SROP

MICHIGAN STATE UNIVERSITY

Summer Research Opportunities Program
2020 Closing Activity Program Book

Table of Contents

Greetings Friends and Colleagues,

It is with great pleasure that I invite you to the Closing Activities of the 2020 MSU SROP program. We ask that the faculty, graduate students, post-docs, administrators, and fellow interns that helped to make this a memorable experience join us as we recognize the hard work of each intern. Over twenty undergraduate students from schools across the United States including Puerto Rico & U.S. Virgin Islands will showcase their research findings.

These outstanding undergraduates have participated in a 4-week intensive research training under the supervision of a Michigan State University mentor. Project topics ranged from the life sciences, social sciences, education, humanities, physical sciences, and engineering. Interns also participated in workshops that prepare them for successfully applying to graduate school. Oral presentations will be held in Zoom on Wednesday July 29 and Thursday July 30.

We look forward to seeing you!

Best Wishes,

Steven D. Thomas
MSU SROP Program Director
The Graduate School
Michigan State University

WELCOME TO SROP AT MICHIGAN STATE UNIVERSITY

The Summer Research Opportunities Program (SROP) at MSU is a gateway to graduate education at Michigan State University. The goal of the program is to increase the number of domestic under-represented students who wish to pursue graduate study. The program helps to prepare undergraduate students for graduate study through intensive research experiences with faculty mentors and professional development activities that give students a competitive advantage.

INTRODUCTION TO MSU SROP

Graduate Opportunities through Graduate Planning, Research, Academic Resources and Development (GO GRAD)

GO GRAD is the program model for the MSU Summer Research Opportunities Program (SROP). MSU SROP gives undergraduate students a sense of the overall tools they will need for a successful graduate career. MSU SROP provides undergraduate students with a "graduate student experience". MSU SROP participants have an opportunity to use MSU resources to develop their graduate and career plans. MSU SROP provides four thematic areas of professional training for summer interns: Graduate Planning, Research, Academic Resources, and Development.

SCHEDULE OF EVENTS

Oral presentations will be held on Zoom Wednesday, July 29 from 3:00 PM – 5:00 PM and Thursday, July 30 from 3:00 PM – 5:00 PM.

Room	Zoom Link
Room 1	https://bit.ly/SROPFinalSession1, Meeting ID: 99595080524
Room 2	https://bit.ly/SROP20FinalSession2, Meeting ID: 93218608912
Room 3	https://bit.ly/SROP20FinalSession3, Meeting ID: 937 2295 9732
Room 4	https://bit.ly/SROP20FinalSession4, Meeting ID: 94450081833

Student presentations will be for 7 minutes with 6 minutes of questions. Interns will be scheduled in 15 minute blocks of time to allow for transition time between presenters.

2020 MSU SROP-Final Oral Presentation Schedule
Wednesday-Thursday July 29-30, 2020 on Zoom

Wednesday Schedule 3:00 PM – 5:00 PM

	Room 1	Room 2
3:00-3:15 PM	Crystal Gomez	Ubongabasi Ekanem
3:15-3:30 PM	Todd Chung	Hamza Akram
3:30-3:45 PM	Taneisia Grant	Roma Canto
3:45-4:00 PM	Anthony Guiterrez	Eliah Tull
4:00-4:10 PM	**Break**	
	Room 1	Room 2
4:10-4:25 PM	Jada Roberts	Naomi Pajarillo
4:25-4:40 PM	Kayla Ford	Mariangel Varela
4:40-4:55 PM	Jonathan Aguilera	Samantha Oetjen

2020 MSU SROP-Final Oral Presentation Schedule
Wednesday-Thursday July 29-30, 2020 on Zoom

Thursday Schedule 3:00 PM – 5:00 PM

	Room 3	Room 4
3:00-3:15 PM	Kokou Dagbovie	Amon Harris
3:15-3:30 PM	Michael Bugg	Paul Ezimako
3:30-3:45 PM	Mariah Thompson	Natan Berhe
3:45-4:00 PM	Maquela Noel	Stephen Gonzalez
4:00-4:10 PM	**Break**	
	Room 3	Room 4
4:10-4:25 PM	Givanna Ruscitto	Alaura Cunningham
4:25-4:40 PM	Mia Powell	Dexter Smith
4:40-4:55 PM	Miracle Potter	Raul Vega

Abstracts are organized by discipline. An index of student presenters is located at the back of the program book.

BIOCHEMISTRY & MOLECULAR BIOLOGY

Swapping Amino Acids makes Membrane Proteins Water Soluble: the Case for Nrfh
Ubongabasi Ekanem
Day & Time: Wednesday, 3:00 PM - 3:15 PM
Zoom Room: 2
Mentor(s): Eric Hegg

Hydrophobic Membrane proteins such as NrfH usually include the use of protease-detergent buffers to be observed clearly in a hydrophobic-environment. The aggressiveness of these detergents along with the inability to mimic a water soluble environment makes the use of protease-detergent buffers for observation a substandard method for acquiring desired outcomes for this experiment. A probable solution for this problem can be found by substituting the hydrophobic amino-acid residues of insoluble proteins with hydrophilic amino acids. It has been theorized that substituting hydrophobic amino acid residues for hydrophilic ones of similar atom size will allow the protein to keep its structure as well as its function. The process in which these amino acids are substituted is called the QTY code where the amino acids of similar structure are switched with each other. Leucine (L) is switched with Glutamine (Q), Isoleucine (I) and Valine (V) is substituted with Threonine (T), and finally Phenylalanine (F) with Tyrosine (Y). The abbreviated letters for the hydrophilic amino acid residues Glutamine (Q), Threonine (T), and Tyrosine (Y) chronologically spell "QTY" thus naming this process. Instead of compromising the structure of the protein NrfH the QTY code will reduce agitation of the molecule, and this process will allow for the structure of NrfH to be observable in a water soluble/aqueous environment. After making NrfH soluble in an aqueous environment the mechanism of NrfH's role in transporting electrons to hemes in the membrane bound NrfA molecule should be revealed. Along with that the mechanism and intermediates created by NrfHA during Dissimilatory Nitrite Reduction to Ammonium (DNRA) will be revealed as well.

What is Normal? Molar Rations of Selenium and Mercury as a Predictor of Potential Toxicosis
Mariangel Varela
Day & Time: Wednesday, 4:25 PM - 4:40 PM
Zoom Room: 2
Mentor(s): John Buchweitz

Methylmercury enters the food web through the methylation of mercury in aquatic microorganisms and accumulates as it is transferred through the levels of the food chain. For this reason, fish consumers are at a potential risk for mercury toxicosis. Methylmercury is distributed by the blood and accumulates in the organs of the host. Analyzing whole blood can prove useful in predicting the severity of mercury exposure. Selenium serves as a protective mechanism against methylmercury through demethylation, thus reducing its bioavailability and toxicity.

