

Skidmore College



FACULTY STUDENT SUMMER RESEARCH PROGRAM

SUMMER 2014

FINAL PRESENTATIONS

JULY 31, 2014

**Faculty Student Summer Research Program
Summer 2014**

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(In Alphabetical Order by Faculty Name)	

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 2014, there are 91 students and 46 faculty members working on 76 different projects.

Funding Sources for the Faculty Student Summer Research Program

We would like to thank the following donors and funding agencies for their support of our collaborative research efforts and the Faculty Student Summer Research Program:

Alumni, Family, and Friends

Katherine Durham Brechner '76
Harman Cain Family, Class of 2012
Samuel Croll '73
Marlene Oberkotter Fowler '61
Rowena Chan Au '74, Martha Hsu Ho '75, Katherine Suk Ki Lu '74, Winnie H. Wan '74, and Elise Huibonhoa Wen '77
Christiana Johnson '90, given in honor of Tom Lewis
Jim Lippman and Linda Friedman Lippman '82
Philip P. Markowitz '13
Richard A. Mellon '87
Margaret Williams Page '43
Michael Rose '90
Mr. and Mrs. Kenneth Woodcock, Parents 1996

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

Inter-American Institute for Global Change Research: NSF
W.M. Keck Foundation
The National Science Foundation
Rathmann Family Foundation
S3M Transitional Program
New York State Energy Research and Development Authority
The Charles Slaughter Foundation

The Schupf Scholars Program

Each year the Schupf Scholars Program funds up to four students per year 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.

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, July 31, 2014

9:00 am – 9:30 am Coffee and Muffins

9:30 am – 10:30 am Oral Presentations

ROOM A

THE GREAT WAR IMAGE ARCHIVE, FRANCE, 1914-1918

Luke Conley, 2015

John Anzalone, Professor, Department of Foreign Languages and Literatures

VISUAL DIFFERENTIATION OF OBJECTS: AN EYE TRACKING STUDY

W. Emerson O'Donnell, 2015

Flip Phillips, Professor, Department of Psychology, Neuroscience Program

RACE AND UNEMPLOYMENT

Taylor Sczymecki, 2015 and Rebecca Datus, 2015

Amon Emeka, Assistant Professor, Department of Sociology

CALIBRATING A NEW METHOD FOR MEASURING OCEAN CARBON FLUXES IN THE PRESENCE OF HIGH-SILICATE PHYTOPLANKTON BLOOMS

Melanie Feen, 2016

Meg Estapa, Visiting Assistant Professor, Department of Geosciences

ROOM B

THE ECONOMY OF DESIRE

Ryan Crotty, 2015

Erica Bastress-Dukehart, Associate Professor, Department of History

A DISTANT READING OF EMPIRE

Mae Capozzi, 2015

Scott Enderle, Visiting Assistant Professor, Department of English

EXPLORATION OF ENVELOPES AS FOCAL SETS

Adam Winchell, 2016

Mark Huibregtse, Professor, Department of Mathematics and Computer Science

THE OPPORTUNITY PROGRAM (OP) ALUMNI PROJECT: EXPLORING THE CAREER EXPERIENCES OF FIRST GENERATION STUDENTS AND STUDENTS OF COLOR AT A PREDOMINATELY AND HISTORICALLY WHITE LIBERAL ARTS COLLEGE

Amari Boyd, 2014 and Aldin Medunjanin 2016

Sue Layden, Ph.D., Research Analyst on Enrollment, Retention, and Student Achievement, Office of Admissions & Financial Aid

Lei Ouyang Bryant, Ph.D., Associate Professor, Department of Music

Michael Ennis-McMillan, Ph.D., Associate Professor and Chair, Department of Anthropology

Bernardo Rios, Ph.D., Consortium for Faculty Diversity Postdoctoral Fellow, Department of Anthropology

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

ROOM A

AROUND THE WORLD: IRON DISSOLUTION FROM GLOBAL FLY ASH AEROSOLS IN ACIDIC MEDIA

Jaya Borgatta, 2016, and Amanda Paskavitz, 2017

Juan Navea, Assistant Professor, Department of Chemistry

INVESTIGATING THE INFLUENCE OF BEHAVIORIAL ATTRIBUTIONS ON BACKLASH AGAINST MALE ELEMENTARY SCHOOL EDUCATORS

Elizabeth Johnson, 2015

Corinne Moss-Racusin, Assistant Professor, Department of Psychology

NITRATE ADSORPTION ONTO TIO₂: A QUANTUM CHEMICAL COMPUTATIONAL STUDY

Matthew Lueckheide, 2017

Juan Navea, Assistant Professor, Department of Chemistry

THE GENERATIONAL CONSTITUTION: JEFFERSON, MADISON AND THE CALL FOR PERIODIC CONSTITUTIONAL RENEWAL

Ben Polsky, 2015

Beau Breslin, Dean of the Faculty and Vice President for Academic Affairs, Professor, Department of Government

DIFFUSION OF GASES: DEVELOPMENT OF AN UNDERGRADUATE LABORATORY EXPERIMENT

Hannah DeGraaf, 2015

Juan Navea, Assistant Professor, Department of Chemistry

Judith Halstead, Professor, Department of Chemistry

PHOTOCHEMISTRY OF NITRATE CHEMISORBED ON DIFFERENT COMPONENTS OF MINERAL AEROSOL

Daniel Lesko, 2017

Juan Navea, Assistant Professor, Department of Chemistry

ROOM B

SYNTHETIC STRATEGIES AND THEIR APPLICATION IN THE ORGANIC CHEMISTRY LAB

Lauren Soong, 2016

Kara Cetto Bales, Senior Teaching Associate, Department of Chemistry

ROLE OF AN EXTRACELLULAR AMINO ACID RESIDUE IN ALCOHOL MODULATION OF LIGAND-GATED ION CHANNELS

Travers M.D. Ruel, 2016

Rebecca J. Howard, Assistant Professor, Department of Chemistry

LAB ON A CD PLAYER

Julie Bryant, 2016

Kimberley Frederick, Professor, Department of Chemistry

EXPLORING THE EVOLUTION OF ETHANOL: DEVELOPMENT OF TEACHING TOOLS AND NEW EXPERIMENTS ON ETHYL ALCOHOL

Glenna E. Joyce, 2016

Rebecca J. Howard, Assistant Professor, Department of Chemistry

MICROFLUDIC CHIP FOR PRE-CONCENTRATION AND ANALYSIS OF ORGANIC WATER CONTAMINANTS

Sarah Markiewicz, 2016 and Justin O'Sullivan, 2017

Kimberley Frederick, Professor, Department of Chemistry

ROLE OF PORE-LINING RESIDUES IN DRUG MODULATION OF LIGAND-GATED ION CHANNELS

Thomas R. Schneider, 2015

Rebecca J. Howard, Assistant Professor, Department of Chemistry

ROOM C

SEED EXCHANGE NETWORKS AND FOOD SYSTEM RESILIENCE IN THE UNITED STATES

Lauren Bosche, 2015; Helen Alemayehu Mebrate, 2016; Tsering Choden, 2017

Nurcan Atalan-Helicke, Assistant Professor, Environmental Studies Program

DOES GENTLY CLEARING THE NASAL CAVITY IMPACT ODOR IDENTIFICATION?

Mitchell Spring, 2015

Robert M. Hallock, Visiting Assistant Professor, Neuroscience Program

TOWARDS FACIAL RECOGNITION FOR SPEAKERS AT SKIDMORE FACULTY MEETINGS

Yang Yu, 2016

Michael Eckmann, Associate Professor, Department of Mathematics and Computer Science

A TOY MODEL FOR THE NONLINEAR OPTICAL RESPONSE OF MOLECULES WITH MODULATED CONJUGATION

Quanhang Chen, 2016

Javier Perez-Moreno, Assistant Professor, Department of Physics

EXPANDING THE GENETIC CODE WITH PYROGLUTAMATE

Miles Calzini, 2016 and Stephanie Zhen, 2016

Kelly Sheppard, Assistant Professor, Department of Chemistry

DUAL ROUTES FOR *B. HALODURANS* ASPARAGINYL-tRNA FORMATION

Nilendra Nair, 2015

Kelly Sheppard, Assistant Professor, Department of Chemistry

12:00 pm – 1:00 pm Lunch, Murray Aikins Dining Hall

1:00 pm – 2:00 pm Oral Presentations

ROOM A

SUCCINIC ACID TREATMENT DOES NOT IMPROVE INSULIN RESISTANCE OR ALTER ENERGY HOMEOSTASIS IN OBESE MICE

Daniela Escudero, 2016 and Gabriella Vero

T.H. Reynolds, Associate Professor, Department of Health and Exercise Sciences

IDENTIFYING THE CELLULAR MECHANISM FOR THE MnTBAP-INDUCED REDUCTION IN BODY WEIGHT

Saada Legesse, 2015 and Caitlin Sheridan, 2015

T.H. Reynolds, Associate Professor, Department of Health and Exercise Sciences

MITOCHONDRIA'S ROLE IN SCA1 DISEASE PROGRESSION

Austin Ferro, 2015 and Jenny Zhang, 2016

Sarita Lagalwar, Assistant Professor, Neuroscience Program

PROPAGATION AND DEGRADATION OF ATAXIN-1 PROTEIN IN AN SCA1 CELL CULTURE MODEL

Mayumi Kohiyama, 2015 and Nicholas Toker, 2015
Sarita Lagalwar, Assistant Professor, Neuroscience Program

