Skidmore College

FACULTY STUDENT SUMMER RESEARCH PROGRAM

SUMMER 2018

FINAL PRESENTATIONS
AUGUST 2, 2018

Funding Sources for Faculty Student Summer

Faculty Student Summer Research Program

Schedule of Final Research Presentations

Thursday, August 2, 2018

9:00 am – 9:25 am Coffee and Muffins

9:30 am – 10:40 am Poster Presentations

ROOM A

EFFECTS OF CAPSAICIN ON THE VASCULAR RESPONSE TO PASSIVE LEG MOVEMENT
Meaghan Lynch, 2019
Stephen Ives, Assistant Professor, Department of Health and Human Physiological Sciences

ASSESSING THE NEEDS AND ASSETS OF OLDER ADULTS AND THEIR CAREGIVERS
Bailey Hutchins, 2019
Kelly Melekis,Assistant Professor, Department of Social Work

UNDERSTANDING THE KINETICS AND REGULATION OF GLUCAN PHOSPHATASES
Tiffany Henao, 2019
Madushi Raththagala, Assistant Professor, Department of Chemistry

RECONSTRUCTION AND ANALYSIS OF FUNCTIONAL NEURAL NETWORKS OF THE OPTIC TECTUM IN XENOPUS TADPOLES
Philip Steudel, 2019; Ella Long, 2020
Csilla Szabo, Visiting Assistant Professor, Department of Mathematics and Statistics

PETROLOGIC EVOLUTION OF LOW-PRESSURE METAMORPHIC ROCKS FROM COASTAL MAINE
Nathan Smail, 2020
Victor Guevara, Assistant Professor, Department of Geosciences

OLD ORGENIC COLLAPSE AND YOUNG HYDROTHERMAL ALTERATION OF THE ADIRONDACKS REVEALED BY U-Pb ZIRCON PETROCHRONOLOGY
Tess Drauschak, 2020
Victor Guevara, Assistant Professor, Department of Geosciences

ROOM B

CHARACTERIZATION OF ArkA SEGMENT 1 BINDING TO Abp1-SH3 USING MARKOV STATE MODELS

Henry Huang, 2020; Gabriella Gerlach, 2019; Robyn Stix, 2018, Elliott K. Stollar*
K. Aurelia Ball, Assistant

PRELIMINARY EXPLORATION OF A STORAGE MODEL FOR SOCIAL NETWORK DATA
John Litscher, 2020; Esteban Acosta, 2020
Christine F. Reilly, Assistant Professor, Department of Computer Science

10:45 am – 11:50 am Oral Presentations

ROOM A

A COGNITIVE MEDIATION MODEL OF MUSICAL PREFERENCE
Ethan Simon, 2019
Dominique Vuvan, Assistant Professor, Department of Psychology

TESTING DIFFERENT CHRIMSON TRANSGENES TO OPTIMIZE OPTOGENETIC SLEEP EXPERIMENTS
Terrence Gatton, 2020
Christopher Vecsey, Assistant Professor, Neuroscience Program

DISRUPTING THE ENDOCANNABINOID SYSTEM DURING ADOLESCENCE: EFFECTS ON ANXIETY & SOCIABILITY
Colin Johnston, 2019; Henry Stadler, 2019
Hassan Lopez, Associate Professor, Department of Psychology

ROOM B

THE CELLULAR" POST OFFICE": CELL WALL COMPONENTS DELIVER MECHANISM FOR SPECIFIC LOCI AT THE CELL SURFACE
Liangyu Zhou, 2019
David Domozych, Professor, Department of Biology

INVESTIGATING EXTERNAL ELECTRIC FIELD EFFECTS ON ORGANIC SEMICONDUCTORS
Farouq Yusuf, 2021
W. Ruchira Silva, Visiting Assistant Professor, Department of Chemistry

STRUCTURAL AND FUNCTIONAL CHARACTERIZATION OF STARCH EXCESS4
Jordan Alvarez, 2020
Madushi Raththagala, Associate Professor, Department of Chemistry

LOS MERCADOS INDIGENAS DE AMERICA LATINA: SABIDURIA Y EMPODERAMIENTO PARA LAS MUJERES
Alex Ahrens, 2019
Viviana Rangil, Professor, Department of

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

ROOM A

ASSESSING THE NEEDS AND ASSETS OF OLDER ADULTS AND THEIR CAREGIVERS
Bailey Hutchins, 2019
Kelly Melekis, Assistant Professor, Department of Social Work

