Skidmore College

FACULTY STUDENT SUMMER RESEARCH PROGRAM

SUMMER 2016

FINAL PRESENTATIONS
AUGUST 4, 2016

Faculty Student Summer Research Program
Summer 2016

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 2016, there are 74 students working with 36 faculty members on 54 summer-long research projects in a wide range of disciplines. In addition, 4 students are engaged in off-campus research at a NY6 member college through the NY6-UGC program.

Funding Sources for Faculty Student Summer Research Programs

ALUMNI, FAMILY, AND FRIENDS

Harman Cain Family ‘12
Family from the Class of 2016
Samuel Croll ‘73
Marlene Oberkotter Fowler ‘61
Christy Johnson ‘90
Jim Lippman and Linda Friedman Lippman ‘82
Richard A. Mellon ‘87
Rafael M. Nasser ‘88
Wilder Building Corporation
Margaret Williams Page ‘43
Don and Jean Richards
The Riederer Family
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

Mellon Foundation (NY6)
W.M. Keck Foundation
The National Science Foundation
OP Alumni Project
Rathmann Family Foundation
S3M Transitional Program

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.

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

2009-2010
Korena Burgio ‘11
Evan Caster ‘11
Megan Gaugler ‘12
James Turner ‘11

2008-2009
Catherine Baranowski ‘11
Maria DiSanto-Rose ‘11
Michael Letko ‘11
Paul Russell ‘11

Faculty Student Summer Research Program

Schedule of Final Research Presentations

Thursday, August 4, 2016

9:00 am – 9:25 am Coffee and Muffins

9:30 am – 10:30 am Oral Presentations

ROOM A

"I VOTED" STICKERS
Henry Jaffe, 2018; Chloe Singer, 2018
Christopher Mann, Assistant Professor, Department of Political Science

RESTORATIVE JUSTICE IN UNIVERSITIES: WHAT WORKS
Megan Schachter, 2017
David Karp, Professor, Department of Sociology

THE ART OF THE LOCATIVE AUDIO DOCUMENTARY
Emily Rizzo, 2018
Adam Tinkle, Visiting Assistant Professor, MDOCS/Media & Film Studies

ROOM B

ASSESSING INDUSTRIAL POLICY USING FINANCIAL MARKETS
Lukas Raynaud, 2017
Monica Das, Associate Professor, Department of Economics

VAN DER WAALS EQUATION OF STATE AS A MODEL OF INFLATION
Akaylia Morgan, 2018; Dante Tobar, 2018
Evan Halstead, Teaching Professor, Department of Physics

EFFECTS OF A COMBINED PROTEIN AND ANTIOXIDANT SUPPLEMENT ON MUSCLE RECOVERY IN COLLEGE-AGED MALES
Sam Bloom, 2017; Noelle Morrow, 2019; Alexs Matias, 2018
Paul J. Arciero, Professor, Department of Health and Exercise Sciences
Stephen J. Ives, Assistant Professor, Department of Health and Exercise Sciences

SOCIAL WASPS AS BIOCONTROL AGENTS
Bruce Martin, 2018
Monica Raveret Richter, Associate Professor, Department of Biology

ROOM C

RESPONSE OF *PENIUM MARGARITACEUM* TO ENVIRONMENTAL STRESSORS THROUGH THE LENS OF REACTIVE OXYGEN SPECIES
Eleanore Ritter, 2018
David Domozych, Professor, Department of Biology

EXPLORING THE ENDOMEMBRANE SYSTEM OF *P. MARGARITACEUM*, A MODEL ORGANISM FOR PLANT CELL STUDIES
Kalika Likhi, 2018
David Domozych, Professor, Department of Biology

THE EFFECTS OF STRESSORS ON THE CELLULOSE NETWORK OF *PENIUM MARGARITACEUM*
Kurt Hanebrink, 2017
David Domozych, Professor, Department of Biology

DISSECTING THE ROLES OF ENDOMEMBRANE ORGANELLES IN *PENIUM MARGARITACEUM*
Alan Xiao, 2018
David S. Domozych, Professor, Department of Biology

10:40 am – 11:50 am Poster Presentations #1

ROOM A

CHARACTERIZATION OF DUAL PATHWAYS OF ASPARAGINYL-TRNA FORMATION IN *B. SUBTILIS* AND *B. ANTHRACIS*
Karli Rasmussen, 2018
Kelly Sheppard, Associate Professor, Department of Chemistry

EXAMINING SLEEP AS A BEHAVIORAL IMMUNE RESPONSE IN *DROSOPHILA MELANOGASTER*
Sara Fontana, 2018
Christopher G. Vecsey, Assistant Professor, Neuroscience Program

HYDROGEN-DEUTERIUM EXCHANGE ON ALDEHYDES CATALYZED BY AN N-HETEROCYCLIC CARBENE
Robyn Stix, 2018
Jessada Mahattananchai, Visiting Assistant Professor, Department of Chemistry

EXPANDING THE GENETIC CODE WITH PYROGLUTAMATE
Meggie Danielson, 2017; Hannah Schapiro, 2017
Kelly Sheppard, Associate Professor, Department of Chemistry

DEVELOPMENT OF A MICROFLUIDIC ASSAY FOR ANALYSIS OF IODIDE IN WATER SYSTEMS
Laura Swenson, 2019
Kimberley A. Frederick, Professor, Department of Chemistry

SEPARATION OF CHIRAL COMPOUNDS WITH CAPILLARY ELECTROPHORESIS USING CYCLODEXTRINS AS BUFFER ADDITIVES
Emily O'Connor, 2019
Kimberley A. Frederick, Professor, Department of Chemistry

#MORETHANMYDISORDER: A CONTACT AND EDUCATION VIDEO CAMPAIGN TARGETING KNOWLEDGE AND STIGMA ATTITUDES FOR SOCIAL ANXIETY DISORDER
Gabriella Ponzini, 2018
Casey Schofield, Assistant Professor, Department of Psychology

ABSORPTION AND EMISSION PROPERTIES OF INDOLE: WHAT'S THE RIGHT FUNCTIONAL TO USE?
Justin Gerard, 2017
William W. Kennerly, Teaching Professor, Department of Chemistry

EFFECTS OF SUPPLEMENTARY INFORMATION ON SOLUTION METHODS TO KINEMATICS PROBLEMS
Erin Maloney, 2018
Evan Halstead, Teaching Professor, Department of Physics

TUNNELING NANOTUBES AS A MECHANISM FOR THE CELL-TO-CELL SEEDING OF ATXN1 AGGREGATES IN SPINOCEREBELLAR ATAXIA TYPE 1
Eliza Burr '17
Sarita Lagalwar, Assistant Professor, Neuroscience Program

DOES A GENE CLUSTER CONFERRING COPPER RESISTANCE AID BACTERIAL SURVIVAL OF PHAGOCYTOSIS?
Cheyanne Slocum, 2017
Sylvia Franke McDevitt, Associate Professor, Department of Biology

DEVELOPING A METHOD TO STUDY SOCIOSEXUAL MOTIVATION IN RATS
Morgan Lavoie, 2017
Hassan Lopez, Associate Professor, Department of Psychology

ELUCIDATING THE MECHANISM BEHIND POST-COPULATORY SLEEP REDUCTION IN FEMALE DROSOPHILA MELANOGASTER
Brianne Luz Cook, 2018
Christopher G. Vecsey, Assistant Professor, Neuroscience Program

SINGLE VS MIXED APPROACHES TO FORM GREEN NANOPARTICLE FILMS
Hannah Skipper, 2017
Maryuri Roca, Teaching Professor, Department of Chemistry

