2018 CUPO Summer Journal

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Message from the CUPO Director

I am thrilled to start the 2018-19 academic year showcasing the Community of Underrepresented Professional Opportunities Scholars through our Journal Volume 7. This Journal showcases the abstracts of all our scholars who completed a research experience this past summer. Their passion, hard work and dedication is reflected here, as well as the strong guidance and support they get from their faculty mentors. The journal also highlights the great successes of our alumni. I would like to thank all the faculty, staff and administration that devote their time and energy to prepare our scholars for graduate programs and successful careers.

Here are some CUPO facts of 2017-2018
CUPO served 252 students
43% Female, 57% Male
100% STEM Majors
58 graduated
96.428% retention

31 Summer Research Scholars completed 10 weeks of faculty guided research
All presented their research at Clarkson’s RAPS Conference
All attended the UB McNair Conference
Attended weekly seminar speakers and graduate school prep workshops
Took 6 week GRE Prep course and took the GRE Exam

McNair Fast Facts.....since 1996
98.23% Graduation Rate
41.52% Completed Master’s
11.19% completed PhD

National Facts
9.3% of people over 25 have a master’s degree
2% of Americans have a PhD

Marjorie Warden
Director
Community of Underrepresented Professional Opportunities
CUPO Staff and Location

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The Community of Underrepresented Professional Opportunities
CUPO

The CUPO office is located in New Snell 235
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The Community of Underrepresented Professional Opportunities (CUPO)

The CUPO office is the shared home to the Collegiate Science and Technology Entry Program (CSTEP), the Ronald E. McNair Post-Baccalaureate Achievement Program (McNair), the Louis Stokes Alliances for Minority Participation Program (LSAMP), and the Academic Success Program to Improve Retention and Education (ASPIRE). The creation of this office brings together four long-standing federal and state Department of Education and National Science Foundation programs in one location, providing ease in access to services for students. The CUPO office provides academic enrichment, graduate school preparation, career and professional development, research opportunities, and social and cultural experiences for eligible students.

* **Academic Support:** academic advisement, private tutoring, academic success workshops, book grants, and laptop loans

* **Enriching Activities:** conferences, cultural and social activities

* **Career Development:** resume writing, professional skills workshops, guest speakers, industry visits, FE exam funding, job shadowing and internship/co-op guidance

* **Graduate School Preparedness:** faculty mentors, alumni speakers, research opportunities, conferences to present research, GRE prep, GRE exam support, graduate application assistance, funding to visit graduate schools and workshops
The Community of Underrepresented Professional Opportunities (CUPO)

**Academic Success Program to Improve Retention and Education (ASPIRE)**

Provides four-year scholarships to academically talented, financially needy underrepresented students in STEM majors.

Increases the number of students graduating, attending graduate school and/or obtaining employment in the STEM fields

**Eligibility:** Women and underrepresented minority students in STEM majors.

**Funding:** National Science Foundation (NSF) and Clarkson University

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**Collegiate Science and Technology Entry Program (CSTEP)**

Increases the number of historically underrepresented and economically disadvantaged students pursuing careers in STEM or licensed professions.

**Eligibility:** New York State resident. Underrepresented minority student who is in a STEM major or intends to enter a licensed profession.

**Funding:** NYS Department of Education and Clarkson University

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**Louis Stokes Alliances for Minority Participation Program (LSAMP)**

Increases the number of students completing STEM degrees, increases the number of students matriculating into graduate programs

**Eligibility:** African American, Hispanic, Native American, Pacific Islander; STEM major

**Funding:** National Science Foundation, the consortium comprises 7 institutions: Syracuse University (lead institution) and Clarkson University, Cornell University, Rensselaer Polytechnic Institute, Rochester Institute of Technology, and Monroe and Onondaga Community College

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**Ronald E. McNair Post-Baccalaureate Achievement Program (McNair)**

Increases the number of historically underrepresented and economically disadvantaged students entering graduate school and obtaining their PhD

**Eligibility:** Underrepresented minority students OR first-generation college students from a low-income background U.S. citizen or permanent U.S. resident, 2.8 GPA or higher sophomore or junior undergraduate.

