Skidmore College

FACULTY STUDENT SUMMER RESEARCH PROGRAM

SUMMER 2022

FINAL PRESENTATIONS
AUGUST 4, 2022

Faculty Student Summer Research Program
Summer 2022

Index

Since 1989, Skidmore College's Faculty Student Summer Research Program has given students a singular opportunity to work one-on-one with a faculty member. For periods ranging from five to ten weeks, students work with faculty on original research in disciplines ranging from biology to management and business, including classics and geosciences. Hands-on research with a faculty member allows students to become part of the research enterprise in a way that both complements and informs regular class work. In some cases, the collaborative research forms the basis for a senior's honors thesis or can lead to published articles in a peer-reviewed academic journal. Long-term, participation can help students gain admission to graduate schools and research careers. Skidmore alumni who have continued their education in graduate school have reported that experience as researchers has given them distinct advantages as scholars. For summer 2022, there are 115 students and 40 faculty members engaged over 40 collaborative research projects in a wide range of disciplines funded by the Faculty Student Summer Research program, external grants, the S3M Program, indirect cost funds, start-up funds, and other funding sources.

Funding Sources for Faculty Student Summer Research Programs

ALUMNI, FAMILY, AND FRIENDS

Marlene Oberkotter Fowler ’61
Ralph Garboushian ’92
Jim Lippman and Linda Friedman Lippman ’82
Richard A. Mellon ’87
Margaret Williams Page ’43
Tina and David Wilson P’25
Mr. and Mrs. Kenneth Woodcock, Parents ’96

Axelrod-Porges Scholars

Established in 2006 by Felicia Axelrod ’62 and Robert Porges to support faculty-student teams in the area of the sciences

Schupf Scholars

Established in 2008 by Sara Lubin Schupf ’62 to support summer faculty-student research with a preference given to students pursuing projects in the STEM disciplines. Schupf Scholars are selected beginning the summer after their freshman or sophomore year. Schupf Scholars may access additional funding for travel to meetings and conferences as well as for research supplies and expense during their continuing research with faculty during their academic career at Skidmore.

Weg Scholars

Established in 2010 by Carol Little Weg ’64 and Ken Weg and awarded with a preference for students pursuing projects in the sciences and social sciences.

FOUNDATIONS AND GRANTS

Caney Fork Farms
The Charles Slaughter Foundation
The GKV Foundation
The GRAMMY Foundation
W.M. Keck Foundation
The National Institutes of Health
The National Science Foundation
Rathmann Family Foundation
The Senft Family Fund
The Skidmore Scholars in Science and Mathematics (S3M) Program
University of Massachusetts Boston

The Schupf Scholars Program

Each year the Schupf Scholars Program funds students to participate in the Faculty Student Summer Research Program and to continue that research with their faculty mentor in the ensuing academic year. The Schupf Scholars Program focuses on science, technology, and mathematics, and pays special attention to interdisciplinary projects and to female students in fields where women are underrepresented. Each year these scholarships will provide students and a faculty partner with up to $10,000 for research beginning the summer after their freshman or sophomore year and continuing through the following academic year. Schupf Scholars will be able to use additional funding for travel to meetings and conferences as well as for research supplies and expenses during their continuing research with faculty during their academic career at Skidmore.

Trustee Sara Lee Schupf '62 established the $1.1 million scholarship fund for student research in an endeavor to inspire, cultivate, and support students' interest in science, because she sees it as an excellent avenue for exercising critical thought and shaping the progress of an idea from theory to practice. She says: this is what a Skidmore education is all about—getting involved in the process of discovery, which includes the satisfaction of success, failure, and mentorship. More broadly the Schupf Scholars Program seeks to help light an accessible pathway to science research and science career preparation. With such an early start on intensive research and continued work into their junior or senior year, Schupf Scholars will be well equipped to move on to graduate or professional school in the sciences.

2022-23
Zoe Gleason, 25
Natasha Machera '25
Sophie McCullough, '25
Hanna Nally, '24
Sarah Sinnot, '24

2021-22
Emily Luo, '23
Elizabeth Miller, '23
Nich Nearyrat Phalkun, '24
Elizabeth Scholer, '24
Sarah Varua, '24

2020-21
Selina Almasarwah, '23
Sarah Finnegan, '22
Heather Ricker, '22

2019-20
Anna Carhart, '22
Rachel Carrock, '22
Katie Rinaolo, '22
Jiayue Hong, '21
Saana Teittinen-Gordon, '22
Molly Cole, '21
Katie Yan, '22

2018-19
Acadia Connor, '21
Katherine Johnson, '20
Angelina Leonardi, '20
Claudia Mak, '20
Julia Danischweski, '20
Ella Long, '20
Jazmin Sepulveda, '20

2017-18
Beatriz Chavez, '18
Gabriella Gerlach, '19
Kyla Johnson, '20
Samantha Kenah, '19
Yutong Li, '19
Suzanne Zeff, '20

2016-2017
Claudia Bennett-Caso '19
Alexandra Cassell '19
Erin Mah '19
Erin Maloney '18
Emily O'Connor '19
Kari Rasmussen '18

2015-2016
Kelly Cantwell, '18
Jillian Greenspan, '17
Katherine Shi, '18
Deborah Kim, '18
Talia Stortini, '18
Hannah Schapiro, '17
Meggie Danielson, '17

2014-2015
Jaya Borgatta, '16
Meti Debela, '16
Glenna Joyce, '16
Jenny Zhang, '16
Stephanie Zhen, '16

2013-2014
Melanie Feen ‘16
Michele Fu ‘15
Kelly Isham ‘16
Angelica Newell ‘15
Rafaella Pontes ‘15

2012-2013
Jennifer Harfmann ‘14
Rafaella Pontes ‘15
Kara Rode ‘15
Carol Wu ‘14

2011-2012
Tim Brodsky ‘13
Andrea Conine ‘13
Brenda Olivo ‘14
Kathryn Stein ‘13

2010-2011
Rebecca Connelly ‘12
Ava Hamilton ‘12
Caroline Loehr ‘12
Taylor Moot ‘13

Faculty Student Summer Research Program

Schedule of Final Research Presentations

Thursday, August 4, 2022

9:00 am – 9:25 am Coffee, Fruit, Yogurt, Muffins

9:30 am – 10:30 am Oral Presentations

ROOM A

DEFINING PRIVACY NORMS FOR FERTILITY DATA (REMOTE)
Zander Chown, 2025
Aarathi Prasad, Assistant Professor, Computer Science Department

THE MILITARY IN DEMOCRACY AND DEMOCRACY IN THE MILITARY (REMOTE)
Billy Lee, 2023; Ilena Berro Pizzarossa, 2024
Yelena Biberman, Associate Professor, Political Science Department

ARE LOCAL VOTERS AS IGNORANT AS POLITICAL SCIENTISTS THINK THEY ARE?
Bella Bruno, 2025
Robert C. Turner, Associate Professor, Political Science Department

THE HOPE OF A HOOP HOUSE
Emily Chase, 2022; Julia Danielson, 2022
Lowery Parker, Visiting Assistant Professor, Environmental Studies and Sciences Program

ROOM B

PROLINE ISOMERIZATION COMPENSATES FOR THE EFFECT OF PHOSPHORYLATION IN CONFORMATIONS OF THE DISORDERED RNA POLYMERASE II CTD
Ray East 2023; Lizbeth Mendoza, 2025, Wei Chen[1]; Scott Showalter[1]; Pennsylvania State University[1]
K. Aurelia Ball, Associate Professor, Chemistry Department

EFFECTS OF SHORT-TERM CALORIC RESTRICTION ON CARDIOMETABOLIC MEASURES IN OVERWEIGHT AND OBESE INDIVIDUALS
Brigitte Yunda; Anna Churchill, 2023
Stephen J. Ives, Associate Professor, Health and Human Physiological Sciences Department
Justin DeBlauw, Visiting Assistant Professor, Health and Human Physiological Sciences Department

CHEMICAL GENOMICS: EXPERIMENTAL INTERROGATION OF THE GOLGI APPARATUS IN THE GREEN ALGA, *PENIUM MARGARITACEUM*
Kaylee Bagdan, 2024
David Domozych, Professor of Biology and Director of the Skidmore Microscopy Imaging Center, Biology Department
Josie LoRicco, Post-doctoral Research Fellow, Department of Biology

OXIDATION OF FATTY ACIDS IN THE PRESENCE OF ENVIRONMENTAL PHOTOSENSITIZERS
Emily Davis, 2023
Juan Navea, Professor, Chemistry Department

10:35 am – 11:45 am Poster Presentations

ROOM A

RESURRECTION OF ANCESTRAL ASPARTYL-tRNA SYNTHETASES
Lindsey Han, 2025
Kelly Sheppard, Associate Professor, Chemistry Department

