compelling thermodynamic characteristics of this upcoming, environmentally friendly refrigerant underlie this study's consideration of two variations of the classic supercritical cycle. Simple transcritical refrigeration was analyzed using R744, with the scholastic hope of positing viable performance improvements to this basic cycle. Through the use of an internal heat exchanger, multistaging and flash intercooling, this study considers all three cycle designs. Using the powerful parametric capabilities of Engineering Equation Solver (EES), cycle considerations for the proposed designs included refrigeration coefficient of performance, COPR, or cooling efficiency, and pressure ratio, CR, among other comparative factors. Operating above the critical temperature and pressure of carbon dioxide for the greater portion of the cycle, where the working refrigerant displays unique supercritical properties, this study will furthermore investigate the unique thermodynamic characteristics of transcritical R744 compared to the more traditional R134a in all three cycles.

Design of a Compost Powered Greenhouse Heat-Pump

Joe Mandia (Mechanical Engineering), Sean Cerven (Mechanical Engineering), Bryan Feigel (Mechanical Engineering)
Faculty Mentor: Rachmadian Wulandana (Mechanical Engineering)

Compost piles are commonly used to provide nutrient rich soil for use in gardens, farms, landscaping, and horticultural purposes. In addition, they provide an environmentally friendly form of waste management which produces a significant amount of heat. This wasted heat can be utilized in a vapor-compression heat pump in order to heat a greenhouse during a typical winter season. This application addresses several United Nations Sustainable Development Goals (SDGs) by encouraging clean energy, sustainability, and responsibility. The study set out to utilize the heat released as a by-product of composting in order to operate a heat pump which keeps a greenhouse warm throughout the winter season. Two working fluids are considered, R134a and CO2, with the victor being selected based on the coefficient of performance of the system and heat output of the cycle. Design parameters will be based on the environment and desired compost behavior. The low temperature of the cycle must be lower than the compost temperature and the high temperature must be higher than the desired greenhouse temperature to ensure proper transfer of heat. Depending on the size of the compost pile and catalyst used, the temperature of the compost pile can be raised to a max of 65 °C before harming its effectiveness as a nutrient source for agricultural use. The low and high pressures of the cycle are studied parametrically to understand their effect on the cycle's performance and the corresponding high and low fluid temperature. R134a was most efficient when these pressure values were close together, and at minimum values. However, these conditions did not meet the necessary temperature conditions of the hot and cold spaces. Furthermore, low heat output required a mass flow rate which was unreasonably high to meet the heating power requirement. The CO2 cycle improves in both heat output and COP as the low pressure increases. A high pressure of at least twice the low pressure provided a significant increase in COP and heat output. The final design cycle utilized a transcritical CO2 working fluid operating at a low pressure of 3558 kPa and high pressure of 7116 kPa. Its final COP was 3 and heat output was 225 kJ which required a mass flow rate of .033 kg/s. The heat length and type of pipe required to exchange the heat between the CO2 and compost was experimentally determined. Future work includes consideration of other working fluids and implementation of best practices.

Benefits of E85 on the Otto Cycle

Eric Milczewski (Mechanical Engineering), Zachary Torigian (Mechanical Engineering),
Kyle Plechaty (Mechanical Engineering)
Faculty Mentor: Rachmadian Wulandana (Mechanical Engineering)

Utilizing ethanol based fuels, engines can be optimized for power, efficiency, and emission reduction while reducing the dependency on foreign sourced oil. E85 refers to an ethanol fuel blend of roughly 85% ethanol fuel and 15% gasoline that is derived from corn (a renewable domestic energy source). E85 has an octane rating higher than that of premium gasoline (91-93). This allows it to be used in higher-compression, or forced induction engines, which tend to produce more power per unit of displacement than if gasoline were used. This is especially beneficial in high performance engines but can be applied to common automobiles. The power output of an engine, utilizing the Otto cycle with Ethanol as the working fluid, was parametrically studied to analyse the compression ratio and effects of boost (positive pressure at the intake of the engine).

Complex Rankine Cycle with Supercritical Fluid CO2

Hadi Rabadi (Mechanical Engineering), Brian Brenton (Mechanical Engineering),
Maritsa Rehma (Mechanical Engineering)
Faculty Mentor: Rachmadian Wulandana (Mechanical Engineering)

The effects of increasing the maximum pressure above the critical point on the power output, power required and the thermal efficiency of the Complex Rankine Cycle with Open and Closed Feedwater Heaters for the supercritical fluid CO2 were analyzed and compared to the Simple Rankine Cycle in this project. The Complex Rankine Cycle will look to generate power for communities using CO2, an abundant environmentally sufficient working fluid which help develop and sustain communities at an affordable cost. The purpose behind this study aims to accomplish Affordable and Clean Energy, Sustainable Communities, and Climate Action which are three Sustainable Development Goals set by the United Nations. Utilizing Engineering Equation Solver (EES), a equation solving program that can solve for fluid properties a parametric study was performed on the maximum pressure from 7,500 kPa to 11,000 kPa. The results from analysis of the parametric study show that the thermal efficiency of the Complex Rankine Cycle increases as the max pressure is increased hitting a max efficiency of 17.2% at around 10,350 kPa compared to the Simple Rankine Cycle which theoretically can reach efficiencies of 32% at 11,000 kPa.

