Skidmore College

FACULTY STUDENT SUMMER RESEARCH PROGRAM

SUMMER 2015

FINAL PRESENTATIONS
AUGUST 6, 2015

Faculty Student Summer Research Program
Summer 2015

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 2015, there are 84 students working with 42 faculty members on 59 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
Samuel Croll ‘73
Shehan Dissanayake ‘89
Marlene Oberkotter Fowler ‘61
Christy Johnson ‘90
Jim Lippman and Linda Friedman Lippman ‘82
Philip P. Markowitz ‘13
Richard A. Mellon ‘87
Rafael M. Nasser ‘88
Margaret Williams Page ‘43
Don and Jean Richards
The Riederer Family
Michael Rose ‘90
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

Arthur Vining Davis Foundations
Higher Education Opportunity Program (NYS)
Mellon Foundation (NY6)
W.M. Keck Foundation
The National Science Foundation
New York State Energy Research and Development Authority
OP Alumni Project
Rathmann Family Foundation
S3M Transitional Program
The Charles Slaughter Foundation

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.

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
Jennifer Harfmann '14
Rafaella Pontes '15
Kara Rode '15
Carol Wu '14

2012-2013

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 6, 2015

9:00 am – 9:25 am Coffee and Muffins

9:30 am – 10:30 am Oral Presentations

ROOM A

ASSESSING THE WATER QUALITY IN THE KAYADEROSSERAS CREEK
Nathan Van Meter, '17 and Jen Cristiano, '18
Anne Ernst, Environmental Studies Coordinator, Environmental Studies Program

STRANGE BEDFELLOWS OF NORTH CAROLINA IMMIGRATION POLITICS
Elena Veatch, '16
Bob Turner, Associate Professor, Government Department

TECHNOLOGICAL PROGRESS IN THE SEMICONDUCTOR INDUSTRY
Lukas Raynaud, '17
Monica Das, Associate Professor, Economics Department

SOCIAL NETWORKING SITES AND MARKETING STRATEGY: THE CASE OF SMALL RESTAURANTS
Sarah Rinaolo, '17
Elzbieta Lepkowska-White, Associate Professor, Management and Business Department

ROOM B

EFFECTS OF ALCOHOL AND MARIJUANA ON NERVOUS SYSTEM DEVELOPMENT
Agnieszka Brojakowska, '17; Delon Campbell, '16; and Hillary Ramirez, '18
Jennifer Bonner, Associate Professor, Biology and Program Director of Neuroscience

JAMES JESSE STRANG AND THE MORMON IDENTITY CRISIS: A CHARISMATIC KINGDOM OF GOD
Alina Williams, '16
Eliza Kent, Professor and Director, Religious Studies Department

INFLATIONARY CONSTRAINTS ON THE VAN DER WAALS EQUATION OF STATE
Guram Vardiashvili, ‘16
Evan Halstead, Visiting Assistant Professor, Physics Department

ROOM C

PRIMARY CELL WALL INVESTIGATION OF *PENIUM MARGARITACEUM* USING CHEMICAL INHIBITORS
Anna Lietz ’17 and Molly Patten, ‘17
David Domozych, Professor, Biology Department

THE EFFECTS OF AGING AND SUCCINIC ACID ON VASCULAR FUNCTION
Cassandra Eddy, ‘17
Stephen Ives, Assistant Professor, Health and Exercise Sciences Department
T.H. Reynolds, Associate Professor, Health and Exercise Sciences Department

THE EFFECTS OF SUCCINIC ACID TREATMENT ON INSULIN ACTION IN OBESE MICE
Daniela Escudero, ‘16
T.H. Reynolds, Associate Professor, Health and Exercise Sciences Department
Stephen Ives, Assistant Professor, Health and Exercise Sciences Department

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

ROOM A

DETERMINANTS OF COLLEGE SUCCESS
Kenzie Furman, ’16 and Sarah Markiewicz, ‘16
Michael Lopez, Assistant Professor, Mathematics and Computer Science Department

STABILIZING REACTION CONDITIONS USING CLAY FOR MALARIA DIAGNOSIS
Sibin Wang, ‘16
Kimberley Frederick, Professor, Chemistry Department

HETEROGENEOUS PHOTOCHEMISTRY OF COADSORBED WATER AND NITRATES ON A TiO_2 SURFACE
Talia Stortini, ‘18
Juan G. Navea, Assistant Professor, Chemistry Department

EXPANDING THE GENETIC CODE WITH PYROGLUTAMATE
Miles Calzini, ‘16; Meggie Danielson, ’17; and Hannah Schapiro, ‘17
Kelly Sheppard, Assistant Professor, Chemistry Department

AUTOMATED FLUORESCENCE DETECTION ON MICROFLUIDIC CHIPS: AN INEXPENSIVE SOLUTION FOR DIAGNOSIS IN THE FIELD
Kelly Cantwell, ‘18, and Julie Bryant, ‘16
Kimberly Frederick, Professor, Chemistry Department

WHO LET THE WOLVES IN? GEOMETRIC MORPHOMETRIC ANALYSIS OF JAW VARIATION DURING DOMESTICATION
Jessica Street, ‘16
Abby Grace Drake, Teaching Professor, Biology Department

CALCULATING UV-VIS ABSORBANCE/FLUORESCENCE SPECTRA OF INDOLE AND TRYPTOPHAN
Elijah Kofke, ’16 and Kristine Vorwerk, ‘17
William Kennerly, Visiting Assistant Professor, Chemistry Department

MEASURING HYDROTHERMAL PLUME PARTICLES WITH OPTICAL BACKSCATTERING SENSORS: PRELIMINARY TESTS OF A NEW METHOD
Emma McCully, ‘16
Meg Estapa, Visiting Assistant Professor, Geosciences Department

BREEDING SPINOCEREBELLAR ATAXIA TYPE 1 MICE AND CREATION OF A BRAIN AND DNA BANK
Eliza Burr, '17
Sara Lagalwar, Assistant Professor, Neuroscience Program

ANXIOUSLY AWAITING THE FUTURE OF RESTORATIVE JUSTICE IN THE UNITED STATES
Olivia Frank, ‘15
David Karp, Professor, Sociology Department

COMPARATIVE ANALYSIS OF IRON LEACHED FROM NIGHTTIME DISSOLUTION OF FLY ASH FROM DIFFERENT SOURCE REGIONS
Deborah Kim, ‘18
Juan G. Navea, Assistant Professor, Chemistry Department

DISRUPTING PROTEIN INTERACTIONS IN SPINOCEREBELLAR ATAXIA TYPE 1
Spencer Lowry ’18 and Donna Nguyen, ’18
Sara Lagalwar, Assistant Professor, Neuroscience Program