12:00 pm – 12:55 pm Lunch, Murray Aikins Dining Hall

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

ROOM A

CHARACTERIZATION OF THE DUAL PATHWAYS FOR *B. HALODURANS* ASPARAGINYL-TRNA FORMATION
Caitlin Schroeder, 2018
Kelly Sheppard, Associate Professor, Department of Chemistry

NEW TANDEM INTRAMOLECULAR REACTIONS: DIELS-ALDER AND [3+4] ALLYLCATION CYCLIZATIONS
Matthew Mailloux, 2018
Raymond J. Giguere, Professor, Department of Chemistry

PRAGMATIC COMPETENCE: THREE-YEAR-OLDS' ABILITY TO COMPUTE CONVERSATIONAL IMPLICATURES
Katherine Williams, 2017
Jessica Sullivan, Assistant Professor, Department of Psychology

OPTOGENETIC STIMULATION OF sNPF NEURONS IN D. MELANOGASTER
Benjamin Juneau, 2018
Christopher G. Vecsey, Assistant Professor, Neuroscience Program

TRYPTOPHAN ABSORPTION AND FLUORESCENCE DEPENDS ON CONFORMATION
Alexandra Cassell, 2019
William Kennerly, Teaching Professor, Department of Chemistry

OXIDATION OF CHEMISORBED HYDROCARBONS BY NON-THERMAL PLASMAS
Claudia Bennett-Caso, 2019
Juan G. Navea, Assistant Professor, Department of Chemistry

HETEROGENEOUS PHOTOCHEMISTRY IN THE MARINE BOUNDARY LAYER
Erin J. Mah, 2019
Juan G. Navea, Assistant Professor, Department of Chemistry

SYNTHETIC STUDIES ON TANDEM INTRAMOLECULAR DIELS-ALDER AND [3+4] ALLYLCATION CYCLIZATIONS
Matthew Lueckheide, 2017
Raymond J. Giguere, Professor, Department of Chemistry

RESTORATION OF CEREBELLAR PURKINJE CELLS THROUGH SUCCINIC ACID TREATMENT
Donna Nguyen, 2018
Sarita Lagalwar, Assistant Professor, Neuroscience Program

COPPER/SILVER RESISTANCE OF *Enterobacter cloacae* ATCC13047
Makhzuna Khudoynazarova, 2017
Sylvia McDevitt, Associate Professor, Department of Biology

ELLIPTIC CURVES OVER FINITE EXTENSION FIELDS
Chen Lin, 2018
Mark Huibregtse, Professor, Department of Mathematics

EVIDENCE OF PROMISCUOUS TELEOLOGICAL THOUGHT: CHILDREN MAKE FUNCTIONAL JUSTIFICATIONS WHEN CLASSIFYING ANIMATE AND INANIMATE OBJECTS
Julia M. Iannucci, 2017
Jessica Sullivan, Assistant Professor, Department of Psychology

TAKING ADVANTAGE OF SOCIAL MEDIA: A CASE OF SMALL RESTAURANTS
Sarah Rinaolo, 2017
Ela Lepkowska-White, Professor, Department of Management and Business

QUANTUM MECHANICAL CALCULATIONS OF HNO3 CHEMISORBED ONTO TiO2 AND EFFECTS OF HUMIDITY
Christopher J. Ostaszewski, 2018
Juan G. Navea, Assistant Professor, Department of Chemistry

PROJECT ABSTRACTS

Project:

EFFECTS OF A COMBINED PROTEIN AND ANTIOXIDANT SUPPLEMENT ON MUSCLE RECOVERY IN COLLEGE-AGED MALES

Sam Bloom, 2017; Noelle Morrow, 2019; Alexs Matias, 2018
Paul J. Arciero, Professor, Department of Health and Exercise Sciences
Stephen J. Ives, Assistant Professor, Department of Health and Exercise Sciences

The purpose of this study was to determine the effects of combined protein and antioxidant (PRO+AO) on muscle soreness (MS) and function (MF). College-aged males were assigned to either: carbohydrates (CHO), protein (PRO), or PRO+AO. After baseline measures of peak isometric torque (PIT), peak isokinetic torque (PIKT), and MS, subjects performed 100 maximal eccentric contractions (ECC) of the quadriceps muscles. MF and MS were then measured at 1, 2, 6, and 24h post-ECC. Participants consumed their supplement immediately, 6, and 22h post-ECC. MF decreased, while MS increased over time. Though not statistically significant, there was a trend towards improved MF for PRO and PRO+AO compared to CHO within 24 hours. In conclusion, PRO+AO may facilitate recovery following fatiguing ECC

Project:

POWER, IMPUNITY AND CIVILIAN VICTIMIZATION IN KASHMIR

Trevor Cloen, 2018
Yelena Biberman-Ocakli, Assistant Professor, Department of Political Science

Why do army officers victimize civilians in counterinsurgency? Why did Indian army majors commit significantly more human rights violations than other officers in India-administered Kashmir? Drawing on an in-depth analysis of 214 cases of civilian victimization in Kashmir (1990-2012), we identify the strategic logic of civilian victimization. Human rights abuses, such as extra-judicial killings, enforced disappearances, torture, and sexual assault, may generate a perception of selective violence on the part of the state. Selective violence signals the state's ability to identify and neutralize the threat, thereby encouraging collaboration. We find that indiscipline, poor training, and mental instability are insufficient for explaining the variation in civilian victimization by officer rank. Majors, the highest-ranking officers "on the ground," were more likely to commit human rights abuses because they had the tactical incentives and power to do so.

Project:

THE EFFECT OF CANNABINOID SIGNALLING ON AXON PATHFINDING

William Armero, 2017; Sylvana Finn, 2018
Jennifer Bonner, Associate Professor, Department of Biology and Neuroscience Program

Axons of developing neurons respond sequentially to guidance cues to facilitate formation of central nervous system (CNS) structures. Previous research has found that activation of Cannabinoid receptor 1 (CB1), a G-Protein coupled receptor that is found throughout the CNS, limits the axons' ability to respond to these cues *in vitro.* To elucidate CB1's role in axon pathfinding *in vivo*, we exposed zebrafish (*Danio rerio)* embryos to AM251, a CB1 inverse

agonist, and visualized developmental changes in commissural primary ascending (CoPA) and motor neurons through immunofluorescence. Neither CoPA nor motor neurons were substantially affected by AM251 exposure. These findings suggest that CB1 function understood in cell culture may not hold true *in vivo*.

Project:

ASSESSING INDUSTRIAL POLICY USING FINANCIAL MARKETS

Lukas Raynaud, 2017
Monica Das, Associate Professor, Department of Economics

"Industrial policy" refers to a set of actions by a governing body—R&D subsidies, tax exemptions, trade agreements, direct funding, etc.—with the intent to foster the growth of targeted, domestic industries that are seen as integral to economic success. However, economists are divided on the extent to which governments should intervene in market activity; properly analyzing how effective these policies truly are being essential to the ongoing debate. Our approach utilizes the "*efficient market hypothesis"* (all information is immediately priced into financial market) and the "*event study"* statistical method (a linear regression measuring abnormal historical data) to perform an analysis on policy announcements related to the semiconductor industry and corresponding security returns. This method is conducted both against US and Japanese policies and markets.

Project:

THE EFFECTS OF STRESSORS ON THE CELLULOSE NETWORK OF *PENIUM MARGARITACEUM*

Kurt Hanebrink, 2017
David Domozych, Professor, Department of Biology

Plant cell walls consist of highly structured composites that are vital for the cell's survival. Cell wall components represent the largest source of biopolymers on the planet and are used for textiles, pharmaceuticals, and biofuels. However, the mechanisms of cell wall biosynthesis are poorly resolved. In this study, an analysis of cellulose synthesis was performed in the unicellular model alga, *Penium margaritaceum*, using rapid screening tools of chemical genomics, endomembrane- and wall-specific dyes, and microscopy. Three inhibitors were chosen to interrogate the cellulose synthesis: amiprophos-methyl, 2,6-dichlorobenzonitrile, and Isoxaben caused weakening of the cell wall by targeting either microtubules or cellulose synthase, resulting in turgor pressure swelling the cell at the isthmus. The results highlight the complexity and elucidate potential mechanisms of cellulose biosynthesis in *Penium*.

