RAISE UP INCLUSIVE STEM RETREAT

Sponsored by the Hanson Center for Inclusive STEM Education

Saturday April 22nd

-RETREAT PROGRAM-

LAFAYETTE
HANSON CENTER
FOR INCLUSIVE STEM EDUCATION

Retreat Mission

This retreat aims to equip, empower and energize participants for their academic and professional paths in STEM. Join us for interactive sessions and dynamic networking opportunities that will forge your future as we work together to promote a more diverse, equitable, and inclusive STEM community. All students and faculty are welcome to attend.

Retreat Organizers

Kovalevsky Society

LEADERS

National Society of Black Engineers

Out in STEM

Society of Hispanic Professional Engineers

Society of Women Engineers

Women+ in Physics

Co-Sponsors

Biology Department, Engineering Division, Gateway Career Center, Health Professions Program, Information Technology Division, Sustainability Office, Women's, Gender, and Sexuality Program

RAISE Committee

Harshil Bhavsar, Michael Bonnah, Sabrina Gonzalez, Jessie Grewal, Rachel Kimball, Sophia Kosednar, Bruno Loyola San Martin, Jessica McDivitt, Youmin Park, Louisa Rose. Faculty Advisor: Dr. Wendy Hill

What is RAISE?

RAISE is a coalition of existing student STEM organizations and "at large" members to help harness our shared missions and actions to enhance inclusive STEM education at Lafayette.

Our mission is to...

- ***collaborate on projects across the STEM fields to deepen and expand their impact***
- ***collaborate and share information among the student organizations to increase the effectiveness and influence of their programs***
- ***provide student input and advice on Hanson Center projects and initiatives.***

RAISE

A Hanson Center Initiative for Change

Science, Technology, Engineering, and Mathematics

Keynote: Dr. Lataisia Jones

Dr. Jones is a **Scientific Review Officer** at the **National Institute of Neurological Disorders and Stroke** at the National Institutes of Health She was the **first African American to earn a Ph.D.** within the biomedical sciences department at Florida State University and has conducted research to better understand the **neural basis of conditions such as autism and movement disorders.**

In 2019, Dr. Jones was selected as an **IF/THEN Ambassador by the American Association for the Advancement of Science (AAAS)** as part of their initiative "to further women in STEM by empowering current innovators and inspiring the next generation of pioneers."

Dr. Jones is the leader of **S.T.E.M.ing While Black**, a mentoring network that supports Black scientists. She has developed outreach programs for children to help encourage young girls to pursue STEM careers, including appearances on television and radio programs, and has received a number of awards for her efforts in STEM education and advocacy for diversity in STEM.

NIH National Institute of Neurological Disorders and Stroke

AAAS AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

IF/THEN® Ambassador

Retreat Schedule

11:45 –12:00 pm	**Registration (Marquis Lobby)**
12:00–1:15 pm	**Plated lunch and Keynote: Dr. Jones (Marquis Dining Hall)**

Workshops: RISC *

1:30–2:05 pm	**Session 1**
2:05–2:15 pm	**Break** (*enjoy snacks in Dyer Center*)
2:15–2:50 pm	**Session 2**
2:50–3:00 pm	**Break** (*enjoy snacks in Dyer Center*)
3:00–3:35 pm	**Session 3**

Hot Seats: RISC**

3:45–4:30 pm	**Industry and Graduate School**

RISC Eco Café and Courtyard

4:30–5:30 pm	**RAISE a Glass: Mocktails, Posters and Networking**

**Each session has multiple workshops so you may select one workshop to attend per session.*

***All hot seats will be happening concurrently but feel free to move between different hot seat sessions as you wish.*

You will receive a raffle ticket for <u>each</u> workshop you attend to be entered into a drawing to win a gift card. A few winners will be selected.

Workshop Session 1

(Concurrent sessions from 1:30 to 2:05 pm)

Conversation with Dr. Lataisia Jones

Host: Dr. Lataisia Jones

RISC 360

Inspired by Dr. Jones's talk? Want to talk with her about her work or research? Stop by to have an informal conversation with our keynote speaker, Dr. Jones! Dr. Jones looks forward to meeting Lafayette students and hearing about their experiences in STEM.

Networking 101

Host: Gateway Career Center

RISC 262

Gateway will provide an interactive workshop on how to network. This session will demystify what networking is and provide concrete strategies to use when talking to employers, alumni, professionals. Students will practice these tools during this dynamic workshop.