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

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

ROOM A

THE EFFECTS OF AGING, A HIGH FAT DIET, AND LONG TERM SUCCINIC ACID TREATMENT ON VASCULAR HEALTH AND MITOCHONDRIAL FUNCTION IN MICE
Gabe O'Brien, '16
Stephen Ives, Assistant Professor, Health and Exercise Sciences Department
T.H. Reynolds, Associate Professor, Health and Exercise Sciences Department

GEOMETRIC MORPHOMETRIC ANALYSIS OF THE EFFECTS OF LEAD ON FRUIT FLY (*DROSOPHILA)* WING SHAPE AND BODY SIZE
Randy Cuevas, '16
Bernie Possidente, Professor, Biology Department
Abby Grace Drake, Teaching Professor, Biology Department

THE PROCESSING OF BLEND WORDS IN VISUAL WORD RECOGNITION
Sarah Rose Slate, '16
Rebecca Johnson, Associate Professor, Psychology Department

DEVELOPMENT OF A URINE-BASED ASSAY FOR D-LACTATE USING PAPER: A DIAGNOSTIC TEST FOR MALARIA
Nathanael Rehmeyer, '18
Kimberley Frederick, Professor, Chemistry Department

PURIFICATION OF *BACILLI* ASPARAGINE BIOSYNTHETIC PATHWAYS
Ruth Allard, '16 and David Sweezy, '17
Kelly Sheppard, Assistant Professor, Chemistry Department

QUANTUM CHEMICAL CALCULATIONS AND VIBRATIONAL SPECTROSCOPY OF ADSORBED NITRATE ON SiO_2.
Katie C. Shi, '18
Dr. Juan G. Navea, Assistant Professor, Chemistry Department

DEVELOPMENT OF CHIP-BASED WATER ANALYSIS THROUGH MICELLAR ELECTROKINETIC CHROMATOGRAPHY
Jillian Greenspan, '17
Kimberly Frederick, Professor, Chemistry Department

SYNTHESIS AND PURIFICATION OF AN AGRICULTURALLY RELEVANT MOLECULE
Nicholas M.G. Friedman, '17
Kara Cetto Bales, Senior Instructor, Chemistry Department

SYNTHETIC INVESTIGATION OF A HIGHLY SUBSTITUTED CYCLOHEXENE COMPOUND
Justin James O'Sullivan, '17
Kara Cetto Bales, Senior Instructor, Chemistry Department

THE INFLUENCE OF PH ON THE CATION EXCHANGE OF ALUMINUM WITH IRON IN HUMIC ACIDS
Jaya Borgatta, '16
Juan Navea, Assistant Professor, Chemistry Department

PROATIVE INTERFERENCE WITH POSITIVE WORDS
Juliana Boucher, '16
H. Faye Knickerbocker, Visiting Assistant Professor, Psychology Department

THE PROCESSING OF POSITIVE AND NEGATIVE EMOTION-LADEN WORDS DURING READING: AN EYE-TRACKING STUDY
Emma Starr, '16
Rebecca Johnson, Associate Professor, Psychology Department

PROJECT ABSTRACTS

Project:

SYNTHESIS AND PURIFICATION OF AN AGRICULTURALLY RELEVANT MOLECULE

Nicholas M.G. Friedman, '17
Kara Cetto Bales, Senior Instructor, Chemistry Department

Organic synthesis allows for molecules with biomedical and industrial applications to be produced from readily available materials. This project is focused on investigating the synthesis and purification of a molecule of potential relevance to the agricultural industry. Previous work in our group has shown this compound to effectively inhibit the growth of pathogenic fungi. The current goal is to discover if this compound promotes plant growth, as structurally similar compounds are known to exhibit this behavior. Before testing the compound as a plant-growth promoter, the method of isolation must be improved to obtain biological grade product in quantities suitable for treating plants. Isolating the synthesized molecule from newly detected impurities has proved challenging. The progress of our isolation and purification methods will be discussed.

Project:

SYNTHETIC INVESTIGATION OF A HIGHLY SUBSTITUTED CYCLOHEXENE COMPOUND

Justin James O'Sullivan, '17
Kara Cetto Bales, Senior Instructor, Chemistry Department

Organic synthesis holds an essential role in the creation of complex molecules with a variety of applications from pharmaceuticals to agriculture. Often, expensive reagents and complex reaction schemes are necessary. Our group is interested in a class of highly substituted cyclohexene compounds that can behave as anti-fungal agents, and are used as fragrances and preservatives. Our research attempts to develop inexpensive and time efficient methods for the synthesis of these materials. We have recently optimized a one-step synthesis of a compound that shows promise as an anti-microbial agent. Our current project seeks to develop a method to prepare a structurally similar compound which may also possess these properties. Preliminary studies suggest that this may be challenging due to the nature of the starting material.

Project:

SYNTHETIC INVESTIGATION OF DIELS ALDER REACTIONS WITH α-β UNSATURATED KETONES

Lauren Soong, '16
Kara Cetto Bales, Senior Instructor, Chemistry Department

α-β Unsaturated ketones are often used as precursors to form highly substituted cyclohexene compounds that have various functions ranging from antimicrobials and pain relievers, to preservatives. Because of their ubiquity in every-day applications, the goal of this research is to

develop innovative synthetic methods for these ciompounds using inexpensive and readily available materials. Our group has recently synthesized a cyclohexene compound and have conducted studies that show it to be an effective fungicide. As such, we are investigating the synthesis of a similar product and our developments will be discussed in detail.

Project:

EFFECTS OF ALCOHOL AND MARIJUANA ON NERVOUS SYSTEM DEVELOPMENT

Agnieszka Brojakowska, '17; Delon Campbell, '16; and Hillary Ramirez, '18
Jennifer Bonner, Associate Professor, Biology and Program Director of Neuroscience

Fetal exposure to alcohol and marijuana via consumption by pregnant women can cause developmental defects, including delayed neurological and motor processing. We investigated the roles of ethanol and cannabinoids (active ingredient in marijuana such as THC) on zebrafish development. Confocal microscopy was used to observe the effects of 1% ethanol on axon guidance. Fluorescent labeling with CB1 receptor antagonist (AM251) in embryos at 24, 36, and 41 hours post fertilization (hpf) localized cannabinoid receptors during development. Ethanol exposure resulted in increased branching and shortening of motor neuron axons. Fluorescent AM251 staining revealed receptor expression in the anterior and posterior optic commissures in the brain. Fetal exposure to alcohol influences nervous system development. CB1 receptor expression in the commissures indicates susceptibility to marijuana exposure during development.

