University at Buffalo
STEM Diversity Programs
School of Engineering and Applied Sciences

LSAMP Summer Program Newsletter, Summer 2022

UB Louis Stokes Alliance for Minority Participation (LSAMP) 2022 Summer Research Interns during the Research Poster Symposium in Davis Hall

The Office of STEM Diversity Programs in the University at Buffalo (UB) School of Engineering and Applied Sciences (SEAS) is pleased to highlight the accomplishments of our **2022 Louis Stokes Alliance for Minority Participation (LSAMP) Summer Research Internship Program**.

LSAMP is funded by the National Science Foundation (NSF) and seeks to increase the number of underrepresented students pursuing degrees in science, technology, engineering, and mathematics (STEM) disciplines. The program funded 11 undergraduates who participated in research internships during a 10- week summer program.

Students spent a minimum of 30 hours per week in the lab under the direction of a UB faculty member. Additional time was spent on "essential skills" and community service activities. Professional skills workshops included *Lab Safety, Dress for Success, Digital Networking, STEM Funding Workshop,* and *DISC Training*. The students also toured the National Fuel Gas, where they learned to join gas pipes and UB Sustainability talk and look at the Solar Strand. Community Service projects included the Adopt-a-Beach cleanup of Woodlawn Beach State Park and planting new trees at Tifft Nature Preserve.

The interns were excited to share their research posters and give oral presentations at the [virtual] UB Undergraduate Research Conference. The Undergraduate Research Conference is a national conference sponsored by the UB Graduate School, which attracted over 300 undergraduates engaged in research. The students did a wonderful job with their oral presentations. Students also presented orals at the *Louis Stokes Center for Promotion of Academic Careers (LSPAC) Conference* in New Orleans, LA. Known as the "Buffalo Crew", our students were well received by their peers, faculty, and staff. The summer ended with the *UB SEAS Summer Research Symposium*, featuring LSAMP and REU students. All students presented research posters and two LSAMP students joined REU teams for spotlight oral presentations. It was a busy summer filled with exciting research projects, new friends and colleagues, and fun times!

Words from the Director, Dr. Letitia Thomas

Letitia Thomas, PhD
Assistant Dean for Diversity

What a wonderful summer! The 2022 LSAMP Summer Research Interns were true to our motto, #WeDoScienceandEngineering!

As the largest and most comprehensive of all the State University of New York, a SUNY flagship institution and member of the Association of American Universities -where the majority of the federally funded university research that contributes to our economic competitiveness, health, well-being, and national security takes place- it is in our DNA to prepare the next generation of scientists and engineers for global leadership.

LSAMP students were proud to be a part of UB's research legacy, and their research mentors are some of the finest scholars in the country. Students researched a wide variety of topics, including liposomes and nanoparticles, the use of high-altitude balloons to gather atmospheric data, using 3D printed models to study strokes, blockchain programming, using satellite imagery to study the Greenland ice sheet and the study of the structural properties of viral proteins. During these ten weeks, we did science, performed service, and gained professional skills. We traveled to New Orleans for the LSPAC Conference and won best overall oral presentation! It was an intense 10 weeks, but the students persevered and had a great attitude along the way.

We hope you enjoy our summer program review as much as we enjoyed creating these moments.

2022 LSAMP Summer Research Interns

Ruth	Bello	Chemical Engineering
Matthew	Haynes	Computer Science
Dephil	Jones	Environmental Geosciences
Brandon	Manley	Chemical Engineering
Jocelin	Mendez	Chemical Engineering
Bubacar	Ndoye	Biomedical Engineering
Valerie	Ortiz	Environmental Geosciences
Allanis	Persaud	Biomedical Engineering
Hannah	Sheffield	Biomedical Sciences
Christine	Shiyam	Computer Engineering
Shane	Varner	Chemical Engineering

Meet the Office of STEM Diversity Programs

Assistant for STEM Diversity Programs, Ms. Sonia Grant

Sonia Grant, MS, EdM
Assistant for STEM Diversity Programs

Ms. Sonia Grant serves as our Assistant for STEM Diversity Programs. Ms. Sonia served as an Administrative Assistant in the Academic Advising Office before moving to Engineering.