Project:

EXPLORING THE ENDOMEMBRANE SYSTEM OF *P. MARGARITACEUM*, A MODEL ORGANISM FOR PLANT CELL STUDIES

Kalika Likhi, 2018
David Domozych, Professor, Department of Biology

The endomembrane system of plant cells is a complex network of interacting organelles that function both in secretion of critical biochemicals to the outside and internalization/recycling of cell membrane. Only recently have specific components of the endomembrane system been identified and their functional roles revealed. In this study, an analysis of endomembrane components was performed in the unicellular alga, *Penium margaritaceum*, using endomembrane specific dyes, inhibitors and confocal laser microscopy. The dyes chosen include FM 4-64, a florescent styryl dye, and others such as the Yeast Vacuolar Dye. The inhibitor chosen is 1-Napthelenacetic Acid (NAA), a synthetic auxin. The results of this study reveal, for the first time, the complex yet dynamic nature of the endomembrane system of *Penium*, a model organism for plant cell studies.

Project:

RESPONSE OF *PENIUM MARGARITACEUM* TO ENVIRONMENTAL STRESSORS THROUGH THE LENS OF REACTIVE OXYGEN SPECIES

Eleanore Ritter, 2018
David Domozych, Professor, Department of Biology

Oxygen gas (O_2) is essential for cellular respiration and is generally beneficial. However, this molecule can become harmful when it forms reactive oxygen species (ROS). Despite their toxicity in high concentrations, ROS are important in plants as a response to stress. Many questions need to be resolved concerning ROS including their roles in the evolution of land plants and extant early divergent organisms such as green algae. *Penium margaritaceum*, a unicellular green alga, was subjected to environmental stressors. ROS levels and the subcellular impacts of these stressors were identified using fluorescent dyes. Salt stress caused significant ROS production and subcellular defects while other chemicals did not show the same response. These results suggest that ROS play an important role in stress response in *P. margaritaceum*.

Project:

DISSECTING THE ROLES OF ENDOMEMBRANE ORGANELLES IN *PENIUM MARGARITACEUM*

Alan Xiao, 2018
David S. Domozych, Professor, Department of Biology

Plant cell walls consist of highly structured composites of polysaccharides and glycoproteins that are produced via interactive secretory mechanisms. These macromolecules are used for textiles, food additives, paper, medicinal products and biofuels. An analysis of endomembrane components was performed in the unicellular model alga, *Penium margaritaceum*, using rapid screening tools

of chemical genomics, endomembrane-specific dyes, and confocal laser microscopy. Four specific inhibitors, brefeldin A, cytochalasin E, flufenacet, and monensin were chosen to interrogate the structure of the endomembrane system. Aberrations were noted in the endomembrane organelles for cells incubated with these inhibitors; however, only cytochalasin E and flufenacet showed disruptions in cell wall deposition. The results of this study highlight the complexity of the endomembrane system of *Penium* and its putative role in wall development.

Project:

EPARATION OF CHIRAL COMPUNDS WITH CAPILLARY ELECTROPHORESIS USING CYCLODEXTRINS AS BUFFER ADDITIVES

Emily O'Connor, 2019
Kimberley A. Frederick, Professor, Department of Chemistry

The function of biologically relevant compounds depends on their shape; it is common that one form delivers the intended therapeutic effect, while the other may have harmful effects. This makes it extremely important to know if you have the pure form or a racemic mixture for quality control purposes. Because the different forms are chemically identical except for shape, it is challenging to separate and identify them. The goal of this project is to develop a protocol for the separation of chiral compounds using Cyclodextrins as a buffer additive in capillary electrophoresis. We have focused on optimizing conditions for separations of the amino acid phenylalanine and the pharmaceutical naproxen by using novel derivatized alpha, beta, and gamma cyclodextrins as buffer additives.

Project:

DEVELOPMENT OF A MICROFLUIDIC ASSAY FOR ANALYSIS OF IODIDE IN WATER SYSTEMS

Laura Swenson, 2019
Kimberley A. Frederick, Professor, Department of Chemistry

Hydraulic fracturing (hydrofracking) is a technique used to extract oil and natural gas. Hydrofracking wells produce several million liters of flowback water containing ions (bromide, chloride and iodide), organic matter and radioactive materials. The water produced by these wells can contaminate nearby waters and contains 50,000-150,000 ppm dissolved solids which is more than 100 times the U.S.'s drinking water standard. The goal of this project is to develop a simple and inexpensive device that can detect the presence of iodide in water systems. Microfluidic paper chips offer many advantages: easy of transportation, low cost, and rapid detection. We have developed a paper chip that measures the colorimetric reaction between methylene blue and iodine, and is able to quantify concentrations up to 120 ppm. This color change is measured by absorption as well as an iPhone.

Project:

SYNTHETIC STUDIES ON TANDEM INTRAMOLECULAR DIELS-ALDER AND [3+4] ALLYLCATION CYCLIZATIONS

Matthew Lueckheide, 2017
Raymond J. Giguere, Professor, Department of Chemistry

The formation of carbon-carbon bonds is essential for organic synthesis. Our research projects investigate the generation of multiple chemical bonds within a single reaction. Many natural and synthetic organic molecules, especially those found in pharmaceuticals, often contain complex ring systems. We primarily focus on Tandem Intramolecular Diels-Alder (TIMDA) reactions, which create four carbon-carbon bonds and four rings in one transformation. Additionally, we began studying an intramolecular [3+4] allylcation cycloaddition that forms three carbon-carbon bonds and three rings in one step, yielding a novel tricyclic molecule. This presentation describes the preparation, isolation, and purification of the organic molecules in both synthetic pathways.

Project:

NEW TANDEM INTRAMOLECULAR REACTIONS: DIELS-ALDER AND [3+4] ALLYLCATION CYCLIZATIONS

Matthew Mailloux, 2018
Raymond J. Giguere, Professor, Department of Chemistry

Carbon-carbon bond formation is considered the cornerstone of organic synthesis. Our research investigates new methods of creating carbon-carbon bonds through Tandem Intramolecular Diels-Alder (TIMDA) reactions. One synthetic pathway consists of seven reactions leading to the TIMDA cyclization, which forms four new carbon-carbon bonds and yields a tetracyclic ring structure in a single step. Polycyclic organic compounds are of interest due to their abundance in natural products and are found, for example, in steroids. This presentation will outline preparation, isolation, purification, and characterization of new organic compounds. In a related project, an intramolecular cyclization reaction involving a [3+4] cycloaddition is being explored to generate a spiro, tricyclic structure in a single step.

Project:

EFFECTS OF SUPPLEMENTARY INFORMATION ON SOLUTION METHODS TO KINEMATICS PROBLEMS

Erin Maloney, 2018
Evan Halstead, Teaching Professor, Department of Physics

We looked into the effects of different supplementary information on the method that people used to solve kinematics questions. The data was taken prior to this summer via an online survey. Participants solved three kinematics questions and were given either relevant equations, irrelevant equations, an image, or no supplementary information at all. They were then asked to describe their solution process. We then grouped the answers based on solution method. The goal is to judge whether the supplementary information provided was correlated in any way with the solution method. We present and comment on the results.