CHARACTERIZING A SUBVOLCANIC MAGMA PLUMBING SYSTEM IN ICELAND
Caroline Rogers, 2024
Andrew Horst, Visiting Assistant Professor, Geosciences Department

PROCESSING PORTRAIT EMOTIONS IN ARTIST LIA COOK'S WOVEN TAPESTRIES AND PHOTOGRAPHS: EFFECT OF MEDIUM, HEMISPHERIC SPECIALIZATION, AND VIEWER EMOTIONAL STATE
Victoria Thorpe, 2023; Lilia Sattler, 2023; Kelby Wittenberg, 2023
Denise L. Evert, Associate Professor, Neuroscience Program and Psychology Department

EFFECTS OF ACID CONCENTRATION AND AQUEOUS WASHES ON TiO_2 DOPED WITH FE AND CU
Johanna Nally, 2024; Ciaran Healey, 2024
Maryuri Roca, Senior Teaching Professor, Chemistry Department

DEVELOPMENT OF LOW-COST METHODS FOR ANALYZING IODIDE IN HYDROFRACKING FLOW BACK WATER
Leonard Ivan Parra Jr, 2024
Kimberly Frederick, Professor, Chemistry Department

PASSIVATION OF GOLD ANTIBODY NANOCONJUGATES FOR A FASTER WESTERN BLOT
Zack Barnet, 2024
Maryuri Roca, Senior Teaching Professor, Chemistry Department

ROOM B

ATMOSPHERIC MOBILITY OF IRON FROM SIMULATED COMBUSTION PARTICLES
Olivia Kazanjian, 2024; Lyra Flinn, 2025
Juan Navea, Professor, Chemistry Department

FOOD CAPACITY IN THE GLOBAL SOUTH
Morgan Hidalgo, 2024
Feryaz Ocakli, Associate Professor, Political Science Department & IA Program

GENE *NERFIN-2* AMELIORATES DIP-α-MEDIATED NEUROMUSCULAR CONNECTIVITY DEFICITS IN *DROSOPHILA MELANOGASTER*
Bill Wu, 2023
Christopher Vecsey, Associate Professor, Neuroscience Program

HIDDEN TREASURES: REDISCOVERING LOST ART FROM THE 1980 WINTER OLYMPICS IN LAKE PLACID, NY
Maddie Egger, 2023; Evan Little, 2022
David Howson, Senior Teaching Professor and Arthur Zankel Executive Director of Arts Administration, Arts Administration

ANALYZING BINDING OF EACH SEGMENT OF A DISORDERED PEPTIDE TO AN SH3 DOMAIN
Adriana Cuibus, 2024; Ray East, 2023
K. Aurelia Ball, Associate Professor, Chemistry Department

STRUCTURAL ANALYSIS OF GLUCAN PHOSPHATASE STARCH EXCESS4
Kenyon Weis
Madushi Raththagala, Assistant Professor, Chemistry Department

ROOM C

STRUCTURAL CHARACTERIZATION OF STARCH EXCESS4 FROM STORAGE CROPS
Juan Carlos Cruz Vargas, 2023
Madushi Raththagala, Assistant Professor, Chemistry Department

INVESTIGATING THE CO-ACTIVATION OF sNPF- AND LEUCOKININ-PRODUCING NEURONS IN *DROSOPHILA MELANOGASTER*
Ariana Tucker, 2024; Sophie Sacco, 2024
Christopher Vecsey, Associate Professor, Neuroscience Program

DROSOPHILA MELANOGASTER AS A MODEL FOR EFFECTS OF DIFFERENT SIZED MICROPLASTICS ON CIRCADIAN RHYTHMS
Anika Eastman, 2025; Sara Burr; 2025, Ethan Hull, 2023
Bernard Possidente, Professor, Biology Department

INVESTIGATING ALLOSTERIC REGULATION OF STARCH EXCESS4 USING X-RAY CRYSTALLOGRAPHY AND SITE-DIRECTED MUTAGENESIS
Sarah Sinnott; Murphy Alcantara, 2024
Madushi Raththagala, Assistant Professor, Chemistry Department

PURIFICATION OF THE *BACILLUS SUBTILIS* TRANSAMIDOSOME COMPONENTS
Aya Awawdeh, 2022
Kelly Sheppard, Associate Professor, Chemistry Department

OPTOGENETIC STIMULATION OF NEUROPEPTIDE F NEURONS INDUCES SLEEP AND GROOMING BEHAVIOR IN *DROSOPHILA MELANOGASTER*
Sophie Sacco, 2024; Ariana Tucker, 2024
Christopher Vecsey, Associate Professor, Neuroscience Program

11:45 am – 12:50 pm Lunch, Murray Aikins Dining Hall

1:00 pm – 2:10 pm Poster Presentations #2

ROOM A

CONCANAVALIN-BASED IN-VITRO SEDIMENTATION ASSAY TO DETERMINE BINDING AFFINITY OF GLUCAN PHOSPHATASES
Marissa Frenett, 2023; Natasha Machera, 2025
Madushi Raththagala, Assistant Professor, Chemistry Department

DETERMINING THE EFFECTS OF LIGHT INTENSITY ON SLEEP IN *DROSOPHILA MELANOGASTER*
Aaliyah J. Peralta, 2024
Christopher Vecsey, Associate Professor, Neuroscience Program

AQUEOUS STABILITY AND ELECTROCHEMICAL CHARACTERIZATION OF MANGANESE COMPOUNDS AS MIMICS OF SUPEROXIDE DISMUTASE
Aidan Spengler, 2024
Steven Frey, Associate Professor, Chemistry Department.

SH3 BINDING PATHWAY AND KINETICS IN THE PRESENCE OF SALT
Frida Anguiano, 2023
K. Aurelia Ball, Associate Professor, Department of Chemistry

STABILITY AND REACTIVITY OF A MANGANESE(II) COMPOUND WITH A TRIPODAL, PYRIDINE-CONTAINING LIGAND THAT MIMICS SUPEROXIDE DISMUTASE
Samantha Claussen '23
Steven Frey, Associate Professor, Chemistry Department

DEVELOPMENT OF 3D PRINTED CHIPS FOR NITRATE DETECTION
Sophie McCullough, 2025
Kimberley Frederick, Professor, Chemistry Department

ROOM B

DELETION OF SNORD116, A PRADER-WILLI SYNDROME CANDIDATE GENE, DOES NOT AFFECT CIRCADIAN RHYTHMS IN MICE
Amr Fatafta; Maggie Arms, 2023
Bernard Possidente, Professor, Biology Department

STABILITY OF THE HIV VIF-A3F INTERFACE OVER TIME
Elizabeth Miller, 2023
K. Aurelia Ball, Associate Professor, Chemistry Department

DEVELOPMENT OF MULTI-LAYER PAPER MICROFLUIDIC DEVICE FOR ANALYSIS OF PHOSPHATE IN SOIL
Zoe Gleason, 2025
Kimberley Frederick, Professor, Chemistry Department

ASTROCYTES PROMOTE SLEEP IN *DROSOPHILA MELANOGASTER*
Matthew Grega, 2023
Christopher Vecsey, Associate Professor, Neuroscience Program

STABILITY OF SILVER NANOPARTICLES FOR AN OPTIMIZED WESTERN BLOT
Haru Kato, 2024
Maryuri Roca, Senior Teaching Professor, Chemistry Department

EVALUATION OF THE SUPPORT SYSTEMS ECOMAP FOR LGBTQ+ YOUTH
Minghuang Wang, 2023
June Paul, Assistant Professor, Social Work Department

ROOM C

HETEROGENOUS OZONOLYSIS OF CHEMISORBED ORGANIC COMPOUNDS
Aida Castelblanco, 2023; Madison Bourassa, 2024
Juan Navea, Professor, Chemistry Department

DOES LITHIUM HAVE AN EFFECT ON THE CIRCADIAN RHYTHM OF A TRANSGENIC DROSOPHILA MODEL OF ALZHEIMERS DISEASE?
Jessica Auerbach, 2023
Bernard Possidente, Professor, Biology Department

4-BENZOYLBENZOIC ACID AS A MOLECULAR PHOTOSENSITIZER IN THE CONVERSION OF NO_2 INTO HONO
Syafira Nurlita 2023; Roman Montenegro 2024
Juan Navea, Professor, Chemistry Department

B. ANTHRACIS **INDIRCT PATHWATY FOR ASPARAGINYL-TRNA FORMATION**
Michelle Sawunyama, 2024
Kelly Sheppard, Associate Professor, Chemistry Department

BINDING EFFECTS OF A KEY NEGATIVE CHARGED RESIDUE MUTATION ON THE BINDING PATHWAY OF SH3 DOMAIN COMPLEX AND ARKA PEPTIDE
Oluebube Onwuzulu, 2024
K. Aurelia Ball, Associate Professor, Chemistry Department

PROLINE ISOMERIZATION AND ITS EFFECT ON SH3 BINDING
Lizbeth Mendoza ‘25
K. Aurelia Ball, Associate Professor, Chemistry Department

PROJECT ABSTRACTS

Project:

SH3 BINDING PATHWAY AND KINETICS IN THE PRESENCE OF SALT

Frida Anguiano, 2023
K. Aurelia Ball, Associate Professor, Chemistry Department

Protein-protein interactions are involved in a wide range of cellular processes in which intrinsically disordered proteins (IDPs) and protein binding domains are often a part of. This project focuses on the yeast protein interactions of the Abp1 SH3 domain (AbpSH3), and the intrinsically disordered peptide ArkA. To understand how this important interaction functions, we are investigating the binding pathway using molecular dynamics in the presence of sodium chloride. We expect the addition of 800 mM sodium chloride to destabilize the encounter complex leading to a slower formation of the complex and a decrease in electrostatic contacts. Simulating the binding between ApbSH3 and ArkA in the presence of salt can provide insight into the role of electrostatics in SH3 binding in general and in experimental settings.