DIRECT PATHWAY FOR *BACILLUS ANTHRACIS* tRNA ASPARAGINYLATION
Jose Giron, 2020
Kelly Sheppard, Associate Professor, Department of Chemistry

CHARACTERIZATION OF THE DUAL PATHWAYS FOR *B. HALODURANS* ASPARAGINYL-tRNA FORMATION
Jon Matthew Bilé, 2021
Kelly Sheppard, Associate Professor, Department of Chemistry

WHAT PROCESSES DROVE METAMORPHISM AND EXHUMATION OF EARTH'S
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Project:

CHARACTERIZATION OF ArkA SEGMENT 1 BINDING TO Abp1-SH3 USING MARKOV STATE MODELS

Henry Huang, 2020
K. Aurelia Ball, Assistant Professor, Department of Chemistry

An SH3 domain is an interaction domain involved in a large number of the cellular processes responsible for signal transduction or supramolecular complex formation. To function, SH3 domains interact with intrinsically disordered proteins (IDPs). However, these IDPs bind in multiple steps, making the characterization of their full binding pathway a difficult task to complete with experiments alone. To better understand how such interactions contribute to cellular function, we used Molecular Dynamics to simulate the domain-peptide interaction between the peptide ArkA12 and domain AbpSH3. Hidden Markov state models were further used to define separate bound states and their specific transition rates on statistically relevant timescales. Preliminary work suggests that similar analytical methods using different sample features may produce results with improved prediction performance and computational efficiency.

*Other Contributors: Gabriella Gerlach, 2019; Robyn Stix, 2018; Elliott K. Stollar**
**Eastern New Mexico University*

Project:

CONFORMATIONAL FLEXIBILITY OF HIV-VIF/APOBEC3F BINDING REGION IN HIJACKED UBIQUITINATION COMPLEX

Kate Johnson, 2020

Cul5) complex, an E3 ubiquitin ligase complex. Understanding how Vif interacts with the ubiquitin complex is essential for creating therapeutics. This complex has been crystallized and to understand the intermolecular interactions, Molecular Dynamics (MD) simulations were run to characterize the conformational changes of the VCBC complex with and without with and without Cul5 to show additiona global and local conformational sampling when Cul5 is not bound to the VCBC complex. These alternate conformations of the VCBC complex may be important for preventing binding and ubiquitination of APOBEC.

Project:

LOCAL CONFORMATIONS OF VCBC COMPLEX WITH V25-A MUTATION

Acadia Connor, 2021
K. Aurelia Ball, Associate Professor, Department of Chemistry

The HIV-Vif protein hijacks an E3 ubiquitin ligase complex by binding to Elongin B (ELoB), Elongin C (EloC), CBF-β and Cullin 5 (Cul5) forming the Vif-CBFβ-EloB-EloC-Cul5 (VCBC-Cul5) complex which is in charge of tagging molecules to be degraded. Through previous experimental research, single point mutations on the N-terminus of Vif have been observed to affect Cul5 binding to the VCBC complex. To determine the effects of the mutation on local conformational sampling, atomic fluctuations and dihedral angle analysis were performed on MD simulations of VCBC, VCBC-V25a and VCBC-Cul5 complexes. Understanding the local conformational changes of the complex with V25a is important for understanding the mechanics of Vif and how the mutation might interrupt Hiv-Vif function to develop a possible therapeutic treatment.

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explore the degree of damage they cause toward the cables. My last project was involved with using actin and myosin affecting poisons to stop or significantly slow streaming rate, and then restart streaming by washing the poison out. This is to show the importance of actin-myosin motility system in cell division.

Project:

ENVIRONMENTAL JUSTICE IN SARATOGA SPRINGS

Jillian Seigel, 2018
Jordana Dym, Professor, Department of History

Environmental justice ensures fair treatment and access to natural resources for all people regardless of their backgrounds. What does local environmental justice look like in Saratoga Springs? How has the community factored access to environmental resources into planning, development, regulations and policies, and implementations of environmental laws? Through working with Project HAL (Humanities Action Lab) and our community partner, Sustainable Saratoga, we began the research of stories and materials to be used by Skidmore students in a traveling exhibit in the Spring of 2019. The theme of modes of and access to transportation weaves through the project, and will help address other issues prevalent in the community such as housing, green spaces, work opportunities, gentrification, and others.