Project:

VAN DER WAALS EQUATION OF STATE AS A MODEL OF INFLATION

Akaylia Morgan, 2018; Dante Tobar, 2018
Evan Halstead, Teaching Professor, Department of Physics

The most popular theory for the creation of our universe, the Big Bang, has become a household term in the 21st century. With it came the prediction that the universe would have background radiation from all directions hailing from its dense past. When this phenomena was finally observed it had certain peculiar characteristics; it was both isotropic and homogenous. To explain this, a period of rapid expansion was postulated, known as inflation. Our research seeks to explain these observations using a model of inflation. To evaluate our model we treated the universe as a fluid and modified its properties. We compared the results from our computational models to observations of the cosmic microwave background which allowed us to constrain the parameters of the model.

Project:

ELLIPTIC CURVES OVER FINITE EXTENSION FIELDS

Chen Lin, 2018
Mark Huibregtse, Professor, Department of Mathematics

An elliptic curve $E(K)$ is the set of solutions (x, y) to an equation of the form $y^2 = x^3 + ax^2 + bx + c$ over a field K. There is an addition law on $E(K)$; when K is finite, $E(K)$ is a finite group under this operation, which is used in applications such as the encryption and decryption of digital communications. The algorithms are most easily implemented when $K = F_p$, the field of integers modulo the prime p. We chose to implement the algorithms over the finite extension field F_{p^n}; we programmed the arithmetic of F_{p^n}, the addition of points on $E(K)$, the encryption/decryption of messages using $E(K)$, and the computation of the size of $E(K)$ in several ways, including Schoof's algorithm, which required programs for the arithmetic of rational functions over F_{p^n}.

Project:

DOES PREDICTABILITY AFFECT THE PARAFOVEAL PROCESSING OF DEVELOPING READERS?

Elizabeth Oehrlein, 2017
Dr. Rebecca Johnson, Associate Professor, Department of Psychology

When we read, we gather information from the word we are looking at, as well as the word to the right, located in the parafovea. Ehrlich and Rayner (1981) found that when a word is predictable in context, adults more effectively utilize visual information in the parafovea. Here, we describe a study in which we will explore the role of context in parafoveal processing in developing readers of English. We will use the gaze-contingent boundary technique in a 2(context: predictable, neutral;) x 3(preview condition: identity, similar, dissimilar) experimental design using children ages 7 to 11 to explore the developmental trend of these effects previously only explored in adult readers.

Project:

RESTORATIVE JUSTICE IN UNIVERSITIES: WHAT WORKS

Megan Schachter, 2017
David Karp, Professor, Department of Sociology

Restorative Justice (RJ) offers an alternative approach to the traditional criminal justice system. It is being implemented in initiatives around the country through the criminal court and education systems. Professor Karp's work focuses on the implementation of RJ throughout universities and he is the director of Skidmore's RJ project. The crux of research this summer has focused on writing a chapter for the Routledge Handbook of Restorative Justice, entitled "Restorative Justice in Universities: What Works." In this chapter, we align learning outcomes a student obtains from participating in a RJ dialogue with real life stories from universities throughout the country. It demonstrates the breadth of RJ and the transformative power it can have on a person's college experience from both a theoretical and practical perspective.

Project:

RYPTOPHAN ABSORPTION AND FLUORESCENCE DEPENDS ON CONFORMATION

Alexandra Cassell, 2019
William Kennerly, Teaching Professor, Department of Chemistry

Tryptophan is an essential amino acid: one of three that can fluoresce in the near UV spectrum. We use quantum mechanical calculations to learn about Trp's absorption and emission properties when excited with light. Our main goal has been to find a computational method that is accurate, quick, and independent of the conformation of Trp. We plot excitation energy vs. optimization step to determine the validity of Gaussian's optimization, since several functionals optimize the incorrect state. With this method, we can calculate excited-state structures, dipole moments, oscillator strengths, and excitation energies at each state; data that aids in analyzing Trp's fluorescence trends. Simultaneously, we perform similar calculations with a solvated conformation of Trp to model the effect of its aqueous environment.

Project:

STRUCTURAL CHANGES OF TRYPTOPHAN IN A MELITTIN MOLECULAR DYNAMICS SIMULATION

Charles Clayton, 2018
William Kennerly, Teaching Professor, Department of Chemistry

Molecules interacting with light influence so much of our lives and modern technology. Tryptophan reacts to light, and when it does, its structure changes. We worked with a tryptophan-containing protein called melittin. The software package AMBER calculates the entire motion of a molecule over time using molecular dynamics simulations. These simulations reveal the total energy, RMSD, bond lengths within the tryptophan molecule, and distances between tryptophan and a water molecule. We worked to get statistical analysis, such as plots over time, averages, and standard deviations of these parameters.

Project:

ABSORPTION AND EMISSION PROPERTIES OF INDOLE: WHAT'S THE RIGHT FUNCTIONAL TO USE?

Justin Gerard, 2017
William W. Kennerly, Teaching Professor, Department of Chemistry

Indole is the aromatic side chain of tryptophan, an essential amino acid that fluoresces in the near-UV. Trp is used as a fluorescent probe in biological systems. As experiments on the fluorescence mechanism of Trp can be difficult to perform, we are using computational quantum methods to calculate information about Trp in its different electronic excitation states. We have tested the suitability of functionals and basis sets using time-dependent density functional theory (with Gaussian) for calculating absorption and fluorescence properties at the optimized geometries of indole in several excited states. As our research progresses, we will apply our findings to explore the effects of solvation on indole's fluorescence properties and extend our work to a full tryptophan molecule.

Project:

TUNNELING NANOTUBES AS A MECHANISM FOR THE CELL-TO-CELL SEEDING OF ATXN1 AGGREGATES IN SPINOCEREBELLAR ATAXIA TYPE 1

Eliza Burr, 2017
Sarita Lagalwar, Assistant Professor, Neuroscience Program

Spinocerebellar Ataxia Type 1 (SCA1) is a neurodegenerative disorder that causes degeneration of neurons in conjunction with aggregation of mutant Ataxin-1 (ATXN1) protein within the nucleus of the degenerating neurons. SCA1 degeneration is progressive and spreads from the cerebellum to the brainstem. As a result, symptoms begin with loss of movement and coordination and end in death due to dysfunctional respiration and swallowing. Our research seeks to understand the mechanism by which aggregating ATXN1 is spread from diseased to normal cells. We will transfect cerebellar-derived Daoy cells with two different fluorescently taggedATXN1 genes and observe interactions between aggregated and non-aggregated ATXN1 proteins via Fluorescence Resonance Energy Transfer (FRET) . In preparation for this work, this summer I amplified bacterial plasmids inserted with one of two mutant or two normal green fluorescent protein-tagged ATXN1 DNA constructs in DH5-alpha competent *E. Coli* cells and verified the insertion of the constructs through restriction enzyme digest and gel electrophoresis. These plasmids will be transfected into Daoy cells and co-cultured with Daoy cells expressing red fluorescent protein-tagged mutant ATXN1. The presence of ATXN1 aggregation, tunneling nanotubes as a mechanism for cell-to-cell aggregate transfer, and *inter*cellular aggregate seeding will be determined by confocal microscopy and FRET analysis.

Project:

RESTORATION OF CEREBELLAR PURKINJE CELLS THROUGH SUCCINIC ACID TREATMENT

Donna Nguyen, 2018
Sarita Lagalwar, Assistant Professor, Neuroscience Program

Spinocerebellar ataxia type 1 (SCA1) is a neurodegenerative disorder caused by a polyglutamine expansion within the Ataxin-1 protein, leading to a degeneration of Purkinje cells within the cerebellum. This degeneration causes poor motor coordination and can lead to death within 15 years of symptom onset. Our lab has previously identified dysfunction in mitochondria during SCA1 pathogenesis. Therefore, we hypothesized that boosting cerebellar mitochondria with exogenous succinic acid, a natural product of the mitochondrial Kreb's cycle that stimulates the mitochondrial electron transport chain, may help prevent Purkinje cell degeneration and restore motor coordination. Succinic acid treatment was administered in mutant transgenic SCA1 mice for four weeks or four months until 20 weeks of age. Mice were run through several behavioral tests to determine the efficacy of succinic acid treatment on motor coordination. Immunohistochemistry was then performed on cerebellar tissue to ascertain if succinic acid prevents Purkinje cells from degradation. Our results show that treatment improved motor coordination when administered for four weeks. However, the four-month treatment was less successful and caused motor coordination to worsen.