Demethylation occurs when molar concentrations of selenium are greater than or equal to molar concentrations of mercury. Should the molar ratio of selenium to mercury fall below one, the risk of neurotoxicity increases. The extreme variance in methylmercury exposure across species generates uncertainties regarding toxic thresholds. To investigate this further, a large data set of whole blood mercury and selenium concentrations for marine mammals (dolphins and sharks), avians (eagles, vultures, and pelicans) and domestic cats was collected from a 10-year time period spanning 2010-2020. By plotting the log normal concentration of mercury against the log normal ratio of selenium to mercury a linear regression was fit to the data. Interpolation to the y-axis provided estimates of mercury threshold concentrations. The interpolated mercury concentrations ranged from 524 – 1,828 ppb for wildlife and 1,884 ppb for the domestic cat. The molar ratios of selenium to mercury provided a useful guide for establishing predictive concentrations of mercury with toxic potential.

BIOSYSTEMS & AGRICULTURAL ENGINEERING

Evaluating the Inactivation of Echovirus in Different pH Buffer Conditions
Stephen Gonzalez
Day & Time: Thursday, 3:45 PM – 4:00 PM
Zoom Room: 4
Mentor(s): Jade Mitchell

E Viruses have been cited as potentially the most important and hazardous pathogens found in wastewater. One class of viruses that is associated with enteric disease in humans are known as enteric cytopathic human orphan virus (echovirus). Echovirus is a type of single-stranded RNA (ssRNA) virus that can cause a variety of mild symptoms such as a cough, sore throat or nausea. Dr. Tamar Kohn's lab published three articles in 2015, 2016, and 2017 detailing the persistence of 12 different types of viruses. All three articles concluded two findings: a higher pH for wastewater storage was ideal and that the bacteriophage MS2 was a conservative indicator for assessing inactivation of ssRNA viruses. In the original analysis of these experiments, only the log-linear decay model was fit to the persistence data. However, the log-linear decay model fails to capture any shoulders or tails that may be evident in the data. In collaboration with the Kohn lab, we are evaluating their original log-linear persistence against 17 different persistence models with one, two, and three-parameters, to determine which model best represents Kohn's data. The data has been analyzed using these different models and compared to the prior log-linear analyses to conclude which model allows the best prediction on the effects that different pH buffer conditions have on Echovirus inactivation. These models and predictions can serve as a template for future viral studies.

Detecting Bacterial Load with Mobile Applications
Natan Berehe
Day & Time: Thursday, 3:45 PM – 4:00 PM
Zoom Room: 4
Mentor(s): Jade Mitchell

In order to overcome the many challenges that are present in everyday life, many lifeforms have become adept at adjusting to adversarial environments. An example of this is the global rise of antibiotic resistance. As antibiotics are increasingly misused, bacteria have adapted in ways that decrease the effectiveness of antibiotic medicine. This is concerning as antibiotics have been the cornerstone of modern

medicine for a long time. This problem is more severe in developing nations where there is less regulation on antibiotic use. Physicians in this environment often do not have the resources to efficiently diagnose and treat their patients. However, new technologies could help physicians provide better diagnosis to their patients. This work presents a mobile application that leverages mobile smart phone cameras as biosensors to analyze residue from Alocilja magnetic nanoparticle tests.

CELL BIOLOGY, GENETICS, & GENOMICS

Measuring Levels of Exchangeability between Populations of Hyla Andersonii
Anthony Gutierrez
Day & Time: Wednesday, 3:45 PM - 4:00 PM
Zoom Room: 1
Mentor(s): Alexa Warwick

The Pine Barrens Treefrog (Hyla andersonii) is restricted to three isolated (disjunct) regions in the eastern United States: New Jersey, North and South Carolina, and the Florida panhandle and southern Alabama. It is a seepage bog specialist and a species of conservation concern in each state in which it occurs. Previous work showed a similar gradient of differentiation among the three regions in genetic, morphometric, and acoustic data, but supported keeping the regions as a single species. Local conservation management of this species, however, requires (1) a clearer understanding of how populations within each of these three regions may differ from one another and (2) how populations within regions are structured. To address these two objectives, we used an existing genetic data set from Dr. Alexa Warwick. Warwick developed 15 microsatellite markers for this H. andersonii and genotyped tissue samples from 52 populations across the three regions. We plan to estimate important population parameters such as effective population size, expected heterozygosity, and migration rates using the program MIGRATE. Based on previous research and preliminary estimates we expect that New Jersey will be a single panmictic population, whereas the greatest genetic break will be between North Carolina and South Carolina. In Alabama/Florida, the northwestern Florida panhandle and Alabama populations form a single cluster from the remaining populations, although a single population forms a third cluster. These results are important for state wildlife managers and local landowners to better focus conservation efforts for this rare treefrog.

Early Life Undernutrition causes Growth Restrictions for Adulthood Mice
Jada Roberts
Day & Time: Wedensday, 4:10 PM - 4:25 PM
Zoom Room: 1
Mentor(s): David Ferguson

Early life undernutrition tends to cause onset chronic conditions later on in adulthood. Thus, the purpose of this research was to understand the growth restrictions associated with undernutrition during early life development resulted with a reduction of cardiomyocyte size and binucleated cells in adulthood. FVB dams were selectively given either a control (CON: 20% protein), or isocaloric low-protein (LP: 8%) diet before mating. In this investigation, a cross-fostering model was utilized in which the pups were nursed by dams given a low protein diet during early [EUN; postnatal day (PN) 1–10], late (LUN; PN11–21) and the complete (PUN; 1–21) phase of the mice's postnatal life. Respectively on PN21, the mice's heart were ethically removed in which the cardiomyocytes were preserved with 10% zinc formation and phosphate saline buffer and later

stained with antibodies to myosin heavy chain followed by an AlexaFluor 647 tagged-secondary antibody. The nuclei were highlighted visually with Sytox Green using an inverted confocal laser microscope along with ImageJ to examine nucleation and cardiomyocytes cross sectional area (CSA). Undernourished pups that were late (LUN) and postnatal (PUN) had a significantly larger (CSA) of binucleated cells compared to the control (CON) and early (EUN) mice (P=0.0452). CON and EUN mice had a significantly smaller polynucleated (CSA) than PUN and LUN mice (P=0.0288). In conclusion, undernutrition during early life development has shown negative impairments resulting in compensatory mechanisms on the heart physiology leading into adulthood.