Variability in Disinfection By-Product Formation Potential in Two Watersheds during a Storm Event

Puja Saha (Environmental GeoChem)
Mentors: David Richardson (Biology) & Karen Moore (NYC Department of Environmental Protection)

Natural Organic matter (NOM) is made up of carbon-based molecules and comes from plant and animal sources and their waste products. NOM originating in watersheds and reservoirs can react with chlorine to form disinfection by-products (DBPs). Currently the regulated DBPs in drinking water in the US are four Trihalomethanes (THMs) and five Haloacetic acids (HAAs). The dissolved organic matter that fluoresces (also called fDOM) is one potential proxy measurement for DBP precursors. Another proxy measurement is absorbance at a wavelength of 254 nm (UV254). UV254 provides an indication of the aromatic compounds and may give clues to the reactivity of the NOM with chlorine. In this study we examined the variability in disinfection by-product (DBP) precursors (specifically organic carbon) and resulting THM and HAA formation potential during spring storm events in the Neversink and Cannonsville basins. Neversink is a forested watershed while Cannonsville has a much larger drainage area and more agricultural activity. A March rain-on-snow event was captured for the main inflows to Neversink and Cannonsville Reservoirs. Samples were selected for analysis based on fDOM and UV254 measurements and analyzed for THMs and HAAs using gas chromatography. The overall goal of this study is to contribute to the NYC DEP efforts in making predictions and guiding operational decisions to minimize the presence of DBPs in the NYC water supply.

Constructing a Vibrating Probe for Measuring Minute Electric Fields

Nicholas Piaquadio (Engineering/Physics)
Faculty Mentor: Richard Halpern (Physics)

In this poster, we describe the theory, construction, and use of device called a vibrating probe. It is well known that some living creatures are capable of regenerating a missing body part. A newt, for example, can regenerate an arm that has been cut off. Associated with this regeneration are minute electric currents at the site of the cut. One would think that these currents could be measured using a detector of sufficiently high sensitivity. Unfortunately, that is not the case. Biological currents are often on the nano- and pico-ampere scale and are difficult to measure directly. Simply placing two metal probes in an effort to measure a potential difference fails because the ambient noise is often higher than the signal. To isolate the signal against the background, a single probe is used, but vibrated at a set frequency. This vibrating probe detects the potential difference between the extremes of its travel, turning a DC signal into an AC signal at the set frequency. A lock-in amplifier zeros in on the set frequency and removes signals of all other frequencies. Hence, the desired potential difference is obtained. This technique has applications not only for biogenic currents, but also for the study of diffusion and corrosion.

Controlling Calcite Rhombohedrons in a Polarized Optical Trap

Johanna Levey (Physics)
Faculty Mentor: Catherine Herne (Physics & Astronomy)

Using rhombohedral calcite, a birefringent material, we investigate the non-uniform rotational motion displayed by a crystal rotating at the focus of an optical trap. This work improves on the current model of rotational torque on calcite and allows for better use in measurement and actuation applications. These applications include stretching cells to learn about cell membranes, pushing tiny nanospheres through constricted flow areas such as blood vessels, and creating an entire "lab on a chip" where light makes many functions occur in a tiny area. Two significant factors contribute to the calcite motion, the shape of the calcite crystals that we grow, and the polarization of the light used to trap them. We create calcium carbonate precipitate in the form of rhombohedral calcite with equimolar solutions of calcium chloride and sodium carbonate. The other polymorphs of precipitate are also explored, as calcium carbonate can form into three different crystal structures. We measure the effect of elliptically polarized light by changing the polarization direction and recording the motion of the calcite. The distinct birefringent calcite crystal axes, "ordinary" and "extraordinary," are affected by the polarization orientation in complex ways that have not previously been studied. In this poster, we explain our method for calcite growth, show images of the crystals, and demonstrate our current experimental model of rotational dynamics.

Differences in Reactions to Infidelity Based on Sex and Sexuality

Alec Goldstein (Psychology), Julie Planke (Psychology)
Faculty Mentor: Glenn Geher (Psychology)

Sex differences in mating psychology, particularly reactions to infidelity, have been well documented by Buss and colleagues (1992), and replicated by Howard and Perilloux (2017) with heterosexual and homosexual individuals. Exclusively assessing homosexual and heterosexual participants, these differences were found to be the result of one's biological sex, rather than sexual orientation. Assessing both reactions to various types of infidelity and other mating behaviors. Better accounting for the inherent fluidity of human sexuality, participants self-identified using the 7-point Kinsey-scale, A total of 438 (M = 101, F = 337) college-aged adults participated. Although results generally aligned with previous research, only 37.4% of the sample identified as exclusively heterosexual, and 4.6% identified as exclusively homosexual - showcasing the fluidity of human sexuality.