ROOM B

SELECTIVELY DISTRUPTION OF THE CELL WALL OF CHAROPHYTE ALGA *Penium margaritaceum*

Berke Tinaz, 2016
David Domozych, Professor, Department of Biology

A NEW ECONOMY OF JOKES: HASHTAG SOCIAL MEDIA, HASHTAG COMEDY

Rebecca Baruc, 2015
Beck Krefting, Assistant Professor, Department of American Studies

UNDERSTANDING THE INTEGRATION OF OXYGEN TRANSPORT AND UTILIZATION: A MITOCHONDRIAL PERSPECTIVE

Cheyenne Slocum, 2017
Stephen Ives, Assistant Professor, Department of Health and Exercise Sciences

2:10 pm –3:20 pm Poster Session #2

ROOM A

POST-CONFLICT RECONSTRUCTION: WOMEN AND DEVELOPMENT IN AFGHANISTAN

Nahid Paiman, 2015
Nurcan Atalan-Helicke, Assistant Professor, Environmental Studies Program

DISCRIMINATING NATURE OF THE *B. ANTHRACIS* ASPARTYL-tRNA SYNTHETASES

Julia Erskine, 2017
Kelly Sheppard, Assistant Professor, Department of Chemistry

THE EFFECTS OF MUSIC ON AUTOBIOGRAPHICAL MEMORY IN ALZHEIMER'S DISEASE (AD) PATIENTS AND HEALTHY OLDER ADULTS

Renee Schapiro, 2015
Denise Evert, Associate Professor, Department of Psychology and Neuroscience Program

DISCRIMINATING NATURE OF THE ASPARTYL-tRNA SYNTHETASES FROM THREE HUMAN PATHOGENS

Mohammed Islam, 2015
Kelly Sheppard, Assistant Professor, Department of Chemistry

VACCINE COVERAGE AND INCOME INEQUALITY IN MIDDLE INCOME DEVELOPING COUNTRIES

Rachel Spring '15

Mehmet Odekon, Professor, Department of Economics

DUAL ROUTES FOR *B. SUBTILIS* ASPARAGINYL-tRNA FORMATION

Hannah Raff, 2015

Kelly Sheppard, Assistant Professor, Department of Chemistry

ROOM B

ENGINEERING A COST-EFFECTIVE MICROMANIPULATOR FOR *XENOPUS* OOCYTE INJECTION

Heather A. Braun, 2015

Rebecca J. Howard, Assistant Professor, Department of Chemistry

QUANTITATIVE MODELING OF ETHANOL BINDING IN LIGAND-GATED ION CHANNELS

Daniel E. Manson, 2015

Rebecca J. Howard, Assistant Professor, Department of Chemistry

PHARMACOLOGY OF BACTERIAL MODELS OF THE HUMAN GABAA RECEPTOR

Thomas B. Voigt, 2015

Rebecca J. Howard, Assistant Professor, Department of Chemistry

ARTIFICIAL SWEETNER IN NEW "COKE LIFE" AFFECTS SLEEP CYCLES IN FRUIT FLIES

Agnieszka Brojakowska, 2017 and Cemile Antal (Doan Stuart School)

Bernard Possidente, Professor, Department of Biology

DO C(60) FULLERENE NANOPARTICLES ALTER SLEEP CYCLES IN FRUIT FLIES?

Matt Ciotti (Siena College)

Bernard Possidente, Professor, Department of Biology

FRUIT FLY FLASH MOBS

Arianna Laszlo, 2015 and Nicholas Friedman 2017

Bernard Possidente, Professor, Department of Biology

ROOM C

SYNTHETIC INVESTIGATION AND APPLICATION OF A SUBSTITUTED 4,6-DIMETHYL-3-CYCLOHEXENE COMPOUND

William Miller, 2015

Kara Cetto Bales, Senior Teaching Associate, Department of Chemistry

IMAGINATION INFLATION AND LEI ONLINE ADMINISTRATION

Jennifer Wicks, 2014

Rebecca B. Bays, Professor, Department of Psychology

STABLIZING ENZYMES FOR A MALARIA DIAGNOSTIC TEST

Meti Debela, 2016

Kimberly Frederick, Professor, Department of Chemistry

DEVELOPMENT OF A MICROFLUIDIC ASSAY FOR ANALYSIS OF D-LACTATE IN URINE: A DIAGNOSTIC TEST FOR MALARIA

Sibin Wang, 2016

Kimberly Frederick, Professor, Department of Chemistry

AMOEBAS AS A MODEL SYSTEM TO STUDY METAL DEPENDENT BACTERIAL KILLING BY MACROPHAGES

Ketan Yerneni, 2017

Sylvia Franke McDevitt, Associate Professor, Department of Biology

COPPER-SILVER CROSS RESISTANCE – TESTING THE POTENTIAL OF HOMOLOG PROTEINS OF COPA FROM *ESCHERICHIA COLI*

Bryan Zepeda-Carranza, 2017

Sylvia Franke McDevitt, Associate Professor, Department of Biology

PROJECT ABSTRACTS

Project:

THE GREAT WAR IMAGE ARCHIVE, FRANCE, 1914-1918

Luke Conley, 2015

John Anzalone, Professor, Department of Foreign Languages and Literatures

We constructed a digital image archive of rare French illustrations for the study of "representations of The Great War." In conjunction with contemporary texts as well as later writing from historical, journalistic and literary sources, this imagery offers an enhancement to learning by allowing students to see, for example, the images that contemporaries of the war experienced themselves, for instance: the powerful images of violence that fed the waves of propaganda after the early days of the war; or the deep sadness inherent in images of the war's cruelty, of grief, and of loss. The pedagogical questions we faced involved the editing of material for inclusion, its arrangement in thematic clusters, and the formatting that would lead to most effective use.

Project:

POST-CONFLICT RECONSTRUCTION: WOMEN AND DEVELOPMENT IN AFGHANISTAN

Nahid Paiman, 2015

Nurcan Atalan-Helicke, Assistant Professor, Environmental Studies Program

Conflict causes inequality and exclusion and women often bear the brunt of conflict. In transition towards democracy, good governance, economic development and sustainable peace, post-conflict countries have to consider and implement inclusive development. International organizations have recognized and emphasized women's participation in the processes of peace negotiations, and promotion of gender equality locally and nationally in the reconstruction process. Afghan women have been part of the reconstruction of Afghanistan since 2003, and gender equality has also been on the agenda of the government, international organizations and civil society organizations in the Transformation Decade (2015-2024). By examining the work of three organizations working on women and development in Afghanistan, the research explores the priorities for gender equality and the impact of the work of these organizations.

Project:

SEED EXCHANGE NETWORKS AND FOOD SYSTEM RESILIENCE IN THE UNITED STATES

Lauren Bosche, 2015; Helen Alemayehu Mebrate, 2016; Tsering Choden, 2017

Nurcan Atalan-Helicke, Assistant Professor, Environmental Studies Program

Abstract: Farmers in the United States, like global farmers, face the loss of seeds that their communities have planted for hundreds of years. Threats to seeds and associated agricultural practices are numerous. However, more diverse agro-ecosystems tend to show higher socio-

ecological resilience to disturbances and unforeseen events. Seed exchange networks facilitate seed saving, exchange, breeding and cultivation outside of formal market structures and thus contribute to food system resilience. This research examines four seed exchange networks in the United States that have existed since 1975 to compare their concerns and their impact on agri-food systems. It concludes that each organization fulfills an important conservation and scientific role for maintaining seed diversity leading to multiple collaborations in the alternative food movement of the United States.

Project:

SYNTHETIC INVESTIGATION AND APPLICATION OF A SUBSTITUTED 4,6-DIMETHYL-3-CYCLOHEXENE COMPOUND

William Miller, 2015

Kara Cetto Bales, Senior Teaching Associate, Department of Chemistry

Organic chemical synthesis is the creative science in which complex molecules are constructed from simple, readily available materials. These molecules may be used in commercial products or as starting components for additional reactions. Previous work has addressed the synthesis and isolation of a highly substituted cyclohexene compound. Current efforts are geared towards investigating the nonmedical antibiotic properties of this chemical species as well as its use in the formation of new compounds. Preliminary studies suggest that this cyclohexene compound can prevent fungal growth. This data, in addition to the reaction of this substance to generate a new complex molecule, will be presented.