**Funding:** A TRiO program funded by the U.S. Department of Education & Clarkson University
Andres Garcia Jimenez, a graduate of Egg Harbor Township High School, is a sophomore McNair Scholar double majoring in Physics and Aeronautical Engineering. Since freshman year, he has been conducting research under Asst. Prof. of Mechanical & Aeronautical Engineering Ioannis Mastorakos. The focus of the project is to strengthen metallic nanofoams through ligaments scale molecular dynamics. During the summer Andres, along with his research team, worked on this project and will be publishing a paper in molecular dynamics and finite element analysis of nanometallic foams. This project is a collaboration between Clarkson University and Purdue University aiming to improve the strength of nanofoams using nanometallic coatings in order to broaden their applications. He is also involved in a research project with Assoc. Prof. of Physics Michael Ramsdell (Research Coordinator for the CUPO/McNair summer research program) on enhancing vision and motion in virtual reality linking a rollercoaster motion platform with virtual reality. Andres was born in Colombia and moved to the United States five years ago where he learned to speak English. He studied abroad in France during high school and is currently planning to study abroad in Germany during the spring semester of 2019. He speaks three languages: English, French, and Spanish. He is planning to continue his education in Germany or the United States earning a Ph.D., in Aerospace Engineering and later on he will continue to do research on aerospace materials and structures, specifically, nanosatellites, satellites, and orbiters. Andres has also been awarded the Barry M. Goldwater Scholarship.

*The Barry M. Goldwater Scholarship and Excellence in Education Foundation is a federally endowed agency established in 1986. The scholarship program honoring Senator Barry M. Goldwater was designed to foster and encourage outstanding students to pursue careers in the fields of mathematics, the natural sciences, and engineering.
Student Highlight
Emmalyn Dupree

**Emmalyn Dupree**, a Clarkson University chemistry doctoral student and former McNair Scholar (2014 and 2015) from Massena, N.Y., will travel to Plainsboro, N.J. in November to accept the EAS Graduate Student Research Award and present her research at the Eastern Analytical Symposium.

Emmalyn is currently performing proteomic studies to identify the effect of legacy chemicals on the Great Lakes ecosystem, specifically contaminants like polychlorinated biphenyls (PCBs) and organochlorine pesticides.

PCBs and organochlorine pesticides are ubiquitous persistent, bioaccumulative and toxic chemicals (PBTs) that have been targeted by the Great Lakes Water Quality Initiative and environmental monitoring programs for decades. Although the manufacturing of these chemicals has been banned by Congress, release and exposure – specifically through consumption of fish exposed to runoff pollution – is still possible. This is very problematic due to the copious adverse health effects of these chemicals, including cancers.

Emmalyn’s work includes developing a unique protein database for the top-predator lake trout species that can be used in future Great Lakes studies. Emmalyn also utilizes human sera samples and proteomic methods to research the effects of legacy chemicals in the ecosystem on the human proteome.

She hopes that this research will contribute to society by identifying how contaminants that accumulate in the Great Lakes are negatively affecting fish and human consumers.

Emmalyn continues to work in her former McNair Mentor’s lab, Associate Professor of Chemistry & Biomolecular Science Costel C. Darie's Biochemistry and Proteomics Lab.
# Research Mentors and Research Scholars

## Summer 2018

### McNair Scholars
- Abby Avolio
- Meaghan Barker
- T.J. Beaumier
- Samantha Corcoran
- Sara Cote
- Andres Garcia-Jimenez
- Thomas Gitlin
- Aurora Goodwin
- Katey Hunt
- Kayla Jurchak
- Ying Liang
- Mariama Njie
- Marharyta Pliazhuk
- Md Rob
- Samantha Salim
- Hayden Woodworth
- Rachel Yerden

### CSTEP Scholars
- Te-Ree Parrish
- Marissa Alamo
- Rabbi-Pierre Djomnag-Pedie
- Steven Hopkins
- Jaquan Vidot
- Sidrat Rahman

### LSAMP Scholars
- Tyannah Anderson
- Chelsea Alamo
- Royce Nsiah
- Jeremy Macks
- Elena Sanchez

### ASPIRE Scholars
- Sasha Gallimore-Repole
- Sage Donovan
- Cassandra Orr

### Major
- Biology/PT
- Psychology
- Aeronautical
- Civil Engineering
- Bio-Pre Veterinary
- Aeronautical
- Eng & Management
- Bio-Pre Med
- Biology
- Psychology
- Civil Engineering
- Chemistry
- Computer Sci/Math
- Computer Engineering
- Chem/BioMolc
- Physics/Math
- Chemical Eng/Bio

### Major
- Biology
- Chemical Engineering
- Mechanical Engineering
- Engineering
- Psychology
- Integrative Neuroscience

### Major
- Computer Science
- Chemical Engineering
- Biology
- Mechanical Engineering
- Mechanical Engineering

### Major
- Environmental Engineering
- Chemical Engineering
- Chemical Engineering

### Faculty Mentor
- Ali Boolani
- Jennifer Boolani
- Daqing Hou
- Ian Knack
- Andrew David
- Ioannis Mastorakos
- Eric Backus
- Ali Boolani
- Damien Samways
- University of Buffalo
- Tyler Smith
- Jenna Matthews
- Marcias Martinez
- Ajay Sonar
- Artem Melman
- Jan Scrimgeour
- Harvard University