Project:

ANALYZING BINDING OF EACH SEGMENT OF A DISORDERED PEPTIDE TO AN SH3 DOMAIN

Adriana Cuibus, 2024; Ray East, 2023
K. Aurelia Ball, Associate Professor, Chemistry Department

The yeast AbpSH3 domain is involved in cellular signaling and cytoskeleton regulation. AbpSH3 binds to an intrinsically disordered protein ArkA17 made of two segments. It is crucial to understand how one segment of ArkA17 might cause the domain to change structure and allow the other segment to bind differently, an effect known as allostery. We use molecular dynamics simulations to characterize how the ArkA17 segments interact with the domain. Results show how segment 1 is not affected by the absence of segment 2, but segment 2 binding is impacted by the absence of segment 1, showing a high degree of flexibility. This will help us understand the role of each segment in binding to further understand intrinsically disordered proteins.

Project:

STABILITY OF THE HIV VIF-A3F INTERFACE OVER TIME

Elizabeth Miller, 2023
K. Aurelia Ball, Associate Professor, Chemistry Department

HIV hijacks an immune cell's natural function to evade its antiviral defenses with assistance from the protein viral infectivity factor (Vif). Vif is an intrinsically disordered protein that lacks a fixed structure but binds to an E3 ubiquitin ligase complex to gain stability. The HIV-hijacked complex tags the antiviral protein A3F for ubiquitination and subsequent degradation. We want to study the dynamics of the complex and how Vif can bind A3F. Molecular dynamics simulations were used to identify the specific residue interactions between Vif-A3F. Preliminary results showed the

complex with A3F bound was less flexible than the complex by itself. Understanding the molecular basis of Vif's affinity towards A3F will allow for the development of therapeutics that interrupt the Vif-A3F binding, rendering the virus useless.

Project:

PROLINE ISOMERIZATION AND ITS EFFECT ON SH3 BINDING

Lizbeth Mendoza, 2025
K. Aurelia Ball, Associate Professor, Chemistry Department

SH3 domains are one of the most frequent protein interactions in eukaryotes. Intrinsically disordered proteins (IDPs), which are flexible sequences, commonly bind to SH3 domains. However, since it is difficult to study these interactions through experimental methods because of the multi-step binding process, Molecular Dynamics (MD) computer simulations of binding can be used to study the interactions between the proline-rich IDP ArkA and the SH3 domain. Further examination of proline isomerization was conducted, where the proline peptide bond undergoes a conformational change from *trans* to *cis*. MD simulations were used to examine whether the conformation of ArkA with one proline in *cis* while the others are in *trans* can bind to SH3 domain. This tells us how conformation of a protein is important to binding.

Project:

BINDING EFFECTS OF A KEY NEGATIVE CHARGED RESIDUE MUTATION ON THE BINDING PATHWAY OF SH3 DOMAIN COMPLEX AND ARKA PEPTIDE

Oluebube Onwuzulu, 2024
K. Aurelia Ball, Associate Professor, Chemistry Department

SH3 domains are common protein domains found across all forms of life and serve important functions in cell signaling and cytoskeletal regulation. Previous experimental results have shown that cellular processes are mediated by interactions between proteins. In this experiment, we used molecular dynamics simulations to simulate the contact interaction between SH3 domain, and a disordered peptide ArkA, while analyzing the effect a residue mutation has on the transitioning of ArkA peptide and Abp1p SH3 domain through the binding stages. Using molecular dynamics simulations, we ran analysis which refuted our hypothesis that by mutating the central peptide residue fewer contacts will be observed when compared to the wild-type simulations. The study has helped us understand that by mutating the residue the binding is not fully affected.

Project:

PROLINE ISOMERIZATION COMPENSATES FOR THE EFFECT OF PHOSPHORYLATION IN CONFORMATIONS OF THE DISORDERED RNA POLYMERASE II CTD

Ray East, 2023; Lizbeth Mendoza, 2025; Wei Chen[1]; Scott Showalter[1]; Pennsylvania State University[1]
K. Aurelia Ball, Associate Professor, Chemistry Department

RNA Polymerase II transcribes mRNA. The largest subunit of this complex contains a C-terminal domain (CTD) that is an intrinsically disordered protein with a repetitive amino acid heptad sequence making the domain very difficult to study. Phosphatases regulate CTD through post-

translational modifications. We use molecular dynamics simulations to analyze how the CTD domain is impacted by phosphorylation. Results show that due to proline isomerization, the domain can move reversibly between a compact and extended structure. The phosphorylated CTD domain samples more prolines in *cis*, which compensates for the effect of phosphorylation resulting in the domain functioning similar when unphosphorylated. Future work includes running simulations changing the 14th amino acid from asparagine to serine as we hypothesize that the interaction between threonine and asparagine increase isomerization.

Project:

THE MILITARY IN DEMOCRACY AND DEMOCRACY IN THE MILITARY

Billy Lee, 2023; Ilena Berro Pizzarossa, 2024
Yelena Biberman-Ocakli, Associate Professor, Political Science Department

How do the armed forces affect a country's democratic development? Is it possible to have a democratic society while maintaining a robust military - one capable of dominating other societies? How is the military, as an organization, shaped by the society it serves? This project explores the relationship between democracy and the military; how the military can hinder or enhance democracy. We applied a combination of qualitative and quantitative methods to data collection and analysis, including interviews and spatial analysis.

Project:

CHEMICAL GENOMICS: EXPERIMENTAL INTERROGATION OF THE GOLGI APPARATUS IN THE GREEN ALGA, *PENIUM MARGARITACEUM*

Kaylee Bagdan, 2024
David Domozych, Professor of Biology and Director of the Skidmore Microscopy Imaging Center, Biology Department
Josie LoRicco, Post-doctoral Research Fellow, Department of Biology

Approximately 600 million years ago, an ancestor of the Charophycean green alga *Penium margaritaceum* successfully invaded a terrestrial habitat and ultimately yielded modern day land plants (Jiao et al., 2020). *P. margaritaceum* has become a model organism for elucidating the subcellular mechanisms for secretion. Through employing chemical genomic technology, we can now interrogate the structural/functional features of the specific components of the secretory system including the Golgi Apparatus and the trans-Golgi network. This can be synthesized with molecular data to produce 4-dimensional model profiles. Our team employed a range of subcellular inhibitors and monitored their effects using light, confocal laser scanning, scanning electron (SEM), and transmission electron microscopy (TEM). Our data reveals significant structural and functional disruptions to the secretory apparatus.

Project:

PROCESSING PORTRAIT EMOTIONS IN ARTIST LIA COOK'S WOVEN TAPESTRIES AND PHOTOGRAPHS: EFFECT OF MEDIUM, HEMISPHERIC SPECIALIZATION, AND VIEWER EMOTIONAL STATE

Victoria Thorpe, 2023; Lilia Sattler, 2023; Kelby Wittenberg, 2023
Denise L. Evert, Associate Professor, Neuroscience Program and Psychology Department

Brain imaging and behavioral experiments are essential in neuroaesthetic research, which aims to understand the neural substrates and mechanisms of aesthetic experience. Lia Cook is a fiber artist whose work consists of cotton and rayon woven tapestries depicting close-up portrait images of faces translated from photographs. Due to the brain's asymmetries, the study is primarily interested in whether the side of space in which an image appears affects the emotional ratings of fairly ambiguous facial expressions and whether ratings of woven tapestries are inherently more emotional than photographs. The hemispheric specialization of functions was assessed using the divided-visual field methodology. All participants were assigned the naturalistic observation condition, whereby they viewed and rated the images as they would in a museum in a lab setting. The emotions are fear, surprise, anger, sadness, happiness, and disgust.