Project:

SYNTHETIC STRATEGIES AND THEIR APPLICATION IN THE ORGANIC CHEMISTRY LAB

Lauren Soong, 2016

Kara Cetto Bales, Senior Teaching Associate, Department of Chemistry

Organic synthesis involves the creation of new molecules. The goal of this research is to develop innovative synthetic methods for compounds using inexpensive and readily available materials. We have successfully developed and optimized a small scale synthetic method to produce higher quality 3-penten-2-one than is available commercially. In addition, our group has demonstrated that 3-penten-2-one can be used as a reactant to form highly substituted cyclohexene compounds, which have applications ranging from antimicrobials and pain relievers, to preservatives. As such, we are investigating the synthesis of similar cyclohexene compounds and the progress of our work will be discussed in detail.

Project:

THE ECONOMY OF DESIRE

Ryan Crotty, 2015

Erica Bastress-Dukehart, Associate Professor, Department of History

The focus of this summer collaboration has been to work on a chapter of my larger manuscript, entitled *The Economy of Desire: Botany and Empire in Seventeenth-Century Europe*. This particular chapter, *The Economy of Desire*, focuses on the economic aspects and problems associated with importing plants and animals from around the world in an age when discoveries of new cultures, continents, animals, plants, and planets profoundly changed how men and women viewed and interacted with their universe. Lavishly funded scientific academies sprang up in every European country as monarchs, emperors, and natural philosophers vied to be at the forefront of these intellectual changes and nascent paradigms.

Project:

IMAGINATION INFLATION AND LEI ONLINE ADMINISTRATION

Jennifer Wicks, 2014

Rebecca B. Bays, Professor, Department of Psychology

We looked at imagination inflation, an effect in which imagining counterfactual events can lead to false beliefs in event occurrences. We tested reliability of online administration of the Life Events Inventory (LEI); results showed no significant differences in ratings for administration format, suggesting that future imagination inflation studies can decrease participant commitment from three face-to-face sessions to one. For our face-to-face study four events were used from the survey for imagery exercises. Participants were given instructions to use a first- or third-person perspective for imagining the events. Although there was no significant imagination inflation, there was a significant difference in pretest LEI ratings between first- and third-person conditions, a difference that diminished in posttest ratings. Selecting events of equally low occurrence could create stronger effects.

Project:

THE GENERATIONAL CONSTITUTION: JEFFERSON, MADISON AND THE CALL FOR PERIODIC CONSTITUTIONAL RENEWAL

Ben Polsky, 2015

Beau Breslin, Dean of the Faculty and Vice President for Academic Affairs, Professor, Department of Government

The Generational Constitution is an exercise in retrospective constitutional re-imagining. What would have happened if Jefferson had won his debate with Madison, and as a result, each generation rewrote the federal constitution? Using evidence from 1800s state constitutions and accounts of the contemporaneous political movements, we have concluded that the revision of

1825 would have tended toward the federalization and liberalization of suffrage. Figures such as Daniel Webster, Martin Van Buren and Nathan Sanford act as vehicles in our narrative of the imagined debate that might have unfolded at the constitutional convention of 1825. Our work will appear as one of five chapters, each dealing with a different year, or generation, that together present a plausible yet counterfactual version of constitutional American history.

Project:

**SELECTIVELY DISTRUPTION OF THE CELL WALL OF CHAROPHYTE ALGA
*Penium margaritaceum***

Berke Tinaz, 2016

David Domozych, Professor, Department of Biology

One of the most abundant things on the earth, cell wall is very significant in the nature both for humans and plants. While it has many usages for us such as textile industry, it is also very important for the plants from defense to interaction with other plants. It is just now that we start to understand how cell wall is synthesized. In this project we used *Penium margaritaceum*, a unicellular green alga, as a model organism in order to understand the cell wall. We've initiated a study in which we selectively disrupted different parts of the cell wall and watched how the cell responded to this stress using different microscopy techniques.

Project:

**MAPPING SARATOGA SPRINGS: AN EXHIBIT AT THE SARATOGA SPRINGS
HISTORY MUSEUM**

Deirdre Schiff, 2015; Allie Smith, 2015; Zach Mooring, 2015 (Duke University)

Jordana Dym, Professor, Department of History

In Spring 2015, the Saratoga Springs History Museum (Canfield Casino) will put on an exhibit "Mapping a City: Saratoga Springs, 1819-1915-2015" curated by Jordana Dym (Skidmore College, History), Teri Blasko (Saratoga Springs Public Library) and Mary-Ann Fitzgerald (City Historian). This summer collaborative research team developed exhibit themes, timelines and research materials. These materials will serve the Fall 2014 history class "Mapping the Americas," which will take the big ideas and turn them into carefully researched, engagingly presented history that will serve as the exhibit's base. The collaboration included archival research, project design, exhibit design, history database building and initial work on a virtual 3-D model of Congress Park (ca. 1900).

Project:

TOWARDS FACIAL RECOGNITION FOR SPEAKERS AT SKIDMORE FACULTY MEETINGS

Yang Yu, 2016

Michael Eckmann, Associate Professor, Department of Mathematics and Computer Science

We are creating a system that can be used at Skidmore faculty meetings to identify the person standing at a microphone using face recognition. Much of the summer was spent writing testing software that uses three standard face recognition techniques provided by the OpenCV library. We performed tests to determine which technique has the best performance for our environment and the performance at various distances, zooms, occlusions, etc.

We collected 750 images from 60 subjects. Images were taken in everyday settings from multiple cameras or collected from online databases. Query images of subjects were taken in Gannett. Initial tests are promising (82% accurate) but more work will be done. We expect the system that we develop can be used in any similar kinds of gatherings.

Project:

RACE AND UNEMPLOYMENT

Taylor Sczymecki, 2015 and Rebecca Datus, 2015

Amon Emeka, Assistant Professor, Department of Sociology

Despite measureable improvement in racial attitudes in recent decades, the relationship between one's racial identity and one's ability to secure employment has persisted and even intensified by some accounts, particularly for Blacks. Whatever the White unemployment rate has been over the last several decades, the Black unemployment has been nearly twice as great, if not more. We employ data collected through the 2005-2007 American Community Survey (ACS) to answer the questions, in which of the 50 largest metropolitan areas and in which of the 50 states in the U.S. does racial group membership bear most and least heavily on patterns of unemployment and why? We uncover statistically significant differences in the salience of racial group membership across metropolitan areas and states having controlled for age, gender, place of birth, English proficiency, and education. We offer preliminary evidence as to why racial group membership matters more in some labor markets and less in others.

Project:

A DISTANT READING OF EMPIRE

Mae Capozzi, 2015

Scott Enderle, Visiting Assistant Professor, Department of English

Topic modeling uses machine learning algorithms to discover patterns in texts. By assuming that words that appear together in the same text are about the same subject, topic modeling is able to

create clusters of words associated with topics, and to measure the number of words in a particular document associated with each topic. In this project, we used topic modeling to “read” a corpus of about 2,500 books published between 1757 and 1795. We then developed a number of visualization tools in collaboration with Empire Windrush, a local digital humanities startup. Analyzing the resulting data and visualizations, we discovered patterns that lend broad support to the view that imperial and domestic discourses were already tightly interwoven in the early phases of British colonialism in India.

Project:

CALIBRATING A NEW METHOD FOR MEASURING OCEAN CARBON FLUXES IN THE PRESENCE OF HIGH-SILICATE PHYTOPLANKTON BLOOMS

Melanie Feen, 2016

Meg Estapa, Visiting Assistant Professor, Department of Geosciences

Understanding how carbon moves throughout the ocean is crucial for prediction of the impacts of increased human-generated atmospheric carbon dioxide on the ocean. Atmospheric carbon dioxide dissolves into the ocean and is consumed by photosynthetic plankton, such as diatoms, a common vector for sinking carbon. We used a transmissometer, a type of optical sensor to measure the amount of particulate carbon sinking out of the ocean. We analyzed how layered diatoms on the transmissometer window affected the linearity of transmissometer response. We also studied the chemical composition of diatoms to determine their silica to carbon ratio. Connecting the optical properties and chemical composition of diatoms decreases uncertainty in carbon flux measurements from transmissometers deployed in the ocean, allowing better observations of the ocean carbon cycle.