Exploring Identity and Community at Lafayette

Host: Robert Young and Members of the Office of Intercultural Development

RISC 362

Members of the Office of Intercultural Development will facilitate a conversation on identity and solidarity. We will take a bit of time to learn about ourselves and one another. We will discuss how we can be most supportive to one another so our Lafayette campus is inclusive and welcoming to all of us.

Workshop Session 2

(Concurrent sessions from 2:15 to 2:50 pm)

LinkedIn Workshop

Host: Society of Women Engineers (SWE)

RISC 360

Getting the best from your LinkedIn profile! A workshop explaining the steps to make your LinkedIn platform more appealing and beneficial for your future career. Learn how recruiters use the platform, how to respectfully network whilst standing out to recruiters and connections.

Queer in STEM

Host: Out in STEM (oSTEM)

RISC 262

oSTEM Lafayette will be facilitating a panel of Queer students across all grade levels to discuss their experiences of being Queer in STEM, both at Lafayette and beyond. Stop by to have informal conversations with oSTEM students and learn about what it means to be Queer in STEM and methods to be good allies to LGBTQ+ students in STEM.

Scientific Storytelling

Host: LEADERS

RISC 362

Storytelling is a powerful tool when it comes to influence and persuasion. Science ... is often more polarizing ... and statistics ... are difficult to retain. But if you blend the two together and weave them into an engaging narrative, suddenly, you can tug at heart strings and change minds. Come learn how to communicate your own story and reflect on your journey in STEM so that you can use these skills to standout in interviews and personal statements!

Workshop Session 3

(Concurrent sessions from to 3:00 to 3:35 pm)

Neurodiversity and Accessibility in STEM

Host: RAISE and NSBE

RISC 360

What is neurodiversity, and how is it relevant in STEM fields? In this interactive workshop, participants will learn about the bias, discrimination, and lack of accommodations that neurodivergent individuals in STEM fields face. When these differences are viewed as strengths, neurodiversity can lead to innovative problem-solving and unique perspectives. Through videos, activities, and discussion, we will better educate ourselves about neurodiversity in STEM and brainstorm actionable steps to create positive change on campus and beyond.

Thriving in STEM: Finding a Joy Beyond STEM

Host: Women + in Physics (WiP+)

RISC 262

This workshop will highlight anecdotes of Lafayette students and alumni who have found how to thrive in STEM. The following discussion will explore the ways that experiences of students here on campus reflect theoretical understanding of retention of minoritized groups in STEM fields. Participants will leave with strategies and approaches to foster positive work/life balance.

The Role of Psychological Safety in Innovation and Allyship

Host: Millie Smith, Hanson Center for Inclusive STEM Education

RISC 362

Do you feel comfortable expressing your ideas or challenging decisions? Does the thought of group projects give you the heebie-jeebies? In this workshop students will learn about the concept of psychological safety, its potential barriers, and how it can impact both innovation and effective allyship. Through interactive exercises and discussions, students will leave with practical knowledge and strategies that can be applied to participation in classes, navigating group projects, and enhancing their community.

Industry and Academia Hot Seats

(Concurrent sessions from 3:45 to 4:30 pm)

‡ in-person

Grad School in Natural Sciences
RISC 262

Jafar Bhatti '19‡ –Neuroscience, University of Pennsylvania
Aaron Shoemaker '22–Chemistry, Northwestern
Beth Anne Castellano '22–Math, Dartmouth
Tara Leininger '22–Physics, California Institute of Technology

Grad School in Engineering
RISC 260

Molly Dougher '22–ChemE, Notre Dame
Alex Ashley '22‡ –ChemE, Drexel
Talia Baddour '19–MechE, University of California, San Diego

Industry in Natural Sciences
RISC 360

Koby Acheampong '22‡ –Clinical Science Intern, Bristol Myer Squibb
Maria Liberti '13 –Clinical Scientist, Merck
Milena Berestko '22–Behavioral Research Fellow, Northwestern
Savanna Touré '21–Graduate Research Fellow, Mayo Clinic

Industry in Engineering
RISC 362

Maddie Carroll '22‡ –Chemical Engineer CDP, Air Products
Oscar Jopp '22‡ –Project Engineer, Victaulic
Austin Ray '21‡ –Project Engineer, Whiting-Turner
Lovejoy Afoakwa '21–Field Engineer, Turner

Industry in Math/ Computer Science/ Economics
RISC 460

Irwin Frimpong '20‡ –Hardware Engineer, IBM
Aurie Greenberg '22–FIG Analyst, BlackRock