Project:

TECHNOLOGICAL PROGRESS IN THE SEMICONDUCTOR INDUSTRY

Lukas Raynaud, '17
Monica Das, Associate Professor, Economics Department

The emergence of a startup semiconductor plant (Global Foundries) in Malta along with the development of the Nanotech park in SUNY Albany is a recent development in the upstate New York region. Excited about these recent developments and curious about its impact on the local economy, we decided to conduct an academic investigation of the semi conductor industry with statistical analysis and a macro growth model. Currently our focus is on U.S. industry level data, however, our methodology can be extended to study the semi conductor industries in the Asia Pacific Region, which show promising signs for development in the area. Finally we hope to use the results of our findings to make predictions for the economy of upstate NY.

Project:

PRIMARY CELL WALL INVESTIGATION OF *PENIUM MARGARITACEUM* USING CHEMICAL INHIBITORS

Anna Lietz, '17 and Molly Patten, '17
David Domozych, Professor, Biology Department

Penium margaritaceum, a unicellular charophycean green alga, was used in this investigation of primary cell walls. The cell wall of *Penium* was studied using cellulose inhibitors, microtubule inhibitors and cytokinesis inhibitors. *Penium* was treated with the various chemicals and the

resulting morphology was analyzed through light microscopy, confocal laser microscopy and electron microscopy. Cellulose and cytokinesis inhibitors caused elongated cells as they prevented cell division, while microtubule inhibitors caused swelling in the isthmus of the cells. The morphological effects resulting from the inhibition of certain cellular processes hints toward the functions of cell wall constituents such as pectins, cellulose, and arabinogalactan proteins.

Project:

WHO LET THE WOLVES IN? GEOMETRIC MORPHOMETRIC ANALYSIS OF JAW VARIATION DURING DOMESTICATION

Jessica Street, '16
Abby Grace Drake, Teaching Professor, Biology Department

Determining when and how dog domestication took place has continued to be a source of controversy and debate, as dates range widely from the Paleolithic (13-50,000YBP) to Neolithic (13-5,000YBP). Previous research includes many sources of error from small sample sizes and the use of caliper-based measurements to fragmented fossils, such as pieces of incomplete jaws, and most egregiously, no definitive method for distinguishing dogs from wolves. 3D shape analysis is a holistic way to determine whether jaws alone present enough morphometric differences to distinguish dogs from wolves and whether jaw shape would allow us to reliably classify ancient canids as either dog or wolf. We show that dog, wolf, and jackal jaws are indistinguishable in shape and size, therefore rendering all fossil *Canis* jaws unclassifiable.

Project:

ASSESSING THE WATER QUALITY IN THE KAYADEROSSERAS CREEK

Nathan Van Meter, '17 and Jen Cristiano, '18
Anne Ernst, Environmental Studies Coordinator, Environmental Studies Program

Anticipated development within Saratoga County poses a potential threat to the historically high water quality of the Kayaderosseras Creek. We began a long-term study of the Kayaderosseras to establish a baseline and determine how changes in the watershed affect water quality. We deployed CT2X sensors in three sites along the Kayaderosseras to measure conductivity, temperature, pressure, salinity, and total dissolved solids. HOBO temperature loggers were also installed in five main tributaries to the Kayaderosseras, with loggers above and below a location of high imperviousness. Thus far, we have found an increase in all variables, with the exception of temperature, within the Kayaderosseras from upstream to downstream. We plan to continue to monitor this creek and assess how urbanization affects water quality in the Kayaderosseras watershed.

Project:

MEASURING HYDROTHERMAL PLUME PARTICLES WITH OPTICAL BACKSCATTERING SENSORS: PRELIMINARY TESTS OF A NEW METHOD

Emma McCully, ‘16
Meg Estapa, Visiting Assistant Professor, Geosciences Department

Hydrothermal vents hold potential clues to the iron cycling of the oceans. It is unclear if the minerals contained in the plume are deposited onto the seafloor, or rather incorporated into the surrounding cold, low-oxygen seawater. Here, optical sensors were used to measure backscattering of pyrite and hematite particles, which are commonly found in hydrothermal plumes. Hopefully future explorations will use this catalogue of backscattering data to better determine concentrations without having to collect samples, which is both time and labor intensive. The data for both minerals indicates that smaller sized particles backscatter at greater efficiency than larger particles, and that hematite backscattering is greater than pyrite’s, particularly at the 700 wavelength. This is due to hematite’s red hue, which reflects more red light than it absorbs.

Project:

AUTOMATED FLUORESCENCE DETECTION ON MICROFLUIDIC CHIPS: AN INEXPENSIVE SOLUTION FOR DIAGNOSIS IN THE FIELD

Kelly Cantwell, ‘18, and Julie Bryant, ‘16
Kimberly Frederick, Professor, Chemistry Department

Traditional scientific equipment is not practical for use in under resourced areas; it is expensive, delicate, and immobile. Microfluidic devices have re-invented lab instruments in both size and needs. Unlike many of the instruments used in laboratories, microfluidic platforms use significantly less sample, and analysis can be done on site. Our lab is working to develop an automated, inexpensive, and portable “Lab-on-a-CD-player.” This device will be compact enough to take into the field, and will have a user-friendly interface, allowing people with little to no prior training to operate it with ease. Using a Raspberry Pi, we are able to create a centrifugal microfluidic platform which will detect fluorescence in samples and can be used in many capacities—from detecting malaria to monitoring water for contaminants.

Project:

DEVELOPMENT OF CHIP-BASED WATER ANALYSIS THROUGH MICELLAR ELECTROKINETIC CHROMATOGRAPHY

Jillian Greenspan, ‘17
Kimberly Frederick, Professor, Chemistry Department

Hydraulic fracturing wastewater spills are a major cause of drinking water contamination. These spills can contaminate large volumes of water with low concentrations of various organic compounds. Using magnetic Osorb beads, the organic analytes can be separated from the water. The concentration of each separated analyte is determined through micellar electrokinetic chromatography, in which micelles are added to the running buffer in a capillary electrophoresis

system. This is advantageous because it allows for the analysis of countless water contaminants all at once. We have analyzed two organic compounds, toluene and m-xylene, and determined the degree to which the Osorb beads separate them from water samples.

Project:

DEVELOPMENT OF A URINE-BASED ASSAY FOR D-LACTATE USING PAPER: A DIAGNOSTIC TEST FOR MALARIA

Nathanael Rehmeyer, ‘18
Kimberley Frederick, Professor, Chemistry Department

A paper based diagnostic test for Malaria can be produced cost effectively, transported easily, and disposed of by burning. Using a urine-based assay on paper as a replacement for the current blood-based malaria test removes the need for microscopic instrumentation, specialized skills and resources that are not extensively available in affected areas. Our goal this summer was to transfer the assay from the solution into paper, like a pregnancy test. Chromatography paper strips were used with hydrophobic barriers created with melted crayons and tape, to create an environment for the reaction to occur, within the fibers of the paper. We investigated both fluorescence and absorbance based detection at varying concentrations of D-Lactate in urine and attempted to optimize the paper reaction.