She has a master's degrees in Economics, and in Higher Education from UB and is pursuing her PhD in Engineering Education. She has been with the Office of STEM Diversity Programs for five years.

Ms. Sonia is excited to be a part of the office and looks forward to continuing her work with LSAMP, STEMinism, and UB NERDS students as well as members of NSBE, SHPE, and WiSE.

Meet our Research Methods Instructor, Ms. Starla Taylor

Starla Taylor was born and raised right here in Buffalo, New York. Given her love of her hometown, she decided to attend the University at Buffalo to obtain her bachelor's degree in Biomedical Engineering (conferred 2018), continuing to a master's degree in one of our newer departments, Material Design and Innovation (conferred 2020) and is currently working on her doctorate. She anticipates graduation in Fall 2023.

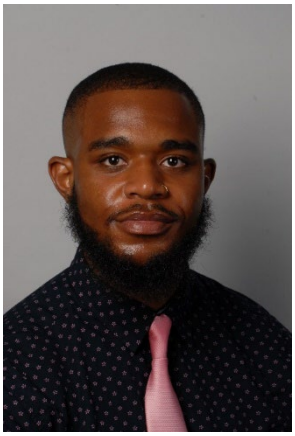
Starla participates in outreach and mentorship at the University, including our very own LSAMP program, as well as programs targeted toward middle and high school students.

Starla is dedicated to inspiring a diverse group of newer generations to pursue STEM fields to create more efficient and well-rounded work environments. The lack of diversity can lead to one-sided approaches, and Starla is committed to addressing and correcting these deficits.

In her free time, Starla enjoys caring for her plants, building, tinkering, drawing, painting, braiding, and anything else that involves being creative and crafty.

Starla Taylor, PhD Candidate
Research Methods Instructor

Meet our Research Methods Instructor, Mr. Alec Pitter



Alec Pitter, PhD Candidate
Research Methods Assistant

Alec Pitter received his BS in chemistry here at the University at Buffalo in 2021. He then transitioned into doctoral studies under the mentorship of chemistry professors Dr. Martin Trebbin and Dr. Janet Morrow. He is currently in the second year of his Ph.D. research assistantship with a focus on the synthesis of biomedical nanoparticles via microfluidics. The National Institute of General Medical Sciences (NIGMS) funds Alec through the Initiative for Maximizing Student Development (IMSD) Grant, allowing him to focus solely on his research efforts.

Aside from experimentation, mentorship also excites Alec. This past summer, Alec was excited to co-instruct the Summer 2022 Louis Stokes Alliance for Minority Participation Program (LSAMP) research methods course, where he taught undergraduate students how to construct and present research posters and slides.

Meet our LSAMP Graduate Assistants, Ms. Lori-Ann Johnson, and Mr. Imani Muhammad-Graham

Lori held the Graduate Assistant position for the office of STEM Diversity Programs in the School of Engineering and Applied Sciences at UB from February 2022 to August 2022. As a graduate assistant, she assisted Dr. Thomas, Ms. Grant, students, and staff with academic and social programs such as STEMinism, Men of Color, and LSAMP. Additionally, she provided administrative, creative, and organizational support to the office.
Recently, Lori graduated with her Master of Arts in Biological Sciences and currently holds a staff position as the Project Coordinator for the Nutrition and Health Research Lab at UB. She also has a Bachelor of Science degree in Biological Sciences from Syracuse University. Driven by her passion for clinical medicine and the mitigation of health disparities, she intends to continue her academic pursuits with a focus on public health and medicine. A native of Jamaica and mother to a daughter named Ryann, Lori enjoys traveling, cooking, singing, and spending time with loved ones in her spare time.