Alumni Bios

Aaron Shoemaker

Aaron is currently pursuing a PhD in chemistry at Northwestern University. Specifically, he's researching at the intersection of organic and inorganic chemistry using electrochemical and synthetic techniques. Outside of the lab, Aaron loves to run and hike, and he's looking forward to doing more lake activities when the weather gets warmer! Aaron also loves to explore Chicago and all the thrift stores around :)

Alex Ashley

Alex Ashley was the George Wharton Pepper Prize Winner for 2022. He is wrapping up the first year of his PhD at Drexel University in Solar Technology and Photovoltaics. Hobbies during college were limited to Netflixing, going out to parties, and hosting kickbacks. New-found hobbies since graduation include gardening, travelling, and of course, dancing. Alex is quite interested in his field of study and coupling that with his relatable, understanding, and approachable grad advisor, his grad school experience so far has greatly exceeded his expectations. Alex strongly believes that he is enjoying his grad life because he considered the location, quality of life, cost of living, ease of travel within and outside of the area/city, the school itself and the research groups he wanted to join, and the work of his potential advisors. Quite a lot indeed! Grad school is a 5 year commitment, so you want to make sure that your decision results in your happiness both during and after that 5 year commitment; many forget to think about their happiness during their PhD. Come to Alex's panel discussion, and you can learn more about his path to PhD in Engineering.

Aurie Greenberg

Aurie works in BlackRock's Financial Institutions Group where she maintains relationships with insurers and other taxable clients. Her role includes data analysis, content creation and client engagements. At Lafayette, Aurie was a math-econ major and wrote an economics thesis with Prof. Biener. Her favorite class was case studies in math modeling. She was involved in MOSAIC, Kovalevsky Society and the women's ice hockey team. Outside of work, Aurie is a KS mentor, enjoys podcasts, walks in Central Park and doing crosswords.

Austin Ray

Austin is from Washington, D.C., and attended Lafayette on a Posse Scholarship. He graduated in the fall of 2020 with a degree in Mechanical Engineering. In February of 2021, he began working full-time for Whiting-Turner. Whiting-Turner is a general contracting company in the field of construction management. Join Austin in a discussion about his experiences at Lafayette and how they prepared him socially and professionally for the working world being a fall (delayed) graduate. Austin looks forward to sharing his experiences in the work place as a young professional and any other topics of interest to you.

Alumni Bios

Beth Anne Castellano

Beth Anne is a first-year mathematics PhD student at Dartmouth College. She graduated from Lafayette in 2022 with a major in math and minor in music. She's interested in doing research in the field of algebraic combinatorics, which uses combinatorial objects–often these are finite collections of fun diagrams or pictures–to study abstract algebraic structures. She is passionate about teaching and making mathematical spaces more welcoming and inclusive. In particular, at Dartmouth, Beth Anne was involved with AWM (Association for Women in Mathematics) activities and outreach events for younger students. Outside of math, she enjoys playing violin and making music with others!

Irwin Frimpong

Irwin is currently a Hardware Engineer at IBM where he implements low-level logic design on the CPU core of IBM z Mainframe high performance computers. While at Lafayette, he was a Posse Scholar and studied Electrical & Computer Engineering - later graduating in May of 2021. Outside of his day job, Irwin is a part of the National Society of Black Engineers (NSBE) Professional Network, taking part in volunteer opportunities promoting the importance of a STEM education and career preparation. His hobbies include cooking, photography, and recently hiking.

Jafar Bhatti

Jafar is currently a 2nd year PhD student in the Neuroscience Graduate Group (NGG) at the University of Pennsylvania. At this early stage, he is wrapping up the last of his required coursework and preparing for his candidacy exam, which consists of a written document and oral presentation of his proposed thesis work. Over the past two years, Jafar has done rotations through different labs and taken courses that touch on all key aspects in the field of neuroscience. After completing his candidacy exam, Jafar will begin his thesis years consisting of full time-research. The lab he decided to join studies auditory neuroscience. His project is focused on explaining how seemingly distinct brain regions communicate to effectively process and respond to auditory stimuli. Outside of the lab, Jafar loves exercising, reading for pleasure, and playing pool. He's also attempted to pick up squash and rock climbing. One of his favorite things to do is explore the city of Philadelphia, which has so much to offer. After graduate school, Jafar hopes to work in industry. Some things that he may be interested in the future are science communication, life sciences consulting, or biotech.

Alumni Bios cont..

Kwabena Acheampong

Kwabena graduated from Lafayette College with High Honors and a B.S. Biology degree on a pre-med track. He has a strong passion for the Health Sciences Industry in both the biological and financial sectors. He is a results-driven scientist with competent critical thinking and problem-solving skills. He has expertise in Project management, Public Speaking, and Leadership. His educational goals are to study biological mechanisms/systems of interest within Black and Underrepresented patient populations predisposed to aggressive cancers and crippling diseases. Currently, he conducts clinical research as a Clinical Science Intern at Bristol Myers Squibb (BMS) in the Hematology/Oncology and Cell Therapy on the Early Clinical Development team. Kwabena has a dedicated passion for directly fighting the burden/impact of health disparities on Black and Underrepresented patients using precision medicine approaches. His career goal is to increase Black representation among clinical teams (physician-scientists, physicians, scientists, etc.) within his field and to collaborate with others to consolidate the knowledge acquired during their years of study and clinical experience into practical and effective targeted therapeutic methods to alleviate the significant and ever emerging health burden seen within the African diaspora across disease types.

Lovejoy Afoakwa

Lovejoy graduated from Lafayette in 2020 with a degree in Mechanical Engineering. As a junior at Lafayette, he interned with Turner Construction Company at the Rockwell Integrated Science Center and joined the company in a full time basis in September 2020. In his first 6 months with the company, he worked as a Field Engineer with a focus in Mechanical, Electrical and Plumbing systems on the new health science building for Drexel University. He then transitioned into the full engineering role until the completion of that project in early 2023. Lovejoy is currently working with a team of 5 completing some lab and vivarium renovations at Thomas Jefferson University in Philadelphia. Outside of work, Lovejoy is very passionate about sports so he spends a lot of time following favorite soccer teams around the world and traveling.

Madeline Carroll

Madeline (Maddie) is a Lafayette College 2022 graduate who majored in Chemical Engineering and minored in Computational Methods. During her time at Lafayette, she did research with Assistant Professor Aseel Bala on using computational methods to build thermodynamic models and was on the Executive Board for AIChE for a number of years. Maddie did three internships at Air Products during her time at Lafayette and is now in their Career Development Program where Chemical and Mechanical Engineers have the opportunity to rotate through 2-3 positions/locations during a 2 year program to explore their interests in industry. Maddie is in the first rotation as a Process Safety Engineer and her next rotation will be an Advanced Controls Engineer, both at the Allentown, PA headquarters. Outside of work, she like cooking and baking, watching sports and binging shows with friends, and traveling.

Alumni Bios cont..

Molly Dougher

Molly graduated from Lafayette in 2022 with a degree in Chemical Engineering. While at Lafayette, she had the opportunity to work with Dr. Bala and Dr. Soh, where she participated in summer research and completed an Honors Thesis. Her undergraduate research was a techno-economic analysis of biodiesel production via interesterification. The paper for this work was published earlier this year. Molly is now a first-year graduate student in the Chemical Engineering PhD program at The University of Notre Dame. She is nearly finished with her second semester of classes and has completed the advisor matching process. Molly works in Dr. Dowling's Lab, which is a computational research lab at Notre Dame focused on sustainable energy applications. Molly is happy to answer any questions you may have about research and graduate school in general!

Maria Laberti

Maria Liberti graduated from Lafayette College with a BS in Biology. While at Lafayette, she worked in Dr. Kurt's lab on an independent research project and quickly realized that she wanted to pursue a career in research. Before her senior year, she completed a Summer Undergraduate Research Fellowship at Boston University to expand her research experiences and learn more about research possibilities in graduate school. After returning to Lafayette College and completing an Honors Thesis, Maria pursued a PhD in Biochemistry at Cornell University and joined the Locasale lab studying therapeutic strategies for targeting the Warburg Effect. During her PhD, the lab relocated to Duke University where she completed the remainder of her graduate studies as a visiting scholar. After graduating from Cornell in Fall 2018, she pursued postdoctoral studies as an NCI F99/K00 fellow in the Tavazoie and Birsoy labs studying metabolic regulation in metastatic cancers. While Maria enjoys academic research, she wanted to transition more into clinical development. In Fall 2020, she joined Merck as a clinical scientist and she is currently a senior clinical scientist working on clinical trials in early-stage development. Outside of work, Maria enjoys traveling, baking, and hiking.