The Effect of Hand Proximity on Letter Identification

Danielle Lukaszewski (Psychology)
Faculty Mentor: Giordana Grossi (Psychology)

Hand proximity effects have been reported in a variety of tasks. Previous research suggests that hand proximity enhances certain tasks while impeding others. The goal of this study is to test whether hand proximity enhances letter encoding as suggested by Adam et al. (2012), who found that this factor improves letter encoding in letter identification tasks. In this study, we utilized a forced-choice letter identification task in which participants are presented with letter strings presented very quickly and masked. Their task is to decide which of two letters was presented in a given position. Participants are more accurate at identifying letters in words than pseudowords (letter strings that resemble real word in orthographic and phonological structure, but have no lexical meaning) and more accurate at identifying letters in pseudowords than nonwords (unpronounceable letter strings). These two effects are known as the word superiority effect (WSE) and pseudoword superiority effect (PSE), respectively. We conducted a WSE/PSE experiment in order to pinpoint the locus of hand proximity effects and better understand their nature. The accuracy of participants was greater for words than it was for pseudowords and greater for pseudowords than nonwords, which indicates a successful replication of the WSE and PSE. However, we did not find any effects of hand proximity. We are now conducting a stricter replication of the experiment conducted by Adam et al. (2012).

Is Semantic Categorization Affected by Hand Proximity?

Katelynn Mulligan (Psychology)
Faculty Mentor: Giordana Grossi (Psychology)

Semantic categorization is the cognitive ability to process an abstract meaning from a signifier, such as a written word. Reading written language is a daily occurrence for people in any work industry, so it is a vital aspect of our comprehension of language. In the semantic decision task conducted by Davoli et al. (2010), the task used full sentences to investigate whether semantic processing was altered by hand proximity to the stimulus. According to the authors, the findings of the study suggested that semantic meaning was hindered when the hands were closer to the computer. After a failed attempt at replicating this result, we adopted a more direct measure of semantic processing at a single word level. A go/no-go semantic categorization task was administered to participants in which they were directed to respond to one type of stimulus, non- animal words, on a desktop computer. Participants performed the task twice, once with their hands next to the computer screen and once with their hands on computer mice placed on their lap. The study also tested the effect of an additional variable pertaining to semantic processing, semantic distance. The results did not replicate Davoli et al.'s hand proximity effect, but showed that semantic distance affected speed in recognition of the words.

The Adult Play Fulfillment Index (APFI)

Griffen Camberdella (Psychology), Alessandra Moss (Psychological Science)
Faculty Mentor: Doug Maynard (Psychology)

The study of adult play and playfulness is an emerging field. Nevertheless, there is little existing research on the effects of play fulfillment or deprivation in adults. We crafted a brief measure of play fulfillment for use in future research. We collected data from two samples to evaluate the scale's reliability and validity. In the first sample (N = 113 students), an exploratory factor analysis found the scale to be unidimensional. The resulting 4-item scale, the Adult Play Fulfillment Index (APFI) also exhibited excellent reliability. As expected, scores on the APFI were positively correlated with life satisfaction and a negatively correlated relationship with perceived stress was approaching significance. The results from a second sample (N = 315 adults) will be presented. These will include a confirmatory factor analysis and associations between play fulfillment and factors such as mood and personality. Future research directions will also be discussed.

Examining Gender Salience in Preschoolers through a Category Formation Task

Julie Planke (Psychology)
Faculty Mentor: Glenn Geher (Psychology)

Ample evidence exists suggesting children as young as 2-years-old can successfully classify colors, various objects, and people into stereotypical male and female categories. However, it is unknown if these gender categories are perceived as important and meaningful to them. While children have sufficient gender knowledge to categorize by gender, do they in fact perceive their environments through a gendered lens? In order to investigate gender salience in preschoolers, and its cognitive and social underpinnings, the proposed study utilized free-sorting methodology with highly sex-typed toys. While the central focus of this study is to examine gender salience (i.e., how gender schematic a child is), measures of gender constancy, gender-related beliefs, and gender- relevant parental characteristics were expected to substantiate children's sorting behaviors. A total of 12 preschoolers and their parents were recruited from local preschool centers and results are currently being analyzed. It is predicted that 5-year-olds, holding a greater understanding of gender constancy and highly rigid beliefs compared to younger 3- and 4-year-olds, will sort the stimuli by gender-type most frequently. Results are anticipated to elucidate the importance and social awareness of gender as a social category in early childhood development.

Increased Looking and More Reactive Facial Expressions to Impossible Figures in Infants

Sarah Shuwairi (Psychology), Danielle Longo (Psychology), Christina Krause (Psychology)
Faculty Mentor: Sarah Shuwairi (Psychology)

This research evaluated infants' facial expressions as they viewed pictures of possible and impossible objects on a TV screen. Previous studies in our lab demonstrated that four-month-old infants looked longer at the impossible figures and fixated to a greater extent within the problematic region of the impossible shape suggesting they were sensitive to novel or unusual object geometry. Our work takes studies of looking time data a step further, determining if increased looking co-occurs with facial expressions associated with increased visual interest and curiosity, or even puzzlement and surprise. We predicted that infants would display more facial expressions consistent with either "interest" or "surprise" when viewing the impossible objects relative to possible ones, which would provide further evidence of increased perceptual processing due to incompatible spatial information. Our results showed that the impossible cubes evoked both longer looking times and more reactive expressions in the majority of infants. Specifically, the data revealed significantly greater frequency of raised eyebrows, widened eyes and returns to looking when viewing impossible figures with the most robust effects occurring after a period of habituation. The pattern of facial expressions were consistent with the "interest" family of facial expressions and appears to reflect infants' ability to perceive systematic differences between matched pairs of possible and impossible objects as well as recognize novel geometry found in impossible objects. Therefore, as young infants are beginning to register perceptual discrepancies in visual displays, their facial expressions may reflect heightened attention and increased information processing associated with identifying irreconcilable contours in line drawings of objects. This work further clarifies the ongoing formation and development of early mental representations of coherent 3D objects.