Project:

SUPERSTAR EFFECT AND CONSUMER TIPPING BEHAVIOR: EVIDENCE FROM THE NBA

Chenyu Zhou, 2019
Qi Ge, Assistant Professor, Department of Economics

We match NBA game outcomes with a high frequency dataset on taxi rides in New York City to investigate how emotions as a result of sporting events, particularly in the presence of superstars, affect passengers' tipping behavior. Our empirical results indicate that the post-game tipping amounts are not only driven by surprises due to deviations from pre-

ago in coastal Maine. How are high thermal gradients reached during LPM? What was the source of heat? The pressure-temperature paths recorded by metamorphic rocks may be diagnostic of heating mechanism(s). Results from one sample show a polymetamorphic history, with an initial, high-pressure metamorphism (~8 kbar, 610°C), followed by LPM (3.6 kbar, 670°C) concurrent with movement along a crustal-scale strike-slip fault. Another sample only records evidence for the initial, high-pressure event. This suggests: 1) these rocks record previously unrecognized metamorphism related to continental collision, and 2) the later LPM was more limited in spatial extent than previously assumed.

Project:

WHAT PROCESSES DROVE METAMORPHISM AND EXHUMATION OF EARTH'S YOUNGEST EXPOSED METAMORPHIC ROCKS? INSIGHTS FROM U-Th-Pb PETROCRHONOLOGY

Telemak Olsen, 2020
Victor Guevara, Assistant Professor, Department of Geosciences

Nanga Parbat (NP), one of the highest mountains in the western Himalaya, is comprised of the youngest high-temperature, partially melted metamorphic rocks on Earth, which crystallized approximately 1 million years ago (Ma). This is in contrast to the rest of the Himalaya, in which older (15-25 Ma) rocks are exhumed, with previous studies suggesting that rapid erosion by the Indus River at NP drove deep crustal metamorphism/partial melting. We used U-Th-Pb dating, chemical analyses, and textures of accessory minerals to constrain the timing and duration of metamorphism and partial melting in NP. Our results suggest anomalously young (~2 Ma) partial melting occurred, rapidly followed by exhumation and cooling at ~1 Ma. This history could be consistent with either rapid erosion driving partial melting, or vice-versa.

Project:

OLD ORGENIC COLLAPSE AND YOUNG HYDROTHERMAL ALTERATION OF THE ADIRONDACKS REVEALED BY U-Pb ZIRCON PETROCHRONOLOGY

Tess Drauschak, 2020
Victor Guevara, Assistant Professor, Department of Geosciences

The rocks that comprise the Adirondacks represent the deep crust of a mountain belt known as the Grenville orogenic province, ~1.1 billion years ago. A significant portion of the Adirondacks is comprised of a rock known as the Marcy Anorthosite massif (Mm), whose margins are ductilely deformed. This deformation suggests that the Marcy massif was exhumed during collapse of the Grenville orogen, ~1050 million years ago (Ma). We dated rocks potentially related to this exhumation using U-Pb isotopes. Our data shows that the Mm was exhumed at ~1050 Ma. Data from another sample indicates that the Adirondacks experienced hydrothermal alteration at ~211 Ma, during breakup of the Pangea supercontinent. Our study is the first to document that the Adirondacks were affected by continental rifting at ~200 Ma.

Project:

THE SOCIAL ECONOMY IN CHINA: THE CASE OF HAPPY LIVING

Siqi Chen, 2019
Xiaoshuo Hou, Associate Professor, Department of Sociology and Asian Studies Program

The social economy, revived in the West as a response to neoliberalization, is often seen as a way to moralize the economy under the principles of locality, reciprocity, and solidarity. Through the case study of Happy Living, a non-profit organization in China that provides aging and youth services, we explore how such organizations navigate their external environment. We find that the state is both an enabler and an inhibitor in the development of organizations like Happy Living that heavily depend on state resources. While previous literature often regards social economy organizations as forces for democratic empowerment, we find that service-oriented social organizations in China do not necessarily view challenging the status quo as their mission. They do, however, provide more localized services to marginalized populations.