Project:

DEVELOPMENT OF MULTI-LAYER PAPER MICROFLUIDIC DEVICE FOR ANALYSIS OF PHOSPHATE IN SOIL

Zoe Gleason, 2025
Kimberley Frederick, Professor, Chemistry Department

Phosphate is an important component of modern agriculture as phosphate is an essential nutrient added to most fertilizers. The overapplication of fertilizers leads to runoff that causes algal blooms and eutrophication. Ideally, if farmers could measure the correct amounts of phosphate in their soil, they could measure the right amount of fertilizer to apply in order to reduce runoff. The goal of this project is to create a color-changing assay that is able to detect different amounts of phosphate in soil. The assay runs on inexpensive paper-based microfluidic chips using the ascorbic acid method, which causes the chips to turn blue. This allows for the different concentrations of phosphate to be detected based on the shade and intensity of the blue. We will present our successful efforts in creating a simple, low-cost multilayer microfluidic chip that will filter out the soil, allowing for the amounts of phosphate to be accurately measured. We will also detail our efforts to ensure the long-term stability of the reagents deposited on the chips.

Project:

DEVELOPMENT OF 3D PRINTED CHIPS FOR NITRATE DETECTION

Sophie McCullough, 2025
Kimberley Frederick, Professor, Chemistry Department

Nitrate is a critical nutrient for plant growth, which makes it critical for modern agriculture. However excessive nutrients in the soil are washed into watersheds, which is intensified by the large-scale farming. This runoff causes an excess of algae growth in the process of eutrophication,

pulling the oxygen from the water and causing dead zones by suffocating the aquatic species. Being able to accurately apply fertilizer at the source will help minimize runoff. Thus, the goal is to get easy, quick, and affordable testing options for people without technical training like farmers. The detection of nitrate involves a reaction which produces a vibrant pink product. The intensity of the pink color is directly proportional to the concentration of nitrate. To be able to read the assay, the soil needs to be filtered out from the slurry so there can be a clear access for color detection. 3D printing allows for complex chips, using multiple materials, to be cheaply and efficiently made and thus well suited to our scenario. We will present data on our efforts to design and print the chips as well as preliminary results on nitrate detection.

Project:

DEVELOPMENT OF LOW-COST METHODS FOR ANALYZING IODIDE IN HYDROFRACKING FLOW BACK WATER

Leonard Ivan Parra Jr, 2024
Kimberly Frederick, Professor, Chemistry Department

Microfluidics paper analytical devices (μPADs) are useful, low-cost technology that provide the opportunity for individual to gain access scientific analysis without the need for training or expensive instrumentation. In comparison to the traditional method of measuring color, analysis methods that use fluorescence as a detection method have lower limits of detection of desired chemical and has a wider linear range and a higher sensitivity. They also able to detect a wider variety of compounds by using both direct and indirect analysis strategies. Therefore, in this project, the goal is to use 3D printing and a cell phone to make a portable fluorescence detector. This portable fluorimeter uses a low-cost LED as a light source and a cell phone as the detector. We will present our work to design and print a portable fluorescent detector. We will also describe our first application of this detector of the amount of iodide in water indirectly with a fluorescent dye.

Project:

STABILITY AND REACTIVITY OF A MANGANESE(II) COMPOUND WITH A TRIPODAL, PYRIDINE-CONTAINING LIGAND THAT MIMICS SUPEROXIDE DISMUTASE

Samantha Claussen ‘23
Steven Frey, Associate Professor, Chemistry Department.

Superoxide dismutases (SODs) have evolved within organisms to protect cells from the toxic metabolism and disease byproduct, superoxide ion (O_2^-). The goal of our work is to synthesize compounds that resemble the active site of manganese-containing SOD, and to access their ability mimic SOD activity. Thus, we have synthesized a manganese(II) complex with DPEA, where DPEA is the tripodal ligand N,N-bis(2-pyridylmethyl)hydroxyethylamine. The stability of this complex in aqueous solution has been examined by potentiometric and ^{1}H-NMR titrations. Cyclic voltammetry (CV) of the complex indicates that the Mn(III)/Mn(II) reduction potentials mimic the catalytic activity of SODs. Using the Fridovich assay, the complex was observed to catalyze the efficient disproportionation of superoxide ion with a catalytic rate constant (k_{cat}) that is high among compounds reported previously.

Project:

AQUEOUS STABILITY AND ELECTROCHEMICAL CHARACTERIZATION OF MANGANESE COMPOUNDS AS MIMICS OF SUPEROXIDE DISMUTASE

Aidan Spengler, 2024
Steven Frey, Associate Professor, Chemistry Department

Superoxide dismutase's (SODs) are a class of enzymes that protect cells against toxic superoxide radicals ($O_2^{\bullet-}$) that are produced as a product of metabolism. SODs utilize metal cofactors to disproportionate $O_2^{\bullet-}$ to oxygen and hydrogen peroxide. The goal of our work is to synthesize compounds that mimic the active site of manganese-containing superoxide dismutase, and to study these compounds to understand Mn-SOD itself. With that in mind, we have synthesized a series of manganese(II) compounds with tripodal, nitrogen and oxygen-containing ligands. Our work this summer focused on determining the aqueous stability of these compounds and their reduction potentials. To determine the stability of the compounds, we have employed a potentiometric titration technique. Reduction potentials have been determined using cyclic voltammetry.

Project:

CHARACTERIZING A SUBVOLCANIC MAGMA PLUMBING SYSTEM IN ICELAND

Caroline Rogers, 2024
Andrew Horst, Visiting Assistant Professor, Geosciences Department

In Skagaströnd, Iceland, exposures of gabbro intrusions provide an opportunity to learn about subvolcanic magma flow direction. Many of these formations were created by processes analogous to the creation of oceanic crust. The subaerial setting of Iceland allows for the study of these deep earth processes which would be difficult to access in a marine setting. As this magma cools, the magnetic titanomagnetite crystals are solidified in a specific arrangement, creating the magnetic fabric. By studying this magnetic fabric and comparing the results to observations of thin section samples of the rock, the direction of magma flow can be determined. In this study, observations and software analysis was performed on nineteen thin section samples from seven different locations.

Project:

HIDDEN TREASURES: REDISCOVERING LOST ART FROM THE 1980 WINTER OLYMPICS IN LAKE PLACID, NY

Maddie Egger, 2023, Evan Little, 2022
David Howson, Senior Teaching Professor and Arthur Zankel Executive Director of Arts Administration, Arts Administration Program

In the years leading up to the 1980 Winter Olympics in Lake Placid, NY, the Olympic Regional Development Authority and other partners commissioned a dozen or more large, outdoor works of art for display during the Games. These large objects were installed throughout the Village of Lake Placid and the Olympic Complex. In the more than 40 years since the Olympic Torch made its way to the Adirondacks, the objects have been largely forgotten. Our project introduced us to Lake Placid community members, Olympic Commission officials, and both local and international arts figures to gather the first ever inventory of art made for the 1980 Winter Olympics. Our findings have led to a comprehensive overview of the remaining artwork and identifies pieces that have

been destroyed or lost altogether. Additionally, we created a new interactive map and physical handout to share our findings with the community.

Project:

EFFECTS OF SHORT-TERM CALORIC RESTRICTION ON CARDIOMETABOLIC MEASURES IN OVERWEIGHT AND OBESE INDIVIDUALS

Brigitte Yunda; Anna Churchill, 2023
Stephen J. Ives, Associate Professor, Health and Human Physiological Sciences Department
Justin DeBlauw, Visiting Assistant Professor, Health and Human Physiological Sciences Department

Obesity is a major risk factor for developing serious diseases like cardiovascular disease and cancer, but also impairs fat metabolism. Previous dietary interventions have been explored, but little is known about the short-term changes, particularly with caloric restriction (CR). We assessed the acute effects of a 3-day CR using commercially available diet (3-day reset, Plexus) on cardiometabolic health (fat use via respiratory quotient (RQ)) and body composition (% body fat, visceral fat score (Vfs)) in overweight and obese adults. Body fat (28.6±0.14% to 27.35±0.49%) and Vfs (12.25±1.77 to 11.25±1.77) were reduced with CR ($p<0.05$). RQ decreased with CR (0.84±0.01 to 0.76±0.00, $p<0.05$), indicating increased fat metabolism. The 3-day CR significantly improved body composition and fat metabolism, future studies should explore use in intermittent fasting regimens.