Project:

TAKING ADVANTAGE OF SOCIAL MEDIA: A CASE OF SMALL RESTAURANTS

Sarah Rinaolo, 2017
Ela Lepkowska-White, Professor, Department of Management and Business

Past research shows that restaurants have a difficult time adopting social networking sites (SNS) into their marketing mix. Most of this research, however centers on larger establishments. In this study we examine the challenges of social media adoption in small restaurants and suggest ways to address them. We conducted interviews with twenty small restaurants and content analyzed their Facebook posts. Our findings show that restaurants spend little time on social media, manage them ad hoc, with little guidance or expertise. They think of social media as a passive advertising tool to attract new customers and to monitor their target market. We recommend that, in addition to advertising, restaurants foster engagement and relationships on SNS but to do this effectively they need to acquire more expertise and develop guidelines.

Project:

DEVELOPING A METHOD TO STUDY SOCIOSEXUAL MOTIVATION IN RATS

Morgan Lavoie, 2017
Hassan Lopez, Associate Professor, Department of Psychology

A sample of 13 adult female rats were tested in a three-chambered social interaction apparatus over two consecutive experiments. In the first, sexual motivation was assessed. A male target was confined to one side chamber, and a female target was placed in the other. Subjects explored the

apparatus for 10 minutes. Subjects were tested under two hormonal conditions: nonestrous and estrous. We predicted that subjects would spend more time in the male chamber when in estrus. In the second experiment, subjects' sociality was assessed by presenting them with an unfamiliar female and an empty cage. Subjects were tested over three trials, following administration of an oxytocin receptor antagonist (L-368,899; 0.0, 0.5, and 1.0 mg/kg). We predicted that drug treatment would dose-dependently attenuate social investigation time.

Project:

MONEYBALL FOR SOFTBALL: EXPLORING SOFTBALL ANALYTICS

Jillian Strileckis, 2018
Michael Lopez, Assistant Professor, Department of Mathematics

Following my season on the Skidmore softball team, I wanted to implement statistical tools to aid my coach and team in future seasons. Using regression models, we created player predictions for returning Liberty League hitters and pitchers. Next, we used player level data to explore growth from freshman year to senior year. Finally, using team level data across Division 3, we quantify the strength of each team's offense and defense, as well as the impact that each team's field has on run scoring.

Project:

NOVEL ISOTOPIC LABELING REACTION VIA THIAMINE CATALYSIS

Matthew J. Lueckheide, 2017
Jessada Mahatthananchai, Visiting Assistant Professor, Department of Chemistry

Isotope labeling has facilitated scientific progress within many fields and is repeatedly used in drug metabolism studies and understanding the structure or reaction of newly synthesized molecules. The method for incorporating deuterium, a stable isotope of hydrogen, into useful organic molecules such as aldehydes is typically multi-step, expensive, and wasteful. Our research focuses on determining the feasibility of employing thiamine or vitamin B1 to catalyze an isotopic labeling reaction via hydrogen-deuterium exchange with inexpensive reagents and mild reaction condition.

Project:

HYDROGEN-DEUTERIUM EXCHANGE ON ALDEHYDES CATALYZED BY N-HETEROCYCLIC CARBENE

Robyn Stix, 2018
Jessada Mahattananchai, Visiting Assistant Professor, Department of Chemistry

Deuterium, a stable isotope of hydrogen, has long been used in physical organic chemistry and medically-relevant metabolic studies. Deuterium has also recently been incorporated into drug candidates for possible benefit of slowing drug metabolism and reduced side effects. However, standard methods for incorporating deuterium into organic molecules are wasteful and expensive. The focus of this research was to determine if inexpensive thiamine (vitamin B1)-like catalysts could catalyze a hydrogen-deuterium exchange reaction using inexpensive reagents and mild

conditions. The percent incorporation was measured using a proton NMR spectroscopy. Over five aldehydes were studied, and percent incorporation was determined to be 23-90%.

Project:

"I VOTED" STICKERS

Henry Jaffe, 2018; Chloe Singer, 2018
Christopher Mann, Assistant Professor, Department of Political Science

"I Voted" stickers are a quintessential part of American voting culture. But do they have an impact on our elections? We investigated the provision of "I Voted" stickers across counties and their subsequent effect on voter turnout. Our research began with a survey of election administrators about their counties' use of stickers. We compared this data with demographic information to attempt to model "I Voted" sticker distribution. Using the same information, we assessed the relationship between sticker distribution and voter turnout. In addition, we took a closer look at the distribution of stickers in mail ballots to examine the effect of receiving a sticker in advance of voting. Here, we compared individuals with similar backgrounds who did and did not receive a sticker.

Project:

COPPER/SILVER RESISTANCE OF *Enterobacter cloacae* ATCC13047

Makhzuna Khudoynazarova, 2017
Sylvia McDevitt, Associate Professor, Department of Biology

Different modes of horizontal gene transfer have made it possible for bacteria develop metal resistant through exchange of genetic material. *Enterobacter cloacae* ATCC13047 harbors two 20-gene gene clusters in its genome expected to confer copper and silver resistance. One of these gene islands is located on a plasmid, pECL_A, which was successfully transferred into *E. coli* GR161 and we are currently in the process of testing the response of the transconjugants, *E. coli* GR161(pECL_A), towards the presence of silver. Part of the gene cluster believed to be responsible for copper resistance is interrupted by a transposon in pECL_A. As a second aim we are working to clone the respective genes from the chromosomal copy of the gene cluster of *E. cloacae* to be expressed from a second plasmid in *E. coli* GR161(pECL_A).

Project:

CLONING OF *pcoRS*$_{(chr)}$ FROM *Enterobacter cloacae* TO BE EXPRESSED IN *E. coli*.

Sthorm Pyrame, 2018
Sylvia McDevitt, Associate Professor, Department of Biology

While copper is an essential trace element, at high concentrations copper is toxic to all cells including bacteria. *Enterobacter cloacae* posesses two 20-gene copper resistance gene clusters, one of which is encoded on a plasmid (pECL_A) which can be transferred to other bacteria. After transfer of pECL_A into *E. coli* no increase in copper resistance has been observed. This is presumably due to the presence of a transposon within one of the regulatory genes. The aim of this work was to clone the regulatory genes (*pcoRS*) of the chromosomal 20-gene gene cluster of *E. cloacae* for expression in *E. coli* (pECL_A) and observe the effect on the bacterium's ability to

handle copper stress. After successful amplification we are currently working to insert the genes into plasmid pACYC177.

Project:

DOES A GENE CLUSTER CONFERRING COPPER RESISTANCE AID BACTERIAL SURVIVAL OF PHAGOCYTOSIS?

Cheyanne Slocum, 2017
Sylvia Franke McDevitt, Associate Professor, Department of Biology

A twenty-gene cluster encoding resistance mechanisms against heavy metals, including copper, has been identified within the genomes of several bacteria in the Enterobacteriacae family. This gene cluster has also been found on extrachromosomal plasmids and can be transferred from one bacterium to another via the process of conjugation. Since one of the ways macrophages kill phagocytized bacteria is by pumping copper into them, this gene cluster may enhance bacterial survival of phagocytosis. After verifying the existence of this gene cluster in *Citrobacter freundi* ATCC 43864, this gene cluster was transferred to *Escherichia coli* GR161 via conjugation. Transconjugants were then subjected to *in vitro* experiments testing for enhanced growth in the presence of copper followed by *in vivo* experiments to test for increased survival of phagocytic attack by macrophages.