Project:

THE EFFECTS OF MUSIC ON AUTOBIOGRAPHICAL MEMORY IN ALZHEIMER'S DISEASE (AD) PATIENTS AND HEALTHY OLDER ADULTS

Renee Schapiro, 2015

Denise Evert, Associate Professor, Department of Psychology and Neuroscience Program

The present study assesses the effect of familiar, emotional music on autobiographical memory for aging adults with and without Alzheimer's-type dementia (AD). Across three testing sessions participants listen to a familiar, emotional song from either a remote (1940's-50's) or medium-remote (1970's-80s) time period, or they sit in silence. Participants' moods are assessed before and after listening to the song. They then share a memory from their past, and answer autobiographical memory questions. The goal of this study is to assess the relationship between the strength of recalled memories and the type of music used. For example, we expect that participants with AD who listen to familiar, happy songs from their adulthood, will have strongest memories of happy events that occurred during that time period in their lives.

Project:

LAB ON A CD PLAYER

Julie Bryant, 2016

Kimberley Frederick, Professor, Department of Chemistry

Scientific equipment, which is expensive, delicate, and immobile, has limited its use to analyze samples in under resourced areas. 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 inexpensive and portable Lab-on-a-CD-player. This device will be compact enough to take into the field while also having a user-friendly interface. Using an Arduino Uno controller running a motor and optical detection module, we are able to create a centrifugal microfluidic platform which can be used in many capacities- from detecting malaria to monitoring water for contaminants.

Project:

STABILIZING ENZYMES FOR A MALARIA DIAGNOSTIC TEST

Meti Debela, 2016

Kimberly Frederick, Professor, Department of Chemistry

Malaria is one of the biggest public health problems around the world and is one of the leading causes of death in many developing countries. Malaria is currently diagnosed through a blood-based test that requires expensive instruments that are scarce in many developing countries. Hence it's important to develop an inexpensive, easy, fast and non-blood based way of detecting malaria. Our assay detects the presence of D-lactate, a metabolic byproduct of the malaria parasite, in an infected person's urine; the D-lactate is measured by color change catalyzed by enzymes. In order to be able to store and ship the diagnostic tests, it is important to maintain the enzymes' ability to react. This is particularly difficult in high temperature and humid environments. As a result, we focused on increasing the stability of the enzymes by using certain sugars and drying the reagents to increase the portability of our diagnostic tests on microchips or paper strips.

Project:

MICROFLUIDIC CHIP FOR PRE-CONCENTRATION AND ANALYSIS OF ORGANIC WATER CONTAMINANTS

Sarah Markiewicz, 2016 and Justin O'Sullivan, 2017

Kimberley Frederick, Professor, Department of Chemistry

In today's world, environmental contaminants have become an ever-increasing issue due to modern industrial processes. As such, the Environmental Protection Agency has identified a suite of potentially hazardous organic compounds, such as herbicides and hydrofracking chemicals, which commonly contaminate ground water. Because these chemicals are found in low concentrations, detecting them is difficult and costly. In order to combat this issue, our goal is to develop a low-

cost, automated microfluidic device that will pre-concentrate and separate these contaminants. Osorb, a glass material developed by ABSMaterials, will be used to pre-concentrate the contaminants, which will then be separated and analyzed through the application of an electric potential. We have focused on optimizing a method for pre-concentrating, releasing, and separating organic dyes, which can later be applied to organic contaminants.

Project:

DEVELOPMENT OF A MICROFLUIDIC ASSAY FOR ANALYSIS OF D-LACTATE IN URINE: A DIAGNOSTIC TEST FOR MALARIA

Sibin Wang, 2016

Kimberley Frederick, Professor, Department of Chemistry

One of the main challenges in science is to apply techniques and instruments developed in labs into areas where there is limited access to proper equipment. Micro paper analytical devices (μ PAD) technology holds great promise as because it is portable, easy to dispose of, and capable of producing a rapid and user-friendly result, one such example is a pregnancy test. Our goal is to investigate a μ PAD for malaria. Our method will detect d-lactate, a byproduct of the metabolism of the malaria parasite, in urine. Previous studies done in our lab have developed a urine-based test through a coupled chemical reaction. Our efforts have focused more on testing the chemical reactions and measuring concentration of d-lactate on the μ PADs.

Project:

SYNTHETIC STUDIES ON NEW TANDEM INTRAMOLECULAR DIELS-ALDER REACTIONS

Hannah DeGraaf, 2015

Raymond J. Giguere, Professor, Department of Chemistry

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:

DOES GENTLY CLEARING THE NASAL CAVITY IMPACT ODOR IDENTIFICATION?

Mitchell Spring, 2015

Robert M. Hallock, Visiting Assistant Professor, Neuroscience Program

Wine tasters often clear their nasal cavity before sniffing the aromas of a wine. Here, we tested whether this behavior has any effect on olfactory performance in a group of undergraduate participants. We had 25 undergraduates gently blow their noses before a standardized test of olfaction, the Sniffin' Sticks test. This test required the recognition of a battery of odors, and population data for this test is available. A t-test between the participant scores and population data revealed that clearing the nasal cavity did not alter olfactory performance, $t(24) = 0.464$, $p > 0.05$. Our data strongly suggest that clearing the nasal cavity does not alter an individual's ability to identify odors.

Project:

ENGINEERING A COST-EFFECTIVE MICROMANIPULATOR FOR *XENOPUS* OOCYTE INJECTION

Heather A. Braun, 2015

Rebecca J. Howard, Assistant Professor, Department of Chemistry

Alcohol is one of the most widely used and abused drugs, though its action on brain receptor proteins remains unclear. *Xenopus* oocytes are a model system that can be injected with DNA encoding putative alcohol receptors for functional characterization. An important piece of equipment for injecting oocytes, the micromanipulator, is prohibitively expensive due to the precision it requires. To facilitate research and teaching on alcohol receptors, we sought to create our own micromanipulator using parts from a 3D printer. Starting from open-source plans available online, we developed a protocol for building a micromanipulator base, and generated a novel microinjection adaptor using free computer-aided design software. We have begun testing the function of a chimeric brain receptor to explore structural determinants of alcohol sensitivity.

Project:

EXPLORING THE EVOLUTION OF ETHANOL: DEVELOPMENT OF TEACHING TOOLS AND NEW EXPERIMENTS ON ETHYL ALCOHOL

Glenna E. Joyce, 2016

Rebecca J. Howard, Assistant Professor, Department of Chemistry

We sought to develop materials and protocols to explore properties of ethyl alcohol (ethanol) both in a first-year seminar course, and through novel experiments on brain proteins. To provide students with first-hand experience of ethanol's biochemical origins, we validated a simple fermentation and distillation process, reproducible using grocery store supplies and standard lab

glassware. We then designed exercises using spirit lamps, flavorings, and fruit flies to characterize ethanol as a fuel, solvent, and intoxicant. Our lab also recently identified an ethanol binding site in a bacterial protein similar to those found in human brain. To test the relevance of this binding site in eukaryotes, we synthesized RNA encoding a closely related protein, the GluCl pentameric ligand-gated ion channel from *Caenorhabditis elegans*, for pharmacological testing.

Project:

QUANTITATIVE MODELING OF ETHANOL BINDING IN LIGAND-GATED ION CHANNELS

Daniel E. Manson, 2015

Rebecca J. Howard, Assistant Professor, Department of Chemistry

Despite its widespread use and abuse, the molecular mechanisms behind alcohol (ethanol) action in the brain remain poorly understood. Previous research has shown that alcohols modulate ligand gated ion channels. Our lab recently showed that ethanol binds to a small pocket in the trans-membrane domain of a variant of GLIC, a prokaryotic ion channel that is structurally similar to proteins in the human brain. Using software that allows exploration and manipulation of protein structure data, we investigated the physicochemical properties of putative ethanol binding pockets in multiple ion channels. In correlation with functional data, we determined that the target pockets were more hydrophobic and, in one case, more voluminous in ethanol-sensitive versus nonsensitive GLIC variants.

Project:

ROLE OF LOOP 2 IN ETHANOL MODULATION OF THE GABA_AR

Alex Mola, 2016

Rebecca J. Howard, Assistant Professor, Department of Chemistry

The effects of ethanol on the brain are poorly understood on a molecular level. It is thought that alcohol allosterically modulates the γ -aminobutyric acid type A receptor (GABA_AR). These receptors belong to a superfamily of ligand-gated ion channels that are composed of five subunits. The δ subunit has been shown to influence ethanol sensitivity of the channel. Using a homologous ethanol-insensitive protein, GLIC, I have been creating mutations to make GLIC similar to the human GABA_AR δ subunit by replacing extracellular loop 2. I inject and express mutant DNA in *Xenopus laevis* oocytes, then test pH and ethanol sensitivity using two-electrode voltage clamp electrophysiology. Preliminary data show this mutation to reverse ethanol sensitivity, indicating an important role for loop 2 in modulation.