Project:

STABILIZING REACTION CONDITIONS USING CLAY FOR MALARIA DIAGNOSIS

Sibin Wang, ‘16
Kimberley Frederick, Professor, Chemistry Department

Many places lack proper storage conditions to prolong assay activities. It is even worse when a reaction involves proteins because different temperature and humidity can denature the enzymes and cause a loss of activity. Stabilizing reagents, however, allows an enzyme to prolong its activity under different temperature and moisture conditions. This project focuses on stabilizing the enzymes that have been tested for the detection of malaria. Our assay utilizes the concentration of d-lactate, a by-product of the malaria parasite, as an indicator for the infectious stages. It is a colorimetric reaction that gives explicit selectivity and sensitivity. The presented work focuses on stabilization of enzymes using clay.

Project:

SYNTHETIC STUDIES ON NEW TANDEM INTRAMOLECULAR DIELS-ALDER REACTIONS

Jood Ani, ‘16
Raymond J. Giguere, Professor, Chemistry Department

Carbon-carbon bond formation rests at the center of organic synthesis; our basic research project investigates new ways to create multiple carbon-carbon bonds. Carbon molecules found in nature (or made synthetically) often contain complex rings, such as those used in many pharmaceuticals. With focus on further development of Tandem Intramolecular Diels-Alder (TIMDA) reactions, this approach initially involves seven synthetic transformations, and the final TIMDA reaction

creates four carbon-carbon bonds as well as four rings, in a single reaction. The presentation will describe methods employed to prepare, isolate, purify, and identify the organic molecules in this novel synthetic study.

Project:

INFLATIONARY CONSTRAINTS ON THE VAN DER WAALS EQUATION OF STATE

Guram Vardiashvili, ‘16
Evan Halstead, Visiting Assistant Professor, Physics Department

The discovery of the accelerated expansion of the Universe motivated the search for physical theories that are capable of explaining this behavior. One way to achieve this is to model the Universe as a uniform fluid with a "dark" component, particles of which behave according to the Van der Waals equation of state. In this project, the Van der Waals equation of state was used to model inflation, a particular period of rapid expansion in the early Universe. It was found that the constraints provided from previous studies of the Van der Waals cosmological model do not produce enough expansion in the early universe to explain current observations.

Project:

PHYSICOCHEMICAL DETERMINANTS OF ALCOHOL MODULATION IN A MODEL LIGAND-GATED ION CHANNEL BINDING SITE

Alex R. Mola, ‘16 and Travers M.D. Ruel, ‘16
Dr. Rebecca Howard, Assistant Professor, Chemistry Department

Pentameric ligand-gated ion channels are modulated by alcohols, yet a structural understanding of this process remains limited by a lack of high-resolution crystallographic data. The prokaryotic homolog GLIC is a potentially valuable model system whose structure has been determined. In particular, modification of the 14’ position in GLIC made it sensitive to alcohol modulation, and enabled co-crystallization with ethanol and other anesthetics. We substituted a wide range of amino acids at GLIC position 14’, expressed the mutated channels in Xenopus oocytes, and measured their gating and alcohol modulation properties. We correlated the results using molecular modeling of the predicted binding site. Our results implicate both volume and hydrophobicity as important determinants of direct alcohol binding in the intersubunit transmembrane region of this family of receptors.

Project:

THE EFFECTS OF AGING, A HIGH FAT DIET, AND LONG TERM SUCCINIC ACID TREATMENT ON VASCULAR HEALTH AND MITOCHONDRIAL FUNCTION IN MICE

Gabe O'Brien, ‘16
Stephen Ives, Assistant Professor, Health and Exercise Sciences Department
T.H. Reynolds, Associate Professor, Health and Exercise Sciences Department

Mitochondrial dysfunction has been linked to disease. A high fat diet is also known to induce mitochondrial dysfunction. Succinic acid (SA) is thought to improve mitochondrial function. Therefore, the purpose of this study was to determine the effect of diet and SA on mitochondrial

function and in fat. It was hypothesized that the SA treatment would improve mitochondrial respiration in fat through improved oxidative phosphorylation and might rescue the negative effects of a high fat diet. Visceral fat tissues were analyzed from 20 mice with an oxytherm system. There were no significant findings found.

Project:

THE EFFECTS OF AGING AND SUCCINIC ACID ON VASCULAR FUNCTION

Cassandra Eddy, ‘17
Stephen Ives, Assistant Professor, Health and Exercise Sciences Department
T.H. Reynolds, Associate Professor, Health and Exercise Sciences Department

Mitochondrial dysfunction may play a role in the development of insulin resistance. Succinic Acid (SA) is a naturally occurring compound that can activate mitochondrial proteins and possibly correct mitochondrial dysfunction. The purpose of this research was to determine if SA could improve insulin resistance and energy homeostasis in obese mice. To accomplish this we fed mice either a low fat (LF) or a high fat (HF) diet and added SA to the drinking water in a subset of the mice. During the dietary and SA intervention, we assessed insulin resistance, body weight, caloric intake, and energy expenditure. Although we observed significant effects of a HF diet, SA provided no benefit in any of the health outcomes measured in either group.

Project:

THE PROCESSING OF POSITIVE AND NEGATIVE EMOTION-LADEN WORDS DURING READING: AN EYE-TRACKING STUDY

Emma Starr, ‘16
Rebecca Johnson, Associate Professor, Psychology Department

Previous research has found that emotional stimuli, including emotion words, have a processing advantage over neutral stimuli. However, previous research has not specifically examined emotion-laden words, which are words that do not express a state of mind (e.g., joy) but have emotional connotations (e.g., birthday). The present study examined the processing of positive and negative emotion-laden words compared to neutral words utilizing eye-tracking methodology. Results indicated that both positive and negative emotion-laden words have a processing advantage over neutral words. Positive emotion-laden words showed advantages in early, late, and post-target measures, while negative emotion-laden words showed effects only in late and post-target measures. These results indicate that the arousal (emotional content) and the valence (positivity/negativity) of words do affect readers' processing speeds.