Defining the Role of Early Infant Microbiome in Mediating Allergic Outcomes Associated with Asthma in a Mouse Model with Sex Differentiation
Naomi Pajarillo
Day & Time: Wednesday, 4:10 PM - 4:25 PM
Zoom Room: 2
Mentor(s): Dr. Linda Mansfield

Mounting evidence suggests that exposure to microbially rich environments in infancy reduces risk for allergy and asthma, and thavb``n1t gut microbiota influence maturation of immune function in early life. Yet, translation of this knowledge to prevent allergy and asthma has not been achieved. It is hypothesized that alterations in the gut microbiome during early development of the immune system in the human infant can increase the risk of allergic sensitization and development of allergic diseases such as asthma, and that biological sex will influence allergic response. Three mouse models were created of microbiome-related allergic sensitization by giving germ free mice gut microbiota from infants with allergies. We then tested these "allergic microbiome" mice for development of asthma after challenge with a known human allergen—house dust mite—and compared them with non-allergic mice with a standard mouse microbiome. In most cases mice with human "allergic microbiomes" had higher increased airway hyperresponsiveness, represented as decreased lung function, when compared to mice with a mouse microbiome. When mice were also given the foodborne pathogen Campylobacter jejuni, this susceptibility was often greater. In these studies, we measured the immune/inflammatory responses such as number of eosinophils and neutrophils, serum levels of total IgE, lung mast cell activity, and panels of lung cytokines. Through statistical analysis, we can determine influence of biological sex in immune responses which is relevant because of the differences in allergy incidence between females and male. This data will help demonstrate the role biological sex has in gut microbiota allergic response.

CHEMICAL ENGINEERING & MATERIAL SCIENCE

Finite Element Analysis of Plastic Deformation Behavior of Zn-Mg Hybrids Processed by High-Pressure Torsion
Raul Vega-Torres
Day & Time: Thursday, 4:40 PM - 4:55 PM
Zoom Room: 4
Mentor(s): Carl Boehlert

Biomaterials are very commonly used in the medical industry for treating injuries and the majority of these are permanent. However, absorbable metallic materials have started to take place because of their ability to dissolve and gradually become part of the body with time. Zinc (Zn) and magnesium (Mg) are essential components for the human body and it has been proven that these exhibit amazing advantages in the healing process. In the other hand, mechanical properties have to be tailored in order to satisfy the demanding requirements for implant

applications. In this work, a Zn-Mg hybrid sample with dimensions of 10 mm diameter and 1mm thickness, consisting in a multilayered set up in the form of Zn/Mg/Zn, is subjected to high-pressure torsion (HPT). HPT process is considered the most effective severe plastic deformation technique in terms of grain refinement and deforms the disc sample between two anvils through a compressive force and torsion applied simultaneously. This set up, and the plastic deformation method is simulated using the finite element analysis software Abaqus. Model mesh was defined to 26,000 elements and it is analyzed using a 6 GPa pressure, which is equivalent to an applied compressive load of 471 kN. Analysis show an increase in hardness at increasing distance from the center, in good agreement with the experimental data available. The simulation model is yet to be adapted for in order to capture more realistic conditions of the HPT hybrid processing.

COMPUTER SCIENCE & ENGINEERING

Graphical User Inerface Development
Amon Harris
Day & Time: Thrusday, 3:00 PM - 3:15 PM
Zoom Room: 4
Mentor(s): Dirk Colbry

Image segmentation has long been a process that researchers have utilized to analyze images pertaining to their research. As the complexity of images being analyzed has increased, the complexity of the software required to analyze these images has also increased. The purpose of our research is to identify tools and techniques to simplify the image segmentation process for researchers that do not have programming knowledge. We aim to enable researchers to select exactly what part of an image they would like to segment without having to write the code required to do so. Using Python programming language and Ubuntu Linux operating system, we were hopeful to be able to develop a graphical user interface (GUI) with an algorithm that allows researchers to pick which part of the image they would like to be segmented for further analysis. Dash is the Python framework we utilize to develop the graphical user interface. In conclusion, we were unable to fully develop the graphical user interface that allows users to segment which parts of an image they desired to further analyze due to time constraints. However, we were able to make significant strides in doing so.

Learning Segmentation with Simple Evolutionary Exploration
Paul Ezimako
Day & Time: Thrusday, 3:15 PM - 3:30 PM
Zoom Room: 4
Mentor(s): Dirk Colbry

Simple Evolutionary Exploration (SEE) utilizes genetic algorithms to find the best image segmentation algorithm for arbitrary problems and the best type of parameters for that algorithm. This is a very practical project due to the fact image segmentation is becoming more common and necessary by many different researchers and users in all fields ranging from biology, chemistry, and astronomy. For a specific example, image segmentation is used in microbiology with cells and the now trendier self-driving vehicles such as Tesla. The problem that comes into play is that image segmentation can be time-consuming and tedious. Simple Evolutionary Exploration or SEE's goal is to do the work for the user. There are other software's that does the work like SEE, however the difference is SEE goes a step further to adjust the parameters that fit the image the best, so the user does not have to adjust the parameters repeatedly. In this work, we are developing a learning interface that will help users and researchers learn the mechanics, code, and overall what exactly is going on in the background while an image is being segmented. This interface will teach

users code while still segmenting and doing the work efficiently for the user. The goal is for the user to become comfortable with segmenting images. Our results consisted of implementing dialogue boxes that pop up on the interface that explain the parameters of the image when adjusting.

ENVIRONMENTAL SCIENCE & NATURAL RESOURCES

Examining the Relationship between Urban Trees, Race, and Income in New York City
Taneisia Grant
Day & Time: Wednesday, 3:30 PM- 3:45 PM
Zoom Room: 1
Mentor(s): David Rothstein

In New York city there are low-income communities that have fewer trees than higher-income communities. New York has major disparities regarding economic and health benefits. Understanding the relationship between income, race, and urban forests can help understand why these characteristics influence where urban trees are planted. Health and economic dssparites plague communities across the United states and is an alarming concern. As air pollution is a major problem in New York City therefore, having more trees may improve air quality of residents in New York City (NYC). Multiple studies indicate that urban trees are fewer in communities that produce less income and certain races. In this study, our goal was to examine tree type, tree location, and community demographics (income and race) in Brooklyn (Flatbush and Seaview), New York using a software called i-Tree. In this study we found that Flatbush Brooklyn has higher tree density and richness than trees in Seaview Brooklyn. We also found that there were relationships between tree species, tree location, income, and race of residents in the distribution of urban trees in NYC. Overall we were able to get more insight into urban tree distribution and community demographics in NYC.