Lori-Ann Johnson
STEM Diversity Programs
Graduate Assistant

Imani Muhammad-Graham
LSAMP Graduate Assistant

Imani Muhammad-Graham is a first-year master's student in Electrical Engineering. Throughout his tenure, he has expanded his technical, communication, and other skills through his classes, projects, research, hackathons, and internships. Imani was raised in Brooklyn, NY, where he was exposed to computer science at an early age by his parents, who are also UB alums. Imani also chose UB and received his BS degree in Computer Engineering in May 2022.

He is involved in communities and clubs such as NSBE, LSAMP, and Men of Color in STEM. He enjoys facilitating activities and is always available to give students encouragement and advice. Imani believes introspection, balance, relationships, and communication are essential things in life.

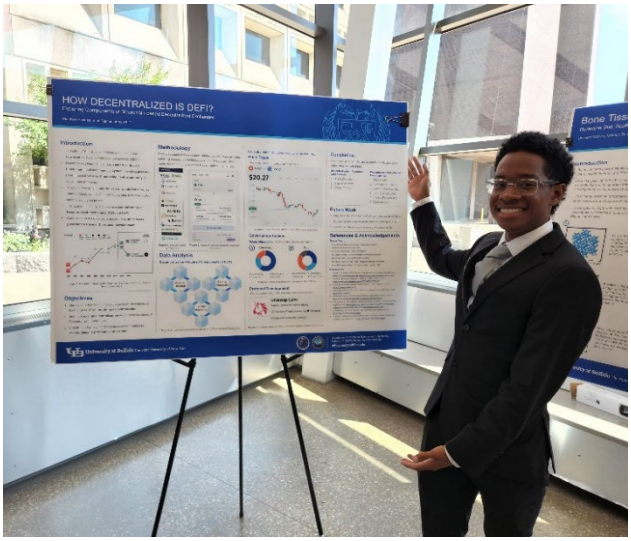
2022 LSAMP Summer Program Research Abstracts

Optimizing Carbon Purification Through the Use of Silver Promoted Zeolite, Ag/SSZ-13

Ruth Bello
Chemical Engineering
University at Buffalo
Mentor: Dr. Eleni Kyriakidou

CO2 is the most produced greenhouse gas which damages the ozone layer and puts our environment at risk. After capture from industrial streams, CO_2 needs to purify in order to be used in food production, enhanced oil recovery (EOR) and feedstock for methanol or urea production. Zeolites are aluminosilicates which are able to act as molecular sieves to adsorb impurities and purify the carbon stream. In this work, the following impurities are modeled for their adsorption properties to silver promoted zeolite, Ag/SSZ-13 (Si/Al = 11); carbon dioxide (CO_2), oxygen (O_2), water (H_2O), dimethyl sulfide (DMS, C_2H_6S), hydrogen sulfide (H_2S), carbonyl sulfide (COS), sulfur dioxide (SO_2). Density functional theory (DFT) calculations were used to calculate the adsorption energies of CO_2, H_2O, dimethyl sulfide, and other impurities in the carbon dioxide stream. The PBE and HSE-06 functionals were used to perform these calculations, and frequency calculations were also carried out to obtain zero-point energy and entropy corrections.

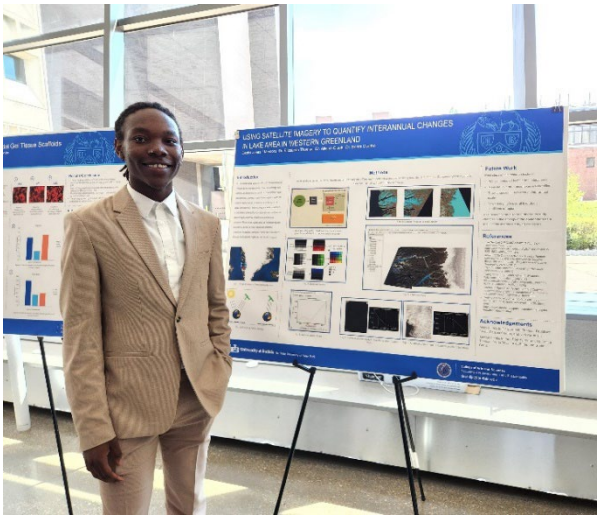
Matthew Haynes
Computer Science
University at Buffalo
Mentor: Dr. Bina Ramamurthy