Hot Stuff! The Evolutionary Psychology behind the Attractiveness of Volunteer Firefighters

Nicholas Primavera (Psychology)
Faculty Mentor: Glenn Geher (Psychology)

Historically, research has demonstrated a clear relationship between riskiness and reported levels of attraction. Additionally, research has also explored altruistic behaviors and reported levels of attraction. However, no previous study has examined if these same findings apply to members of the volunteer fire service. This current study seeks to examine this question, by providing participants with pictures and biographies of volunteer firefighters in order to measure their levels of attraction. The pictures will either show the model in the traditional gear of the firefighter, the dress uniform, or plain clothes. The biography paired with these pictures will either depict a risky firefighter, a community focused firefighter, or simply include that they are a firefighter. Multiple 3x3 ANOVA's will be used to determine which group has the highest reported levels of attraction. The basic prediction is that the firefighter in the turnout gear, when paired with the risky biography will be rated the most attractive for short-term relationships, while the firefighter in the dress uniform, when paired with the altruistic biography, will be rated as most attractive for long-term relationships.

Dark Parenting: Parents Who Score as High in the Dark Triad Demonstrate Non-Authoritative Parenting Styles

Julie Planke (Psychology), Genevieve Durso (Psychology), Jacqueline Di Santo (Psychology), Alec Goldstein (Psychology), Ferdaus Akhmadi (Psychology), Mariah Griffin (Psychology), Nicholas Primavera (Psychology), Zachary Rausch (Psychology), Kanjira Rodriguez (Psychology), Graham Thompson (Psychology), Jeremy Weintraub (Psychology)
Faculty Mentor: Glenn Geher (Psychology)

The Dark Triad of personality, including the traits of Machiavellianism, psychopathy, and narcissism, have been shown to strongly predict a broad array of social and behavioral outcomes—particularly in the domain of mating. From an evolutionary perspective, the parenting domain of life is just as critical as is the mating domain: Parenting behaviors bear directly on long-term reproductive success. In spite of this fact, little past research has examined the relationship between the Dark Triad and parenting behaviors. This research administered a measure of the Dark Triad along with three different parenting style measures to 251 parents (211 females, 39 males; mean age = 39.15, SD = 9.63). Participants also completed a measure of the Big Five personality scale and adult attachment styles. Analyses revealed that each facet of the Dark Triad was predictive of at least one of the non-authoritative parenting styles (including neglectful/uninvolved). Implications regarding the social psychology of parenting are discussed.

Clogged Ears and Loud Mouths: A Review of the Ape That Understood the Universe

Zachary Rausch (Psychology), Kanjira Rodriguez (Psychology), Jeremy Weintraub (Psychology)
Faculty Mentor: Glen Geher (Psychology)

This is a critical review of the recently published book, The Ape that Understood the Universe by Steven Stewart-Williams. Stewart-Williams, an associate professor of psychology at the University of Nottingham Malaysia Campus, produced an exposé on recent developments in the field of Evolutionary Psychology. The journey in the literature began with an exploration of the profoundly influential forces driving human behavior: genes and memes. Stewart-Williams used accessible language and modern-day examples regarding evolution as a means to invite non-academics into the field. This was especially noticeable in the introduction when Stewart-Williams introduced the readers to an asexual, genderless space alien, as a tool to remove human biases. The introduction provided an accessible and enjoyable narrative-based writing style to help familiarize the reader with evolutionary theory. After a discussion about the content and quality of the work, the reviewers attempted to place and understand the book within the context of the current ideological conflicts and discourses between Evolutionary Psychologists and Social Constructivists, amongst others. The reviewers unpacked and discussed the potential implications of Stewart-Williams' engagement style with this alternative and oftentimes competing ideological framework. Though the author intended to educate the audience on divisive debates in the field, he nonetheless perpetuates them further.