What are the Urban Forestry Stakeholders Perception of an Preferences for Scientific Research?
Todd Chung
Day & Time: Wednesday, 3:15 PM- 3:30 PM
Zoom Room: 1
Mentor(s): Asia Dowtin, Emily Huff

Urban trees offer benefits to humans and wildlife in the various communities where they exist. Previous studies have shown that urban residents can enjoy both mental and physical benefits from living within proximity to these urban trees (Roy et al 2012). As the residents of such urban areas receive the direct benefits of the urban trees, there has been concern over the authority of these tree communities (Moskell, 2013). Urban tree communities are sometimes governed by a local government's forestry and/or parks department, or through a partnership with a non-profit organization. A non-profit organization may be operated by residents of the city and trained forestry professionals. However, non-profit organizations may not have access to new advancements in urban forestry to assist them with the current demands of tree governance. This study will inquire on the preferred methods of by which urban forestry advancements should be communicated to non-profit stakeholders. As urban forest scholars witness new advancements in the urban forestry world, it is important that the stakeholder has access to this information. Additionally, the stakeholders must express a desire for new information on the advancements within urban forestry. It is my hypothesis that there is a negative perception of communication from non-profit stakeholders as it pertains to the urban forestry academic community. This research will explore the perceived availability of academically sourced information on urban forestry topics to non-profit stakeholders. It is our goal to look

at the size of the organization, as well as the size of the city or cities where the organization operates. Through a series of investigative techniques, we will attempt to recognize patterns in of perception in the aforementioned areas.

Communication is a Two-way S(trees)t: Pattern in Bi-Directional Communication between Researchers and Non-Profit Organization in Urban Forestry topics
Crystal Gomez
Day & Time: Wednesday 3:30 PM- 3:15 PM
Zoom Room: 1
Mentor(s): Asia Dowtin, Emily Huff

Urban forestry is the proper management of street trees and other green spaces located in urban centers, they better these urban centers through numerous benefits. The information on urban forestry topics is imperative to non-profit stakeholder in order for them to manage urban forest yet there is a lack of research on these topics. In this project we would like to explore the accessibility and quality of urban forestry topics. We created surveys and distributed it to several non-profit stakeholder located in the eastern region of the United States. We use descriptive summary analysis to analyze the data. With the data collected we will demonstrate that there is a lack of urban forestry topics making it more difficult for non-profit stakeholders to care and manage these urban forests.

EPIDEMIOLOGY & PUBLIC HEALTH

How Fathers' Childhood Experiences may Impact His Relationship with the Mother Of His Baby
Maquela Noel
Day & Time: Thursday, 3:45 PM - 4:00 PM
Zoom Room: 3
Mentor(s): Dawn Misra

The purpose of the study was to measure if a father's adverse childhood experiences (neglect, abuse and household dysfunction experienced prior to the age of 18) are associated with conflict in his relationship (during pregnancy) with the mother of his baby (MOB). Assessing the father's ACES can determine how involved he is with MOB throughout the pregnancy and the amount of support the father will be able to provide. Previous research has proven that a father being present during pregnancy can buffer depressive symptoms and poor birth outcomes among mothers. Because of previous research findings, we decided to assess a father's ACES to determine if his ACES score can affect how involved he is during pregnancy. In our study, African American mothers were recruited at ob/gyn resident programs within the prenatal care sites from three different locations from 2017 to 2020. The sites mothers were recruited from was Ascension Providence Hospital in Southfield, Michigan, Ascension Saint John Hospital in Detroit, Michigan and Ohio State University in Columbus, Ohio. The mothers included within our study was asked to provide the contact information for the father of their baby (FOB). Our research staff recruited the fathers to include each within our study. 117 fathers consented and participated within our study. Fathers were asked to complete two questionnaires (ACES, Relationship with MOB). We identified the questionnaires regarding FOB's ACES, relationship with MOB, socio-demographic and health characteristics as the primary variables within our study. Fathers completed ten questions that measured their ACES. The theoretical range of the questionnaire was 0-10. We found that approximately 37.4% of fathers had a score of 3 or higher ACES score. These results demonstrate that 37.4% of fathers in our study had a high ACES score which concludes that the FOB experienced higher

rates of adversity in their childhood, relative to their counterparts. The questionnaire that measured the FOB relationship with MOB consisted of a 5 category Likert response containing 14 questions, which we focused on the questions (10-14) that measured the conflict between FOB and MOB. About half of the fathers in our study had conflict scores of 12.0 or less, out of a total possible of 25. These findings demonstrate that majority of the fathers had a moderate score of conflict in the relationship with MOB. In our study, we utilized a t-test to measure the average score of conflict among fathers and we found that the average score of conflict was higher for fathers with an ACES score of 3 or more, relative to fathers with an ACES score of 2 or lower. From our findings, we concluded that FOB with an ACES score of 3 or more is more likely to have conflict within his relationship with MOB during the time of pregnancy.

Moral Distress in Nurses: A Qualitative Study of Nurses Caring for Patients with COVID-19 Virus
Roma Cantu
Day & Time: Wednesday, 3:00 PM - 3:15 PM
Zoom Room: 2
Mentor(s): Linda J. Keilman

This year, 2020, is the year of the nurse and nurse midwife. Nurses and nurse midwives were to be recognized internationally for their tremendous amount of work and dedication that is put into this career. However, things did not go as planned and the world was struck with a novel infectious respiratory virus and with no cure insight. This deadly virus is later named as the Novel Corona Virus or COVID-19 for short. Since the COVID-19 pandemic started in the beginning of this year, nurses all over the globe have been working diligently to care for individuals who had contracted this deadly disease. As the months passed by, the number of patients with COVID-19 was increasing. Nurses and physicians had to choose who survives and who does not because of equipment shortage. These dilemmas may cause the nurse to experience moral distress (MD). This pilot research study was created to explore the following question: What are the experiences of nurses in community practice caring for patients with the COVID-19 virus? The research team employed a qualitative method that focused on open-ended questions in interviews with licensed practicing nurses. Ten to fifteen nurses were interviewed; interviews were audio-recorded and transcribed. Nurses were later asked to describe their MD levels by completing the Moral Distress Thermometer (Wocial & Weaver, 2012) which measures their feelings during their MD experience. The purpose of this research was to use themes of the nurse's MD experiences to develop a foundation which can later support smaller research projects.