Project:

OXIDATION OF CHEMISORBED HYDROCARBONS BY NON-THERMAL PLASMAS

Claudia Bennett-Caso, 2019
Juan G. Navea, Assistant Professor, Department of Chemistry

Free radical reactions with chemisorbed substrates have been studied by generating free radicals with UV light. This method limits the reaction to non-photoactive systems. Non-thermal plasma is an alternative source for the selective generation of free radicals to study photoactive systems without photochemical side-reactions. Functionalization of chemisorbed hydrocarbon via non-thermal plasma is investigated *in situ* in order to determine the conditions and kinetics for an effective oxidation. Through UV-vis spectroscopy analysis, trends in hydrogen, oxygen and hydroxyl free radical production are investigated to determine the most favorable pressure and relative humidity for free radical production. In this work, reactions of $O(^3P)$ with chemisorbed benzaldehyde on aluminum oxide are investigated via vibrational spectroscopy. An optimum oxidation time and kinetics of functional group formation are discussed.

Project:

HETEROGENEOUS PHOTOCHEMISTRY IN THE MARINE BOUNDARY LAYER

Erin J. Mah, 2019
Juan G. Navea, Assistant Professor, Department of Chemistry

The marine atmospheric boundary layer (MBL), the region where the atmosphere has direct contact with the ocean, is the source of sea spray aerosols (SSA). These aerosols are rich in nitrate particles and humic-like substances (HULIS), a complex mixture of organic compounds. It has

been proposed that HULIS acts as a chromophore allowing nitrate containing particles to photolize in a wider region of the solar spectrum.

In this project, HULIS photosensitization of nitrate salts was investigated under broad band radiation, simulating the surface interactions in the MBL. The HULIS-nitrate system was studied in a state-of-the-art system that allows the *in situ* study of both condense and gaseous phase products. The experiments we present here indicate that HULIS can act as a photosensitizer of nitrate particles.

Project:

QUANTUM MECHANICAL CALCULATIONS OF HNO_3 CHEMISORBED ONTO TIO_2 AND EFFECTS OF HUMIDITY

Christopher J. Ostaszewski, 2018
Juan G. Navea, Assistant Professor, Department of Chemistry

Semiconductor components of atmospheric aerosols (titanium dioxide) can trigger photo-induced reactions on surface-bound species (nitrates) with important environmental implications. Yet, experimental vibrational spectroscopy studies of nitric acid adsorbed onto TiO_2 are difficult to interpret because of the convoluted spectrum resulting from the multiple adsorption coordinations.

In this work, several coordination structures of nitrate on TiO_2 were modeled. Vibrational frequency calculations correlated the nitrate geometries with a deconvoluted experimental infrared spectrum of nitric acid chemisorbed onto TiO_2. Our optimizations of chemisorbed nitrates yield five distinct structures in which nitrate loses its D_{3h} symmetry. By adding co-adsorbed water to simulate the effect of humidity, the frequencies of chemisorbed nitrate suggest that the substrate consists on partially solvated nitrate ions.

Project:

CLASSIFYING THE ENVIRONMENT OF HI-RICH EARLY-TYPE GALAXIES USING PYTHON

Kelly Cantwell 2018; Todd Jensen 2016; Erin Maloney 2018; Henry Thoreen 2018
Mary Crone Odekon, Professor, Department of Physics

Over the past year, our research group at Skidmore has identified dozens of unusual, early-type galaxies with significant amounts of atomic hydrogen (HI) gas. In order to test whether their HI gas content depends on local or large-scale structure, we have used Python code to calculate the nearest neighbor density and average density for each galaxy in a new catalog containing 46,648 galaxies which have been observed as part of the Arecibo Legacy Fast Arecibo L-Band Feed Array. We are also revising existing code to classify large-scale environments into voids, tendrils, filaments, and groups using a minimal spanning tree algorithm.

Project:

CREATING A CATALOG OF ATOMIC HYDROGEN IN GALAXIES

Thomas Cane, 2019; Oscar Flory, 2019; T. Brough Morris, 2017
Mary Crone Odekon, Professor, Department of Physics

We are working to test the hypothesis that the atomic hydrogen (HI) content of early-type galaxies depends on local environment, suggesting recent infall from the "cosmic web." To this end we are creating a catalog of 41,527 galaxies including HI data along with position, photometric data, Galaxy Zoo classification, and Yang galaxy group classification. Our HI measurements come from the α70 release of the Arecibo Legacy Fast ALFA survey. We combine this with photometric data from the Sloan Digital Sky Survey DR12 and DR7 for galaxies within the region where the α70 survey is complete. Along with the photometric data we include the galactic extinction in the direction of each galaxy using the Infrared Science Archive.

Project:

ASSESSING WITHDRAWAL FROM METHAMPHETAMINE IN *DROSOPHILA MELANOGASTER* THROUGH CHANGES IN CIRCADIAN ACTIVITY RHYTHMS

Alexandra Fall, 2018
Dr. Bernard Possidente, Professor, Department of Biology

Drug abuse contributes to over 500,000 American deaths every year. Methamphetamine, an abused illicit drug, is a psychoactive stimulant that is known to affect circadian activity rhythms. Circadian rhythms are driven by an endogenous clock in the brain and oscillate on a 24 hour cycle, which can become entrained to light. Using *Drosophila melanogaster* fruit flies, we looked for changes in circadian activity rhythms as evidence for methamphetamine withdrawal. Flies were given methamphetamine for four days and placed in activity monitors on a 12:12 light-dark cycle then taken off methamphetamine for the final four days. Data will be presented on whether the flies showed withdrawal symptoms, as well as the plausibility of using *Drosophila* as a model to study methamphetamine addiction.

Project:

DEVELOPMENTAL ETHANOL EXPOSURE OF *DROSOPHILA MELANOGASTER* INTERACTS WITH ADULT LITHIUM TREATMENT TO ALTER LOCOMOTOR ACTIVITY

Lisa Leung, 2017
Dr. Bernard Possidente, Professor, Department of Biology

About 1-2% of people suffer from bipolar disorder. Bipolar disorder is also associated with many comorbidities including alcohol abuse. Recent studies suggest that alcohol may cancel out therapeutic effects of lithium—one of the most common drug treatments for bipolar disorder. We treated wild-type *Drosophila melanogaster* fruit flies raised on 10% ethanol with lithium and analyzed effects on activity. Our results indicated highly significant treatment interactions when ethanol-raised flies received lithium treatment. Our experiment suggests that ethanol exposure in early stages of life may alter the proper development of certain biological systems that lithium acts on, thus changing the outcome of lithium treatment depending on whether or not one was prematurely exposed to alcohol.

Project:

SOCIAL WASPS AS BIOCONTROL AGENTS

Bruce Martin, 2018
Monica Raveret Richter, Associate Professor, Department of Biology

Polistes paper wasps prey on many types of caterpillars including cabbage worms, pests of mustard (*Brassica*) plants, and hornworms, pests of tomato and tobacco plants. We installed nest boxes at local farms and gardens to enhance population densities of *Polistes* wasps. Since natural colonization rates were low, we collected nests from other locations, installed them in the nest boxes, and monitored their growth and survivorship. We collected and cultured pestiferous caterpillars and used them to bait wasps and accustom them to foraging for prey on target crops. Preliminary observations demonstrate that transplanted wasps will seek out and prey upon cabbage worms and hornworms. We plan to mark prospective "queen" wasps reared in our nest boxes to see if they naturally recolonize these boxes next spring.