Project:

HETEROGENOUS OZONOLYSIS OF CHEMISORBED ORGANIC COMPOUNDS

Aida Castelblanco, 2023; Madison Bourassa, 2024
Juan Navea, Professor, Chemistry Department

Atmospheric particles have active surface sites available to adsorb organic compounds, which undergo oxidation in the presence of ozone. The study of this heterogeneous atmospheric ozonolysis is necessary to understand the energy and chemical balance of the atmosphere. We present a study from various ozonolysis reactions conducted in a state-of-the-art chamber that allows for *in-situ* spectroscopic observation of the reaction between ozone and a hydrocarbon-coated alumina surface. *In-situ* analysis was used to investigate the chemical kinetics of the oxidation process and *ex-situ* analysis was conducted to determine the reaction products. Finally, quantum chemical calculations were performed to determine the most favorable configuration of the adsorbed species. Our results suggest that organic carbonyl compounds, primarily aldehydes and ketones, are the main products of this heterogeneous ozonolysis.

Project:

OXIDATION OF FATTY ACIDS IN THE PRESENCE OF ENVIRONMENTAL PHOTOSENSITIZERS

Emily Davis, 2023
Juan Navea, Professor, Chemistry Department

Oxidation of organic compounds within sea spray aerosols can lead to chemical changes in atmospheric particles. These aerosol particles contain organic compounds, including fatty acids

and chromophoric compounds. The latter can initiate photochemistry, though this reaction is poorly understood. To study the varying interactions between these fatty acids and photosensitizers, gravimetric and vibrational spectroscopy was used to determine rates of oxidation. Thin films containing a photosensitizer (4-benzoylbenzoic acid (4BBA), 4-imidazolecarboxylahyde (imidazole), humic acid, or marine chromophoric dissolved organic matter) (M-DOM), and nonanoic acid were exposed to simulated solar radiation to determine daytime versus nighttime oxidation. Considerable differences were found in the photosensitizing capability of the four photosensitizers. Ex-situ analysis via (LC-MS) shows primarily photooxidation of nonanoic acid induced by the photosensitizer.

Project:

ATMOSPHERIC MOBILITY OF IRON FROM SIMULATED COMBUSTION PARTICLES

Olivia Kazanjian, 2024; Lyra Flinn, 2025
Juan Navea, Professor, Chemistry Department

Over the last two decades, combustion particles significantly contributed to the iron deposition flux in the marine boundary layer. Recent work suggests that the composition of these particles, in particular the presence of copper, enhances the mobility of bioavailable Fe(II) through redox cycling. Yet, the complex minerology of combustion particles makes it difficult to fully understand the role of composition or surface area in overall environmental iron flux. Here, we used a controlled model of combustion particles in TiO_2-anatase doped with iron and copper. The particles were introduced to an acidic (pH 1) environment to mimic the atmospheric processing of combustion particles. Two doped anatase variants were tested: TiO_2Fe and TiO_2FeCu. Here we present the effect of minerology in iron leaching from combustion particles.

Project:

4-BENZOYLBENZOIC ACID AS A MOLECULAR PHOTOSENSITIZER IN THE CONVERSION OF NO_2 INTO HONO

Syafira Nurlita, 2023; Roman Montenegro, 2024
Juan Navea, Professor, Chemistry Department

Nitrous acid (HONO) is an atmospheric trace gas that rapidly photo-dissociates to form hydroxyl radicals (OH), a powerful oxidizing agent. Yet, HONO reaches maximum concentration in the marine atmosphere at noon, suggesting that there is an unrecognized daytime HONO formation pathway. We hypothesize that atmospheric organic photosensitizers can enhance HONO formation by reducing NO_2. To better understand the formation of daytime HONO at a molecular level, 4-benzoylbenzoic acid (4BBA) was used as a proxy organic photosensitizer in sea spray aerosols. A thin film of 4BBA exposed to NO_2 was irradiated under different acidic conditions, to investigate the effect of pH. Using a dual FT-IR system, in situ analysis of condensed-phase and gas-phase are simultaneously performed. Our results suggest that atmospheric organic photosensitizers reduce adsorbed NO_2 to form HONO and other nitrogen-containing gases. In addition, a parallel reaction yields nitrogen incorporation in the photosensitizer.

Project:

FOOD CAPACITY IN THE GLOBAL SOUTH

Morgan Hidalgo, 2024
Feryaz Ocakli, Associate Professor, Political Science Department & IA Program

Access to food is a growing issue around the world, yet remains largely undiscussed in Political Science. Our research addresses this issue by examining the food capacity in five significant states in the global south: Egypt, Lebanon, Nigeria, Singapore, and Indonesia. The main goal of this investigation is to illuminate common responses to food crises, and address governmental reactions to potential supply chain shortages and market contractions. This poster presents a series of data points regarding the contextual factors which appeal influential. This includes international investment, agricultural land usage, access to scarce resources, food stockpiles, state subsidization, and regime stability.

Project:

THE HOPE OF A HOOP HOUSE

Emily Chase, 2022; Julia Danielsen, 2022
Lowery Parker, Visiting Assistant Professor, Environmental Studies and Sciences Program

A hoop house is a type of temporary greenhouse that extends the growing season through winters in the Northeast. The structure encourages environmental awareness, has the potential to be economically profitable, and increases social resources such as learning and community building. After hearing the benefits that hoop houses bring to our local farmers, we recognized the potential for a hoop house on Skidmore's campus. For the past ten weeks, we have managed this pilot project, the Skidmore hoop house, building the structure and providing forward-thinking research for its longevity on campus. Our experience has shown us the value in community-based projects in bringing together multiple stakeholders that are working towards a shared goal.

Project:

EVALUATION OF THE SUPPORT SYSTEMS ECOMAP FOR LGBTQ+ YOUTH

Minghuang Wang, 2023
June Paul, Assistant Professor, Social Work Department

LGBTQ+ youth may have difficulty accessing the support they need to achieve healthy development and functioning. This is especially true for youth that experience multiple forms of identity-related oppression, such as LGBTQ+ youth of color and youth that identify as transgender and nonbinary. Additionally, there is a lack of research, tools, and strategies designed to evaluate and enhance levels of support among LGBTQ+ youth. This qualitative study uses participant observations, survey evaluation, and focus group interviews to evaluate the perceived useability and effectiveness of the ecomap, a clinical assessment tool, specifically designed to assist youth and practitioners with evaluating and enhancing the support networks of LGBTQ+ youth, among paired dyads (15 pairs) consisting of one youth (aged 16-25 years old) and one practitioner. This presentation will discuss the study's research aims and recruitment process, the ecomap tool and training curriculum, and implications for social work practice.

Project:

DOES LITHIUM HAVE AN EFFECT ON THE CIRCADIAN RHYTHM OF A TRANSGENIC DROSOPHILA MODEL OF ALZHEIMERS DISEASE?

Jessica Auerbach, 2023
Bernard Possidente, Professor, Biology Department

Alzheimer's disease is characterized by beta-amyloid plaques and tau tangles in neuronal and glial cells in the brain. Alzheimer's disrupts sleep, and disrupted sleep promotes plaque and tangle formation. Since glial cell pathology is less well understood than neuronal pathology we used a *Drosophila* glial tauopathy Alzheimer's model to investigate how lithium affects circadian clock function that regulates sleep cycles. Lithium has been explored as a "treatment" for Alzheimer's. It is primarily prescribed for bipolar disorder where it reducespsychological symptoms and helps regulate sleep. Our mainquestions are: How does lithium affect the circadian clock period, and a phase-shift in the timing of the activity rhythm in response to a light pulse against a constant dark background, in Alzheimer's vs control flies?

Project:

DROSOPHILA MELANOGASTER AS A MODEL FOR EFFECTS OF DIFFERENT SIZED MICROPLASTICS ON CIRCADIAN RHYTHMS

Anika Eastman, 2025; Sara Burr, 2025; Ethan Hull, 2023
Bernard Possidente, Professor, Biology Department

Research on animal models can facilitate research on potential health effects of microplastics exposure. We examined the effects of exposure to different sized polystyrene spheres on circadian activity rhythms in female Drosophila melanogaster. The flies were tested in a 12:12 light:dark photoperiod and in constant darkness. Exposure to microplastic spheres caused a significant decrease in lifespan, and a significant increase in locomotor activity. There was, however, no significant effect on the circadian rhythm of activity. Our results suggest that microplastics can alter survival and activity levels, but not the circadian clock timing daily rhythms of activity. Drosophila is a useful model for further research on effects of environmental exposure to microplastics on behavior.