Dwarf Pitch Pine Survival and Plant Community Response to Wildfire at Sam's Point Preserve, NY

Rory Schiafo (Biology)
Faculty Mentor: Eric Keeling (Biology)

The Shawangunk Mountains are home to a globally and ecologically rare ridgetop dwarf pitch pine barren. The role of fire in this specific community type is understudied. In April 2016, a 2,027-acre human-caused fire occurred at Sam's Point Park Preserve. Twenty-one permanent plots (40.5 m2 per plot) were established in three different burn severities (moderate, high, and very high) containing a total of 523 pitch pines. Pitch pine vegetative and seedling regeneration, and dominant understory relative abundances were measured during each summer, 2016-2018. In 2018, a complete understory plant survey was conducted. Resprouting type (basal, epicormic, apical, or none) was recorded for each tree. Within each plot, the number of pitch pine seedlings and dominant vegetation species and percent cover (all vegetation species in 2018) were recorded. Basal resprouting was the most frequently observed regeneration type. Pitch pine apical resprouting was most frequent in the moderate burn severity plots, while basal resprouting was most frequent in the very-high severity plots. By 2018, the 390 trees (75%) showing no resprouting can be assumed dead. 53 pitch pine seedlings were found in 2016, 84 in 2017 and 37 in 2018. 44 vascular plant species were recorded in the understory in 2018. Huckleberry, sheep laurel and lowbush blueberry dominated plots. Rhodora, a NYS protected species was found within four plots and no invasive plant species were found. There were no significant differences in understory community composition between different burn severities. Future monitoring will provide insight into how this rare ridgetop dwarf pitch pine barren responds to large, high-intensity fire and will aid in future management at the preserve.

Topography and Diversity of Tree Communities in Peterskill

Ethan Heineman (Biology)
Faculty Mentor: Eric Keeling (Biology)

While tree species diversity and community composition vary greatly across landscapes, there is uncertainty about the specific environmental factors that affect these patterns. In order to observe and explain relationships between environmental factors and tree community composition, SUNY New Paltz Ecology students studied six distinct tree community zones in the Peterskill area of Minnewaska State Park during 2016 - 2018. The zones were associated with particular topographic positions or land-use history (basin, talus, mid-slope, rocky slope, ravine, and disturbed area). A total of 1065 trees were identified by a transect survey method (5-6 transects per zone) and environmental factors including aspect, slope, soil depth, soil pH, and soil texture were measured. We found striking differences between the tree communities in the different zones. Zones dominated by evergreen species had low diversity values, while zones dominated by deciduous species had higher diversity values. Further analysis of similar topographic locations that differ in other abiotic factors could reveal further correlations not present in this study. Studies such as this can provide useful insight to forest managers as they tackle conservation and forest health issues, especially in the context of climate change and ongoing ecological changes in our local environments.

Gender Stereotypes Reinforced throughout Children's T.V. Commercials

Alexandra Hillaris (Sociology)
Faculty Mentor: Judith Halasz (Sociology)

The media is a powerful institutional agent which promotes gender stereotypes and gender norms. Though our society has become more socially informed, gendered media portrayals are continually reproduced, and these messages socialize individuals to act a certain way according to their gender. This study seeks to understand how television commercials targeting children reinforce gender stereotypes. A qualitative and quantitative content analysis will be used to analyze emerging patterns and themes in 15 single-gender and mixed-gender television commercials which target children in the United States. Utilizing content analysis allows one to clearly identify underlying, subtle gender differences in children's commercials that would otherwise go unnoticed by a casual viewer. The results from the content analysis will provide a broader understanding of the media's role in reinforcing gender stereotypes throughout children's television commercials. These gendered messages are important to examine because they provide a gendered model of behavior for youth, which can have lasting effects on gender norms in society.

How Perceptions of Racial Diversity on Campus Vary by Race

Alexander Martino (Sociology)
Faculty Mentor: Judith Halasz (Sociology)

Existing research indicates that different racial-ethnic groups have considerably different experiences at college, both inside and outside of the classroom. I wanted to know, do students of color view the racial climate and issues of campus diversity at SUNY New Paltz more critically than white students do? I went about answering this question by creating an online survey to gather data about students' opinions on issues of race and diversity at the university. The survey was distributed to all sociology students, and the results were analyzed using chi-square tests of significance. Significant differences were found, for example, in the degree to which students agreed that the New Paltz campus is diverse, and the degree to which they feel uncomfortable on campus due to its racial demographics. Nearly all of the findings were statistically significant at the .05 level, and confirmed the original hypothesis that non-white students are more critical of campus diversity and the general racial climate at SUNY New Paltz than white students are. This research has important implications for SUNY New Paltz and other colleges' efforts to maintain an inclusive learning environment for all students.

Complex Cell Geometry When Estimating Glutamate Transporter Density in Astrocytes

Cassandra Williams (Mathematics)
Mentor: Anca Râdulescu (Mathematics)

Glutamate is the main excitatory neurotransmitter released in the brain. Its removal from the extracellular space prevents build-up of neurotoxicity. The removal process is intermediated by non-neuronal cells called astrocytes. These take in the excess extracellular glutamate via prism-shaped cross-membrane transporters densely expressed in the wall of the cell membrane. To understand their impact on neurotransmission efficiency, one needs to estimate the density of transporters for an average astrocyte.