Project:

ROLE OF AN EXTRACELLULAR AMINO ACID RESIDUE IN ALCOHOL MODULATION OF LIGAND-GATED ION CHANNELS

Travers M.D. Ruel, 2016

Rebecca J. Howard, Assistant Professor, Department of Chemistry

The mechanism by which alcohols affect the brain on a molecular scale is poorly understood. Alcohols have been found to modulate pentameric ligand-gated ion channels (pLGICs), proteins which mediate electrochemical signaling in brain. An extracellular amino acid residue has been implicated in alcohol modulation of human pLGICs; however, its role is unclear in the absence of structural information. We aimed to validate a role for this residue, Asp31, in GLIC, a bacterial pLGIC whose structure is known in the absence and presence of ethanol. We generated four mutations based on sequence alignments and physicochemical properties, and characterized activation and modulation of resulting mutants. Preliminary data indicate that substitutions of small or polar residues have little effect on ethanol modulation, while tyrosine may decrease alcohol sensitivity.

Project:

ROLE OF PORE-LINING RESIDUES IN DRUG MODULATION OF LIGAND-GATED ION CHANNELS

Thomas R. Schneider, 2015

Rebecca J. Howard, Assistant Professor, Department of Chemistry

Alcohol and other drugs have been shown to modulate a group of protein receptors that are expressed throughout the brain. In the presence of their neurotransmitter ligands, these membrane-bound channels mediate neuronal signaling by passing ions across the cell membrane. In order to elucidate the influence of alcohol and other drugs on the structure and function of these channels, mutations were introduced to GLIC, a bacterial model receptor, at two pore-facing residues that are believed to play an important role in the gating mechanism of the channel. These mutant ion channels were expressed in *Xenopus laevis* oocytes and characterized using two-electrode voltage clamp electrophysiology. Preliminary results show that polar substitutions in the pore decrease channel sensitivity to agonist (protons) and ethanol.

Project:

PHARMACOLOGY OF BACTERIAL MODELS OF THE HUMAN GABA_A RECEPTOR

Thomas B. Voigt, 2015

Rebecca J. Howard, Assistant Professor, Department of Chemistry

Alcohol's effects in the brain and body are known to be associated with a specific subset of pentameric ligand-gated ion channels (pLGICs). GABA_A receptors, of the pLGIC family, are potentiated by alcohol. However, because the pharmacologically relevant crystallographic

structure of GABA_A receptors is yet to be determined, model proteins are required for structural analysis. GLIC, a bacterial pLGIC, is structurally homologous to GABA_A receptors but is not potentiated by ethanol. It has been shown that mutating the F14' position of GLIC to alanine (A) resulted in alcohol potentiation, and facilitated the cocrystallization with ethanol. Here, we mutated positions adjacent to F14' to their respective amino acid residues in the human GABA_A receptor. We found that the mutants showed altered modulation by pH and alcohols.

Project:

EXPLORATION OF ENVELOPES AS FOCAL SETS

Adam Winchell, 2016

Mark Huibregtse, Professor, Department of Mathematics and Computer Science

How can a boundary line be determined between cities on opposite banks of a river? One answer is to find the “midset” curve that consists of all points that are equidistant from each of the river banks. That is, each point on the midset curve is the center of a circle that is tangent to each of the river banks. Abstracting from the situation, we are given two sets of points called focal sets (e.g., the river banks) and are asked to find the midset curve. Alternatively, one may ask: given a curve and a family of circles, does the “envelope” formed by the circles yield focal curves such that the original curve is their midset.

Project:

EXAMINING STONE TOOL PRODUCTION AT WATER’S EDGE

Elizabeth Hopkins, Class of 2015

Professor Heather Hurst, Assistant Professor, Department of Anthropology

Professor Matthew Kroot, Visiting Assistant Professor, Department of Anthropology

My research investigates the behavioral choices of people who occupied the Water’s Edge archaeological site in Saratoga Springs, NY. By examining the various stone tools being used and the purposes they served, I gained an understanding of how people produced tools and how the materials reflect the community’s use of available stone resources. The ratio of pre-planned to spontaneously-produced stone tools in the collection provides evidence for how much the population at Water’s Edge moved across the regional landscape. By comparing stone artifacts and their physical location in six excavation units, I was able to examine changes in stone tool production over time.

Project:

CHRONOLOGICAL AND SPATIAL DIMENSIONS OF ARCHAEOLOGICAL WORK AT THE WATER'S EDGE SITE

Priscilla Montalto, 2015

Heather Hurst, Assistant Professor, Department of Anthropology

Matthew Kroot, Visiting Assistant Professor, Department of Anthropology

The Water's Edge Site has been heavily excavated since the 1970s by many different groups, ranging from an amateur archaeologist to large firms from New York City. The Skidmore Archaeological Collection archives from the Water's Edge Site contain over 50 maps of the area. This project analyzes data from these maps using ArcGIS. Important elements from each scanned and georeferenced map were highlighted and further defined in a detailed timeline of excavation. This work will facilitate public access to the archives and has produced a single unified document chronicling the history of archaeological work done at Water's Edge.

Project:

A CHRONOLOGY OF HABITATION AT WATER'S EDGE

Kim Snow, 2015 and John Kolios, 2016

Heather Hurst, Assistant Professor, Department of Anthropology

The Water's Edge archaeological site in Saratoga Springs has served as a significant location of human occupation for thousands of years. This project uses artifact analysis to outline the chronological development of the site's cultural history and periods of habitation. Recovered pottery sherds and various projectile points (spearheads, dart points, arrowheads) play an important role in identifying and contextualizing the cultural phases and traditions of Water's Edge. The examination of projectile point and ceramic characteristics allows us to create a detailed chronology of the periods of occupation at the Water's Edge site.

Project:

UNDERSTANDING THE INTEGRATION OF OXYGEN TRANSPORT AND UTILIZATION: A MITOCHONDRIAL PERSPECTIVE

Cheyenne Slocum, 2017

Stephen Ives, Assistant Professor, Department of Health and Exercise Sciences

Previous work has independently investigated mitochondrial function of heart, smooth, and skeletal muscle. The purpose of this study was to examine mitochondrial respiration of cardiac, skeletal, and vascular smooth muscle in tissue from the same mouse, to better understand the linkage between these organ systems. Tissues were obtained, permeabilized, and the rate of oxygen consumption (JO_2) measured while stimulating complexes ($\pm ADP$) in the electron transport chain. Complex I and II respiration decreased from cardiac, to skeletal, and vascular smooth muscle, respectively. Normalizing the JO_2 for Complex I and II to maximal respiratory capacity, an

indicator of mitochondrial content, respiration was similar across the tissues, indicating that increased mitochondrial content, not differences in individual mitochondrial complexes, explain dissimilarities in the respiratory rates of these tissues.

Project:

SERIAL PROCESSING OF LETTERS OR FIRST LETTER ADVANTAGE?

Haley Cirka, 2016

Rebecca Johnson, Associate Professor, Department of Psychology

Johnson, Staub, and Brown (2013) demonstrated that words presented serially from left-to-right are processed faster than words presented right-to-left. These results are either due to (1) actual left-to-right processing when reading or (2) the immediate presence of the first letter. To tease apart these two explanations, we conducted naming and lexical decision studies with an additional presentation type: the first letter was presented, followed by the remaining letters from right-to-left. While the lexical decision data showed the new condition was most similar to the left-to-right condition (suggesting that there is a first letter advantage in visual word recognition), the results from the naming study indicated that readers also utilize a left-to-right serial processing strategy in reading aloud.

Project:

A NEW ECONOMY OF JOKES: HASHTAG SOCIAL MEDIA, HASHTAG COMEDY

Rebecca Baruc, 2015

Beck Krefting, Assistant Professor, Department of American Studies

Comics have availed themselves of new technologies on the Internet for networking and promotional purposes. Social media online sites provide stand-up comics a platform to generate interest and allegiance from consumers and comics are proving themselves quite capable of harnessing these possibilities. Some of the questions we explore are: How are comics harnessing social media tools – to what effects? What are the effects of social media on stand-up comedy? How do online platforms alter the exchange and consumption of humor? In what ways (if any) are these networking tools changing the substance, style, or means of humor production? We explore the ways comics make use of these social media sites and how social media currently impacts the production, exchange and consumption of humor, as well as what this may mean for the future of stand-up comedy and humor at large.

Project:

MITOCHONDRIA'S ROLE IN SCA1 DISEASE PROGRESSION

Austin Ferro, 2015 and Jenny Zhang, 2016

Sarita Lagalwar, Assistant Professor, Neuroscience Program

Spinocerebellar ataxia type 1 (SCA1) is a fatal neurodegenerative disease caused by a mutation in the ataxin-1 gene. Recently mitochondrial dysfunction has been reported in similar diseases such as Huntington's. The aim of this study was to deduce mitochondria's role in SCA1 disease progression using a cell and mouse model of SCA1. Using both models we show that that mitochondrial structure is compromised in the disease state. We also show that changes in the expression of proteins involved with mitochondrial electron transport were reduced when SCA1 mice were treated with succinic acid, a donor of the electron transport chain. Therefore, mitochondria may play an important role in SCA1 disease progression and succinic acid may provide a therapy for SCA1 and other neurodegenerative diseases.