How Decentralized is DeFi? Searching for Centralization within Decentralized Exchange Protocols

With the central bank raising interest rates in hopes to lower inflation, consumers are facing the imminent threat of lower wages, less spending, and higher unemployment rates, along with the possible risk of driving the entire economy into recession. Centralization in our global financial system exposes critical flaws including lack of trust, entry barriers, financial censorship, and global inequality. DeFi, short for Decentralized Finance, is a smart contract and blockchain mediated financial system aiming to solve these problems by providing peer-to-peer financial services. However, there are increasing concerns for centralization existing within each DeFi protocol. The project features an analysis of the most popular liquidity pool based Decentralized Exchange protocols, examining factors that potentially contribute to centralization. It has been concluded that no Decentralized Exchange protocol is completely decentralized, meaning there exists at least one component containing a degree of centralization. The conclusions drawn from this investigation will capture the full granularity of decentralization within prominent protocols in the DeFi ecosystem.

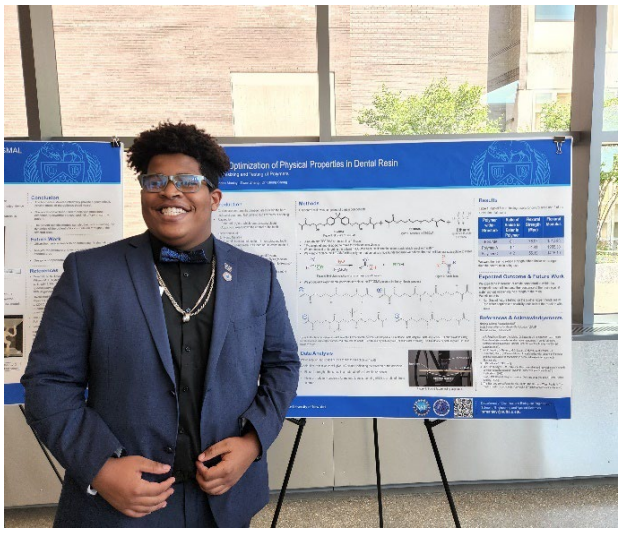
Dephil Jones
Environmental Geosciences
University at Buffalo
Mentor: Dr. Elizabeth Thomas



Using Satellite Imagery to Quantify Seasonal and Inter-annual Changes in Lake Area on Western Greenland

In Greenland, lakes serve as indicators of environmental change as they are sensitive to fluxes in hydrology and climate. As climate warms and Arctic environments begin to experience changes in precipitation regimes, lakes are showing early signs of drying climate in the region. To study the changes in the hydrology and water availability of the region, we examine changes in lake area through the ice-free season and between years in western Greenland. We mapped lake presence and areas using geographic information systems and remote sensing tools to analyze satellite imagery from the USGS Sentinel database. We expect analysis of data to show a reduction in the number of lakes from year to year at rate X, with some large lakes also decreasing in size over this same time span. This retreat would be indicative of an overall tendency towards drying in the region with serious ecological impacts, as many organisms living in deglaciated Greenland rely on these lakes not only as sources of water, but habitat as well.

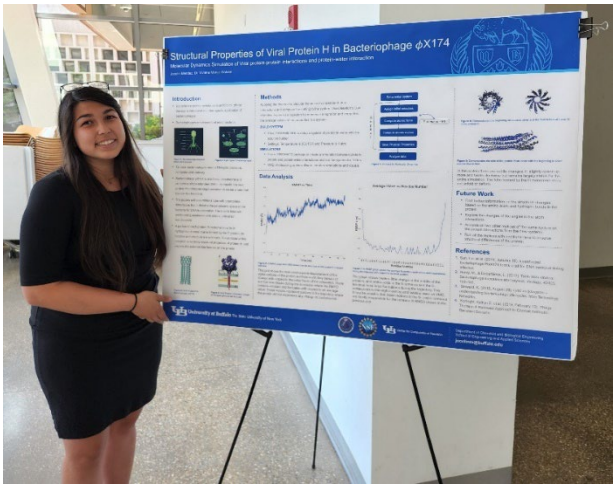
Brandon Manley
Chemical Engineering
University at Buffalo
Mentor: Dr. Chong Cheng