Universality of the Configuration-Dynamics Relationship in Nonlinear Networks

Simone Evans (Biochemistry/Mathematics)
Anca Râdulescu (Mathematics)

We study how architecture affects dynamics in nonlinear networks. First, we discuss our results from coupled quadratic nodes. While single-map complex quadratic iterations have been studied over the past century, considering ensembles of such functions, organized as coupled nodes in a network, generates new questions with potentially interesting applications to the life sciences. We discuss extensions of concepts like escape radius and Julia and Mandelbrot sets. One can conveniently use the system's asymptotic sets to calculate, visualize and interpret the long-term behavior of the system (in both phase and parameter spaces, with the network structure acting as a bifurcation parameter). The advantage is that of using clear topological markers (e.g., connectedness of a set) as the signature for the global dynamics of the system, amenable for prediction and classification. We review ongoing research on two other nonlinear network models from neuroscience: threshold-linear networks and a reduced model of spiking inhibitory networks. For each of these models, we seek out graph properties which can be used to predict or classify dynamics. Finally, we search for graph properties which are robust within each model, but that also translate between the three models.

Publication Opportunities for Undergraduates

Stanford Undergraduate Research Journal is an annual peer-reviewed publication of research articles written primarily by Stanford undergraduates, but also well-qualified students at other institutions, from all academic fields. http://surj.stanford.edu

Pittsburgh Undergraduate Review PUR is a multidisciplinary journal that accepts papers from around the world http://www.pur.honorscollege.pitt.edu/

Undergraduate Economic Review aimed at promoting high quality undergraduate research http://titan.iwu.edu/%7Eecon/uer/index.html

Undergraduate Journal for Global Business and Community, offers undergraduate students a venue for publishing works http://jgbc.fiu.edu/index.php?journal=JGBC

The Dialectics Undergraduate Journal of Leadership, Politics, and Society aim is to promote undergraduate discourse and scholarship and to encourage students to pursue and engage in thoughtful discourses on topics of societal importance. http://www.abington.psu.edu/dialectics/

Pi Sigma Alpha Undergraduate Journal of Politics built a reputation for publishing outstanding research by undergraduate students. http://web.ics.purdue.edu/~psalpha/journal/call.html

Issues in Political Economy is committed to supporting and encouraging quality undergraduate research in all areas of economics. http://www.elon.edu/e-web/students/ipe/journalinfo.xhtml

Critique provides a forum for graduate and undergraduate students of politics to express and exchange diverse ideas and to imagine new possibilities for democracy and justice https://about.illinoisstate.edu/critique/Pages/default.aspx

Journal of Science and Health at the University of Alabama - JOSHUA includes topics with societal or ethical implications, emerging methodologies or fields, et cetera. http://www.bama.ua.edu/~joshua/index.htm

The Penn Bioethics Journal is the nation's premier peer-reviewed undergraduate bioethics journal. http://bioethicsjournal.com/about/

BIOS to publish their undergraduate biology work http://www.tri-beta.org/publish.html

IMPULSE is the first international, online neuroscience journal for undergraduate publications. http://impulse.appstate.edu/

Undergraduate Research Journal for the Human Sciences. The URC Undergraduate Research Journal is an annual online national, reviewed journal dedicated to the publication of undergraduate student research. The twofold purpose of the journal is to foster and reward the scholarly efforts of undergraduate human sciences students as well as to provide a valuable learning experience. http://www.kon.org/CFP/cfp_urjhs.html

National Undergraduate Research Clearinghouse accepts any scientific manuscript. They can be empirical studies or literature reviews. http://www.webclearinghouse.net/help.php

American Journal of Undergraduate Research A refereed journal for undergraduate research in the pure and applied sciences, mathematics, engineering, technology, and related areas in education. http://www.ajur.uni.edu/

Catalyst: Rice Undergraduate Science and Engineering Review http://catalyst.rice.edu/ Submissions for reviews will be accepted from undergraduate students who have performed science or engineering research at any international university or research institution laboratory.

The Undergraduate Psychology Journal (UPJ) at the University of California Los Angeles is a publication which features outstanding research work performed by undergraduate students at UCLA and around the country http://www.studentgroups.ucla.edu/psychjournal/

The Yale Review of Undergraduate Research in Psychology is an annual journal that showcases the best and most original research in psychology conducted by undergraduates from around the world. http://www.yale.edu/yrurp/

Psi Chi Journal of Undergraduate Research a national, fully reviewed, quarterly journal dedicated to the publication of undergraduate psychology student research. http://www.psichi.org

Journal of Young Investigators JYI's web journal (which is also called JYI) is dedicated to the presentation of undergraduate research in science, mathematics, and engineering. http://www.jyi.org/about/

Morehead Journal of Applicable Mathematics MEJAM accepts papers which are outside the realm of the typical undergraduate curriculum and which emphasize the applicability of mathematics while maintaining significant mathematical interest. http://www.moreheadstate.edu/mejam/

Rose-Hulman Undergraduate Mathematics Journal is devoted entirely to papers written by undergraduates on topics related to mathematics http://www.rose-hulman.edu/mathjournal/index.php

Journal of Undergraduate Chemistry Research is a new peer review journal that will be published quarterly with papers of original research performed by undergraduates. http://www.vmi.edu/show.aspx?tid=36955&id=2214&ekmensel=8f9c37c3_156_160_2214_3

The Allegheny Review is one of America's few nationwide literary magazines dedicated exclusively to undergraduate works of poetry, fiction, creative nonfiction, and art http://alleghenyreview.wordpress.com/

The Oswald Review, An International Journal of Undergraduate Research and Criticism in the Discipline of English http://scholarcommons.sc.edu/tor/

Young Scholars in Writing: Undergraduate Research Young Scholars in Writing: Undergraduate Research in Writing and Rhetoric, a peer-reviewed journal for undergraduates.http://cas.umkc.edu/english/publications/youngscholarsinwriting/index3.html

Undergraduate Journal of Service Learning and Community-Based Research http://www.bk.psu.edu/Academics/33679.htm.