Project:

EFFECTS OF CAPSAICIN ON THE VASCULAR RESPONSE TO PASSIVE LEG MOVEMENT

Meaghan Lynch, 2019
Stephen Ives, Assistant Professor, Department of Health and Human Physiological Sciences

Previous work in isolated and animal models suggests, capsaicin, the spicy ingredient in peppers, improves vascular function. Therefore, we sought to determine the effects of capsaicin on vascular function using passive leg movement (PLM), a technique shown to be sensitive to alterations in vascular health. In a single blind crossover design, 13 healthy young males underwent continuous PLM at 60 cycles/minute for two minutes after taking placebo or capsaicin. At baseline and during PLM Near infrared spectroscopy (NIRS) of the thigh was recorded for oxygen saturation (StO2), total hemoglobin concentration (THC), oxyhemoglobin concentration (HbO), and deoxyhemoglobin concentration (Hb), as estimates of vascular function. Preliminary analyses suggest acute capsaicin ingestion attenuated vascular function and thus further work is needed to determine if capsaicin supplementation is advisable.

Project:

DISRUPTING THE ENDOCANNABINOID SYSTEM DURING ADOLESCENCE: EFFECTS ON ANXIETY & SOCIABILITY

Colin Johnston, 2019; Henry Stadler, 2019
Hassan Lopez, Associate Professor, Department of Psychology

Animal models suggest that the endocannabinoid system (eCS) helps regulate various aspects of social behavior, including play, during childhood and adolescence. In the current experiment, we pharmacologically disrupted the eCS during early adolescence, and then assessed the short and long-term behavioral effects. 36 male Long Evans rats received daily injections between post-natal day (PND) 25-39 of either: 1) vehicle, 2) CP55,940 (a cannabinoid agonist), or 3) AM251 (a cannabinoid antagonist). In both middle adolescence (PND 40-44) and early adulthood (PND 66-70), subjects were assessed for general anxiety (using an elevated plus maze) and sociability (using

a 3-chambered sociability apparatus). We hypothesized that drug-treated subjects would express reduced sociability compared to controls. This would indicate that early disruption of the eCS has long-term, persistent neurobehavioral effects.

Project:

A MASKED FORM PRIMING MEGA-STUDY: THE ROLE OF LETTER IDENTITIES AND POSITIONS DURING READING

Jessica Cheng, 2019; Eden Shiferaw, 2018
Rebecca Johnson, Associate Professor, Department of Psychology

Masked form priming is an experimental paradigm in which prime stimuli (words or nonwords) are presented briefly, then masked by a series of #'s, and followed by a target stimulus. Letter position in preview words are manipulated through letter removal, transposition and addition. Participants then identify if the stimulus is a word or nonword, measured by reaction time. The results of masked form priming studies contribute to our understanding of how letter identities and positions are encoded and processed. Findings show that reaction time increased with increased spacing between transposed letters (ie. "ANCHOR"; "ANHCOR", "AOCHNR") and with additions and subtractions of letters. No significant differences wereo ourHt66-2 (t)-2 (e"A)-2-1 (2 (ons)-1 (a)B0

Project:

PYTHON SCRIPTING SUPPORT FOR INDOLE FLUORESCENCE ANALYSIS

Ryan Dohrn, 2020

Project:

COPPER RESISTANCE AS SURVIVAL STRATEGY OF BACTERIAL PATHOGENS

Emily O'Connor, 2019
Sylvia F. McDevitt, Associate Professor, Department of Biology

Research indicates that macrophages are utilizing heavy metals, such as copper and zinc ions, to kill pathogens they engulfed as part of our non-specific immune response. While copper is an essential trace element, at high concentrations copper can be toxic to all cells, including bacteria. Some strains of *Enterobacter cloacae* carry a 20-gen copper resistance gene cluster that can aid them to counteract the toxic effect of elevated metal concentrations. Here we tested if the presence of the 20-gene copper resistance cluster in *E. cloacae* ATCC13047 increases the bacteria's ability to survive short time exposure to high concentrations of copper as well as their survival in the presence of macrophages.

Project:

UNDERSTANDING COPPER RESISTANCE IN *ENTEROBACTER CLOACAE*

Shannon Cassel, 2019; Tzu-Yi Lin, 2019
Sylvia F. McDevitt, Associate Professor, Department of Biology

While copper is an essential trace element, at high concentrations copper can be toxic to all cells, including bacteria. *Enterobacter cloacae* ATCC13047 possesses two 20-gene copper resistance gene clusters, one of which is encoded on a plasmid (pECL_A). However, one of the genes involved in regulation is disrupted on pECL_A. After transfer of pECL_A into *Escherichia coli* we tested the transconjugants' ability to grow in the presence of elevated copper concentrations while at the same time worked on cloning an intact copy of the disrupted pcoRS to be utilized in the transconjugants. Initial results indicate that the transconjugants are as sensitive to the presence of copper as *E. coli* without the plasmid, whereas *E. cloacae* ATCC13047 is able to grow at higher copper concentrations in the medium.