Project:

DELETION OF SNORD116, A PRADER-WILLI SYNDROME CANDIDATE GENE, DOES NOT AFFECT CIRCADIAN RHYTHMS IN MICE

Amr Fatafta; Maggie Arms, 2023
Bernard Possidente, Professor, Biology Department

Background: Prader-Willi syndrome patients with a deletion of the SNORD116 gene have sleep-wake cycle disturbances. SNORD116 is a small nucleolar ribonucleic acid ncRNA primarily expressed in the brain. Methods: Control and SNORD116 deletion mice were tested for running-wheel activity, circadian clock period, and activity rhythm phase, and amplitude under different photoperiod conditions. Results: Juvenile mice showed far lower rates of activity than controls in constant dark, significant differences in activity rhythm phase and amplitude, and near significance for circadian clock period. The same mice, as adults, showed statistical significance for mean

activity and amplitude, but not phase or period. Conclusion: Deletion of SNORD116 affects activity levels of mice, but not circadian clock function, and the effects diminish with age.

Project:

DEFINING PRIVACY NORMS FOR FERTILITY DATA
Zander Chown, 2025
Aarathi Prasad, Assistant Professor, Computer Science Department

After the overturning of Roe v. Wade, people are concerned about the privacy of their mobile health data, especially their period tracking and fertility app data. To provide users control over their data and build better privacy controls for these apps. I did a literature review of legal documents and investigated how privacy policies of current apps handle user's data. I applied the Contextual Integrity framework to the apps that collect or can be used to infer pregnancy or abortion status to better clarify the context in which data should be shared, with whom and under what circumstances. Privacy online matters more and more with an increased use of online data being used in court.

Project:

CONCANAVALIN-BASED IN-VITRO SEDIMENTATION ASSAY TO DETERMINE BINDING AFFINITY OF GLUCAN PHOSPHATASES
Marissa Frenett, 2023; Natasha Machera, 2025
Madushi Raththagala, Assistant Professor, Chemistry Department

Carbohydrate-protein interactions play vital roles in many biological processes. Quantitative measurements of protein-carbohydrate interactions are often difficult due to weak interactions. Glucan phosphatases belong to the larger family of protein tyrosine phosphatases that bind and dephosphorylate carbohydrates-glycogen in animals and starch in plants. We purified glucan phosphatases from plants and humans and developed a lectin based in-vitro sedimentation assay to quantify the binding affinity of glucan phosphatase and glucan substrates. This assay is a fast and reliable method to determine low binding affinities unique to carbohydrate-protein interactions. We envision optimization of this technique for other protein-carbohydrate interactions.

Project:

INVESTIGATING ALLOSTERIC REGULATION OF STARCH EXCESS4 USING X-RAY CRYSTALLOGRAPHY AND SITE-DIRECTED MUTAGENESIS
Sarah Sinnott; Murphy Alcantara, 2024
Madushi Raththagala, Assistant Professor, Chemistry Department

Starch Excess 4 (SEX4) is an enzyme necessary for starch degradation in plants. Previous studies conducted in our lab have shown that SEX4 follows non-Michaelis Menten kinetics with substrate amylopectin, but the question remained as to how the kinetics are allosterically regulated. The X-ray structures of wild-type SEX4 and catalytically inactive mutant C198S from corn were refined through COOT and RefMac software. Using structure-guided, site-directed mutagenesis, we identified potential residues of corn and Arabidopsis SEX4 to study. We purified four mutant proteins and determined their kinetic properties.

Project:

STRUCTURAL CHARACTERIZATION OF STARCH EXCESS4 FROM STORAGE CROPS

Juan Carlos Cruz Vargas, 2023
Madushi Raththagala, Assistant Professor, Chemistry Department

Starch is a water-insoluble branched polymer of glucose. Its degradation requires the concerted action of glucan phosphatases and glucan dikinases. Reversible starch phosphorylation allows for the solubilization of the starch surface, allowing for amylase to degrade starch into maltose units. However, our understanding of how these enzymes contribute to starch degradation in storage crops such as potato and cassava is limited. This study aims to structurally characterize cassava and potato Starch Excess4 (SEX4) enzymes by setting up hanging drop vapor diffusion crystallography plates and conducting enzymatic assays. We also determined the kinetics of SEX4 using both generic and physiologically relevant substrates.

Project:

STRUCTURAL ANALYSIS OF GLUCAN PHOSPHATASE STARCH EXCESS4

Kenyon Weis
Madushi Raththagala, Assistant Professor, Chemistry Department

Starch is one of the most attractive natural polymers because of its biodegradability, abundance, and renewability. However, the inert nature and semicrystalline structure of native starch granules make starch essentially unusable for most industrial applications without further processing. Therefore, starch is additionally modified via physical, chemical, and biotechnological methods to increase processability and function. Starch obtained from corn, rice, wheat, potato, and cassava, serves as the main resource for most starch-based products. However, much of our understanding of starch metabolism is coming from Arabidopsis thaliana transitory starch metabolism. More systematic studies are needed to understand starch turnover in different species and organs of biotechnologically important species. Reversible starch phosphorylation is essential for efficient starch degradation and SEX4 is a key enzyme in this process. We employed biochemical and functional analyses to study SEX4 from agronomically important crops. Taken together, our findings provide an in depth understanding of SEX4 dephosphorylation of agronomically important plants and green algae species and provide compelling evidence of how SEX4 can be utilized to enhance native starch degradation.

Project:

PASSIVATION OF GOLD ANTIBODY NANOCONJUGATES FOR A FASTER WESTERN BLOT

Zack Barnet, 2024
Maryuri Roca, Senior Teaching Professor, Chemistry Department

Western Blot is an immunoassay used to detect specific proteins through their interaction with antibodies. This technique is very useful, but also, time-consuming, repetitive, and expensive. A potential way to speed up Western Blot is by attaching antibodies to the surface of gold nanoparticles creating a nanoconjugate, but the uncovered surface may interfere with the assay. In

this work, we passivated the gold nanoconjugate with 12-aminododecanoic acid (ADDA) to block the uncovered gold surface. Nanoparticles were monitored and characterized using UV-visible spectroscopy and transmission electron microscopy (TEM). Furthermore, we explored the feasibility of this procedure using a real sample, a chicken egg, so the modified assay can be applied in an educational setting.

Project:

STABILITY OF SILVER NANOPARTICLES FOR AN OPTIMIZED WESTERN BLOT

Haru Kato, 2024
Maryuri Roca, Senior Teaching Professor, Chemistry Department

Western blot is a protein analysis assay enabling protein detection by visualizing an antigen-antibody interaction. This technique is powerful but time-consuming. In this work, we covalently attached visible silver nanoparticles to unseeable antibodies, effectively facilitating a physically observable band on the western blot. Nanoparticles and their stability are monitored via transmission electron microscopy and UV-visible spectroscopy. Silver nanoparticles are easier to synthesize but less stable than gold. For this reason, the stability of silver nanoparticles in different media and conditions were explored. Silver labeled antibody enables cost and time optimization as it does not require a secondary antibody or color-developing reaction like horse radish peroxidase.

Project:

EFFECTS OF ACID CONCENTRATION AND AQUEOUS WASHES ON TIO_2 DOPED WITH FE AND CU

Johanna Nally, 2024; Ciaran Healey, 2024
Maryuri Roca, Senior Teaching Professor, Chemistry Department

A source of bioavailable iron in pelagic ecosystems is fly ash, which retains the ions in a semiconductive crystal lattice of titanium dioxide before slowly leeching iron into the ocean. Given the variability of fly ash, it is desirable to create synthetic crystals with controllable composition. In this work, we used sol-gel synthesis to prepare TiO_2 nanocrystals doped with variable mole ratios of iron and copper. We investigated the effects of acid concentration and aqueous washes that remove residual doping metals. Products were characterized via x-ray fluorescence, x-ray diffraction, and scanning electron microscopy. Crystals prepared in this way are used to investigate how the composition of the semiconductor contributes to the bioavailability of iron in the atmosphere.

Project:

PURIFICATION OF THE *BACILLUS SUBTILIS* TRANSAMIDOSOME COMPONENTS

Aya Awawdeh, 2022
Kelly Sheppard, Associate Professor, Chemistry Department

In the bacterium *Bacillus subtilis*, there are two distinct pathways for attaching asparagine (Asn) to its transfer RNA, an essential step in protein synthesis. In the direct pathway, Asn is attached to $tRNA^{Asn}$. In the two-step pathway Asn is synthesized on $tRNA^{Asn}$ via the transamidosome: a complex between ND-AspRS, $tRNA^{Asn}$, and GatCAB. I am working on purifying components of

the transamidosome, testing their binding together, and characterizing the transamidsome's activity under different conditions. I hypothesize that the transamidosome enables *B. subtilis* to synthesize Asn-tRNA^{Asn} under conditions it wouldn't be able to otherwise. This work will further our understanding of the transamidsome's role in the *B. subtilis* life cycle and will be a useful comparison to the pathway in pathogenic strain of Bacilli like *Bacillus anthracis*.

Project:

RESURRECTION OF ANCESTRAL ASPARTYL-tRNA SYNTHETASES
Lindsey Han, 2025
Kelly Sheppard, Associate Professor, Chemistry Department

Protein synthesis is essential for life and requires the correct pairing of amino acids to their cognate transfer tRNA by aminoacyl-tRNA synthetases. Many prokaryotes lack an AsnRS to directly attach Asn to tRNA^{Asn}. Instead these organisms use a non-discriminating AspRS to attach Asp to tRNA^{Asn} and GatCAB to amidate the Asp to Asn. Organisms with an AsnRS often have a discriminating AspRS (D-AspRS) that only attach Asp to tRNA^{Asp}. How that specificity evolved from a bacterial ND-AspRS is unknown. To address, we phylogenetically modeled the last common ancestor of a D-AspRS and an ND-AspRS. We report on the overproduction, and purification of the ancestral enzymes to study how specificity evolved. The work will provide insight into the evolution of life and tools for synthetic biology.

Project:

***B. ANTHRACIS* INDIRCT PATHWATY FOR ASPARAGINYL-TRNA FORMATION**
Michelle Sawunyama, 2024
Kelly Sheppard, Associate Professor, Chemistry Department

Bacillus anthracis, the anthrax causing bacterium, encodes two different routes for attaching asparagine (Asn) to its cognate transfer RNA (tRNA^{Asn}), which is an essential step in protein synthesis and thus life. The direct route involves an asparaginyl-tRNA synthetase directly ligating Asn to tRNA^{Asn}. The indirect route involves an archaeal non-discriminating aspartyl-tRNA synthetase (ND-AspRS) attaching aspartate (Asp) to tRNA^{Asn} . The Asp-tRNA^{Asn} is then amidated by GatCAB to form Asn-tRNA^{Asn}. The three macromolecules (the archaeal ND-AspRS, tRNA^{Asn}, and GatCAB) form the transamidosome to synthesize Asn on tRNA^{Asn}. Components of the trasamidosome are being purified to characterize the indirect pathway under various conditions. The goal of this research is to understand the indirect route of *Bacillus anthracis* and why it acquired an archaeal ND-AspRS.

Project:

ARE LOCAL VOTERS AS IGNORANT AS POLITICAL SCIENTISTS THINK THEY ARE?
Bella Bruno, 2025
Robert C. Turner, Associate Professor Political Science Department

Political scientists have a pessimistic view of local voters. Existing research depicts them as uneducated, ignorant, lazy, or unaware. However, most of the existing research either uses

national data to make inferences about local elections or focuses on voting in large cities. Political scientists know very little about how people make their vote choice in suburban municipal elections. Using a unique dataset of the 2005, 2007, 2013, 2015, 2017, and 2021 Saratoga Springs city elections, we analyze the attributes of local voters, where they get their information about elections, and the educational role of campaigns. Our data demonstrate local voters in suburban elections are motivated, informed, and engaged, although biased towards long term home owning residents.

Project:

ASTROCYTES PROMOTE SLEEP IN *DROSOPHILA MELANOGASTER*

Matthew Grega, 2023
Christopher Vecsey, Associate Professor, Neuroscience Program

Studies examining the mechanisms of sleep largely focus on the roles of neurons, but recent studies have found that astrocytes, a distinct non-neuronal brain cell, also plays a role in sleep regulation. Using the genetically tractable fruit fly *Drosophila melanogaster*, we activated astrocytes and tracked flies' sleep behaviors. We found that astrocytes promote sleep both during and after prolonged activation. These findings suggest that activated astrocytes build up sleep drive and, when activated for long enough, induce persisting sleep following activation. Future imaging and dual-activation studies are necessary to identify how astrocytes fit into known or novel sleep pathways.

Project:

DETERMINING THE EFFECTS OF LIGHT INTENSITY ON SLEEP IN *DROSOPHILA MELANOGASTER*

Aaliyah J. Peralta, 2024
Christopher Vecsey, Associate Professor, Neuroscience Program

Previous light color research has demonstrated various influential effects on sleep in *Drosophila melanogaster*. While analyzing research using red light exposure, we noticed its intensity was lower than baseline white light. This confounding variable led us to question if previously obtained results were truly a result of light color or due to reduced light intensity. Therefore, we studied the sleep effects of reduced white light intensity at varied times of exposure where previous effects of light color had been found. Experiments were performed on flies with normal vision and others with genetically disrupted perception of color. Results demonstrated that, regardless of exposure time, the intensity had no significant effect on sleep, which supported that previous results had in fact been due to light color.

Project:

OPTOGENETIC STIMULATION OF NEUROPEPTIDE F NEURONS INDUCES SLEEP AND GROOMING BEHAVIOR IN *DROSOPHILA MELANOGASTER*

Sophie Sacco, 2024; Ariana Tucker, 2024
Christopher Vecsey, Associate Professor, Neuroscience Program

Signaling molecules called neuropeptides play a key role in controlling sleep and other behaviors such as grooming that are critical for organismal health. Neuropeptide F in *Drosophila*

melanogaster is a homolog of mammalian Neuropeptide Y, which has been shown to play a role in modulating sleep. We used both brief and prolonged optogenetic stimulation, measured through both acute behavioral videotaping and long-term sleep studies, to determine how activation of NPF-producing neurons in adult *Drosophila* alters behavior. Our results showed that stimulation of NPF neurons induced grooming behavior as well as sleep. Imaging was also performed to determine the locations of the NPF neurons being activated within the brain. Future studies will focus on identifying which specific neurons are responsible for these behaviors.

Project:

INVESTIGATING THE CO-ACTIVATION OF sNPF- AND LEUCOKININ-PRODUCING NEURONS IN *DROSOPHILA MELANOGASTER*

Ariana Tucker, 2024; Sophie Sacco, 2024
Christopher Vecsey, Associate Professor, Neuroscience Program

Sleep and feeding are universal physiological processes that impact an organism's health. Several studies have found starvation reduces sleep, though the signals responsible for this are not understood. This project investigated the interaction between sNPF, a neurotransmitter connected to sleep induction and leucokinin, a neurotransmitter connected to feeding and sleep suppression in starved states. This was carried out in *Drosophila* m*elanogaster* by optogenetically stimulating sNPF and leucokinin neurons with Chrimson, an ion channel activated by red light. When flies with this transgene are externally exposed to red light, neurons producing these transmitters become excited. It is expected that sNPF activation will increase sleep and leucokinin activation will decrease sleep when flies are fed. Future studies should investigate how leucokinin stimulation affects sleep in starved states.

Project:

GENE *NERFIN-2* AMELIORATES DIP-α-MEDIATED NEUROMUSCULAR CONNECTIVITY DEFICITS IN *DROSOPHILA MELANOGASTER*

Bill Wu, 2023
Christopher Vecsey, Associate Professor, Neuroscience Program

Neurons form synapses in a highly specific manner during development, but much is still unknown about the mechanisms governing these processes. In *Drosophila melanogaster*, physical interaction of two proteins (DIP-α in neurons and Dpr10 in muscles) is critical for larval RP2 motor neurons to connect to body wall muscle 4. To identify modifiers of DIP-α-mediated connectivity, flies mutant for DIP-α or both DIP-α and Dpr10 were crossed with genomic deficiency lines, and connectivity was assayed by immunostaining. One deficiency region (Df-7634) improved connectivity deficits in DIP-α/Dpr10 heterozygous female flies. Knockdown of individual genes found within the Df-7634 region identified *nerfin-2* as a possible regulator of the DIP/Dpr signaling pathway. This sheds new light on developmental processes shaping neural connectivity.

Project:

DEFOLIATION IN THE LAKE GEORGE WATERSHED CAUSED BY THE LYMANTRIA DISPAR MOTH

Avery Blake, 2023; Morgan Foster, 2023
Charlie Bettigole, Director, GIS Center for Interdisciplinary Research

For the second consecutive summer, the invasive Spongy Moth has left its mark across the Northeast, with a plethora of poop, barren trees, and altered forest canopies. Our research question guided us in understanding the intensity and landscape-scale patterns of defoliation by this insect. We visited 100+ sites within the Lake George watershed to assess browsing intensity at individual trees and canopy openness with hemispheric photography. We combined our field data with daily, high-resolution satellite imagery to analyze patterns and severity of defoliation. While defoliation may appear to simply be an unfortunate and unsightly occurrence, consecutive years of damage, with no population control factors (predation, E. Maimaiga, and NPV), can lead to large-scale forest decline with cascading ecological consequences.

Project:

EXAMINING THE EFFECTS OF A VIRTUAL DANCE CLASS ON QUALITY OF LIFE IN OLDER ADULTS DURING THE COVID-19 PANDEMIC

Lilah Duboff, 2023
Sarah DiPasquale, Associate Professor, Dance Department

Introduction: Quality of life (QoL) in older adults contributes greatly to one's health and wellbeing and has become increasingly relevant during the COVID-19 pandemic. The purpose of this study was to examine the changes in QoL in older adults following exposure to a virtual dance program. Methods: Nine participants age 55+ participated in a 9-week virtual dance class. Participants completed pre- and post-test surveys to measure change in QoL alongside an exit survey to reflect on the process. Results: Statistically significant improvements in QoL were measured in satisfaction with one's family relationships physical abilities. Participant exit surveys revealed general satisfaction of the class. Discussion/Conclusion: Two markers of QoL demonstrated statistically significant improvements. Participant exit surveys suggest positive perceptions including enhanced social relationships during a time of isolation.

Project:

SYNTHESIS AND CHARACTERIZATION OF 1-QUINOLYLMETHYL-1-AZA-12-CROWN-4 AND ITS MANGANESE(II) COMPLEX

Jason Li, 2022
Steven Frey, Associate Professor, Chemistry Department

Superoxide dismutase (SOD) is an enzyme that protects cells from damage caused by superoxide radical anion. SODs utilize a metal cofactor to disproportionate superoxide to hydrogen peroxide and molecular oxygen. Small molecular weight compounds have been studied previously for their ability to mimic SOD. We report herein the synthesis of a macrocyclic ligand, QMAC4, and its

manganese(II) complex, as a putative SOD mimetic. Characterization of the ligand and complex have been achieved by ^{1}H NMR and IR spectroscopies. Additionally, the pK_a of the conjugate acid of QMAC4 was determined with 95% confidence by potentiometric titration to be 7.7 ± 0.1, with the singly protonated species being predominant in acidic solution.

Project:

STRUCTURAL AND SOLUTION-STATE STABILITY AND REACTIVITY STUDIES OF A BIOMIMETIC MANGANESE(II) COMPLEX WITH A PYRIDINE-CONTAINING, TRIPODAL LIGAND

Katie Rinaolo, 2022
Steven Frey, Associate Professor, Chemistry Department

Superoxide dismutases (SODs) are one of the metalloenzymes that function to protect cells from toxic reactive oxygen species (ROS). The goal of our work is to synthesize complexes that resemble the active site center of manganese-containing SOD, and to examine these complexes for their reactivity and their aqueous stability. We have recently synthesized the biomimetic compound $[Mn(DPEA)(OAc)(MeOH)]BPh_4$, where DPEA is N,N-bis(2-pyridylmethyl)hydroxyethylamine. Single crystal X-ray diffraction of this compound reveals a hepta-coordinated manganese(II) ion with distorted, pentagonal bipyramidal geometry. Cyclic voltammetry (CV) of the in situ complex indicates that the Mn(III)/Mn(II) reduction potential is in an optimal range. Using the Fridovich assay, we have observed that the complex efficiently catalyzes the superoxide disproportionation, with a catalytic rate constant (k_{cat}) that is high among compounds reported previously.

Project:

COLLABORATIVE DOCUMENTARY FILM-MAKING: *NDAKINNA*

Riley Mallory, 2022
Siobhan Hart, Associate Professor, Anthropology Department

Joseph, James, and Jesse Bruchac are artists, performers, storytellers, teachers, and scholars of Abenaki descent. Their work is rooted at their family's homestead in Greenfield, N.Y., which today is home to the Ndakinna Education Center. Our research focused on the place-based storytelling of the Bruchacs through interviews and observational footage that we are using to create a documentary. The film is structured through physical locations of tangible heritage, telling the story of Bruchac family history and local Indigenous history. Just as place is centered throughout the film, so is language, pedagogy, and Indigenous understandings of history-making.

Project:

THERE IS NO "ONE SIZE FITS ALL" APPROACH TO PERIODS AND UNDERSTANDING MENSTRUAL ILLNESSES

Aliza Nazir, 2023
Ruth Hernandez-Rios, Teaching Professor, Sociology Department

This research emphasises the history of PMS while digging into the etiology, stigma and treatment of PMDD and its inclusion in the DSM-5 through the analytical lenses of feminism, pathology and psychology. Through analysing research around PMS/PMDD, we uncovered how a stigma

remains on mental illness, there's a lack of education and understanding around menstruation and the severity of symptoms, and how society has pushed the idea of a "one size fits all" approach to treatment. We argue that you cannot understand PMDD without recognising PMS/menstruation through an intersectional lens, as structural factors also contribute to individuals' experiences. We conclude society must become more open and shift its mentality around menstruation and recognise experiences of menstruation-related illnesses as a spectrum of outcomes.

Project:

THE RELATIONSHIP BETWEEN PERSONALITY TRAITS AND THE PROCESSING OF EMOTION WORDS

Abby Spear, 2023; Ashley Smolensky, 2023; Melany Grullon, 2025; Armin Ohadi, 2025; Chanzlah Julien, 2025
Rebecca Johnson, Professor, Psychology Department

Previous research shows that fixation times on emotion words (both negative and positive) are shorter than on non-emotional neutral words. There is also evidence that certain personality traits are correlated with variability in emotion processes. Levels of emotional intelligence have also been shown to be positively correlated with emotion information processing. In the current study, we explored how these personality traits may further influence the processing of emotion versus non-emotion words in the context of silently reading sentences while eye movements were recorded. Although the emotion effect did not strongly interact with any of the predicted personality traits, there were a number of main effects suggesting that there are overall differences in reading patterns as a function of one's personality.

Project:

ISOLATION OF EXOSOMES FROM SCA1 CELLS; IMPLICATIONS FOR DISEASE PROGRESSION

Richard Glynn, 2024; Chloe Mickels, 2023; Lilia Sattler, 2023
Sara Lagalwar, Associate Professor, Neuroscience Program

Patients with Spinocerebellar ataxia type 1 (SCA1) exhibit degeneration of the cerebellum caused by a mutation of the *ataxin-1* gene. Small, endogenous vesicles called exosomes have been implicated as a mechanism for disease progression in several neurodegenerative diseases such as Parkinson's and Alzheimer's disease but have yet to be shown in SCA1. Exosomes were successfully isolated from control and SCA1 cells and their contents were characterized through dot blots. Our results suggest that exosomes were present and responsible for the propagation of *ataxin-1* protein from the SCA1 cell lines to the healthy control cell line. Using a cell line model of SCA1, we aim to show that exosomes seed mutant *ataxin-1* protein from diseased cells into healthy control cells. These results lead to a better understanding of SCA1 pathogenesis and has implications for further treatments.

Project:

COPPER RESISTANCE DETERMINANTS IN *ESCHERICHIA COLI*

Grace Picarillo; Yuxuan Zhao, 2023
Sylvia Franke McDevitt, Associate Professor, Biology Department

Heavy metals are used in immune responses to bacterial infection to disable biological systems that are necessary for the bacteria's survival. Previously, a mechanism of bacterial heavy metal resistance was discovered as the CHASRI system. In the current experiment the factors that confer copper resistance in four strains of *E. coli* possessing varying elements of the CHASRI system were explored. We utilized the Seahorse 96 XFe analyzer to measure the oxygen consumption of the bacteria as an indication of bacterial stress from copper. We also utilized a killing assay in which we used *Dictyostelium* and copper to kill the bacteria and measured the percent survival of the *E. coli* over time.

Project:

MOLECULAR ANALYSIS OF METAL RESISTANT MICROORGANISMS NEAR HISTORICALLY POLLUTED SITES IN SARATOGA COUNTY

Thomas Tao, 2025
Sylvia Franke McDevitt, Associate Professor, Biology Department

We are interested in how heavy metal pollution impacts microbial communities. In other words, how can microorganisms (Bacteria and Archaea) survive in highly toxic environments? Bacterial heavy metal resistance mechanisms have been described, one of them being heavy metal exporting P-type ATPases. We collected sediment samples near historical manufacturing sites along the Kayaderosseras and analyzed the ability of microorganisms to grow in the presence of copper and zinc ions in these samples. We are aiming to isolate and identify metal resistant microorganisms from these samples. We also explored molecular screening methods to identify the presence of heavy metal exporting P-type ATPases in environmental samples. The gain of knowledge of those resistant mechanisms can be potentially applied to bioremediation and environmental evaluation.

Project:

DOES LITHIUM ALTER THE EFFECT OF MICROPLASTICS ON CIRCADIAN RHYTHMS IN FRUIT FLIES?

Cynthia Salas, 2025
Bernard Possidente, Professor, Biology Department

Lithium is used to treat bipolar patients and lengthens the period of circadian rhythms. Microplastics have become a growing global environmental and health concern, and their effects on circadian rhythms have not been examined. We examined effects of microplastics on circadian rhythms, with and without lithium in fruit flies. If lithium and microplastic effects interact, then effects of lithium and other prescribed drugs may be altered by simultaneous exposure to environmental microplastics.