History Matters: An Undergraduate Journal of Historical Research. http://www.historymatters.appstate.edu/

AnthroJournal is an open source journal of outstanding scholarly research papers and reports authored primarily by undergraduate and graduate college students. http://www.anthrojournal.com/

Valley Humanities Review http://www.lvc.edu/vhr

Discussions, the Undergraduate Research Journal of Case Western Reserve University Information about *Discussions* can be found at: http://case.edu/discussions/

2018 SURE Award Recipients

Boris Rapoport, Physics and Astronomy, ’18
(Mentor: Amy Bartholomew, Physics & Astronomy)
Observing a Correlation between Planetary Nebula Sizes and Chemical Compositions

Callie Barth-Dwyer, Organismal/Environmental Biology, ’19 and **Kristyn Gessner**, Biology, ’21
(Mentor: Dr. Kara Loeb Belinsky, Biology)
Color Banding Birds to Track Individual Behavior Across a Suburban Campus

Winiffer Conce, Molecular/Cellular Biology, ’19
(Mentor: Lydia Bright, Biology)
Determination of infection susceptibility of *Paramecium* strains to *Holospora* bacteria

Eleanor Condelles, Sociology and Psychology, ’19
(Mentor: Karl Bryant, Sociology)
U.S. School Shootings in the Trump Era

Penelope Adler-Colvin, Geography, ’19
(Mentor: Huicheng Chien, Geography)
Mapping temperature change in New York State from 1950 to 2017

Puja Saha, Environmental Geochemical Science, ’19
(Mentor: Megan Ferguson, Chemistry)
Examining a bacterial predator’s mechanism of prey identification by quantifying interactions between cell monolayers

Johanna Levey, Physics and Astronomy, ’19
(Mentor: Catherine Herne, Physics and Astronomy)
Polarization measurements in a tightly focused optical trap

Alec Goldstein, Psychology, ’19
(Mentor: Elizabeth Hirshorn, Psychology)
Examining the relationship between visual word and face processing

Rory Schiafo, Biology, ’19
(Mentor: Eric Keeling, Biology)
Pitch pine tree age/fire history relationships and understory plant community responses following the 2016 wildfire at Sam’s Point Preserve, NY.

Jennifer Beahan, Mechanical Engineering, ’19
(Mentor: Heather Lai, Engineering)
Dynamic Behavior of Biologically Inspired 3D Printed Visco-Elastic Heterogeneous Structures

2018 SURE Award Recipients continued…

Michelle Pirrone, Electrical Engineering, ’20
(Mentor: Spencer Mass, Biology)
Comparing the movements of locomotion in ambystomoid salamanders

Sasha Garcia, Geography, ’18
Mentor: Lawrence McGlinn, Geography)
Remote Sensing of Coastal Erosion on Long Island, New York

Anna Woodworth, Anthropology, ’19
(Mentor: Kenneth Nystrom, Anthropology)
Reconstruction of Diet at the Iron Age site of Cvijina Gradina, Croatia

Conor O’Riordan, History and Mathematics (German), ’19
(Mentor: Dr. Vanessa Plumly, Languages, Literatures & Cultures)
Historically Determined Value?: Shifting Perceptions of Monuments and Art in Twentieth-Century Germany”

Brenna O’Brien, Biology with Cell/Molecular Concentration, ’20
(Mentor: David C. Richardson, Biology)
Big fish in a little lake: How the Largemouth Bass (*Micropterus salmoides*) relative health and population size are changing in Lake Minnewaska

Franchesca Arecy, Spanish/Communication Disorders (Deaf Studies), ’19
(Mentor: Deyanira Rojas-Soso, Languages, Literatures & Cultures)
Ideologies about race and bodies in Latinas’ discourses about hair and beauty

Cole Solis, Contract Major in Environmental Science Illustration, ’19
(Mentor: Thomas Sarrantonio, Art)
Retrospect of an Artist’s Roots: Plant to Paper to Poetry and Pigment

Troy Moody, Biochemistry, ’19
(Mentors: Pamela St. John, Chemistry, and Spencer Mass, Biology)
Correlating BPA absorption and the regeneration process in planaria

Liz Dragan, Art History, ’19
(Mentor: Reva Wolf, Art History)
Female Performance, Contemporary Culture, and the Occult: A Holy Trinity

Kieran Cavanagh, Mechanical Engineering & Mathematics, ’21
(Mentor: Rachmadian Wulandana, Engineering)
Computer Modeling of Vortex-Induced Instability of Flow Past Cylinders

Fall 2018 AYURE Award Recipients

Winiffer Conce Alberto, Molecular/Cellular Biology, '19
(Mentor: Lydia Bright, Biology)
Exploring susceptibility of Paramecium to *Holospora* infection