The Optimization of Physical Properties in Dental Resin

Cavities can cause extreme discomfort and lead to problems with the ability to speak, eat and focus. Finding a more resilient dental resin to help fill cavities would help avoid frequent visits to the dentist. In this study, four groups of experimental resin were prepared and compared to the traditional resin for resistance against water (hydrolytic resistance). The traditional resin that is being used contains ester functional groups (OCO) within its chemical structure, which is what we believe to be susceptible to water because water will interact with the ester functional groups and cleave the double bond. The experimental chemical structures possess amide functional groups (OCNH) at different percentages which displays a self-healing ability characteristic. The resins will be tested through various mechanical tests for its mechanical properties such as the elastic and tensile strength. We expect the decrease in concentration of the ester functional group within the resin while the increase the concentration of the amide functional group will increase the ability of the resin to resist water.

Jocelin Mendez
Chemical Engineering
University at Buffalo
Mentor: Dr. Viviana Monje-Galvan



Determining the Structural Properties of Viral Proteins to Leverage

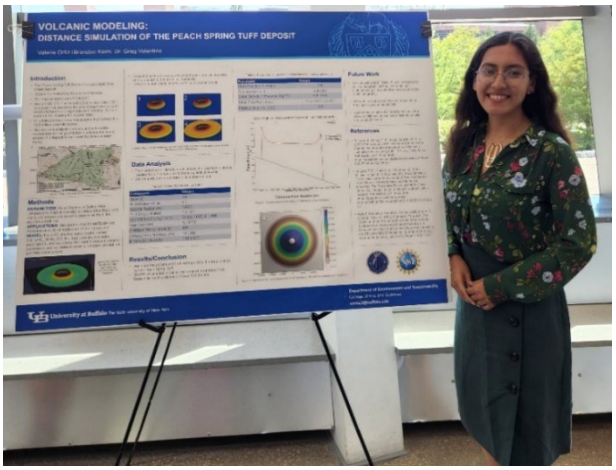
Bacteria, as well as viruses, are ubiquitous. There are a variety of different bacteria, and each could influence the human body differently. While they are evolving and gaining resistance to antibiotics, the usage of bacteriophages had gained more recognition. Bacteriophages are a natural enemy to bacteria; they are a type of virus that can stop bacterial infections by virus-host cell interactions. The use of bacteriophages has helped cure diseases such as E. coli, by using their ability to rapidly but accurately detect and control infections. Aside from the bacteriophages aiding the treatment of bacterial diseases in humans, they also have the potential for other disinfection protocols. By analyzing two specific viral proteins, PhiX174 and MS2 in water. By utilizing molecular dynamics, charmm-gui, and a molecular graphic software (VMD) to observe the structure reaction. If there are no noticeable disturbances in the structures of the bacteriophages, it may be considered to leverage a diverse variety of disinfection protocols.

Bone Tissue Repair and Regeneration with Colloidal Gel Tissue Scaffolds

Bone fractures pose a significant economic and public health burden for millions each year in the U.S, resulting in lost work, unaffordable medical bills, and an overall decrease in quality of life. A significant portion of these fractures, regardless of the quality of surgical treatment, result in non-union fractures requiring additional medical intervention. Colloidal gels can provide a scaffolding material for the repair and regeneration of bone tissue to treat these non-unions. These gels can be embedded with mineral components to enhance the regenerative responses. However, the difficulty lies in determining which gel structure can be optimally engineered with mineral components. To determine this, three different colloidal gels were manufactured by combining a 50% particle fraction of positively charged polyurethane with 5% high molecular weight polyacrylic acid (HPA), 5% low molecular weight polyacrylic acid (LPA), and 2M NaCl. The gels were functionalized with calcium and phosphate ions by treating them with 0.1M CaCl2 and 0.06M K2HPO4. The amount of calcium and phosphate retained by the gel was measured through spectroscopy. We suspect that the gel HPA would retain the most growth factor due to its branched structure.