Project:

RESIDENTAL HOMES FOR THE DYING: UNIQUE TRAINING IN END-OF-LIFE CARE

Bailey Hutchins, 2019
Kelly Melekis, Assistant Professor, Department Social Work

Communityrun residential homes for the dying offer a unique venue for obtaining interprofessional skillstraining to improve students' confidence and ability to provide endoflife care. This mixed-method pilot study examined the impact of placing undergraduates in direct caregiver roles in residential homes for the dying in upstate New York. Data revealed significant increases in empathy ($p < .05$) and perceived selfefficacy to provide palliative care ($p < .001$) after completion of the program. Qualitative data analysis of journal entries unveil that comfort care homes may be an ideal place to train students—across health care disciplines—about caregiving, self-reflection, communication, and teamwork. Students state that these developed skills can be utilized in health care fields and beyond.

Project:

FACTORS ASSOCIATED WITH LONELINESS AMONG RURAL OLDER ADULTS
Bailey Hutchins, 2019

Vibrational spectroscopy is used to investigate the reaction kinetics and quantum calculations aid in the analysis of chemisorbed hydrocarbons and surface-bound oxidized products. Quantum calculations suggest multiple oxidations of 1-hexene, leading to the formation of an alcohol via hydrogen subtraction, followed by carbonyl groups. Continued plasma treatment leads to product loss.

Project:

ATMOSPHERIC PROCESSING OF COMBUSTION PARTICLES: IRON MOBILITY AND NITRITE FORMATION FROM FLY ASH

Yao Xiao, 2019; Renee Karchere-Sun, 2020
Juan G. Navea, Assistant Professor, Department of Chemistry

Fly ash, a byproduct of coal-firing power plants, is an aerosol particle rich in iron oxides. Under atmospheric acidic conditions, it can leach iron, an essential nutrient for living organisms in the ocean. In this study, we compare the iron mobility from fly ash in hydrochloric acid and in nitric acid. In the presence of nitrates, we found that iron containing particles induce a surface-mediated redox reactions that reduces nitrates into nitrites. In this project, the yield and rate of aqueous iron leached and nitrite formed from US, Indian and European ashes has been investigated atmospherically relevant conditions during both daytime and nighttime.

Project:

MIND WANDERING AND TEST PERFOMANCE

Emily Popp, 2020
Daniel Peterson, Associate Professor, Department of Psychology

While performing an everyday task, humans often find their mind beginning to wander to another topic. Instead of thinking about the current task, we imagine future tasks we need to complete, analyze our state of being, and daydream. These types of task unrelated thoughts can be detrimental to performance on the current activity. Mind-wandering often occurs while individuals are reading or studying materials. While previous research has focused on how mind-wandering affects memory, only few experiments have investigated how to reduce levels of mind-wandering. The present research seeks to explore whether different methods of testing (cued recall, recognition, free recall) lead to differential rates of mind-wandering. We predict that mind-wandering will be highest for recognition tests, followed by cued-recall tests, and finally free recall tests.

Project:

MERCADOS INDIGENAS is an archive of oral histories that presents the agency of women as producers and sellers of food and art. We believe that food and art are cultural practices that reaffirm identity, and at the same time, provide the means for women to be players in the global economy. We hope that the texts, images, and interviews we have selected for this presentation will provide a new perspective on the invaluable role indigenous women play in Latin America.

Project:

STRUCTURAL AND FUNCTIONAL CHARACTERIZATION OF STARCH EXCESS4

Jordan Alvarez, 2020
Madushi Raththagala, Associate Professor, Department of Chemistry

Throughout the day starch is synthesized in chloroplast and is then used for cellular maintenance the subsequent night. The reversible phosphorylation of glucose moieties of starch (1 phosphate in 1500 glucose molecules) is essential to starch synthesis and degradation. Plant glucan phosphatase Starch Excess4 (SEX4) binds to starch granular surfaces at the interfaces of CBM (carbohydrate binding module) and DSP (dual specificity phosphatase), then proceeds to remove phosphate groups attached to the C6 and C3 glucose moieties. It is unclear how SEX4 identifies phosphate groups throughout the heterogeneous starch environment. Our goal is to demonstrate the ways SEX4 molecules recognize and dephosphorylate linear and branched chains of glucose. We have used structure guided mutagenesis followed by protein purification and biochemical assays to understand this process.