Project:

PROPAGATION AND DEGRADATION OF ATAXIN-1 PROTEIN IN AN SCA1 CELL CULTURE MODEL

Mayumi Kohiyama, 2015 and Nicholas Toker, 2015

Sarita Lagalwar, Assistant Professor, Neuroscience Program

Spinocerebellar ataxia type 1 (SCA1) is an autosomal dominant fatal neurodegenerative disorder characterized by development of an ataxic gait and motor dysfunction. A hallmark of the disease is the formation of large ataxin-1 protein aggregates in affected cerebellar neurons. These aggregates resist degradation by normal cellular clearance mechanisms and accumulate in the nuclei of affected cells. It was previously thought that these aggregates remained in the nucleus, although recently aggregates have been shown to leave the nucleus and enter unaffected neighboring cells. By inhibiting and activating cellular clearance mechanisms we can better understand the differences between the degradation of normal and mutant protein aggregates. Closer investigation of the movement of these aggregates will aid our understanding of the progression of SCA1 and other neurodegenerative diseases.

Project:

THE OPPORTUNITY PROGRAM (OP) ALUMNI PROJECT: EXPLORING THE CAREER EXPERIENCES OF FIRST GENERATION STUDENTS AND STUDENTS OF COLOR AT A PREDOMINATELY AND HISTORICALLY WHITE LIBERAL ARTS COLLEGE

Amari Boyd, 2014 and Aldin Medunjanin 2016

Sue Layden, Ph.D., Research Analyst on Enrollment, Retention, and Student Achievement, Office of Admissions & Financial Aid

Lei Ouyang Bryant, Ph.D., Associate Professor, Department of Music

Michael Ennis-McMillan, Ph.D., Associate Professor and Chair, Department of Anthropology

Bernardo Rios, Ph.D., Consortium for Faculty Diversity Postdoctoral Fellow, Department of Anthropology

The Opportunity Program (OP) Alumni Project is a multi-year study to understand the post-graduate experiences of OP alumni. While there is growing literature on the experiences of first-generation students and students of color in higher education, much of this has been conducted at large universities with little to no representation of historically white liberal arts colleges. Existing research focuses on the importance of the first year, campus climate, mentoring, and collaborative learning. A handful of studies examine the transition from college to work and graduate school; yet there are no existing studies that address the post-graduation and career experiences of these students. Using surveys and qualitative interviews, the study will identify factors that alumni believe promote achievement and success after college, and aim to develop alumni networks and build career connections for historically underserved students and graduates.

Project:

MEANINGS OF FOOD: CONVERSATIONS OF AMERICAN WOMEN ON FOOD BLOGS

Emily Kortright, 2015

Ela Lepkowska-White, Associate Professor, Department of Management and Business

Our research examine the food blogging community—focusing on the personal food blogs of 18 women—and the ways in which the meanings of food and motives for food choice are represented in blogs, if they are at all. We explore questions such as: Who are the food bloggers? How do they establish credibility within the online community? How (if at all) do they sell products? Are motives of food consumption addressed on websites? And if so, what motives and whose are they? By analyzing the ways in which female food bloggers present themselves, their lives, and food, as well as the ways in which they interact with other bloggers and readers, we glean insight as to the ways in which food blogs and the women that write them shape America's food culture.

Project:

COPPER-SILVER CROSS RESISTANCE – TESTING THE POTENTIAL OF HOMOLOG PROTEINS OF COPA FROM *ESCHERICHIA COLI*

Jody-Ann Facey, 2014

Sylvia Franke McDevitt, Assistant Professor, Department of Biology

The treatment of bacterial infections is becoming a more difficult process due to the rise in antibiotic resistance. Alternative methods of treatment are also becoming stringent as metal detoxification systems in multiple strains of bacteria are highly efficient. These systems have been shown to efflux various type of metal ions which are generally at what should be lethal doses for these organisms. *Escherichia coli*, *E. coli*, isolated from a pig farm in Australia, has been shown to contain a gene implicated in copper resistance and *Salmonella* Typhimurium has been shown to have a gene involved in silver resistance. Both the copper and silver resistance genes have been found in several species of Enterobacteriaceae, and specifically in *E. coli* shown to have increased tolerance to copper and silver with the up regulation of both genes. The goal of our project is to determine if similar systems from other bacterial species have incurred the ability to increase copper and silver resistance.

Project:

AMOEBA AS A MODEL SYSTEM TO STUDY METAL DEPENDENT BACTERIAL KILLING BY MACROPHAGES

Ketan Yerneni, 2017

Sylvia Franke McDevitt, Associate Professor, Department of Biology

Historically, humans have employed metals in the war against bacteria, due to their antimicrobial properties. Metal-resistant bacteria have become a prominent threat to our health and wellbeing. Understanding these mechanisms of resistance has become increasingly important in a time where metal is being used more widely to prevent the spread of these organisms. Our immune system engulfs bacteria and breaks them down using enzymes, reactive oxygen and even heavy metals, such as copper and zinc. We will utilize slime mold as a model system to test the capability of strains of *E. coli* to survive within these cells, mirroring the process of the immune system. This study will provide us insight into the mechanisms of bacterial metal resistance, and how we can combat it.

Project:

COPPER-SILVER CROSS RESISTANCE – TESTING THE POTENTIAL OF HOMOLOG PROTEINS OF COPA FROM *ESCHERICHIA COLI*

Bryan Zepeda-Carranza, 2017

Sylvia Franke McDevitt, Associate Professor, Department of Biology

The evolution of bacterial resistance has become a global issue as older methods, such as antibiotics, have become unsuccessful in treating bacterial infections in the antibiotic-era we live in. Similarly, the introduction of newer antimicrobial methods is met with the same fate as heavy metals approved to be antimicrobial alloys no longer contribute to the complete exclusion of harmful microorganisms. The implementation of antimicrobial alloys in hospitals or even in common doorknobs has become futile as metal resistance allows the bacteria to grow in antimicrobial areas once thought of as aseptic. The bacteria with metal resistance present cellular systems responsible for the detoxification of metal ions, even in higher concentrations that would essentially be considered as lethal doses. *E. coli* and *Salmonella Typhimurium*, both underestimated and evolutionarily successful microbes, are prime examples of microbes with the developed metal resistance, particularly Copper and Silver. The project aims to determine if other similar bacterial systems contain the genetic capability of increasing their resistance to heavy metals.

Project:

DIGIT RATIO: A METHODOLOGICAL REVIEW OF RESEARCH ARTICLES PUBLISHED FROM 2011 TO 2013

Kristina Francoeur, 2015 and Anh Vu Nguyen, 2017

Denise Brooks McQuade, Senior Teaching Associate, Department of Biology

2D:4D digit ratio is the relative length of index to ring finger, and is used as a biomarker for prenatal androgen exposure. Digit ratio is correlated with various cognitive and behavioral states, morphological traits, and medical conditions. Ongoing discussions regarding measuring techniques, including direct and indirect methods, have not reached a consensus on standardized measuring practice and have implications for data reproducibility and reliability. This project collected and reviewed methodologies of all major digit ratio papers published from 2011 to 2013: the 206 papers were categorized based upon topic, subjects, and the measuring technique employed. Initial analysis showed a continued increase in the rate of digit ratio publications, with an increasing use of indirect techniques; measurements of left and right hands utilized various software applications.

Project:

INVESTIGATING THE INFLUENCE OF BEHAVIORAL ATTRIBUTIONS ON BACKLASH AGAINST MALE ELEMENTARY SCHOOL EDUCATORS

Elizabeth Johnson, 2015

Corinne Moss-Racusin, Assistant Professor, Department of Psychology

This research seeks to explore whether men experience *backlash* (i.e., social and economic penalties) when violating gender stereotypes by choosing careers in elementary education, a female gender-typed occupation. Furthermore, this research will be the first to explore whether internal and external behavioral attributions impact levels of backlash. In this pilot study, we created eight novel target profiles describing the qualifications of potential elementary school teachers. Each profile was identical except for target gender and the behavioral attribution given for becoming a teacher. Participants read one of eight profiles, and then rated the target's competence and behavioral attributions. Results indicated that the manipulation was successful, in that each target was rated as equally competent and reflected the intended behavioral attribution type.

Project:

INNOVATION, INTELLECTUAL PROPERTY AND MAKERS

Ramzy Kahhale, Class of 2015

Scott Mulligan, Visiting Assistant Professor, Department of Management & Business and International Affairs Program

The Do-It-Yourself movement, which encourages open-source manufacturing and collaborative innovation, has grown substantially in recent years and holds great potential for future hardware and software development. Examples of this trend are the global rise of Makerspaces and Maker Faires, community-based centers and events that bring together “makers” (individual inventors) to share their ideas, collaborate on construction and then showcase their creations. Maker ideology emphasizes open-source licensing, online collaboration, crowd-sourced financing, and public disclosure of their ideas. This challenges traditional research & development and intellectual property (IP) regimes, which grant inventors certain exclusive rights. Our summer research explores empirically the potential confrontations between the increasingly important “maker movement” and IP, by analyzing makers’ experiences with, attitudes towards, and perceptions of, the modern intellectual property system.