Bubacar Ndoye
Biomedical Engineering
University at Buffalo
Mentor: Dr. Debanjan Sarkar

Valerie Ortiz
Environmental Geosciences
University at Buffalo
Mentor: Dr. Gregory Valentine



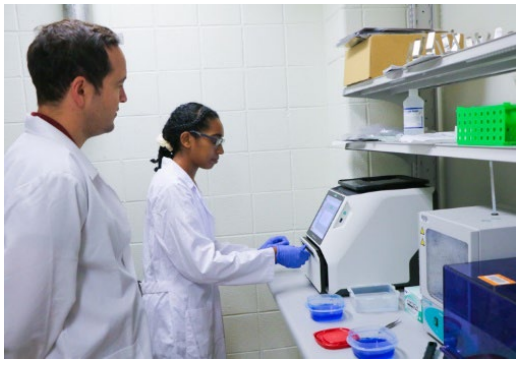
Better Prepare and Better Respond to Volcanic Eruptions as well as Most Efficiently Recover Post Eruptions

Volcanic eruptions are one of nature's greatest and most destructive natural disasters. Having a profound understanding of volcanic explosions is imperative to both human life and wildlife. Through simulations and data analysis we will discover the range of initial conditions that would enable the Peach Tuff Deposit to travel the massive distance seen today through simulations and data analysis. Using a combination of field data and experimental results through the Monte Carlo method in order to make accurate predictions of the volcanic explosion that happened 19 million years ago. This project includes thorough research prior to entering a lab to gain deeper understanding of what kind of explosions happen, the difference in effects during and after explosions, and the reasons behind the difference of explosions. As well as understanding how to run the terminal, and Paraview- a data analysis and visualization application used to visually emulate physical conditions from the initial eruption as more data is collected. Putting the information found into application through MATLAB, to run simulations emulating eruptions and their effects. This has many practical implications, as we gain a deeper understanding of this deposit, we can understand future volcanic eruptions as well as understand deposits with similar characteristics.

Optimal Conditions for Binding Proteins and Liposomes to Create Nanoparticles for Immunization

Allanis Persaud
Biomedical Engineering
University at Buffalo
Mentor: Dr. Jonathan Lovell

Immunization delivery systems avoid triggering immune responses by using a material that is compatible with the body and masks the antigens being delivered. Liposomes can hold both water-soluble and lipophilic molecules to prevent them from being recognized as foreign bodies on the way to the delivery site. A liposome that has binding-compatibility with a virus protein, can potentially be used to deliver vaccines against that particular virus. We aim to find the optimal conditions to increase the binding capabilities of proteins to liposomes. A Nitriloacetic acid (Ni-NTA) affinity competition is used to determine the strength of the interactions between the protein and liposome. The incubation temperature, addition of detergents, and liposome-to-protein concentration affect the protein's relative binding ability to the liposome versus to the Ni-NTA beads. In a test with well binding proteins, we expect to see high amounts of free proteins bound to the liposomes. Under poor conditions we will see most of the proteins bound to the Ni-NTA beads. The conclusion to this study will be a compilation of the conditions that work best with a certain virus protein and use these results to develop an immunization strategy on mice.



Hannah Sheffield
Biomedical Engineering
University at Buffalo
Mentor: Dr. Ciprian Ionita

Using 3D Printed Patient-Specific Models for Aneurysmal Subarachnoid Hemorrhages and Intracranial Atherosclerosis Disease

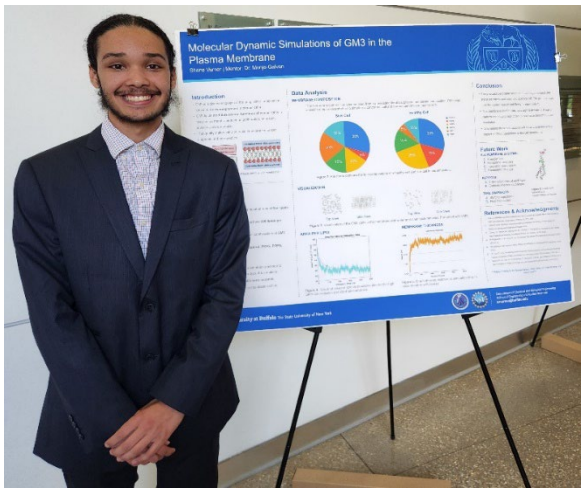
Strokes have a high mortality rate, and survivors tend to have lifelong neurological disabilities. Specifically, Aneurysmal Subarachnoid Hemorrhages (aSAH) and Intracranial Atherosclerosis Disease (ICAD), which occur in the Circle of Willis (CoW), account for 5% and 8% of all strokes and have mortality rates of 50% and up to 67%, respectively. Integrating artificial intelligence, 3D printed patient-specific models, can help enhance the field of medicine by providing physicians with accurate vasculatures of their patients and creating hemodynamic simulations. The process behind obtaining the 3D model includes utilizing medical images (CTA scans), Meshmixer, SolidWorks, and the Stratasys J750 Digital Anatomy printer. As a result, three different versions of the CoW have developed a healthy vasculature, an aSAH, and an ICAD. Hemodynamic testing is being consolidated into patient-specific models to improve the decision-making process. Additionally, incorporating 3D printed models can enhance the field of medicine by simulating a more realistic experience for physicians.

The Observation of Cosmic Rays and Atmospheric Data from a High-Altitude Balloon

High-altitude balloons are an inexpensive and efficient way to explore and observe near space without the need for a satellite. The objective of this study is to capture cosmic rays in Earth's atmosphere and to collect atmospheric data using a high-altitude balloon. The atmospheric data studied will include pressure, temperature, and altitude. The temperature on the inside of the payload will be monitored as well, but only for regulation purposes. The main aspects of this study will include the construction of the balloon payload, its deployment, and the processing of the collected images and data. The balloon payload will have a system to take and record measurements, a system to control the temperature of the inside of the payload, and camera film to capture the cosmic rays. The data collected will be analyzed using Python. From previous observations, it is predicted that as altitude increases, the barometric pressure will decrease.

Christine Shiyam
Computer Engineering
University at Buffalo
Mentor: Dr. John Crassidis

Shane Varner
Chemical Engineering
University at Buffalo
Mentor: Dr. Viviana Monje-Galvan



Molecular Dynamic Simulations of GM3 in the Plasma Membrane

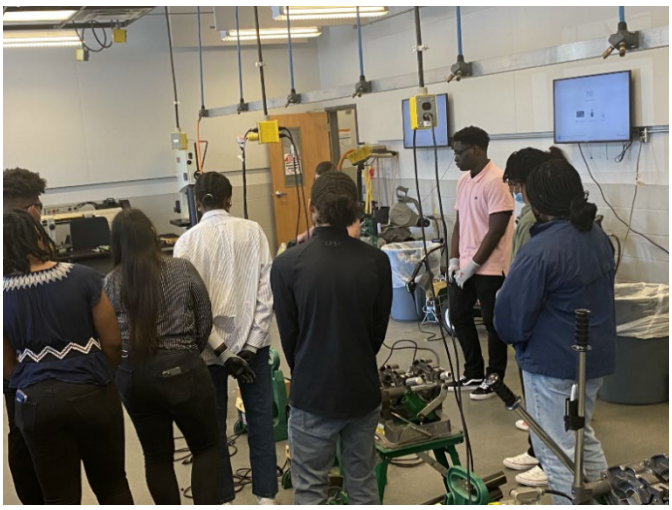
GM3 is a glycosphingolipid of the ganglioside family and is known to be overexpressed in cancer cells. This quality makes them potential candidates for cancer diagnosis and therapeutics. Additionally, GM3 lipids modulate several functions of cancer cells in the plasma membrane such as proliferation, adhesion, invasion, and apoptosis. Using molecular dynamics, four types of membranes will be made using all combinations of the following parameters: short GM3 tail lengths, long GM3 tail length, 5% concentration of GM3, and 20% concentration of GM3. CHARMM-GUI was used to set up the membrane system and GROMACS put the systems through a minimization phase, equilibration phase, and production phase. Following the production phase is analysis on the membrane thickness, the area per lipid in the leaflet, the order parameters of each lipid, and the tilt angle of cholesterol in the membrane. Current results from the analysis on area per lipid and membrane thickness were as expected and revealed that one of the membrane systems was stable and ready for further analysis.