### Mentor
- Ali Boolani
- Silvana Andrescu
- Brian Helenbrook
- Luke Rumbaugh
- University of Albany
- Shantanu Sur

### Mentor
- Daqing Hou
- Silvana Andrescu
- Ali Boolani
- Marcias Martinez
- Kevin Fite

### Mentor
- Shane Rodgers
- Sitaraman Krishnan
- Kenneth Wallace
Abstract:
The purpose of the study was to examine the relationship between sleep quality, quantity, and gait. Subjects (N=21) (mean age=22.29±2.80) completed a series of surveys reporting prior 24-hour activity, including their prior night’s sleep. Subjects then completed a series of cognitive tasks, postural control test and a 2-minute walk around a 6m track while temporo-spatial gait parameters were collected using the Optogait. Another series of surveys to report their usual moods, diet, stress, physical activity, and sleep quality using the Pittsburgh Sleep Quality Index (PSQI) were completed. The interaction between global PSQI, prior night’s sleep and gait parameter were examined.
Forming Impressions from Mock Social Media Profiles: Influence of Profile Content and Individual Difference Variables

Abstract:

People leave traces of their mental health status on social media. We examined whether (1) college students make inferences about an interaction partner based on profile content (i.e., positive, mild depression, high depression) and (2) participants’ own depression, loneliness, and empathy levels influence these inferences. Participants (N = 560) completed online measures of individual differences. Later, participants (N = 144) were randomly assigned to a profile condition. We found participants made different inferences depending on profile content. In addition, participants’ depression level influenced these inferences. Our findings indicate profile content and people’s own depression level influence the inferences people form.
The applications of social engineering on cyber-security and password strength

Abstract:

The field of cyber-security is faced with numerous problems, but none more pressing than the effects of social engineering on the users of a system. In what ways humans can be influenced to create vulnerabilities, how social engineering can be used to learn about the user and bypass their passwords, and how we can help users help themselves from social engineering are the questions of the hour. Are our passwords really secure, and in what ways can passwords be improved to better protect our information and our accounts. Hacks can come from a variety of sources with various methods design each for breaking different types of security, so helping users protect themselves is key. What about our lives is safe, where could we improve, and what does the future hold.
Surveying aquatic biodiversity within the Adirondacks using mitochondrial DNA barcoding: Part I

Abstract:

DNA barcoding is a molecular taxonomic method of identifying different taxa and evolutionary units by comparing nucleotide differences in conservative genes. This method is fairly new in the use of identifying animals by their genes rather than morphologically. In this study we extracted genomic DNA and amplified the COI gene from samples collected in 6 moving lakes and rivers within the Adirondacks. This study represents the first phase of a broader project to barcode the aquatic biodiversity of the Adirondacks, and it focuses specifically on the Mollusca phylum. Of particular interest is a Viviparus viviparus barcode which was previously known to have a strictly Europe distribution, but is morphologically identical to the invasive snail Viviparus georgianus, in the Adirondacks. Three other species known to the Adirondacks were identified; Lampsilis, Physa gyrina and Gyraulus. All the samples were analyzed using the BLAST tool on GenBank, phylogenetic reconstruction and estimation of p-distances which are all based on nucleotide differences among the different species.
Developing LiDAR Systems for Measuring Bed Profiles in Waters With Suspended Sediment

Abstract:

Traditional methods for measuring bed profiles, experimentally, require compromise between speed and accuracy. High accuracy requires time consuming point measurements. Real time measurements reduce vertical accuracy or spatial resolution. Suspended sediment makes the process difficult and reduces accuracy of traditional methods. This study used a prototype LiDAR system developed to take measurements of bed profiles from above the water surface through moving sediment. The system has subcentimeter resolution in stagnant water. Tests were run with different sediment concentrations to determine accuracy of the system under varying conditions. The prototype shows promise for real time bed profile measurement through suspended sediment.
Strengthening Metallic Nanofoams Through Ligaments Scale Materials Design

Abstract:

Pure metal nanofoams in the form of an interconnected network have shown strong potential over the last few years in areas such as catalysts, batteries and optics. However, they are often brittle and therefore difficult to integrate in engineering applications. In order to mechanically strengthen metal nanofoams, a new class of materials consisting of composite nanofoams made of core-shell ligaments is studied in this work. These new materials will operate at the macroscale but at the same time they will maintain an atomistic ordering that is engineered (rather than relying on self-forming methods such as dealloying), requiring a multiscale approach to study their properties. For that purpose, we combined molecular dynamics (MD) and finite elements to study the mechanical behavior of composite metallic nanofoams made of copper and nickel, and compared them to their pure metal counterparts. The tests performed were done using atomistic MD simulations run through ATOMSK, LAMMPS, and OVITO, as well as finite elements analysis using MOOSE Framework. The information obtained from the molecular dynamics simulations in the form of yield functions was then transferred to the finite elements to study the macroscopic behavior of the composite nanofoams, and later compared these results to the experimental data.