Dylan Fitzmaurice, Biochemistry/Applied Mathematics, '19
(Mentor: Megan Ferguson, Chemistry)
Examining interactions between bacterial cells with AFM

Katherine Dobosh, Biology, '19
(Mentor: Lydia Bright, Biology)
Tracking *Paramecim* population changes from season to season in local ponds

Heh-Soo Choi, Computer Science, '19
(Mentor: Min Chen, Computer Science)
Image Classification with Artificial Neural Network

JinSoo Choi, Computer Science, '19
(Mentor: Min Chen, Computer Science)
Genetic Algorithm based Edge Detection for Image Segmentation

Jordan Greenough, Chemistry (Biochemistry emphasis), '19
(Mentor: Preeti Dhar, Chemistry)
Evaluation of *Heracleum maximum* (HM) extracts for Acetylcholinesterase (AChE) and Butyrylcholinesterase (BChE) inhibition

Amber Funk, Biology/Psychology & Art Studio, '18 **& Lindsey Griffin**, Biology/Chemistry, '19
(Mentor: Spencer Mass, Biology)
Hypertrophy or Proliferation in Planarian Regeneration

Degen Mariniello, Chemistry with a concentration in Biochemistry, '19
(Mentor: Preeti Dhar, Chemistry)
Using Sodium Borohydride/bromine to open cyclic ethers

Timothy Earl, Physics, '18
(Mentor: Catherine Herne, Physics & Astronomy)
Polarimetry on rotating rhombohedral calcite

Johanna Levey, Physics & Astronomy, '19
(Mentor: Catheine Herne, Physics & Astronomy)
Controlling Calcite Rhombohedrons in a Polarized Optical Trap

Victoria Narici, Anthropology/Biology, '19
(Mentor: Spencer Mass, Biology)
Characterizing the gait cycle in Ambystomoid salamanders

Fall 2018 AYURE Award Recipients continued…

Hanami Robles and **Bryan Feigel,** Mechanical Engineering, ‘19
(Mentor: Jared Nelson, Engineering Programs)
Isolating mechanical property variation of natural fibers

Simone Evans, Mathematics & Biochemistry/Music, ‘19
(Mentor: Anca Râdulescu, Mathematics)
Universality of dynamic behavior in low-dimensional nonlinear networks

Tucker Lundgren, Mechanical Engineering/Mathematics, ‘19
(Mentor: Anca Râdulescu, Mathematics)
A pharmacokinetic model of lead-calcium interactions

Cassandra Williams, Mathematics, ‘21
(Mentor: Anca Râdulescu, Mathematics)
Revising estimates of glutamate transporter density in astrocytes: a geometric computation

Troy Moody, Biochemistry/Philosophy, ‘19
(Mentors: Pamela St. John & Spencer Mass, Chemistry & Biology)
Correlation between BPA absorption and regeneration in planaria

Jacqueline Taylor, Mechanical Engineering, ‘20
(Mentor: Rachmadian Wulandana, Mechanical Engineering)
An Active Cooling System for Photovoltaic Solar Panel

Ashley Fisher, Biology/Spanish and Deaf Studies, ‘19
(Mentor: Maureen Morrow, Biology)
T cell Signaling in Response to Atrazine

Spring 2019 AYURE Award Recipients

Lina McCary, Mechanical Engineering, ‘20
(Mentor: Ping-Chuan Wang, Mechanical Engineering)
How Localized Joule Heating Degrades Integrated Circuit (Microchip)

Melissa Maddux, Biochemistry, ‘20
(Mentor: Frantz Folmer-Andersen, Chemistry)
Simple DACH ligands for enantioselective molecular recognition

Gerlando Volpe, Theatre Arts (Design/Tech Concentration)/Film Studies, ‘19
(Mentor: Sun Hee Kil)
Designing Customized Entertainment Show Control MIDI Controllers Question 2: Provide a BRIEF review of the literature (citations

Michele Lederer, Mechanical Engineering, ‘20
(Mentor: Rachmadian Wulandana, Mechanical Engineering)
Investigation of 3d-printed metal heat sinks for microchips cooling

Conor N. O’Riordan, Mathematics, ‘19
(Mentor: Hyunchul Park, Mathematics)
Markov Chains and Their Simulation

Katherine Dobosh, Biology and Psychology, Evolutionary Studies, ‘19
(Mentor: Lydia Bright, Biology)
Tracking Paramecium population changes from season to season in local ponds

James Mahoney, Chemistry, ‘19
(Mentor: Miles Wilklow-Marnell, Chemistry)
Synthesis/characterization of quinoid-based iridium pincer complexes

Student Travel Award Recipients

URETA

-Undergraduate Research Experience Travel Award: conference travel funding provided to students who participated in AYURE or SURE. Twenty-three URETA students presented at professional conferences during the 2018/2019 Academic Year.

STA

-Student Travel Award: conference travel funding provided to students who have not participated in AYURE or SURE. Seven STA students presented at professional conferences during the 2017/2018 Academic Year.

SURC

Twenty-two New Paltz students presented the results of their faculty-mentored research projects at the annual **SUNY Undergraduate Research Conference.** The conference was held on April 26, 2019 in Farmingdale, NY.