Free Water in Brain Tissue and Cognitive Decline in Older Adults
Hamza Akram
Day & Time: Wednesday 3:15 PM - 3:30 PM
Zoom Room: 2
Mentor(s):Andrew Bender

Aging is a natural process of life however, studies show that there is some age-related decline in cognitive development. With ever-increasing elder populations, age-related cognitive decline has turned out to be a major public health concern. As a person grows older some brain cells die, shrink, or weaken and cause some decline in brain functions. These cognitive processes include attention, working memory, long-term memory, perception, and executive control. How can we prevent this and find possible biomarkers. Age-related memory impairments have been linked to differences in structural framework of the brain and free water in brain tissue allows us to see the differences, this correlation hasn't been extensively investigated. Free-water is defined as self-diffusing water molecules that do not experience restriction or hindrance from their surroundings in parts of the brain. In a population-based sample of 337 older participants aged 61–82 years, we looked at the free water volume along with verbal learning over a few year period. Participants completed a verbal learning

task multiple times and underwent magnetic resonance imaging known as diffusion tensor imaging which results in microstructural information of the brain along with the possible location, orientation, and direction of the fluid in the brain. Research of the complexity of free water as an adult ages will give us the ability to establish biomarkers that are predictive of cognitive decline before its onset in hopes of slowing the progression of disorders stemming from cognitive decline and preserve brain function. Therefore, a biomarker-based early diagnosis offers great opportunities for preventive treatment development in the near future to the millions at-risk.

INTEGRATIVE BIOLOGY

Intelligence Analysis of Magnetic Particle Imaging for Tracking Stem Cell Differentiated Islet Organoids
Eliah Tull
Day & Time: Wednesday, 3:45 PM- 4:00 PM
Zoom Room: 2
Mentor(s): Ping Wang

Even with a clinical treatment available, type 1 diabetes remains an incredibly prevalent issue in the U.S. Our aim is to advance the treatment of type 1 diabetes through developing methods of data analysis for current biomedical imaging strategies. There is currently a lack of imaging modalities and data analysis combinations which effectively allow for the longitudinal tracking of transplanted islet organoids. Through our use of Magnetic Particle Imaging (MPI) and our novel Kmeans++ artificial intelligence algorithm, we hope to develop a means of longitudinal data analysis. Here we Transplanted differentiated stem cell islet organoids under the kidney capsule of mice, we ran these mice through magnetic particle imaging to obtain imaging data to feed the Kmeans++ algorithm. Magnetic particle imaging is an emerging imaging modality which directly track super paramagnetic iron oxide nanoparticles (SPIONs). Kmeans++ is a clustering algorithm which segments a region of interest (ROI) of the MPI scans and enables the user to quantify the total iron value present in the slice of data. The Ai generates a standard curve from the total pixel intensity's correlation to the total iron value in the image. Through the application of the Kmeans++ algorithm across sets of data for multiple days and multiple mice we assessed the ability of Kmeans++ to accurately segment range of interests for the data, and determine the total Iron amount in the specified region. This Kmeans++ based model was observed and employed to provide a novel, standardized means of quantifying and analyzing MPI data.

Effect of Early-Life Undernutrition on Cardiomyocyte Nucleation and Size in Adult Mice
Jonathan A. Aguilera
Day & Time: Wednesday, 4:40 PM- 4:55 PM
Zoom Room: 2
Mentor(s): David P. Ferguson

Individuals that are undernourished during the postnatal period undergo changes in cardiac development that increase their risk for developing heart disease. Postnatal undernutrition is associated with a reduced cardiomyocyte size and number of nuclei per cardiomyocyte, leading to cardiovascular impairment. Interventions for treating undernourished babies include refeeding a healthy diet, but the specific developmental window at which treatment is unable to mitigate permanent alterations to cardiac morphology has not been identified. In this study, we sought to determine whether refeeding a healthy diet to mice after inducing undernutrition during different stages of postnatal development can restore cardiomyocyte cross-sectional area and nucleation. We assigned pups to nurse from mouse dams fed either a control (20% protein) or a low

protein (8% protein) diet from birth to postnatal day (PN) 21. Pups experienced either early phase undernutrition, (EUN; PN1-10), late phase undernutrition (LUN; PN11-21), entire postnatal undernutrition (PUN; PN1-21) or proper nourishment (CON). After PN21, all groups were fed a control diet. We sacrificed mice at PN90 and processed images of stained cardiomyocytes using Image J software. CON had a significantly higher percentage of polynucleated cells compared to EUN (P=0.018). No significant differences were found in mononucleated cells, binucleated cells, or cross-sectional area. These findings suggest that refeeding treatments do not restore the proportion of polynucleated cardiomyocytes after early phase undernutrition, which may impair functional capacity. Thus, the investigation of postnatal undernourishment interventions that mitigate the alterations to cardiomyocyte nucleation are warranted.

PHYSICAL & MATHEMATICAL SCIENCES

Data from a Bombarding of Calcium-48 on a Beryllium Target
Alaura Cunningham
Day & Time: Wednesday, 4:10 PM - 4:25 PM
Zoom Room: 4
Mentor(s): Thomas Redpath

The understanding of isotopes is essential to the world. Isotopes can be used in various fields such as the agriculture, medical, and industrial energies. Isotopes can also be used in the nuclear power industry. Some isotopes are considered rare because they are not natural to the Earth but can be produced in labs. Gaining a better understanding of rare isotopes could have a substantial impact on the world. In 2016, the MoNa Collaboration performed an experiment at the National Superconducting Cyclotron Laboratory to measure the half-life O-26. The Coupled Cyclotron Facility provided a 140 MeV/u Ca-48 primary beam that impinged on a beryllium target to produce F-27, Ne-28, Ne-29, and Na-30 secondary beams. The analysis of the recorded data focused on events in which the two-neutron decay of O-26 produced from the F-27 secondary beam was measured. As such, a large fraction of the dataset is unused. The current project will extract the decay energy spectra for neutron-unbound systems produced from the Ne-28 and Ne-29 beams and compare them to previous measurements while also searching for possible new unbound states. Studying these beams will provide more information about the beams such as, the time of flight, the beam velocities, the energy of the beams, and the identity of the isotopes made from the beam decaying. The experiment found that Neon 28 and 29 each had multiple isotopes during the decay of the beam. The experiment was also able to identify the identities of these isotopes. The experiment has many future uses including being a reference for further experimentation and provide researches with the knowledge of the isotopes so uses of them can be found.