Andres Garcia-Jimenez
Ioannis Mastorakos Ph.D., Mentor
Mechanical & Aeronautical Engineering
Andres moved from Colombia to the U.S. in 2012, he currently resides in New Jersey. Andres is majoring in both Physics and Aeronautical Engineering. Andres is an active member in Engineers for International Sustainability, Engineers Without Borders, Society of Hispanic Professional Engineers (SHPE), and is the secretary of the Chess Club. Andres aspires to earn a PhD in Aerospace Engineering. Andres was funded through CUPO, McNair.
Abstract:

This summer, I have been conducting preliminary research for a LEED for Communities project taking place in Lake Placid, NY. The primary goal of this preliminary research is to compare the LEED for Communities framework with other Smart and Sustainable frameworks and performance evaluation and rating systems. These frameworks come in many different forms with different methods of evaluation, but when adopted by multiple cities or communities these frameworks create a network that inspires healthy competition between these cities and communities to better themselves in areas of economy, infrastructure, social equity, and sustainability. This presentation will be covering 3 of these different frameworks and/or rating systems and will discuss what each of them have in common as well as what makes each system unique.
The Relationship between Sleep Quality and Quantity and Postural Control

Abstract:

The purpose of this study is to examine the relationship between sleep quality and quantity and postural control. Subjects (N=20, Female=48%) completed a series of surveys reporting prior 24-hour activity, including their prior night’s sleep. Subjects then completed a series of cognitive tasks and performed the modified Clinical Test of Sensory Interaction in Balance (mCTSIB) while wearing APDM monitors. A 2-minute walk and another series of surveys to report their usual moods, diet, stress, physical activity, and sleep quality using the Pittsburg Sleep Quality Index (PSQI) were completed. The interaction between global PSQI, prior night’s sleep and mCTSIB scores were examined.
The cytotoxic effects of Ivermectin on cervical cancer cells

Abstract:
The American Cancer Society estimated 4,170 women will die from cervical cancer in the U.S. in 2018. Recent work screening FDA-approved drugs for anticancer effects suggested Ivermectin had anticancer efficacy; the concentrations used were too high to be clinically relevant and above the concentration this hydrophobic drug precipitates out of aqueous solution. Our research tests the hypothesis that Ivermectin, an anthelminthic used to treat river blindness by activating voltage-gated Cl- channels, has limited toxicity in treating cancer, mostly caused by precipitate damaging the plasma membrane. Calcium oscillations occur when cells are stressed via voltage-gated Ca2+ channels, ER channels, or Ca2+ ATPase pumps. It was proposed that Ivermectin’s cytotoxic effects occur through a P2X channel pathway. Our cervical cancer cell lines (CXT2) do not express P2X channels, a family of plasma membrane receptors involved in purinergic signaling. Ca2+ imaging was used to detect Ca2+ oscillations in CXT2 cells when exposed to various concentrations of Ivermectin, P2X7 channel inhibitors, and adenosine triphosphate (ATP). The P2X7 channel inhibitors did not block the Ca2+ responses. Our preliminary results indicate the concentrations of Ivermectin used did not form precipitate and had cytotoxic effects. Further studies may be to quantify Ivermectin’s cytotoxicity mechanisms in cancer cells.
Trauma Informed Care for the Childbearing Year: 
Breaking Intergenerational Cycles of Trauma

Abstract:
Post-Traumatic Stress Disorder (PTSD) affects 8% of pregnant mothers. African American women report higher levels of trauma exposure, and higher risk of PTSD. PTSD during pregnancy is associated with negative outcomes including risk behaviors, physical complications, lower birth weights and adverse developmental child outcomes. However, neonatal outcomes can be improved by psychoeducation interventions. The Survivor Mom’s Companion is a comprehensive intervention designed to aid pregnant trauma survivors and break intergenerational patterns of child maltreatment. Women who participated in the intervention reported better labor experiences, postpartum mental health and bonding. Work to extend the intervention to the postpartum epoch is underway.