Project:

THE PROCESSING OF BLEND WORDS IN VISUAL WORD RECOGNITION

Sarah Rose Slate, ‘16
Rebecca Johnson, Associate Professor, Psychology Department

Previous research has found that blend words (a word made up of two separate words; e.g., spork) are processed more slowly than non-blend words in a lexical decision task. The present study examined whether there are significant differences in accuracy and speed in the vocalization of

blend words versus non-blend words. Participants were randomly shown blend words and matched control words and asked to speak the word into a microphone as quickly as possible. Reaction time was recorded and measured both manually by examining waveforms and electronically by microphone. Blend words were significantly slower to name than their matched control words on both measurements. Blend word accuracy was also significantly lower. The results suggest that blend words are more difficult to process than non-blend words.

Project:

ANXIOUSLY AWAITING THE FUTURE OF RESTORATIVE JUSTICE IN THE UNITED STATES

Olivia Frank ‘15
David Karp, Professor, Sociology Department

The problem of mass incarceration and other criminal justice system failures in the United States, such as racial disparities, wrongful convictions, and high recidivism rates, have reached a tipping point. For the first time in decades, coalitions of politicians on the left and right are seeking criminal justice reform. What is the place of restorative justice in these efforts? What is the depth and breadth of restorative justice implementation? How familiar is the American public with restorative justice? How successful is the restorative justice movement? In this article, we seek answers to these questions as we try to assess the future of restorative justice in the U.S.

Project:

CARING FOR A LEGACY: MICRO-HYDRO ENERGY AT SKIDMORE COLLEGE

Caroline Hobbs, 2016
Karen Kellogg, Associate Professor, Environmental Studies

Skidmore College and Gravity Renewables saw a unique opportunity for partnership in an artifact of the industrial revolution in the Hudson Valley. A small dam, originally built in the early 1800’s, sat on an existing fault line and waterfall in Stockport, NY, but years of inadequate funding threatened the future of the historical facilities. Gravity Renewables purchased and revitalized the infrastructure, while Skidmore minimized the risk for Gravity by committing to purchase the power produced by the facility for twenty years. We explored the industrial history of the site, the energy regulations that lead to both the decline and the restoration of the facilities, and the social, environmental, and economic impacts of the project. To communicate our findings we created an interactive webpage via WordPress.

Project:

JAMES JESSE STRANG AND THE MORMON IDENTITY CRISIS: A CHARISMATIC KINGDOM OF GOD

Alina Williams, ‘16
Eliza Kent, Professor and Director, Religious Studies Department

Many people consider Mormonism to be a very unified religion, but early Mormon history was plagued by succession crises following the assassination of their prophet, Joseph Smith. The story

of one ordinary convert's rise to power with little institutional legitimacy helps to explain how the Mormon Church established itself as a powerful religion and took on the hierarchical form that continues today. Using Jonathan Brockopp's dynamic model of charismatic authority, I argue that James Jesse Strang's recreation of Joseph Smith's charisma explains his unlikely rise to power. However, by neglecting to establish an organizational hierarchy, Strang's community was ultimately unsustainable because there was no model in place to allow for the cycle of charismatic authority to continue.

Project:

CALCULATING UV-VIS ABSORBANCE/FLUORESCENCE SPECTRA OF INDOLE AND TRYPTOPHAN

Elijah Kofke, '16 and Kristine Vorwerk, '17
William Kennerly, Visiting Assistant Professor, Chemistry Department

When light hits certain molecules, specific frequencies of that light can be absorbed by the molecule, exciting its electrons. When these electrons return to their original "ground state," they emit longer wavelengths of light, a process known as fluorescence. The molecule indole is known to fluoresce in the near-UV spectrum, and is a part of the structure of the amino acid tryptophan. We are using the computational chemistry software Gaussian 09 to theoretically characterize the absorbance/emission spectra of these two molecules. We have calculated their optimized ground-state geometries, and used them to calculate the wavelength absorbed by each molecule to excite it to its first excited state. We are currently working towards including vibrational states, zero-point energies, and solvation effects in our model.

Project:

PROATIVE INTERFERENCE WITH POSITIVE WORDS

Juliana Boucher, 2016
H. Faye Knickerbocker, Visiting Assistant Professor, Psychology Department

Proactive interference (PI) is the hindrance of the recall of current information by older information, typically observed when recalling the same category of stimuli across several trials. Release from PI is the spontaneous recovery of recall ability. Previous research found that shifting between neutral, emotion, and emotion-laden categories of words led to release from PI, (Knickerbocker & Altarriba, 2013). This work only incorporated words with strong negative emotional associations in the emotion and emotion-laden conditions. The current study attempted to replicate the previous findings utilizing neutral, positive emotion, and positive emotion-laden categories. Emotion words represent states of mind that can actually be experienced (e.g., happy), while emotion-laden word represent concepts that have emotional associations (e.g., marriage).

Project:

BREEDING SPINOCEREBELLAR ATAXIA TYPE 1 MICE AND CREATION OF A BRAIN AND DNA BANK

Eliza Burr, '17
Sara Lagalwar, Assistant Professor, Neuroscience Program

The ATXN1 gene has been directly related to Spinocerebellar Ataxia Type 1, an inherited and fatal disease that induces an off-kilter gait and loss of motor skills. The current project aims to set up a supply of transgenic mice with homozygous expression of the human ATXN1 gene, to create a brain bank of cerebellar tissue and genomic DNA for future study and to observe the effects of succinic acid treatment of mice on oxidative phosphorylation complexes in the cerebellum. We successfully bred three generations of ATXN1 mice in order to achieve a self-perpetuating strain of homozygous ATXN1 mice. Additionally, a cerebellar tissue brain bank and a genomic DNA bank were created from existing mice, and will be used in future studies. Finally, the cerebelli of mice treated for one year with succinic acid (part of ongoing research in the lab) were probed with oxidative phosphorylation complex antibodies and the complexes were detected by Western blotting.

Project:

DISRUPTING PROTEIN INTERACTIONS IN SPINOCEREBELLAR ATAXIA TYPE 1

Spencer Lowry, ’18 and Donna Nguyen, ‘18,
Sara Lagalwar, Assistant Professor, Neuroscience Program

Spinocerebellar Ataxia type 1 (SCA1) is a neurodegenerative disease characterized by problems with coordination and gait. SCA1 is caused by a poly-CAG extension in the ATXN1 gene, leading to a build-up of misfolded ATXN1 protein in the cell. When ATXN1 protein is phosphorylated it binds to 14-3-3, which stabilizes it. R18 inhibits 14-3-3 ligand interactions, preventing ATXN1 stabilization, and thus may provide a possible treatment for SCA-1. In order to determine the effects of R18, cerebelli were removed from 4 mice, separated into cytoplasmic and nuclear fractions, and treated with and without R18. Western Blots were used to detect the protein bands. The ataxin-1 protein did not appear, making the effects of R18 inconclusive.

Project:

EDUCATION IN THE INTERNATIONAL CONTEXT

Kendall Gross, 2016
Soyong Lee, Associate Professor, Education Studies Department

This study explores the educational systems of three top-performing countries – Finland, Liechtenstein, and South Korea – based on OECD’s Program for International Student Assessment (PISA) results. Using data gathered from reviews of the literature and interviews, it seeks to respond to three main questions: 1) What are the social, cultural, historical, religious contexts in which the country’s formal educational system is nested? 2) What are the people’s belief systems in relation to education that are most prevalent? 3) And, how are these contexts related to the high levels of academic performance among the youth? Findings point to the importance of having

focused goals in educational reform, respecting localized knowledge as the basis for educational change, and understanding the sociocultural and historical belief systems of the people as a strong force in academic achievement.

Project:

SOCIAL NETWORKING SITES AND MARKETING STRATEGY: THE CASE OF SMALL RESTAURANTS

Sarah Rinaolo, '17
Elzbieta Lepkowska-White, Associate Professor, Management and Business Department

In this study we explored how small restaurants utilize social networking sites in their marketing strategy, the benefits they derive from their usage, and the challenges they face. Past studies on the adoption and use of social networking in business focus mainly on large establishments. In this study we interviewed 16 small restaurants and analyzed the data using content analysis. We found that local restaurants have love and hate relationship with social networking sites, on one hand appreciating its interactive and engaging nature, and on the other being frustrated with lack of control over what consumers say online and limited resources they have to effectively use it in their strategy. Managerial insights and implications are discussed and future research suggested.

Project:

DACRYOCONARID BIOSTRATIGRAPHY OF THE MIDDLE DEVONIAN BAKOVEN SHALE OF EASTERN NYS

Matthew Kilgore, '16
Richard H. Lindemann, Associate Professor, Geosciences Department

Just shy of 390 million years ago, the marine fauna of eastern North America's Appalachian Basin experienced a geologically extinction event. This bioevent is recorded in the Bakoven Shale, which was deposited in an anoxic ocean basin, and is largely devoid of benthic fossils. However, vast numbers planktonic dacryocoanrids, which thrived in the oxygenated near-surface waters, are present. Although only one dacryoconarid (dac) species has been reported formally from the Bakoven the unit is actually contains a diverse dac fauna that had repopulated the basin shortly after an earlier extinction episode known as the Choteč Bioevent. Multiple undescribed species of at least five dac genera including *Styliolina, Striatostyliolina, Costulatostyliolina, Vriatellina,* and *Nowakia,* are now known to occur in the Bakoven Bioevent interval.

Project:

HOW DOES CANNABIDIOL REDUCE SEIZURE ACTIVITY?

Kathleen Schoolcraft, 2016
Hassan Lopez, Associate Professor, Psychology

Cannabidiol (CBD) is a non-psychoactive molecule found in the cannabis plant. Recent research in non-humans and humans indicates that CBD may have anticonvulsant effects, and therefore may serve as a useful medication for seizure disorders, such as epilepsy. The current study had two goals: 1) replicate the anticonvulsant effect of CBD in rodents, and 2) test whether this anticonvulsant effect is mediated by CBD binding to serotonergic 5HT1A receptors. Sixty,

juvenile male Wistar-Kyoto rats were randomly assigned to one of four treatment conditions prior to receiving a single dose of 85 mg/kg pentylenetetrazole, which rapidly induces neurological and behavioral seizures. Our predictions were that CBD pre-treatment would significantly attenuate seizure severity, and that a 5HT1A antagonist would block CBD's ability to reduce seizure.

Project:

DETERMINANTS OF COLLEGE SUCCESS

Kenzie Furman, '16 and Sarah Markiewicz, '16
Michael Lopez, Assistant Professor, Mathematics and Computer Science Department

The relative age effect (RAE) is an advantage conferred on people who are relatively older than their peers. Although it has been studied in sports and elementary schools, there is little research concerning RAEs at the college level. Our study finds that at Skidmore, there is a substantial imbalance in the distribution of birth months of students compared to the national average. We also looked at other factors that could influence success in college. Using multiple linear regression models of GPA and multiple logistic regression models of graduation status at two highly selective liberal arts colleges, we find significant evidence that students from public high schools outperform students from private high schools, and that athletes graduate at higher rates but earn lower GPAs than non-athletes.

Project:

SURVIVAL UNDER COPPER SHOCK – TESTING THE IMPORTANCE OF A PROPOSED COPPER RESISTANCE ISLAND

Ana Sofía Rivera, '16
Sylvia Franke McDevitt, Associate Professor, Biology Department

Macrophages are utilizing heavy metals (such as copper and zinc ions) in addition to destructive enzymes and chemicals, to kill pathogens they engulfed as part of our non-specific immune response. A 20-gene genomic cluster has been identified within Enterobacteriacaea proposed to allow for survival under sudden copper stress (as experienced in macrophages). Two plasmids, pECL_A from *Enterobacter cloacae* subsp. *cloacae* ATCC 13047 and pMG101 from *Escherichia coli* J53, both containing the 20-gene "copper island", were transferred into *E. coli* GR161, and the resulting strains ability to survive under metal stress was tested by determining MIC, MLC and survival under short time high concentration copper exposure. Our experiments shed light into the role this gene cluster plays in survival of pathogenic bacteria when exposed to the cells of our immune system.

Project:

COPPER-SILVER CROSS RESISTANCE – TESTING THE POTENTIAL OF HOMOLOG PROTEINS OF CopA FROM *Escherichia coli*

Bryan Zepeda-Carranza, '17
Sylvia Franke McDevitt, Associate Professor, Biology Department

The evolution of bacterial resistance has become a global issue as antibiotics have become unsuccessful in treating bacterial infections. Similarly, the use of heavy metals as antimicrobial alloys no longer contribute to the complete exclusion of harmful microorganisms due to the ability

of bacteria to share their metal resistance systems. P_{1B-1}type ATPases, a group of membrane bound proteins, have been shown to be important in export of copper and silver ions from the bacterial cell and therefore resistance to these metals. A gene encoding a P_{1B-1}type ATPase from *Enterobacter cloacae* subsp. *cloacae* ATCC 13047 was cloned into pASK-IBA3 to test its ability to rescue a copper sensitive strain of *Escherichia coli* in the presence of copper.