Project:

INSIGHTS INTO SUBSTRATE SPECIFICITY OF STARCH EXCESS4

Claudia Mak, 2020
Madushi Raththagala, Assistant Professor, Department of Chemistry

Glucan phosphatases are vital to the reversible phosphorylation process that occurs during starch degradation in plants. However, little is known about how glucan phosphatases navigate and

of SEX4 and LSF2, the primary mechanism of how glucan phosphatases bind carbohydrate chains and integrate them into the catalytic site. SEX4 preferentially dephosphrylates at the C6 position of glucose in starch where as LSF2 dephosphorylates at the C3 position. However, the kinetics and regulatory mechanisms of these glucan phosphatases have not been studied extensively. Therefore, the project aims to define the enzymology of SEX4 and LSF2. The results of generic phosphatase assay using pNPP as the substrate for SEX4 showed the enzyme to follow Michaelis-Menten Kinetics.

Project:

MONITORING PERFORMANCES OF STUDENT ATHLETES: ETHNOGRAPHY AND WEARABLE TECHNOLOGY

David Rivera, 2020
Bernardo Ramirez Rios, Assistant Professor, Department of Anthropology

This project examined athletic performance using a mixed-methods approach (Ethnography and Player Tracking Technology) by modeling the daily-lived experience of a student-athlete during over a three-week period. First, using ethnography as a methodology, a series of field-notes and interviews were conducted. This qualitative measurement was aggregated at the end of the project to produce cultural themes. Then, these themes were used to build bio-cultural bridges (correlations). Meaning, ethnography provided the daily-lived experience (cultural outcomes) of the model student-athlete that were used as a foundation for the data set. Second, a survey was created using Qualtrics to track daily habits (sleep, energy, nutrition) before gameplay. Finally,

Project:

VALIDATING RAMAN SPECTROSCOPY FOR THE DETECTION OF SURFACE MOLECULES ON SILVER NANOPARTICLES

Julia Danischewski, 2021
Maryuri Roca, Teaching Professor, Department of Chemistry

Recent studies have focused on the ability of silver nanoparticles to enhance the Raman spectra of molecular compounds, but not the signal of the molecules which inherently surround the particle. The signal of these compounds (PVP, ascorbic acid, and PVA), though weak, may be used to track changes in the molecules present at the particle surface. The validation of the Raman spectroscope using relevant standards was followed by SERS investigations of various stages of nanoparticle film production. Changes in the ratio of spectral peaks were observed, suggesting a connection between the ratio and particle size, concentration, and PVA content in films. By better understanding the surface properties of nanoparticles, a clearer picture of how particles interact with each other and other compounds may be generated.

Project:

TIMEOUT

Mary Brimmer, 2019
Rik Scarce, Professor, Department of Sociology

Timeout is a filmic space dedicated to uniting the voices of high school students so often overlooked by those claiming to know their experiences. It follows a group of students' experiences with the conflict resolution and community building technique known as "restorative justice," and finds those students eager to embrace a platform that both encourages them to share their concerns and to suggest how school climate can be improved in a time of great fear. The footage reveals the daily strains in young adults' lives and the emotional turmoil bubbling beneath the surface. In their own words, students call for greater attention to those who are most deeply affected by school change and its consequences.

Project:

EXPANDING THE GENETIC CODE WITH PYROGLUTAMATE

Jazmine Sepulveda, 2020
Kelly Sheppard, Associate Professor, Department of Chemistry

Formation of pyroglutamate in proteins is associated with diseases such as Alzheimer's. To better understand pyroglutamate's role in protein structure and function, an *E. coli* model system was developed to directly incorporate pyroglutamate into proteins. Key to this process is the use of a modified archaeal RNA-dependent glutamine biosynthetic pathway in which pyroglutamate is synthesized on an amber suppressor tRNA. Enhanced yellow fluorescent protein was used as a reporter system to determine levels of read-through, and therefore incorporation, of pyroglutamate in response to an amber codon. As yield was poor, we are developing a new pyroglutamate system using mesophilic enzymes. Success of this system will be confirmed by mass spectrometry.