Photon Detection of PMT and SiPM Arrays for MoNA LISA Applications
Dexter Smith
Day & Time: Thrusday, 4:25 PM - 4:40 PM
Zoom Room: 4
Mentor(s): Thomas Baumann

MoNA LISA is large area neutron detector consisting of an array of fast plastic scintillators at the National Superconducting Cyclotron Laboratory. The study of neutrons has shown to be very beneficial across many fields. Cancer treatments such as the boron neutron capture therapy (BNCT) utilizes neutrons to fight cancer in medical patients in a non-invasive manner. Nuclear power shows the potential to bring about an energy source with the ability to revolutionize the lives of nearly every human on earth using isotopes. Neutron detectors are also important tools to study nuclear structure effects at the drip line. The problem with detecting neutrons comes from

the lack of an electrical charge. MoNA LISA uses a combination of energy transfer and time of flight to study properties of the neutron of interest. This configuration is capable of a 70% detection efficiency for neutrons between 50 MeV to 250 MeV. Detectors of large volume must be constructed to conduct research on such particles. The scintillator arrays currently use photomultiplier tubes to monitor the neutron interactions withing the detectors. Photomultiplier Tubes (PMTs) have proven to be great in monitoring neutron interactions within scintillators by detection of the scintillation light, but still are very dependent on the geometry of the detector setup. This project goes into detail on the possibilities opened by a PMT and silicon Photomultiplier combination. SiPMs have shown promise and have the capabilities to match the PMT in neutron detection while offering versatility in detector orientation and configuration.

SOCIAL, BEHAVIORAL AND ECONOMIC SCIENCES

Etiquette for Minorities in STEM: Soft Skill Training for Graduate students
Giavanna Ruscitto
Day & Time: Thursday, 4:10 PM - 4:25 PM
Zoom Room: 3
Mentor(s): Angela Hall

Statistics show that minorities are not advancing in degrees and have higher unemployment rates than non-minorities in STEM (science, technology, engineering, and mathematics) fields (NSF, n.d.). We propose that the gap among minorities in STEM is due to microaggressions and incivility. Minorities could feel more accepted within the STEM community if graduate students received proper training on their self-efficacy and emotional, social, and practical intelligence (Pearson, Andersson, and Porath, 2000; Ferris, Perrewé, Anthony, and Gilmore, 2000). We plan to conduct an experimental design and a political skill training program. The training will be a production of the most important soft skills demonstrated in a serious of video tutorials followed by situational videos for comparison. Included in our study will be a pre/post-test survey that will consist of questions on stress, burnout, social desirability, and the Political Skill Inventory. We hope that our findings will encourage others to extend the research into equity in STEM including careers, even outside of academia, and other organizations.

Concussion History and Knee Self-Efficacy in Patients after Anterior Cruciate Ligament Reconstruction
Kayla Ford
Day & Time: Wednesday, 4:25 PM - 4:40 PM
Zoom Room: 1
Mentor(s): Shelby Baez

Previous research has demonstrated that patients with a history of anterior cruciate ligament reconstruction (ACLR) also demonstrate poor knee self-efficacy. Poor knee self-efficacy has also been predictive of decreased physical activity in this population. Whether or not history of sports-related concussions (SRC) can enhance these negative psychological factors observed in patients after ACLR, such as further decreases in knee self-efficacy is unknown. Therefore, this study examined differences in knee self-efficacy between patients with history of SRC after ACLR and patients without history of SRC. It was hypothesized that the ACLR group with history of SRC will show worse self-efficacy for physical activity than the ACLR group without history of SRC. Forty participants (24 female, mean age = 24.34.1 years; height (cm) =169.9 (9.1); weight (kg) = 73.2 (15.1)) with a history of ACLR (≥1-year post-operative) were put into a No SRC group (n=29) or SRC group (n=11). The demographics questionnaire asked about the history of concussion. The Knee Self-Efficacy Scale for Physical Activity subscale was used to examine the knee self-efficacy. The higher the score the

higher their knee self-efficacy. To examine the group differences, a Mann-Whitney U test was used. There were statistically significant differences observed between the SRC group (Median=7.5; Range 5.34) and the no SRC group (Median=8.17; Range=6.17). Those with a history of ACLR in the SRC group showed worse knee self-efficacy for physical activity than the ACLR group with no history of SRC. With these results, it is suggested that SRC history may negatively influence a patient's knee self-efficacy after the ACLR.

Shifts in Values Relating to Farm-To-Hospital Programs and Local Food Systems in Wisconsin
Kokou Dagbovie
Day & Time: Thursday, 3:00 PM - 3:15 PM
Zoom Room: 3
Mentor(s): Philip Warsaw

It is essential to look at institutions within communities to find commonalities to see the broad impacts each institution may have on their community and their sustainability. Hospitals are an anchor institution rooted within communities that provide basic necessities that tend not to relocate. These institutions hold significant investment and spending power, which helps communities grow because more money recirculates locally. One form of investment that hospitals contribute to their community is in local food production. The University of Wisconsin (UW) Hospitals is a national leader in local food purchasing. UW hospitals had a shift from not purchasing locally in 2012 to spending about two million dollars in food procurement in 2017. UW hospitals did a complete overhaul of their culinary practices to a more sustainable system. This case study of the University of Wisconsin hospitals show a shift in mentality. The change in prioritization supports a shift from a business standpoint to a community-centered point of view. This project will focus on the question, "what inspired the shift in values and how this applies to other hospitals?". The shift in values is necessary for all communities to build sustainability along with the engagement in the community. Our project will also focus on how those values led to the specific policy, systems, and environmental interventions along with the tensions associated with that shift.

Participatory Inequalities within Local Political Systems
Mia Powell
Day & Time: Thursday, 4:25 PM - 4:40 PM
Zoom Room: 3
Mentor(s): Sarah Reckhow

Roughly 96% of all elected officials in the United States belong to local systems of governance, occupying over 88,000 units of government. Despite the significance of local political systems on the welfare of American citizens, observable disparities in participation and representation remain prevalent in contemporary society. Given the role of local politics in enforcing policies that are integral in the allocation of public services and resources, participation and representation within these systems greatly affects the overall life chances of marginalized groups. Observing factors that are assumed to be significant in indicating participation in local politics, considerations of race and class are often acknowledged. While literature suggests that these variables affect participation in local politics, these variables are not generally assessed empirically or as dual factors in determining political participation in localities. Two primary questions lie there within: (1) Whether relative income is a determinant in participatory inequalities within local political systems across racial/ethnic identities; (2) Whether racial/ethnic classification a determinant in participatory inequalities within local political systems across the variable of income. In our primary research question, we hold race/ethnicity (White, Black, Latinx) is held constant, income is our independent variable (low income operationalized as less than $50,000 per year and high income as above $50,000 per year), and local political participation is held constant (measured by local meeting attendance within the past year). In

research question two, our independent variable is race/ethnicity, income is held constant, and local political participation is our dependent variable. Utilizing quantitative methods this study aims to empirically study trends along lines of race/ethnicity, income, and those effects on local political participation. Applying variables of income and race/ethnicity as indicators of local political participation within twenty-one of the most populated cities in the United States (working with a pooled sample from the Cooperative Congressional Election Survey from the years 2016 and 2018), upon statistical analyses, observable trends that suggest a positive relationship between income and participation in local politics exhibited themselves. Essentially, implications of this relationship result in the amplification of political interests of affluent Americans while simultaneously suppressing local political engagement of lower income Americans. Additionally, these variables applied in varied capacities indicate a relationship where the dominant racial/ethnic group tends to participate in local politics more frequently than marginalized racial and ethnic groups, creating racial and ethnic disparities in participation and in the subsequent representation within local political systems.