Project:

EXPLORING THE THICKNESS OF GOLD NANOPARTICLE FILMS

Diana Alonzo, 2019
Maryuri Roca, Visiting Professor, Department of Chemistry

Stain glass colored by nanoparticles has been used to teach about nano material and to educate students about the properties of gold. In previous experiments the films made were too thin to produce an intense color. In this work, we tried to get inside the parameters that effect the thickness of film by exploring the temperature and percent composition. We used the SEM to measure the thickness of the film and found a negative effect when temperature was changed and a positive outcome from percent composition on the final thickness of the film. Being able to obtain thicker films will increase the impact on colored glass by creating a more intense color.

Project:

SINGLE VS MIXED APPROACHES TO FORM GREEN NANOPARTICLE FILMS

Hannah Skipper, 2017
Maryuri Roca, Teaching Professor, Department of Chemistry

Yellow silver nanoparticle films have been prepared as an educational tool to introduce nanotechnology to the general public. We seek to expand this procedure by preparing green colored films. Previously, we showed that optically similar films can be obtained by a single approach using green nanoparticles, or a mixed approach combining blue and yellow nanoparticles. In this work, we further characterized the composition of the nanoparticles using UV-visible spectroscopy and Transmission Electron Microscopy (TEM). We show that the single approach requires complex chemical synthesis and extensive purification. In contrast, the mixed approach is more reproducible, allows us to form many shades of green that are stable for weeks, and is more appropriate for educational purposes at the introductory level.

Project:

BUILDING AN ATTITUDE OF GRATITUDE: COMPARING ONLINE AND GROUP INTERVENTIONS

Kristen Schiavo, 2017
Mark Rye, Professor, Department of Psychology

Gratitude interventions have been shown to have beneficial effects on health and well-being. This study will compare the effectiveness of a group gratitude intervention with one administered online. 150 Skidmore College students will be randomly assigned to one of the following conditions: No Writing, Gratitude Online, or Gratitude Group. Participants in both intervention conditions will complete a gratitude writing activity each week for three weeks. Unlike the online condition, participants in the group condition will meet each week to discuss their experiences. We hypothesize that 1) participants assigned to the group intervention will improve more on outcome measures than those assigned to the online intervention and 2) participants in both intervention conditions will improve more over time than those in the no-writing condition.

Project:

#MORETHANMYDISORDER: A CONTACT AND EDUCATION VIDEO CAMPAIGN TARGETING KNOWLEDGE AND STIGMA ATTITUDES FOR SOCIAL ANXIETY DISORDER

Gabriella Ponzini, 2018
Casey Schofield, Assistant Professor, Department of Psychology

Treatment barriers for Social Anxiety Disorder (SAD) include concerns about stigma and lack of knowledge about SAD and effective treatments. Research on reducing treatment barriers show that combining education and contact with a sufferer is most effective. This study will test the impact of a contact/education video campaign about SAD on knowledge and stigma attitudes. Participants will be randomly assigned to watch one of three video campaigns (SAD, Diabetes, 3D printing), and complete measures on implicit and explicit stigma attitudes and knowledge about SAD and its treatment. Outcomes will be re-assessed after two weeks. We hypothesize that participants in the SAD condition, compared to other conditions, will show increased knowledge, and decreased explicit and implicit stigma that remains constant over the two week follow-up.

Project:

EXPANDING THE GENETIC CODE WITH PYROGLUTAMATE

Meggie Danielson, 2017; Hannah Schapiro, 2017
Kelly Sheppard, Associate Professor, Department of Chemistry

Non-canonical pyroglutamate incorporation during protein synthesis will aid the study of medical conditions like Alzheimer's disease. Amyloid beta peptides associated with Alzheimer's contain pyroglutamate as a post-translational modification. To better understand pyroglutamate's role in protein structure and function, an *E. coli* model system was developed to directly incorporate pyroglutamate into protein. Key to this process is the use of a modified archaeal RNA-dependent glutamine biosynthetic pathway in which pyroglutamate is synthesized on an amber suppressor

tRNA. Enhanced yellow fluorescent protein was used as a reporter system to determine levels of read-through, and therefore incorporation, of pyroglutamate at the amber stop codon position. Success of this system will be further determined by mass spectrometry to confirm site-specific incorporation of pyroglutamate.

Project:

CHARACTERIZATION OF DUAL PATHWAYS OF ASPARAGINYL-TRNA FORMATION IN *B. SUBTILIS* AND *B. ANTHRACIS*

Karli Rasmussen, 2018
Kelly Sheppard, Associate Professor, Department of Chemistry

Protein synthesis begins by attaching an amino acid to its cognate transfer RNA (tRNA). Some bacteria have two ways to attach asparagine (Asn) to $tRNA^{Asn}$. In the direct route, asparaginyl-tRNA synthetase ligates Asn to tRNA. For the indirect pathway a non-discriminating-AspRS (ND-AspRS) attaches apartate (Asp) to $tRNA^{Asn}$ which GatCAB then amidates. *Bacillus anthracis*, the causative agent for anthrax, possesses both archaeal an ND-AspRS and a bacterial AspRS. After overproducing and purifying the two *B. anthracis* AspRSs, we will test their activities under different chemical conditions to better understand why the archaeal AspRS was acquired. In addition, we will knockout the *Bacillus subtilis* indirect pathway to gain greater insight into why certain bacteria retain both routes for Asn-tRNA formation.

Project:

CHARACTERIZATION OF THE DUAL PATHWAYS FOR *B. HALODURANS* ASPARAGINYL-TRNA FORMATION

Caitlin Schroeder, 2018
Kelly Sheppard, Associate Professor, Department of Chemistry

Protein synthesis requires the attachment of an amino acid to its cognate transfer RNA (tRNA). Two distinct pathways for attaching asparagine (Asn) to $tRNA^{Asn}$ are known: the direct pathway, in which Asn is directly attached to $tRNA^{Asn}$ by the enzyme AsnRS; and the indirect pathway, in which Asn is attached to tRNA by a non-discriminating AspRS and GatCAB. *Bacillus halodurans* uses both routes for Asn-$tRNA^{Asn}$ formation. To better understand why *B. halodurans* possesses both pathways, we are purifying its AsnRS and AspRS in order to test and compare their activities under different chemical conditions such as reactive oxygen species and pH. This research will provide insight into how *B. halodurans* has adapted to survive in different environmental conditions.

Project:

PURIFICATION OF *BACILLUS SUBTILIS* TRANSAMIDOSOME COMPONENTS

David Sweezy, 2017
Kelly Sheppard, Associate Professor, Department of Chemistry

Two distinct routes for attaching asparagine (Asn) to its cognate transfer RNA ($tRNA^{Asn}$), an essential step in protein synthesis, are known. In one path Asn is directly attached to $tRNA^{Asn}$ and

in the other Asn is synthesized on the tRNA using a transamidosome complex composed of a non-discriminating aspartyl-tRNA synthease (ND-AspRS) and GatCAB. *Bacillus subtilis* uses both routes for Asn-tRNA formation. It is unknown why *B. subtilis* encodes for these dual pathways. We are purifying the components of the transamidosome in order to characterize the indirect pathway under various conditions. The work will provide insight into why *B. subtilis* has retained the indirect route for Asn-tRNA synthesis and adapted to survive in different environmental niches.