UB SEAS Research Symposium Group Photo with LSAMP & REU students

LSAMP Summer Research Program Events

LSAMP Students visit UB's GRoW Home & Solar Strand to learn more about sustainability issues

LSAMP Summer Research Program Events



National Fuel Tour

LSAMP Students get hands-on experience joining pipeline together…

LSAMP Summer Research Program Events

Professional Skills Day at UB's Center for Tomorrow

Speaker Series Workshops

Etiquette Luncheon

LSAMP Summer Research Program Events

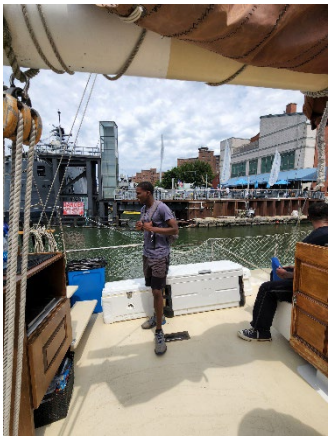






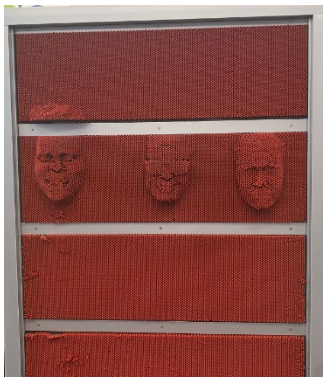







Buffalo Nautical Science Tour on Lake Erie

LSAMP Summer Research Program Events

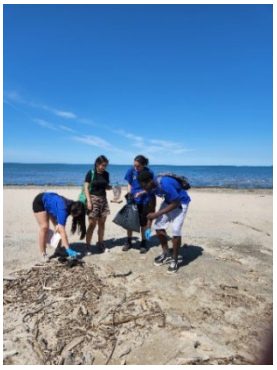






Explore & More Museum

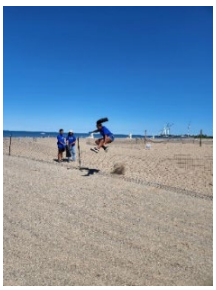
Adopt-a-Beach Clean-Up at Woodlawn Beach


Students learn about environmental stewardship and the effects of plastic pollution in the Great Lakes, and then collected plastics waste from the beach

Over 40 pounds of small plastics waste picked up by LSAMP!






Having a little fun after the beach clean-up!

Tifft Nature Preserve Community Service





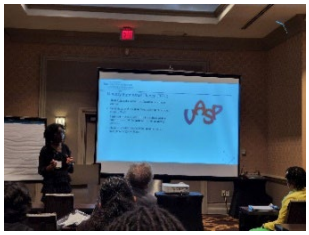


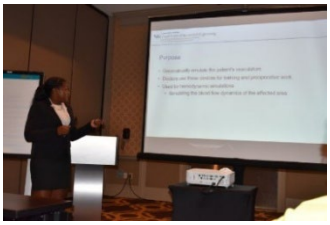





LSAMP students plant native trees at the Tifft Nature Preserve restoration site

LS-PAC Research Conference, New Orleans, LA





End of Summer Program Cookout



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National Fuel

University at Buffalo
Ronald E. McNair Post-Baccalaureate Achievement Program

University at Buffalo
Student Engagement
Student Life

NSF

ALLIANCE for the GREAT LAKES

Louis Stokes Center for Promotion of Academic Careers

University at Buffalo
Office of Fellowships and Scholarships

EHLS

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