Kayla Jurchak
Michelle Sperlich Ph.D.,
University of Buffalo

Kayla is from Chadds Ford PA. She will graduate spring, 2019 with a degree in Psychology. Kayla plans to attended graduate school and one day develop counseling techniques that include nature and coping. This was Kayla’s second year as a CUPO, McNair Scholar. McNair provided her an opportunity to conduct research off campus at the University of Buffalo.
Understanding the parameter sensitivities of simple snowmelt-runoff models

Abstract:

Given that hydrologic models are used extensively in water resources planning and management, the validity of hydrologic models is imperative. While extensive focus has been paid to improve hydrologic models, significant challenges remain. In this study, we explore the sensitivity / variability of parameterizations from simple, coupled snowmelt-runoff models for two alternative model calibration scenarios. Results are considered at 30 snow-dominated catchments located across the western United States. Our analysis highlights the sensitivity of the model parameterizations, underscores the idea of information content in hydrologic modeling, and provides insight into potential strategies for improving model robustness / fidelity.
Comparing Probabilistic Genotyping (PG) Software For Accuracy and Bias

Mariama Njie
Jeanna Matthews Ph.D.,
Mentor
Computer Engineering

Mariama is from Bronx, NY. She will graduate in 2020 from IONA College with degrees in Chemistry and Computer Engineering. Mariama plans to attend graduate school and earn an MD/Ph.D., and conduct research on cardiovascular disease. Mariama is the President of the IONA Golden Key Honor Society. Mariama was funded through the CUPO, McNair program.

Abstract:
A variety of PG software applications are used around the world to compute the likelihood that a suspect’s DNA is present in an evidence sample. Courts in the US are frequently allowing software vendors to claim trade secret protection to avoid third party review of their systems internals, jeopardizing defendant's rights to understand and confront the evidence against them. We are analyzing and comparing different PG systems such as EuroForMix, LRMix and FST, to see the degree to which their results differ. The vital questions we want to answer is whether PG software are accurate and unbiased.
In-situ monitoring of strain formation in vertical similar welds

Abstract:

Today virtually all metal structures are manufactured using welding techniques in one way or another. Welding process is complex in nature and involves extreme heat levels, which cause the formation of unevenly distributed internal residual stresses in finished structures near the weld joint which affect their strength and reliability. This study focuses on the physical understanding of transient and residual strain formation in vertical similar welds through the use of experimental mechanic techniques. A 300 by 300 by 6.35 mm A36 steel plate was machined with a V-Groove. Two Digital Image Correlation cameras in combination with FLIR ONE Pro thermal camera were placed at the back of the plate, while on the same face of the weldment, a fiber optic distributed strain sensor was used to capture strain formation. The results demonstrate a complex behavior of both tensile and compressive regions leading to transversal and longitudinal strains. The exchange of a filler rod even in a short 300 mm weld generates compressive transversal strains in front of the weld pool. In addition, the study demonstrates how the strain formation changes significantly from the bottom to the top of the vertically welded plate.
Badminton Robot

Abstract:
The objective of this project is to design and built a badminton robot that can play with a human player. The previous phase was to hit the shuttlecock with a racquet in a static position. The goal of current phase is to detect and track a badminton shuttlecock. The system will detect the shuttlecock through stereo camera. A omni wheel base bot will move on the court to track the incoming shuttlecock. Based on the known relative position of the stereo camera and racquet head, the based bot will position itself so the racquet can hit the shuttlecock.

Md. Abdur Rob
Ajay Sonar Ph.D., Mentor
Electrical and Computer Engineering

Md Abdur Rob is from Bangladesh, he moved to Bronx, NY. Md is majoring in Computer Engineering and will graduate in December, 2018. Md participates in the Society of Asian Scientist and Engineers (SASE). Md is passionate about badminton, he started the badminton club at CU. He also enjoys playing cricket and soccer. Md plans to be a professional programmer in the future and is interested in quantum computing and next generation technologies. Md was funded through CUPO, McNair
Abstract:

The kinetic parameter KmO2 for Ferritin is important for the understanding of the influence of oxygen concentration on the rate of oxidation of Fe2+ cations by ferritin; the critical step in cellular iron metabolism. The kinetics of oxidation of Fe2+ of ferritin was studied under oxygen-deficient conditions and large excess of Fe2+ cations by UV-Vis spectroscopy using absorption of the resultant Fe3+ hydroxide at 305 nm. A kinetics simulation program is being used to analyze data. The reaction was found to obey Michaelis-Menten kinetics. Reaction rates do not significantly change until concentration of oxygen is below 5 uM and rapidly decrease afterward. Noise was an issue in analyzing experiments. The calculated KmO2 appears to be much lower than reported data in the range 0.7-2.2 uM, much lower than previously reported numbers. The results suggest that the rate of Fe2+ oxidation by ferritin in cells should not decrease even under severe hypoxic conditions.
High Speed 3D Single Particle Tracking using Line Scan Imaging

Abstract:

Single particle tracking enables the direct visualization of many important physical processes. However, its effectiveness is often limited by current hardware. To increase the max temporal resolution of tracking a particle for example, a better, typically more expensive camera would be needed. Our aim to accomplish is to improve the temporal resolution of particle tracking in a relatively cost-effective manner. We intend to apply this to fast applications, such as tracking particles lifting off a surface in a wind tunnel. To achieve this, we are implementing 3-dimensional single particle tracking using the unconventional long and thin images taken by a line scan camera. Line scan cameras can image incredibly fast and are relatively cost effective when compared to a full frame camera that can image at the same speed. The particle tracking methodology uses 2-dimensional cross correlations to match each line scan image to a series of known template images. From this we can calculate where the particle is in all 3 dimensions. We present preliminary data from the implementation of this algorithm.

Hayden Woodworth
Jan Scrimgeour Ph.D.,
Mentor, Physics

Hayden is from Webster, NY. He will graduate in the spring of 2021, with a dual major in Physics and Math. Hayden is involved in Orchestra, the Gaming Club, and the Outing Club. He also enjoys playing Magic The Gathering on the weekends with friends. Hayden plans to attend graduate school and earn a Ph.D., in Physics. His interest is in the areas of Optics, Quantum Physics, and Particle, High Energy Physics. After earning his PhD, Hayden aspires to work as a researcher at a national lab. Hayden was funded through CUPO, McNair
Cloning and Genotyping Techniques and their Application

Research Topic:
Understanding the trajectories of coronal neurons through genotyping and cloning

Objectives and Hypothesis
Our objective is to use cloning and genotyping to manipulate reporter genes in order to identify and understand several subpopulations of coronal neurons. We hypothesize that Emx1 is an identifying gene of the fourth layer of the cortex and we can identify them through the use of TdTomato and loxp and cre techniques.

Techniques and Investigative Procedures
To accomplish the above objectives, a variety of procedures must be utilized. Primarily, molecular cloning shall be used. This will require the understanding of restriction enzymes, ligation, and transformation. Moreover, electroporation will need to be understood to insert the created plasmids into the mouse embryo. To electroporate, surgery of the mother mouse must also be performed. Once the pups are grown, genotyping must be performed to determine if the electroporation worked properly. Additionally, perfusion will be used to remove the blood of the adult mouse so that it may be dissected, the brain will be removed, and cryogenically frozen for sectioning. The techniques necessary for these steps are cryostatic sectioning, dissection, and freezing.

Rachel Yerden
Jeff Macklis Ph.D., Mentor
Harvard University

Rachel is from Redfield, NY. She is a Biology and Chemical Eng. Major. Rachel will graduate spring, 2019. Rachel is in the Honors Program, Phalanx recipient, on The Rugby team, in TriBeta, Doctors Without Borders, and Tau Beta Pi. Rachel plans to earn a MD/Ph.D in the field of Neuroscience. This is Rachel’s 3rd summer as a CUPO Scholar. She has been funded through, ASPIRE and McNair.
Abstract:

The purpose of this study was to determine the relationship between state (current and past 30-days) anxiety and gait. Subjects completed a series of surveys reporting prior 24-hour activity and current moods using the Profile of Mood Survey (POMS). Subjects then completed a series of cognitive tasks, a postural control test, a 2-minute walk where temporospatial gait data was collected using the Optogait. After a series of surveys to report their usual sleep, diet, stress, physical activity, and past 30-day mood using the POMS were completed. The interaction between current and past 30-days anxiety scores and gait parameters were examined.
Nanoparticle-Based Colorimetric Paper Bioassay for the Detection of Lactic Acid

Abstract:

The determination of lactic acid concentration has played a significant role in the medical field, in clinical diagnosis and athletic performance evaluation. Recently, serum lactate was found as new diagnosis criteria for sepsis shock. Sepsis is a life-threatening condition in the U.S, where an estimate of 28-50% of diagnosed patients die, and the Agency for Healthcare Research and Quality consider sepsis as the most expensive condition treated in U.S. hospitals. Moreover, colorimetric paper-based biosensors as a user friendly platform have become popular due to their low cost, high selectivity, high reproducibility, and the potential of analyte detection with naked eyes. However; the reported colorimetric assays for lactic acid requires the use of multiple reagents and enzymes to produce the color response. In this research, we propose utilizing tunable redox nanoparticles as a color generator. The biosensor will be fabricated with immobilization of lactate oxidase enzyme on the top of the nanoparticles modified paper, and upon exposure to lactic acid, a concentration dependent color will be developed.

Marissa Alamo
Silvana Andreescu Ph.D.,
Mentor, Chemical Eng.

Marissa is from Long Island, NY. She will graduate fall, 2018 with a degree in Chemical Engineering. Marissa is active in the Network of Women (NOW) and the Society of Hispanic Professional Engineers (SHPE). Marissa plans to attend graduate school to earn a Masters or PhD in Chemical Engineering or Material Science. Marissa aspires to work in the field of cosmetics, consumer products or the food and beverage industry. Marissa hopes to inspire women and Hispanics alike to pursue education in the STEM fields throughout her career. Marissa was funded through CUPO, CSTEP.
Abstract:
The purpose of this research is primarily understanding the relationship between friction created by the steels of a luge sled and the steering of the luge in order to come up with a physics-based mathematical model of luge steering. The current model treats the sled as a point mass. This model is extended to calculate the moments, angular acceleration, and the contact points between the sled and ice. This new model will provide more insight into how a luge sled is steered and how the shape of the sled’s steel edges affects steering.
Designing and Creating a Prototype ROV Submersible

Abstract:
As part of a summer research experience internship held at Clarkson University, an objective was formed to design and create a remotely operated underwater vehicle prototype to be developed upon, and made autonomous. As Clarkson does not yet have a fully established submersible robotics team, this project was designed to produce a developmental foundation for potential robotic submersible ambitions. The eventual goal for this prototype is to provide a basis for future Clarkson students who intend to submit an autonomous underwater vehicle into the annual RoboSub competition held in San Diego, California. The RoboSub competition has contending teams from varying academic institutions compete to test the abilities, adaptability, and autonomy of their vehicle with the intention to advance the development, and therefore the practicality of autonomous submersibles for realistic missions. The prototype craft was made from plastics such as polycarbonate as well as marine grade high density polyethylene for its structural features as well as workability to be crafted into the necessary parts through the utilization of a CNC mill.
Abstract:

Corticotropin releasing factor (CRF) is very much involved in stress response and has been established as such. Hypothalamic – pituitary – adrenal (HPA) axis has been the focus of research, specifically, the brain regions that control the hypothalamic – pituitary – adrenal (HPA) axis. Nevertheless, research has yet to be orchestrated on the corticotropin releasing factor (CRF) receptor 1 (CRFR1) located in the paraventricular hypothalamus which is associated with stress functions. This investigation focused on the sex difference of corticotropin releasing factor receptor 1 (CRFR1) in the paraventricular hypothalamus.
Profiling Morphodynamic Changes Within Hypoxic Cells

Abstract:

Hypoxic damage is a prevalent health issue in a variety of conditions such as strokes, heart attacks, and diabetes. Here we explore the connection between changes in cell morphology and motility after induction of hypoxia. Alongside its effects, we are investigating the effect of several known pharmacological inhibitors of kinase and GTPase activity on the hypoxic cell response. By profiling these changes after treatments, we hope to elucidate some of the molecular events regarding the initial hypoxic response. This analysis may lead to increasing the inferential power of simple continuous live imaging data to narrow down possible molecular responses.
Security Questions

Abstract:
How can we stop hackers from getting into your accounts? This led me to question the implementation of security questions and other account recovery options, as this is one of the many ways users can gain access into their accounts if they have forgotten their username or password. What makes a good or poor security question? Can I compile data on several types of security questions and their uses and be able to educate people on what information to share with others, especially online.

Tyannah Anderson
Daqing Hou Ph.D., Mentor
Computer Engineering

Tyannah is from Brooklyn, NY, she will graduate in 2020 with a degree in Computer Science. Tyannah is involved with Girls Who Could Code Club. Tyannah plans to enter the workforce after she graduates. She aspires to work with the state or the government in the cyber security field. Tyannah would later like to earn a Masters Degree. Tyannah wants to give back to low income communities, she plans to visit schools and educate children on the STEM fields, and computer coding. Tyannah was funded through CUPO, LSAMP.
Electrochemical Nanostructure-based Biosensor for Ethanol Detection in Food and Beverage Applications

Abstract:

Alcohol detection has played a crucial role in law enforcement and in other industries such as food, beverage, and fermentation. Ethanol is one of the main products in these processes. Quantitative analysis of ethanol is required to attain high quality of these products. Numerous samples that require testing can create a need for more cost-effective and portable devices for ethanol detection. This research focused on the design and development of a nanostructure-based biosensor for rapid and sensitive detection of ethanol. To fabricate the biosensor, screen-printed electrodes (SPEs) were modified with conductive nanoparticles (NPs) and polymers to increase surface area and immobilized an ethanol-sensitive enzyme via a layer by layer (LbL) assembly. The biosensor was characterized using electrochemical techniques such as cyclic voltammetry and amperometry. The immobilization procedure and materials used were optimized to stabilize the enzyme within the nanostructured layer and obtain detection limits that are relevant for practical applications. Results show that the sensor can determine ethanol levels present in common alcohol-containing food products. The sensors allow detection of much lower limits such as in biological samples for human sweat and breath analysis. This method provides a cost-effective, sensitive, selective, easy to use, and portable device for ethanol detection.
The Relationship Between Sleep Quality, Quantity, and Gait

Abstract:

The purpose of this study was to determine the relationship between state (current and past 30-days) depression and gait. Subjects completed a series of surveys reporting prior 24-hour activity and current moods using the Profile of Mood Survey (POMS). Subjects then completed a series of cognitive tasks, a postural control test, a 2-minute walk where temporospatial gait data was collected using the Optogait. After a series of surveys to report their usual sleep, diet, stress, physical activity, and past 30-day mood using the POMS were completed. The interaction between current and past 30-days depression scores and gait parameters were examined.
Upgrading Dynatup 8250 Drop Weight Impact Tester to study impacts

Abstract:
This study focuses on upgrading a Dynatup 8250 Drop Weight Impact Tester in order to measure displacement, force and velocity of impact. The Impact tower will be modified to be compatible with a three-dimensional Digital Image Correlation system (DIC) which will provide full field view of the impact zone. All the measurements are to be performed with respect to time. The gathered data is further used to determine kinetic and impact energy. In addition, the use of this system will be able to observe impacts on composite materials and to determine the correlation between quasi-static indentation and Impacts.

Jeremy Macks
Marcias Martinez Ph.D.,
Mentor
Computer Science

Jeremy is from Rochester, NY. He is majoring in Mechanical Engineering and will graduate in 2020. Jeremy transferred to CU from Monroe Community College where he participated in the Collegiate Science and Technology Entry Program (CSTEP). Jeremy plans to attend graduate school and earn a Master’s degree in Mechanical Engineering. Jeremy plans to work in industry at an environmentally friendly company. He was funded through CUPO, LSAMP.
Development of a Finger Prosthesis for Pediatric Amputees

Abstract:
Pediatric amputees often have difficulty finding a functional prosthesis at an affordable price. 3D printed prostheses are an ideal solution to this problem as the materials for printing are affordable but also robust enough to handle the daily activities of an active child. Additionally, they can be easily scaled to accommodate the growth of the child without becoming a financial burden on the family. A prosthesis is currently being developed for a pediatric amputee with amputations of the thumb and the fourth and fifth phalanges. Prototypes for two different finger designs were developed to ensure a multifaceted approach exploring the pros and cons of material properties versus mechanical solutions. The finger prototypes are cable-driven prostheses that leverage existing hand functions to actuate the fingers. Silicone molding and flexible material have shown potential to increase the comfort of the device for extended daily use. Further research efforts will explore multi-material solutions that can provide enhanced performance and reduced sensitivity to fatigue failure.
Abstract:

Anaerobic digestion (AD) is a viable technology for energy recovery and stabilization of food waste, manure, and sewage treatment sludge. Most installations of manure digesters are on large dairy farms where sufficient manure resources exist for combined heat and power systems to produce sufficient energy to create an attractive payback period. This study reports on expansion of a previously developed AD system for small dairy operations. Biogas production is supplemented by food waste co-digestion, facilitated by addition of a grinder. We will also report on the addition of a solids separator to recover digested solids for other farm uses.
Design of amphiphilic polyurethane coatings for marine biofouling prevention

Abstract:

Marine biofouling is the undesired accumulation of organisms on immersed surfaces. We synthesized amphiphilic polyurethane copolymers consisting of hydrophobic polydimethylsiloxane blocks and hydrophilic polyethylene glycol blocks. The isocyanate terminated linear chains are crosslinked using multifunctional crosslinkers such as pentaerythritol. The curing kinetics is studied and the resulting copolymers are characterized using FTIR spectroscopy, differential scanning calorimetry, rheometry, and water contact angle measurements. It is expected that a coating with optimal composition (mole fractions of polydimethylsiloxane and polyethylene glycol), crosslink density, surface wettability, and mechanical properties will be both antifouling and fouling-release (non-stick).
Characterization of Notch Receptors Involved in Secretory/Enterocyte Choice

Abstract:

The zebrafish intestinal epithelium is comprised of a number of unique cell types that develop utilizing multiple signaling pathways. Epithelial cells use Notch signaling to make the binary choice between enterocyte or secretory cells. Here we will begin to identify which of the four zebrafish Notch receptors are involved in this choice using available receptor mutants. Within fields of epithelial cells with secretory potential, loss of the Notch receptor will result in increased secretory cell numbers. Therefore, only loss of the involved Notch receptor will result in increased secretory cells. Single receptors may be involved or combinations may function redundantly in this process.
## Ph.D. Recipients

<table>
<thead>
<tr>
<th>Scholar Name</th>
<th>UG University &amp; Year of Graduation</th>
<th>Graduate School &amp; Year of Graduation</th>
<th>Field of Study</th>
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<tbody>
<tr>
<td>Derek Lucey</td>
<td>SUNY Potsdam 98’</td>
<td>U of Buffalo 02’</td>
<td>Inorganic Chemistry</td>
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<td>MT Sinai Med 04’</td>
<td>Medicine</td>
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