Mortgage Delinquencies and Bank Profitability
Michael Bugg
Day & Time: Thrusday, 3:15 PM - 3:30 PM
Zoom Room: 3
Mentor(s): Todd Elder

Americans need to know that their paychecks may be damaged if another crisis like 2008 happens in the next 6 months. A major issue today is that there is not much focus in the financial media on mortgage delinquencies. Askitas and Zimmermann (2011) report that mortgage delinquencies played a key role in causing the 2008 recession. In the Washington post it was noted that "the Mortgage Bankers Association's most recent survey found 4.36 percent of outstanding loans were delinquent at the end of the first quarter" of this year (Kathy Orton, 2020). This could potentially mean that a majority of poor Americans will default on their home loans. The ramifications of this happening are uncertain but likely destructive to the future of the U.S Economy. In 2008 to 2010 during the last recession, marked as the housing crisis, people defaulting on their mortgages devastated the economy and put millions of Americans out of jobs. Right now, in the financial media there is more focus on unemployment and the next presidential election. We propose forecasting mortgage delinquencies to predict bank profitability. To get a projection on mortgage defaults we will look at recent unemployment data. Mortgage delinquencies are a signal that borrowers are not paying banks. If borrowers are not paying banks then the banks will fail and damage American paychecks. We use a regression involving mortgage delinquency rates and unemployment. Bank profitability will be forecasted based on projected delinquency rates. We found that delinquencies are forecasted to increase next December but this information is hard to connect to bank profit.

Assessment of Facilitators and Barriers to the Implementation of a Data Management System in Full-Service Community Schools
Miracle Potter
Day & Time: Thursday, 4:40 PM - 4:55 PM
Zoom Room: 3
Mentor(s): Ignacio D. Acevedo-Polakovich

Data management in education has become a fundamental component in school protocol. Using data management systems to effectively record and assess data

has gained importance with the increase of data-based decision making in schools. Proper data collection and analysis can have multilevel outcomes affecting student performance and educational funding. The lack of precise data can result in ill-informed decisions made by educational systems. Challenges attributed to urban schools directly impact the ability to record accurate student data. Although full-service community schools aim to resolve the obstacles associated with urban schools, inaccurate data collection persists. In this project, we identify and assess the facilitators and barriers to the implementation of a data management system in full-service community schools. Using the consolidated framework for implementation research, we compare the practices of community school directors who exceed and fall below the successful implementation of the data management system to identify themes that aid or prohibit proper implementation. Through preliminary analysis of the data, we found that user friendliness and support from management, information technology, and Americorp volunteers were facilitators of the implementation of the data management system. In addition, we found that the lack of training and incompatibility with the school district's data management system were prevalent barriers to the early implementation of the system. Findings from this study will be used to inform the school district about the current state of the implementation of the data management system and improvements that can be made to ensure the continued academic, community and financial success of the schools.

The Relationship Between Black Socio-Political Advancements and Whitelashes in America
Mariah Thompson
Day & Time: Thursday, 3:30 PM - 3:45 PM
Zoom Room: 3
Mentor(s): Glenn Chambers

American history is riddled with peak moments of Black liberation that is subsequently stifled by new discriminatory policies that reinforce a racial hierarchy. When the freedom bells rang in 1865 marking the end of slavery, Jim Crow legislation crept in to steal the show. Jim Crow legislation systematically pushed Black Americans back towards slavery with Black Codes that criminalized a multitude of Black people and used prison labor as slave labor, took away voting rights, restricted employment opportunities to service jobs, and limited when and where Black people could live and travel. These policies ensured political ostracisation while social organizations like the Ku Klux Klan, with members in both high positions of power and poor white communities, incited racial terror making fear and danger an everyday aspect of Black life. Yet, the fight for true equality continued and between 1964 and 1965 the Voting Act, Civil Rights Bill was signed into legislation that legally dismantled Jim Crow policies. Though indidvudals are equal by law we still see evidence of voter suppression, racially biased criminalization and killings of Black people, and limited access to resources. The United States is a prime example of how partial reforms and compromise never quite ended the oppression of those that constantly live on the margins of society. A huge factor in this discrepancy is that for every socio-political advancement made for Black people there have been counter-revolutionary whitelashes which aim to reinstitute racialized legislative policies and Eurocentric social norms of exclusion. We argue that to fully understand the historical significance of this moment we need to unpack where the social discord began within the nation and how anti-black power structures react and respond to the socio-political achievements of Black people in the United States.

The Relationship Between Black Socio-Political Advancements and Whitelashes in America Examining the role of Serotonin in Maternal and Affective Behaviors in Female rodents
Samantha P. Oetjen
Day & Time: Wednesday, 4:40 PM - 4:55 PM
Zoom Room: 2
Mentor(s): Joseph Lonstein

Many behaviors that take place during the early transition to motherhood, including a decrease in anxiety and heightened maternal aggression, are known to be in part due to changes in] serotonin signaling. The nucleus accumbens (NAc), which is known to play a role in processing reward-predictive sensory cues, allows mothers to find the associate between offspring-related cues and maternal care rewarding, ultimately contributing to display of adequate maternal care.. Because serotonin (5-HT) is known to play a role in anxiety and aggression behaviors, and previous data in the Lonstein Lab found upregulation of 5-HT1A in the NAc of female rats at parturition, this research project looks to explore whether downregulation of 5-HT1A receptors in the NAc at parturition affects maternal caregiving and affective behaviors. To address this, a viral 5-HT1A knockdown was performed on pregnant female Long-Evans rats, and anxiety and aggressive behaviors were assessed using an elevated plus-maze (EPM) and maternal aggression paradigm. Behaviors were quantified using Solomon Coder to assess trends in data in relation to a control group. The EPM results showed no differences in anxiety-like behaviors of knockdown animals compared to controls. Analysis of maternal aggression data is on-going. These results may be used to give us a more detailed picture of why reproduction triggers an increase in 1A receptors in the NAc, which can also potentially be used to refine treatments for postpartum affective disorders.

Below is a listing of the faculty mentors of the 2020 SROP Cohort.

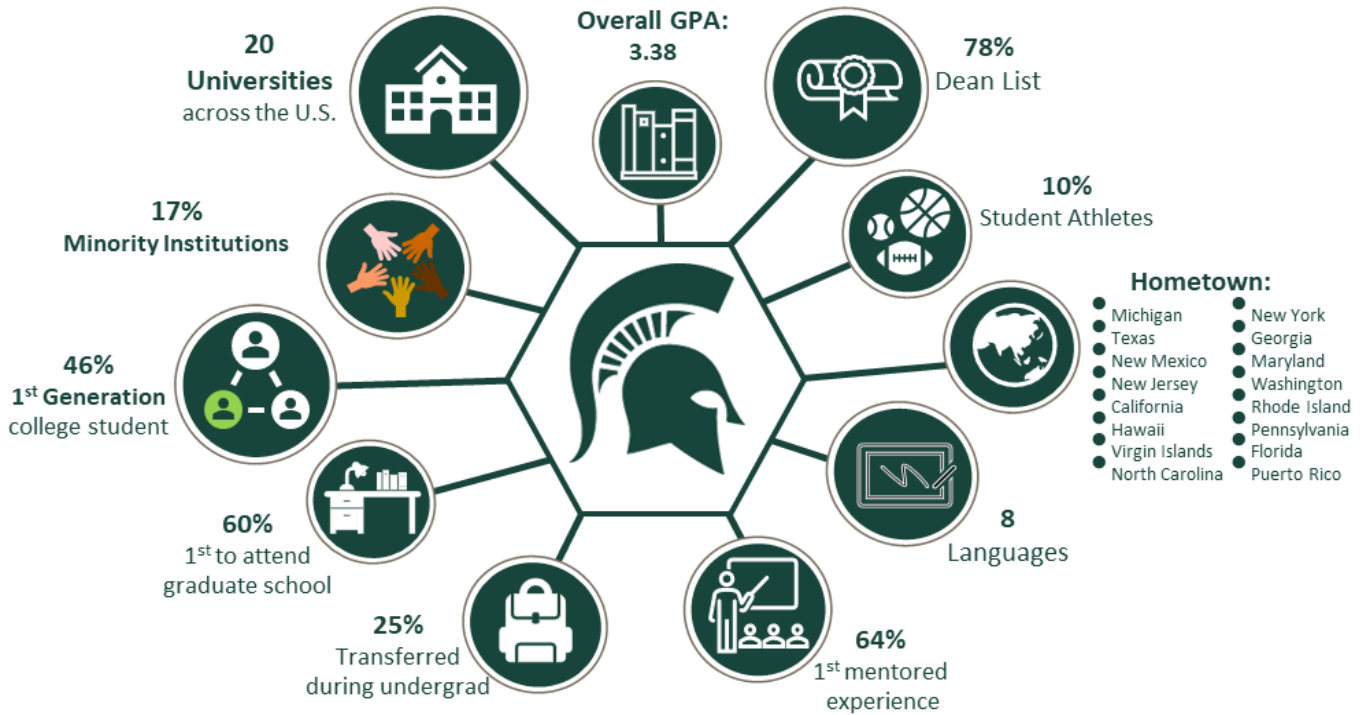**Alexa Warwick,** Fisheries and Wildlife
Andrew Bender, Epidemiology and Biostatistics
Angela Hall, Human Resources and Labor Relations
Asia Dowtin, Forestry
Emily Huff, Forestry
Carl Boehlert, Chemical Engineering
David Ferguson, Kinesiology
David Rothstein, Forestry
Dawn Misra, Epidemiology and Biostatistics
Dirk Colbry, Computational Mathematics, Science and Engineering
Eric Hegg, Biochemistry and Molecular Biology
Evangelyn Alocilja, Biosystems Engineering
Glenn Chambers, History
Ignacio Acevedo-Polakovich, Community Psychology
Jade Mitchell, Biosystems Engineering
John Buchweitz, Biology
Joseph Lonstein, Neuroscience
Linda Keilman, Nursing
Linda Mansfield, Microbiology
Paul Gueye, Physics
Thomas Redpath, Physics
Phillip Warsaw, Community Sustainability
Ping Wang, Biomedical Engineering
Sarah Reckhow, Political Science
Shelby Baez, Kinesiology
Thomas Baumann, Physics
Todd Elder, Economics

FACTS ABOUT SROP 2020 COHORT

20 Universities across the U.S.

Overall GPA: 3.38

78% Dean List

10% Student Athletes

17% Minority Institutions

46% 1st Generation college student

60% 1st to attend graduate school

25% Transferred during undergrad

64% 1st mentored experience

8 Languages

Hometown:
- Michigan
- Texas
- New Mexico
- New Jersey
- California
- Hawaii
- Virgin Islands
- North Carolina
- New York
- Georgia
- Maryland
- Washington
- Rhode Island
- Pennsylvania
- Florida
- Puerto Rico

SROP COHORT 2020 PARTICIPATING INSTITUTIONS

FAMU

NCCentral UNIVERSITY

Heritage University

Northeastern ILLINOIS UNIVERSITY

PVAMU

UNIVERSITY OF THE VIRGIN ISLANDS 1962

Chaminade University

BU

NM STATE UNIVERSITY

VSU VIRGINIA STATE

Berkeley UNIVERSITY OF CALIFORNIA

TSU

UCF UNIVERSITY OF CENTRAL FLORIDA

LB

MEDGAR EVERS COLLEGE THE CITY UNIVERSITY OF NEW YORK

RI

UNIVERSIDAD DE PUERTO RICO CAAM

Penn State

Michigan State

UVU

Maryland

HUNTER The City University of New York

CSUN CALIFORNIA STATE UNIVERSITY NORTHRIDGE

CALIFORNIA STATE UNIVERSITY FULLERTON™

MSU SROP Program Staff

Steven D. Thomas
Program Director

Program Assistants:

Duke Augustin   Neco Wilson

Graduate Facilitators:

Janelle Lemon	Benjamin Fry
Natasha Fowler	Aliyah McIlwain
Jennifer Watts	Uriel Saldivar
Matthew Moreno	Sylmarie Montero
Nkrumah Grant	

NOTES:

MICHIGAN STATE UNIVERSITY

SROP

SUMMER RESEARCH OPPORTUNITIES PROGRAM

Steven Thomas
MSU SROP Program Director

Graduate School
Michigan State University
466 W Circle Drive
Chittenden Hall Room 130
East Lansing, MI 48824
Phone: (517) 432-3268
Fax: (517) 353-3355
msusrop@grd.msu.edu

Visit Us Online:

Linked in

https://grad.msu.edu/srop