Project:

THE ROLE OF THE *BACILLUS SUBTILIS* ASPARGINYL-TRNA SYNTHETASE

Emily Williams, 2018; Veronica Mierzejewski, 2019
Kelly Sheppard, Associate Professor, Department of Chemistry

Two distinct routes for attaching asparagine (Asn) to its cognate transfer RNA ($tRNA^{Asn}$), an essential step in protein synthesis, are known. In one path Asn is directly attached to $tRNA^{Asn}$ by the enzyme AsnRS and in the other Asn is synthesized on the tRNA using a non-discriminating AspRS and GatCAB. *Bacillus subtilis* uses both routes for Asn-tRNA formation. It is unknown why *B. subtilis* encodes for these dual pathways. To better understand why *B. subtilis* uses the direct route, we are knocking out *asnS*, the gene for AsnRS to remove the pathway. In addition, we are purifying AsnRS to test its activities under different chemical conditions. This work will provide insight into how *B. subtilis* has adapted to survive in different environmental niches.

Project:

ENVIRONMENTAL AND PLANT COMMUNITY CONTROLS ON ECOSYSTEM PROCESSES IN THE ADIRONDACK MOUNTAINS OF NEW YORK STATE

Jennifer Cristiano, 2018; Daniel Casarella, 2018
Kurt Smemo, Assistant Professor, Environmental Studies and Sciences Program

Forest trees possess specific traits that regulate many fundamental ecosystem processes, including decomposition and soil fertility. Thus, understanding the relative influence of these traits can provide the means to predict the consequences of environmental change and altered biodiversity. The Adirondack Park provides a novel system for studying such relationships due to a relatively small number of overstory tree species, distinct climatic gradients, and uniform underlying geology. Utilizing a Geographic Information System, we selected study sites based on state land classification, tree species, and environmental conditions and then established 24 plots to quantify tree species patterns expected to control nutrient and carbon cycling. Thus far, we conclude that specific species distribution patterns are apparent across short distances and result in correlating patterns of carbon and nutrient cycling.

Project:

EVIDENCE OF PROMISCUOUS TELEOLOGICAL THOUGHT: CHILDREN MAKE FUNCTIONAL JUSTIFICATIONS WHEN CLASSIFYING ANIMATE AND INANIMATE OBJECTS

Julia M. Iannucci, 2017
Jessica Sullivan, Assistant Professor, Department of Psychology

Teleological thought involves reasoning about the purpose or goal of something's existence. What role does teleological thought play in children's reasoning about and classification of objects? Previous research has shown that children (unlike adults) prioritize information about function/purpose, suggesting a reliance on functional information (e.g., what's a chair *for*?) during classification (Keil, 1992; Keleman,1999). However, research has also shown that children rely heavily on appearance-based information (e.g., what a chair looks like?) when classifying objects (Keil, 1992). In the present study, we tested 41 preschool children and 10 adults to understand whether function or appearance guides classification. Participants learned labels (e.g., *stamo*) for novel objects, and then for each label decided whether (a) a function-matching but appearance-mismatching; or (b) an appearance-matching but function-mismatching item was a *stamo*. Participants were equally likely think that the *stamo* matched the exemplar's appearance as they were to think it matched its function, yet their justifications focused on function.

Project:

PRAGMATIC COMPETENCE: THREE-YEAR-OLDS' ABILITY TO COMPUTE CONVERSATIONAL IMPLICATURES

Katherine Williams, 2017
Jessica Sullivan, Assistant Professor, Department of Psychology

When we hear the utterance "I was hungry before I ate a sandwich", we infer that the speaker is no longer hungry, even though that was never explicitly stated. This inference is a pragmatic inference in which the literal semantics of the sentence conveys that the speaker is hungry, while the pragmatic interpretation suggests that the speaker is no longer hungry. Our research explored children's ability to compute pragmatic inferences. Sixty-three children (*M*= 3;5) and adult participants heard sentences in which the literal and pragmatic interpretations led to opposite conclusions. We found that children struggled to compute pragmatic inferences. By mapping out the steps required to compute this class of inferences, we were able to manipulate the difficulty of several steps, isolating one step that appeared challenging to better understand pragmatic competence.

Project:

REIMAGING ERICA

Paris Baillie, 2017
Sarah Sweeney, Associate Professor, Department of Art

Before social media, taking family photos was very private. The Bentley family has shared over 6,000 personal family photographs in the creative commons on Flickr starting June 15, 2006.

Professor Sweeney and I are focusing on the mother, Erica, manipulating and isolating her to be alone in every photograph leaving large empty gaps in her body where her husband or children used to be. We are presenting a new narrative of her life through these deletions by also publicly sharing these new images for the next year on the same day that Michael originally shared the photos but on flickr, tumblr and instagram. This new digital archive asks uncomfortable questions about ownership, women's bodies and the ethics of photography.

Project:

THE ART OF THE LOCATIVE AUDIO DOCUMENTARY
Emily Rizzo, 2018
Adam Tinkle, Visiting Assistant Professor, MDOCS/Media & Film Studies

With the help of new, GPS-aware mobile apps, we create audio experiences that reveal hidden layers of meaning, permitting us to listen to the voices and stories of those knowledgeable about a particular site. This summer, we finished one such project about a historic farm in North Bennington, VT (and produced a listening event for the community that blended live music and community storytelling with edited clips from oral histories interviews), and initiated another project about Skidmore's North Woods, for which we interviewed a dozen faculty, staff, and community members about its scientific, historical, and pedagogical value, as well as its current uses and challenges. We also piloted a collaboration with Troy's Sanctuary for Independent Media, producing a radio piece about resident's views of gentrification.

Project:

ELUCIDATING THE MECHANISM BEHIND POST-COPULATORY SLEEP REDUCTION IN FEMALE *DROSOPHILA MELANOGASTER*
Brianne Luz Cook, 2018
Christopher G. Vecsey, Assistant Professor, Neuroscience Program

Drosophila melanogaster were studied to better understand how social experiences, such as mating, alter sleep. Female fruit flies experience a post-copulatory reduction in daytime sleep, but the cause of this remains unresolved. The current study aimed to determine which factors lead to the female sleep reduction by preventing attempted copulation with a mesh barrier, and then preventing successful copulation by mating females to males without external genitalia. The results showed that the mesh prevented the mating effect and the genitalia-less males reduced the mating effect only to the extent in which they lacked genitalia. This suggests that the mating effect is most likely due to seminal fluid transfer and not sociosexual experience.

Project:

EXAMINING SLEEP AS A BEHAVIORAL IMMUNE RESPONSE IN *DROSOPHILA MELANOGASTER*
Sara Fontana, 2018
Christopher G. Vecsey, Assistant Professor, Neuroscience Program

A prominent parasite-host interaction in nature occurs between the fruit fly *Drosophila melanogaster* and *Leptopilina heterotoma*, an endoparasitoid wasp that infects fruit fly progeny.

Previous research demonstrates that exposure to this parasitic wasp alters fruit fly behaviors, such as oviposition and ethanol consumption. Based on preliminary evidence suggesting that flies' activity was altered during wasp exposure, we examined whether sleep was in fact altered by wasp exposure. To test this, we exposed wild-type fruit flies to parasitic wasps for either a 1-day or 4-day period and then examined their sleep patterns and circadian rhythms. We found that exposure to these parasitic wasps did not significantly affect fruit fly sleep behavior, suggesting that *Drosophila melanogaster* may not use sleep alterations as a means to combat predation.

Project:

OPTOGENETIC STIMULATION OF sNPF NEURONS IN D. MELANOGASTER

Benjamin Juneau, 2018
Christopher G. Vecsey, Assistant Professor, Neuroscience Program

Short Neuropeptide F (sNPF) has been shown to promote sleep and feeding in Drosophila melanogaster. In this study, we optogenetically stimulated neurons expressing sNPF in fruit flies in order to learn more about its role in the regulation of sleep. This was done by expressing, in the target neurons, an ion channel that causes neuronal stimulation in response to red light. Two experiments were conducted where the flies were exposed to red light, with the exposure occurring at different points and durations in each experiment.