Project:

OVERPRODUCTION OF *B. ANTHRACIS* PROTEINS FOR ASPARAGINE BIOSYNTHESIS

Sento Kai Kargbo, 2020
Kelly Sheppard, Associate Professor, Department of Chemistry

Proteins are essential for all of life and are polymers composed of amino acids. The amino acid asparagine can be synthesized in organisms in one of three ways. 1) Asparagine synthetase A (AsnA) using free ammonia to modify the amino acid aspartate into asparagine; 2) asparagine synthetase B (AsnB) transamidating aspa(i)-2 (n0 A)2 (s)-1 (m)-2 (s)-2n5AsnB) transamin0 Aas6 (ns

Project:

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

Jon Matthew Bilé, 2021
Kelly Sheppard, Associate Professor, Department of Chemistry

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

Project:

INVESTIGATING EXTERNAL ELECTRIC FIELD EFFECTS ON ORGANIC SEMICONDUCTORS

Farouq Yusuf, 2018
W. Ruchira Silva, Visiting Assistant Professor, Department of Chemistry

Project:

Project:

THE ROLE OF VARYING NEURON POPULATIONS IN sNPF-MEDIATED SLEEP BEHAVIOR IN *DROSOPHILA*

Jamie Stonemetz, 2019
Christopher Vecsey, Assistant Professor, Neuroscience Program

In *Drosophila*, a variety of neuropeptides play a role in controlling sleep and circadian rhythms,

Project:

ESSENTIALISM, ATTITUDES TOWARD TRANSGENDER INDIVIDUALS, AND SUPPORT FOR TRANSGENDER RIGHTS

Rebekah Clapham, 2019
Leigh Wilton, Assistant Professor, Department of Psychology

How do essentialist beliefs about transgender identities influence attitudes towards transgender people? Participants (N = 555) completed a novel scale consisting of three transgender essentialism domains: belief that transgender identity is biological and unchangeable (*immutability*), consistent across time and place (*universality*), and a separate social category (*discreteness*). Belief in transgender universality and immutability was associated with less transgender bias (e.g., disapproval of transgender people), less transgender stereotype endorsement (e.g., mentally ill), and more support for transgender rights (e.g., restroom access). Belief in transgender discreteness, however, had the opposite effects. Additionally, belief in lesbian-gay immutability was negatively correlated with attitudes towards transgender individuals. Attempts to reduce transgender bias

Project:

PRELIMINARY EXPLORATION OF A STORAGE MODEL FOR SOCIAL NETWORK DATA

John Litscher, 2020; Esteban Acosta, 2020
Christine F. Reilly, Assistant Professor, Department of Computer Science

This project explores the use of a generic model for the type of data that is commonly used by online social network services. The motivation for this project is to create public knowledge about how to store and query this type of data. We wrote computer programs to demonstrate that the data model can be implemented in two different storage systems. An existing benchmark program was adapted in order to test the two implementations. This is preliminary work for a larger project that focuses on the use of existing distributed storage systems for social network data.

Project:

PURIFICATION OF THE *BACILLUS SUBTILIS* TRANSAMIDOSOME COMPONENTS

Ashley Sisto, 2020 (Haverford College)
Kelly Sheppard, Associate Professor, Department of Chemistry

There are two distinct routes for attaching asparagine (Asn) to its cognate transfer RNA ($tRNA^{Asn}$), an essential step in protein synthesis, in the bacterium *Bacillus subtilis*. The one-step asparaginyl-tRNA synthetase directly attaches asparagine to its corresponding tRNA. In the indirect pathway, a non-discriminating aspartyl-tRNA synthetase (ND-AspRS) initially attaches aspartate to $tRNA^{Asn}$. This aspartate is modified to asparagine by the aminotransferase GatCAB. This two-step pathway synthesizes asparagine using the transamidosome: a complex between the ND-AspRS, $tRNA^{Asn}$, and GatCAB. I am working to purify the components of the transamidosome to characterize the *B. subtilis* indirect pathway to better understand its role in the life cycle of *B. subtilis*, an organism being considered as a probiotic treatment for intestinal disorders.

Project:

IDENTIFYING INTERACTING PARTNERS FOR SYNAPTIC CONNECTIVITY-REGULATING GENE *DIP-*

Terrence Gatton
Christopher Vecsey, Assistant Professor, Neuroscience Program

Motor neurons are thought to achieve selective muscle connectivity through specific extracellular

Project: