Skidmore College

Faculty Student Summer Research Program
Summer 2022

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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 in 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 expenses 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 GRAMMY13.7 (r)1.rDAT (y)20sM40.004 (m)12. k an Td [(.9 (u Tw 6.482 0)5.5 (-2.0.069 A)6 2 (K)

Faculty

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

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 Fataftą 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
W /TT0 1 Tf -17.12 -1.1Ll, 2023 Kimberley Frederick, Professor, Chemistry Department

4-BENZOYLBENZOIC ACID AS A MOLECULAR PHOTOSENSITIZER IN THE CONVERSION OF NO_2 INTO HONO
Syafira Nurlita2023; 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:

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

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

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 Charophyte 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.

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 rororo(c) (nt)-2 (l)3 (op4[/B1 (r) (i2 (l)3 (op4[/(o2 (y))-1 (a)496Tu>4 (c)4(o(c1-2 (ve)4 (p (on w)(a)4

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 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 used a potentiometric titration technique. Reduction potentials have been determined using cyclic voltammetry.

been

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. In-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: FeTiO$_2$ and TiO$_2$-FeCu. 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 photodissociates 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 marine 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-ATR-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

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 reduces psychological symptoms and helps regulate sleep. Our main questions: 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

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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:

Project:

STRUCTURAL CHARACTERIZATION OF STARCH EXCESS4 FROM STORAGE CROPS

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

Starch is a water

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 iT(i)--2 (0..89 0 Td [( )-130 b.o)Tj -0.004 Tc 0.004 cat3alnano1-2 (0..89-0.00

the transamidosome, testing their binding together, and characterizing the transamidsome's activity under different conditions. I hypothesize that the transamidosome enables *B. subtilis*

national data to make inferences about local elections or focus 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

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