Project:

AROUND THE WORLD: IRON DISSOLUTION FROM GLOBAL FLY ASH AEROSOLS IN ACIDIC MEDIA

Jaya Borgatta, 2016, and Amanda Paskavitz, 2017

Juan Navea, Assistant Professor, Department of Chemistry

Fly ash (FA), a product of coal-fired power plants, is an anthropogenic atmospheric aerosol that contains metal oxides in proportions that vary with their source region. One of the most prevalent components of fly ash is iron oxide, which is found in oxidation states Fe(II) and Fe(III). As fly ash is dissolved by atmospheric water, Fe(II) can be deposited on the ocean surface stimulating the growth of phytoplankton. In order to assess the environmental impact of fly ash, it is important to investigate its dissolution in the atmosphere. In this work we report the iron leach from fly ash samples from around the world under atmospherically relevant conditions. Iron dissolution from Midwestern FA is both faster and larger than that of Indian FA.

Project:

DIFFUSION OF GASES: DEVELOPMENT OF AN UNDERGRADUATE LABORATORY EXPERIMENT

Hannah DeGraaf, 2015

Juan Navea, Assistant Professor, Department of Chemistry

Judith Halstead, Professor, Department of Chemistry

Fick's second law of diffusion, which expresses how particle density evolves in response to concentration gradient, states that the diffusion of gases will be faster when the gas concentration changes sharply than when the concentration is nearly uniform. Abstract and mathematically-based laws of physical chemistry can be difficult for students to visualize in the classroom setting, and hands-on experiments can greatly add to their understanding of such concepts. This summer, a complete vacuum system was designed and constructed to develop an experiment that explores applications of Fick's second law. Not only will this experiment help enrich students' understanding of concepts covered in lecture, but it will also provide valuable experience working with vacuum systems.

Project:

NITRATE ADSORPTION ONTO TiO_2 : A QUANTUM CHEMICAL COMPUTATIONAL STUDY

Matthew Lueckheide, 2017

Juan Navea, Assistant Professor, Department of Chemistry

Computational chemistry provides the means to investigate chemical phenomena using quantum mechanical models. Through these theoretical calculations, molecular structures can be determined in order to better understand chemical properties and reactivity. In this work, we report

several molecular structures resulting from the interaction between nitrate (NO_3^-) from atmospheric nitric acid (HNO_3) and titanium oxide (TiO_2), a common component of fly ash aerosols emitted from coal-based power plants. We have found that when adsorbed onto TiO_2 , nitrate exhibits many different modes of vibration that can help us understand the nitrate coordination with fly ash components. By analyzing these calculated structures and comparing them to experimental data, it is possible to determine prevalent molecular geometries and predict nitrate reactivity on fly ash.

Project:

PHOTOCHEMISTRY OF NITRATE CHEMISORBED ON DIFFERENT COMPONENTS OF MINERAL AEROSOL

Daniel Lesko, 2017

Juan Navea, Assistant Professor, Department of Chemistry

Atmospheric particulate matter is known to provide a reactive surface for the uptake atmospheric chemicals such as nitric acid. These atmospheric particles, or aerosols, contain metal oxides that vary with their source region. This wide-ranging composition has important implications in atmospheric processes, such as the reactivity of aerosols with nitric acid and their response to sun light. In fact, the studies presented here suggest that the combination of solar radiation and particular matter provides a pathway for nitric acid to react in the atmosphere and produce nitrogen oxide gases, which can have important environmental implications. In order to assess the effect of aerosols in the atmosphere, we have carried out studies of nitric acid reactivity with several components of atmospheric particular matter.

Project:

VACCINE COVERAGE AND INCOME INEQUALITY IN MIDDLE INCOME DEVELOPING COUNTRIES

Rachel Spring '15

Mehmet Odekon, Professor, Department of Economics

Pharmaceutical companies offer 3-tiered pricing for vaccines, with countries placed into a tier determined by per capita income. This price structure allows poorer regions to have access to vaccines that they would not be able to afford otherwise. The 3-tiered pricing structure is problematic for some people in middle-income countries because there is a small percentage of wealthy people that raise the Gross National Income per capita so the country is classified as middle-income. As a result, the country must pay a higher price for tiered-priced vaccines even though much of the population is poor and can't afford the higher price.

This paper will aim to address the following questions: Is inequality in the distribution of income as measured by the Gini coefficient a significant determinant of vaccine coverage in middle-income developing countries? Ordinary least square regression results support our hypothesis.

Project:

A TOY MODEL FOR THE NONLINEAR OPTICAL RESPONSE OF MOLECULES WITH MODULATED CONJUGATION

Quanhang Chen, 2016

Javier Perez-Moreno, Assistant Professor, Department of Physics

In organic molecules, the optical response originates from the motion of the pi-electrons, which are constrained to move along the molecule's conjugated path. As an electron moves through the conjugated path, it interacts with the rest of the charges such that its motion is very dependent on the shape of the molecule. In this paper we introduce a simple model for that allows us to determine how the shape of the conjugated path affects the nonlinear optical response of the molecule. Our results apply to typical second-order dipolar structures: we have determined how the symmetry of the conjugated path affects the optical response, and we have found potential new strategies for making better molecules.

Project:

VISUAL DIFFERENTIATION OF OBJECTS: AN EYE TRACKING STUDY

W. Emerson O'Donnell, 2015

Flip Phillips, Professor, Department of Psychology, Neuroscience Program

In this presentation, I will explain the basics of eye tracking, as well as the particular approach to it that our study is taking. I will also discuss the theory underlying the analysis of the three-dimensional shapes used in this study, and the process by which these shapes, or "glavens", are generated. I will explain how we have analyzed the eye tracking data we have collected, as well as some of the challenges involved in analysis and how we have overcome them. Finally, I will report on the preliminary findings that our research has led us to, and what they mean with regards to continuing the work we have begun this summer.

Project:

ARTIFICIAL SWEETNER IN NEW "COKE LIFE" AFFECTS SLEEP CYCLES IN FRUIT FLIES

Agnieszka Brojakowska, 2017 and Cemile Antal (Doan Stuart School)

Bernard Possidente, Professor, Department of Biology

Coca-Cola recently debuted its new "Life" beverage with Raboudioside-A, a natural sweetener from the Stevia plant. Although non-toxic, its behavioral affects are less well studied. We investigated Rebiana's effects on sleep cycles using fruit flies. Activity rhythms in wild-type and circadian clock mutants were tested at low and high doses. Low dose wild-type flies had less activity than controls and high dose flies. Mutants had increased activity but only at the high dose. Wild-type flies at either dose showed more regular circadian rhythms in than controls. Rhythms

of clock mutants were unchanged. Overall, Raboudioside-A reduced activity and improved sleep cycles, but these effects depended on having an intact circadian clock.

Project:

DO C(60) FULLERENE NANOPARTICLES ALTER SLEEP CYCLES IN FRUIT FLIES?

Matt Ciotti (Siena College)

Bernard Possidente, Professor, Department of Biology

Buckminsterfullerenes, or “Buckyballs” are composed of 60 carbon atoms in a “soccer ball” configuration named after Buckminster Fuller, known for using similarly shaped geodesic domes in his architectural designs. Buckyballs were discovered and synthesized in the late 20th century, they occur naturally, and represent a family of related carbon compounds called “Fullerenes”. Buckyballs are potentially useful for biological applications, including cancer treatment and other emerging areas of “nanomedical” technology. The increasing use of buckyballs in nanotechnology has generated interest in their possible toxicity to people and ecosystems. There is little evidence for classical biological toxicity of fullerenes, but there are few studies of their behavioral effects. Here we test whether ingestion of C(60) causes changes in the activity level and sleep/wake cycle of fruit flies.

Project:

FRUIT FLY FLASH MOBS

Arianna Laszlo, 2015 and Nicholas Friedman 2017

Bernard Possidente, Professor, Department of Biology

Circadian rhythms are daily activity patterns governed by internal biological mechanisms. They are affected by many factors including light, temperature, and genetics. Although the circadian rhythms of individual *Drosophila melanogaster* (fruit fly) has been studied extensively, effects of social interaction have seldom been studied. Activity patterns of groups of 98 and 196 flies were measured for 5 days in a 12 hour light-dark cycle and 5 days in constant darkness. Groups of females exhibited extended peaks of activity during daytime that are not observed in individuals. Group of males exhibited increased nighttime activity compared to individuals. Identifying social interactions that affect circadian rhythms of fruit flies can lead to a greater understanding of what governs our own circadian rhythms.