Project:

SURVEILLANCE STUDIES: TEACHING EXPERIENTIAL PRIVACY LAW

Makeda Diggs, '17
Scott Mulligan, Teaching Professor, Management & Business/International Affairs

Surveys reveal that a vast majority of Americans remain deeply concerned about the privacy of their personal information, especially in the post-Snowden era. Paradoxically however, many routinely use untrusted systems which collect, store and process enormous quantities of their private data. Bridging this apparent contradiction, direct experience with surveillance technologies produces greater awareness, appreciation and understanding of the pervasiveness and impact of these systems. This project examines various strategies for providing students hands-on, experiential methods for engaging the world around them that is under constant, ever-watching surveillance. Employing GIS mapping of surveillance systems in downtown Saratoga Springs, as well as self-documenting/POV camera technologies, we devised, developed and tested projects and pedagogical materials for student exploration, one which is to be featured in a Tang exhibition.

Project:

REEL SPORT AND HOLLYWOOD

Nevon Kipperman, '16
Daniel Nathan, Professor, American Studies

Our project is a chapter for an anthology about sports and Los Angeles. The chapter briefly chronicles the history of Hollywood-made sports films, considers some of the ways in which Hollywood movie producers have thought about and represented sports, and critiques selected sports films set in Los Angeles, such as *The Bad News Bears* (1976), *White Men Can't Jump* (1992), *Angels in the Outfield* (1994), *Love and Basketball* (2000), *Million Dollar Baby* (2004), and *Lords of Dogtown* (2005), among others. The idea is to think critically about Hollywood's multifaceted relationship to the games people play and to consider how Hollywood filmmakers depict their own local sports landscape.

Project:

COMPARATIVE ANALYSIS OF IRON LEACHED FROM NIGHTTIME DISSOLUTION OF FLY ASH FROM DIFFERENT SOURCE REGIONS

Deborah Kim, '18
Juan G. Navea, Assistant Professor, Chemistry Department

Fly ash, a byproduct of coal-fired power plants, is commonly found in atmospheric aerosol plumes. These particles are rich in iron (II) and (III) oxides and, under the acidic atmospheric condition,

they can leach iron and impact the chemical balance of the atmosphere. In particular, it has been hypothesized that Fe (II) leached from aerosols induces phytoplankton blooms in the open ocean, prompting carbon sequestration and global cooling. In this project, the yield and rate of iron leached from fly ash from different source regions has been investigated. Three sources of ash were examined in nighttime conditions: US Midwest, Northeast India, and European ash. It was found that Midwestern fly ash leaches more iron at a faster rate than either Indian or European fly ash.

Project:

QUANTUM CHEMICAL CALCULATIONS AND VIBRATIONAL SPECTROSCOPY OF ADSORBED NITRATE ON SIO_2

Katie C. Shi, '18
Juan G. Navea, Assistant Professor, Chemistry Department

Atmospheric nitrate (NO_3^-) can interact with aerosol particles, thereby changing its geometry and electron distribution. SiO_2, a common component of aerosols, had previously been thought to interact with nitrates only through hydrogen bonding. Chemisorption of nitrates on SiO_2 would suggest a greater role for SiO_2 in the nitrogen cycle than previously believed. Quantum chemical calculations combined with vibrational spectroscopy were used to investigate the ability of nitrates to chemisorb to SiO_2 and to determine whether SiO_2 can act as an adsorption site for nitrates in the atmosphere. Different coordination structures of nitrates adsorbing to SiO_2 were calculated, and vibrational modes from experimental data of adsorbed nitrates on SiO_2 were used to confirm calculated coordination structures.

Project:

HETEROGENEOUS PHOTOCHEMISTRY OF COADSORBED WATER AND NITRATES ON A TiO_2 SURFACE

Talia Stortini, '18
Juan G. Navea, Assistant Professor, Chemistry Department

Natural and industrial processes release aerosol particles into the atmosphere. Aerosols are known to provide an active surface for the uptake of atmospheric trace gases, such as nitric acid. This particle-gas interaction can lead to reactions with implications in the nitrogen balance of the atmosphere. Titanium dioxide (TiO_2) is a common component of aerosols and is a semiconductor active within the solar spectral region of the atmosphere. In this study, we explore how the properties of TiO_2 impact the heterogeneous photochemistry of nitric acid in the presence of coadsorbed water. Relative humidity is varied and the rate of reaction of nitric acid is investigated. Additionally, the amount of gas products NO, NO_2, N_2O, and HONO are also measured.

Project:

THE INFLUENCE OF PH ON THE CATION EXCHANGE OF ALUMINUM WITH IRON IN HUMIC ACIDS

Jaya Borgatta, ‘16
Juan Navea, Assistant Professor, Chemistry Department

Humic acids (HA) are complex organic molecules found in soil and atmospheric aerosols. HAs are chelating and redox agents that can form interactions with metals. In this study, the chelation of Fe (II) and Fe (III) was observed in different acidic media. The iron-HA complex was then reacted with an excess of aluminium to observe iron recovery. An effective chelation of aqueous phase iron with humic acids was observed, with aqueous iron removed from aqueous phase into a HA complex. In addition, the redox properties of humic acids showed a fraction of iron (III) was reduced into the more bioavailable iron (II). Cation exchange with aluminium suggested that bioavailable iron (II) ions chelate with HULIS in a combination of exchangeable and inexchangable iron. In addition, lower pHs increased the amount of free iron.

Project:

DIVERSE PATHS TO POLITICAL POWER: AN EXAMINATION OF THE CAREER TRAJECTORIES OF TURKISH POLITICAL ELITES

Ovgu Bozgeyik, ‘16, and Oyku Bozgeyik, ‘16
Feryaz Ocakli, Assistant Professor, Government Department

This project examines the career backgrounds of Turkey's political elites to uncover the different paths through which individuals acquire political power. We classify the career information of 1100 parliamentarians, including their political party affiliation, occupation, public sector experience, private sector experience, age, gender, level of education, type of education, marital status, province of origin, electoral district, and duration of service in the parliament. We are primarily interested in observing the career trajectories of private and public sector employees and their party affiliations. This is an important question for our understanding of the impact of bureaucratic institutions, such as the military and provincial administrations, as well as the role of the private sector in paving the road to political power in Turkey’s most influential elected organ.

Project:

HILLIPTICALS

Jarred Green, ’15; Mark Raskin, ’16; Connor Crawford, ’17; and Ryan Morrison, ‘17
Mary Crone Odekon, Professor & Chair, Physics Department

Galaxies can, for the most part, be categorized into two groups; spirals, which have cool hydrogen gas (HI) allowing for star formation, and ellipticals, which are typically devoid of HI. We consider the rare cases of ellipticals with HI detections (*HIllipticals*). From our original data set of 7747 galaxies, 47 fall into the category of *Hillipticals*. We find significant statistical differences between ellipticals with and ing HI. For example, *HIllipticals* tend to be further from the center of their respective galaxy clusters. Looking at the spectra and the color, we also determine that there are

two categories of *HIllipticals*; those with supermassive black holes in the center, and those with normal star formation.

