

# Skidmore College

**FACULTY STUDENT SUMMER RESEARCH PROGRAM**

**SUMMER 2015**

**F**



## **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

## **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



## **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<sub>2</sub> 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, ,  
**BREEDINANX,**

uer F()6(mi)feTd (, 'Tj 0.5.07 Tc 0.01 Tw 0.51 0 Td j313 T [(E3E)-5( 0 Tc 0 Tw j ( 1)]TJ5d ( )Tj EMC /P <

**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**





## PROJECT ABSTRACTS

|                 |
|-----------------|
| <b>Project:</b> |
|-----------------|

### **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.



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 p p p Tw 1 Tw 1 heth7N w4(m)81hetothod forniT

**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:**

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. Th( 3 6 ( ) ] T J



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, '



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 hav



focused goals in educational reform, respecting localized knowledge as the basis for educational  
cha

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 Sofia Rivera, '16

Sylvia Franke McDevitt, Associate Professor, Biology Department

Macrophages are utilizing heavy metals (such as copper and zinc ions) in order to kill pathogens. The ability of macrophages to kill pathogens is dependent on the availability of these metals. In this study, we investigated the role of copper and zinc in the killing of pathogens by macrophages. We found that the presence of copper and zinc ions significantly increased the killing of pathogens by macrophages. This suggests that these metals are essential for the function of macrophages in the immune system.

of bacteria to share their metal resistance systems. P<sub>1B-1</sub>

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

**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 inexchangeable iron. In addition, lower pHs increased the amount of free iron.

**Project:**

on<D1o:1oiiN7t(iN7t(79)n(e)-7t(791( )]TJ 033(on<4.8378 0 Td P(I)ATt(79H(S)-n(e)- Tt(79O(S)-4P(I)O(S)-Lt(79



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



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

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