Project:

SUCCINIC ACID TREATMENT DOES NOT IMPROVE INSULIN RESISTANCE OR ALTER ENERGY HOMEOSTASIS IN OBESE MICE

Daniela Escudero, 2016 and Gabriella Vero

T.H. Reynolds, Associate Professor, Department of Health and Exercise Sciences

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 demonstrate that SA improves 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 did not significantly alter any of the variables measured.

Project:

IDENTIFYING THE CELLULAR MECHANISM FOR THE MnTBAP-INDUCED REDUCTION IN BODY WEIGHT

Saada Legesse, 2015 and Caitlin Sheridan, 2015

T.H. Reynolds, Associate Professor, Department of Health and Exercise Sciences

Obesity is a major public health problem. MnTBAP causes weight loss and reduces caloric intake in mice. CD36 is a trans-membrane glycoprotein that acts as a taste receptor for fat in the tongue and a lipid sensor in the hypothalamus. CD36 signaling from the tongue and the hypothalamus has been shown to regulate appetite. In the present study, we determined if the expression of CD36 was altered in the tongue and hypothalamus of mice fed a high fat diet (HFD) and treated with MnTBAP. In the tongue, CD36 expression was higher in mice treated with MnTBAP. In the hypothalamus, CD36 expression appeared to be higher in mice fed a HFD that were treated with MnTBAP. MnTBAP may reduce caloric intake by altering CD36 expression.

Project:

VISUAL REPRESENTATION IN THE TRANSNATIONAL LIVES OF MEXICAN MIGRANTS

Bethany Hunt, 2017

Bernardo Ramirez Rios, Visiting Professor, Department of Anthropology

Visual media are used as a means of data collection in the discipline of anthropology. The use of visual forms of expression (i.e. photographs and video recordings) as a means of representation of knowledge has become increasingly more accepted. Our exploration in visual representation led to the following research question: How does visual data affect our understanding of the cultural

other in ethnography? To explore this question, we introduced research goals, developed a research design, explored several methodologies within anthropology, and analyzed visual data. Through this process, we found that visual forms of expression can serve as a “text” to convey knowledge rather than just support or embellish the themes present in written text.

Project:

EXPANDING THE GENETIC CODE WITH PYROGLUTAMATE

Miles Calzini, 2016 and Stephanie Zhen, 2016

Kelly Sheppard, Assistant Professor, Department of Chemistry

Pyroglutamate is an unnatural amino acid formed in certain protein residues linked to Alzheimer’s disease. Using *E. coli* as a model organism, we tested the feasibility of expanding the genetic code by reassigning the amber stop codon to pyroglutamate in order to study its role in these proteins. To achieve this, we used a modified archaeal RNA-dependent glutamine biosynthetic pathway in which pyroglutamate is synthesized on an amber suppressor tRNA. An enhanced yellow fluorescent protein reporter was used to determine percent read-through of an amber codon when our pyroglutamate system was present. Using this assay followed by mass spectrometry, we will be able to determine whether our method allows site-specific incorporation of pyroglutamate in response to an amber codon.

Project:

DISCRIMINATING NATURE OF THE *B. ANTHRACIS* ASPARTYL-tRNA SYNTHETASES

Julia Erskine, 2017

Kelly Sheppard, Assistant Professor, Department of Chemistry

Protein synthesis is essential for life and requires the correct pairing of amino acids to their cognate transfer RNA (tRNA). Two routes exist to attach asparagine (Asn), to tRNA^{Asn}: the direct and the indirect pathways. The direct path uses asparaginyl-tRNA synthetase to attach Asn to tRNA^{Asn} when free Asn is present. The second pathway involves two steps in which a non-discriminating AspRS attaches aspartate (Asp) to tRNA^{Asn}. The Asp-tRNA^{Asn} is then amidated to Asn by GatCAB. The causative agent for anthrax, *Bacillus anthracis*, appears to encode both routes for Asn-tRNA^{Asn} formation along with multiple Asn synthetic pathways. We demonstrate one of the two *B. anthracis* AspRSs can attach Asp to tRNA^{Asn} consistent with the organism synthesizing Asn on tRNA^{Asn} using the indirect pathway.

Project:**DISCRIMINATING NATURE OF THE ASPARTYL-tRNA SYNTHETASES FROM THREE HUMAN PATHOGENS**

Mohammed Islam, 2015

Kelly Sheppard, Assistant Professor, Department of Chemistry

Protein synthesis is essential for all known life. Accurate translation during protein synthesis is primarily achieved by pairing an amino acid with its cognate tRNA. For the amino acid asparagine, two routes for asparaginyl-tRNA^{Asn} synthesis have evolved. Asparagine can be directly attached to tRNA by an asparaginyl-tRNA synthetase or can be formed on the tRNA by the concerted actions of a non-discriminating aspartyl-tRNA synthetase and an amidotransferase. The human pathogens *Borrelia burgdorferi*, *Legionella pneumophila*, and *Mycoplasma pneumonia* may synthesize Asn on tRNA^{Asn} in addition to using the direct route. Using both *in vivo* and *in vitro* assays we demonstrate *L. pneumophila* AspRS can be used in asparaginyl-tRNA^{Asn} formation while the AspRSs from *B. burgdorferi* and *M. pneumonia* are confined to aspartyl-tRNA^{Asp} formation.

Project:**DUAL ROUTES FOR *B. HALODURANS* ASPARAGINYL-tRNA FORMATION**

Nilendra Nair, 2015

Kelly Sheppard, Assistant Professor, Department of Chemistry

In nature, two distinct routes have evolved for attaching the amino acid asparagine (Asn) to its cognate transfer RNA (tRNA^{Asn}), an essential step in protein synthesis. In the direct pathway Asn is ligated to tRNA^{Asn} by an asparaginyl-tRNA synthetase (AsnRS). In the second, indirect pathway, a non-discriminating aspartyl-tRNA synthetase (ND-AspRS) misacylates Asp to tRNA^{Asn}. The tRNA-bound Asp is then amidated to Asn by the amidotransferase GatCAB. Bioinformatic analysis clearly shows the Gram-positive *Bacillus halodurans* can use the direct route. Whether it uses the indirect route depends on whether its AspRS is non-discriminating. Using both *in vivo* and *in vitro* assays, we demonstrate the *B. halodurans* AspRS can aspartylate tRNA^{Asn} and can be used with GatCAB to form Asn-tRNA^{Asn}.

Project:**DUAL ROUTES FOR *B. SUBTILIS* ASPARAGINYL-tRNA FORMATION**

Hannah Raff, 2015

Kelly Sheppard, Assistant 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. The one-step, direct pathway uses an asparaginyl-tRNA synthetase (AsnRS) to aminoacylate Asn to tRNA^{Asn}. In organisms lacking AsnRS, a two-

step pathway is used. First a non-discriminating aspartyl-tRNA synthetase (ND-AspRS) attaches aspartate (Asp) to tRNA^{Asn}. The Asp is then amidated to Asn by GatCAB. Despite *Bacillus subtilis* using AsnRS, we predicted the lone *B. subtilis* AspRS is non-discriminating to enable the organism to also use the two-step pathway for Asn-tRNA^{Asn} formation. Our *in vitro* and *in vivo* results are consistent with the AspRS using tRNA^{Asn} as a substrate. The work provides further insight into the life cycle of this model Gram-negative bacterium.

Project:

TECHNOLOGY USE AND EMERGING ADULT COLLEGE STUDENTS

Erica Walker, 2016

Dr. Joan Ann Swanson, Assistant Professor, Department of Education Studies

This study attempts to explicate the relationship emerging adult college students have with technology as it intersects the educational setting. Emerging adults in college classrooms were surveyed concerning their technology practices; preferences and frequencies. Results indicated segregated technological use for academic and non-academic purposes. The resulting conclusion provides theoretical implications for learning and development as these emerging adults' view technology similarly as skin; an integrated source of protection, regulation, and communication, and yet these emerging adults may not be conscious of the utmost importance unless there is a disruption in their technological equilibrium.

Project:

BUILDING BRIDGES ACROSS DISCIPLINARY BOUNDARIES

Lulu Li, 2016

Peter von Allmen, Professor, Department of Economics

Integrative learning is one of the hallmarks of liberal education. Anecdotal evidence indicates that there are commonalities and complementarities in faculty research and teaching interests across departments and divisions. Our goal is to facilitate the discovery of such intersections, creating new avenues for collaborative work both in research and in the classroom. All faculty (including new incoming faculty) were invited to participate in a survey in which they supplied us with data on their research and teaching interests. We received 110 responses. We sorted these into interest groups using keywords and long form descriptions. The next phase of the project is to gather participants by area of interest. The Director of Faculty Development will offer small grants to fund new collaborative teaching or research projects.