Project:

GEOMETRIC MORPHOMETRIC ANALYSIS OF THE EFFECTS OF LEAD ON FRUIT FLY (*DROSOPHILA)* WING SHAPE AND BODY SIZE

Randy Cuevas, ‘16
Bernie Possidente, Professor, Biology Department
Abby Grace Drake, Teaching Professor, Biology Department

Lead exposure, even at low levels, alters metabolism and body weight making it a risk factor for obesity and diabetes as well as cognitive impairment. We analyzed *Drosophila* wing shape and body size to measure effects of developmental lead exposure as a model for studying these mechanisms further in animal models. We will present data on multivariate statistical analysis and geometric morphometrics on body size and wing morphology in both sexes. Geometric morphometrics is a holistic coordinate-based analysis on morphology that elucidates subtle shape variations. This will allow us to determine whether potential lead effects are wing specific or reflect differences in body size. The fruit fly model will allow us to investigate the genetic mechanisms of the toxic effects of lead.

Project:

THE EFFECTS OF SUCCINIC ACID TREATMENT ON INSULIN ACTION IN OBESE MICE

Daniela Escudero, ‘16
T.H. Reynolds, Associate Professor, Health and Exercise Sciences Department
Stephen Ives, Assistant Professor, Health and Exercise Sciences Department

Mitochondrial dysfunction may play a role in the development of insulin resistance. Succinic Acid (SA) is a naturally occurring compound that can activate mitochondrial proteins and possibly correct mitochondrial dysfunction. The purpose of this research was to determine if SA could improve insulin resistance and energy homeostasis in obese mice. To accomplish this we fed mice either a low fat (LF) or a high fat (HF) diet and added SA to the drinking water in a subset of the mice. During the dietary and SA intervention, we assessed insulin resistance, body weight, caloric intake, and energy expenditure. Although we observed significant effects of a HF diet, SA provided no benefit in any of the health outcomes measured in either group.

Project:

SUCCINIC ACID AS A POTENTIAL TREATMENT FOR AGE-RELATED METABOLIC DYSFUNCTION

Lauren Gorstein, ‘17
T.H. Reynolds, Associate Professor, Health and Exercise Sciences Department
Stephen Ives, Assistant Professor, Health and Exercise Sciences Department

Consequences of aging include a decline in mitochondrial function, a decrease in metabolism, and an increase in susceptibility for obesity and insulin resistance. Succinic acid (SA) supplementation has been shown to increase mitochondrial function and enhance insulin signaling. The purpose of this study was to demonstrate that age-related insulin resistance/obesity could be improved through SA supplementation. It was hypothesized that SA treatment would decrease age-related insulin resistance, and lower risk for obesity in mice. Body weight, food intake, physical activity, water/SA consumption, and insulin action were measured in 19 aged mice (11 succinic acid, 8 control) fed a low fat diet. There were no significant effects of succinic acid supplementation on insulin action between both groups.

Project:

OPTIMIZATION OF SILVER NANOPARTICLE FILMS: SEARCHING FOR THE GREEN COLOR

Hannah Skipper, ‘17
Maryuri Roca, Visiting Assistant Professor, Chemistry Department

Silver nanoparticles and their application to stain glass provide a creative way for students to learn about the unique properties of silver at the nano-scale. Previous procedures obtain silver nanoparticle films, but only of a yellow color. In this work, we seek to create silver nanoparticle films of different colors, specifically a green film. The synthesis of colored nanoparticle solutions and colored films were explored. We observed that homogenously colored solutions do not form homogenously colored films. Partially green colored films were obtained by combining yellow and blue nanoparticles. The formation of this green film expands the original application of silver nanoparticles in stain glass.

Project:

MINDSETS AND PUBLIC SPEAKING ANXIETY

Elizabeth Aaron, ‘16
Casey Schofield, Assistant Professor, Psychology Department

People’s beliefs about their abilities (i.e., mindset) impact their behaviors. The "fixed mindset," or the belief that certain characteristics cannot be changed, is associated with avoiding opportunities where success is uncertain, whereas the “growth mindset,” or the belief that certain characteristics can change, is associated with approaching challenges to learn and improve. Understanding what motivates such avoidance behaviors is important for anxiety research because anxiety symptoms are maintained by chronic avoidance. Public speaking anxiety is of particular interest as the most frequently reported fear in the general population. No previous work has evaluated the potentially

maintaining role that mindsets play in public speaking anxiety. The goal of this study is to investigate the nature of the relationship between personal mindset and public speaking anxiety.

Project:

EXPANDING THE GENETIC CODE WITH PYROGLUTAMATE

Miles Calzini, ’16; Meggie Danielson, ‘17, and Hannah Schapiro, ‘17
Kelly Sheppard, Assistant Professor, Chemistry Department

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, we developed an *E. coli* model system to incorporate pyroglutamate into proteins. 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 followed by mass spectrometry to confirm site-specific incorporation of pyroglutamate.

Project:

PURIFICATION OF *BACILLI* ASPARAGINE BIOSYNTHETIC PATHWAYS

Ruth Allard, ‘16, David Sweezy, ‘17
Kelly Sheppard, Assistant Professor, Chemistry Department

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 non-discriminating AspRS and GatCAB. The bacteria *Bacillus halodurans* and *Bacillus subtilis* use both routes for Asn-tRNA formation. In addition, the two bacteria encode homologs of asparagine synthetase B to synthesize Asn without tRNA. Why these *Bacilli* encode more than one route for both Asn-tRNA and Asn biosynthesis is unknown. We are purifying the relevant enzymes to characterize the pathways under different conditions. The work will provide insight into how these bacteria have adapted to different environmental niches.

Project:

THE STRANGE BEDFELLOWS OF NORTH CAROLINA IMMIGRATION POLITICS

Elena Veatch, ‘16
Bob Turner, Associate Professor, Government Department

We analyzed the evolution of North Carolina’s immigrant policies from 1996 to the present. Our analysis of North Carolina’s drivers license, E-Verify, in-state tuition, and enforcement policies shows a gradual evolution in a more integrationist direction. Drawing upon interviews with legislators, lobbyists, government, and interest group officials, our research shows that the strange

bedfellow coalition between ethnic, business interests, and state bureaucrats have been able to achieve incremental policy victories by controlling the policy narrative and leveraging their greater access to policy makers. We find that major integrationist legislative policy goals, such as in-state tuition or driver licenses for the undocumented, remain stuck in the legislature because of the fear of electoral retribution from nativist interests in Republican legislative primaries. Our findings suggest state immigrant policies are more complicated that existing demographic and partisan narratives suggest.