Milena Beretzko

Milena Kinga Berestko is a Posse Leadership Scholar and an alumna from Lafayette College. She earned her B.A. in Psychology and Theatre, with a minor concentration in Women, Gender and Sexuality Studies. In her college years, Milena was an active organizer with the Dear Lafayette Coalition, and held appointments as a President of Psi Chi Honor Society, Office of Intercultural Development Program Coordinator, Digital Humanities Teaching Fellow, and a Mentor Writing Associate in the College Writing Program, among others. She has organized the annual Migration Summit and AAPI Awareness Months, spearheading many DEI initiatives on campus and nationally, which then led her to becoming a Humanity in Action Fellow to Sarajevo. She currently works as a Behavioral Research Fellow at Kellogg School of Management at Northwestern University.

Alumni Bios cont..

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Oscar Jopp

Oscar graduated from Lafayette less than a year ago and has been working in industry as a Global Quality Assurance Engineer since August. He is from England and works in the US on OPT (F1 student visa). While this meant he wasn't able to design rockets - every engineers dream job he knows - he is here to shed some light on the many other, possibly more fulfilling, opportunities available to you once you graduate. Oscar hopes to answer your questions on finding a job you enjoy, networking to create opportunities, how to market yourself to employers, and anything else he is able to assist you with.

Savanna Touré

Bio to come

Talia Badour

Talia is a 2nd year Bioengineering PhD student at University of California San Diego. Her thesis is focused on using sequencing and biomaterial technologies to identify sex-differences in heart disease. Outside of lab, she enjoys going on long runs and rock climbing.

Other Services and Resources

(During the workshop session from 1:30 to 3:30 pm)

Resume Review

Bring your resume and get it reviewed by Gateway peer advisors!

In RISC 302 (fishbowl)

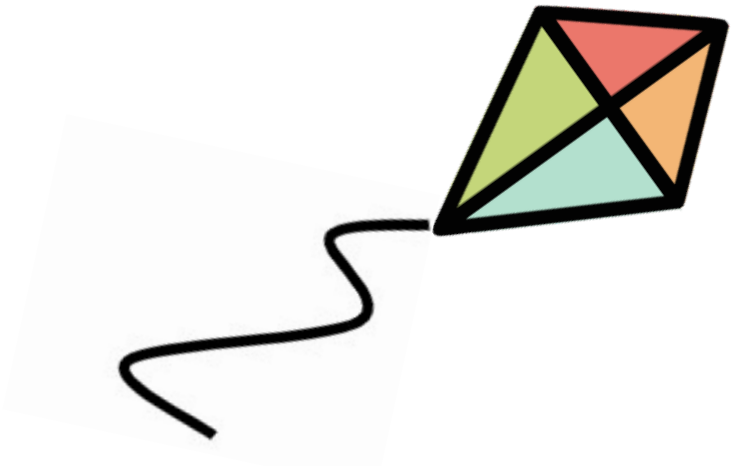
Retreat Lounge in the Dyer Center

Stop by the lounge (Dyer Center) whenever you want for snacks, refreshments, and meet alumni and guests in this informal, casual space.

Scholarships/ Fellowships

Talk to Dean Goldberg about scholarships and fellowships you are eligible for and get application tips from Lafayette student recipients.

In Dyer Center Lounge



RAISE a Glass and Research Poster Session

(4:30-6:30 pm)

Enjoy mocktails and snacks while networking with alumni, faculty, and students during this social hour

Research Poster Session

Students will be giving poster presentations highlighting their research or STEM-focused initiatives on campus. Grab a mocktail and come see the great work being done by Lafayette students. This is a great way to learn about research opportunities!

People's Choice Award

Attendees will vote for the best poster during the session and the presenter with the best poster will be awarded a $100 Visa gift card!

Abstracts on the following page!

Research Poster Abstracts

Identifying Clinically-Relevant IsomiRs Associated with Patient Survival in African Americans and European Americans with Kidney Cancer

Presenter: **Alex Bart '23,** Biology
Advisor: Dr. Khadijah Mitchell

Background: Renal cell carcinoma (RCC) is the most common type of kidney cancer (85%), and has the lowest survival compared to all other urologic cancers. There are three distinct RCC subtypes: clear cell (75%), papillary (15-20%), and chromophobe (5%). African American (AA) RCC patients have worse advanced-stage survival than European Americans (EAs), possibly due to aggressive tumor biology. microRNAs (miRs) and miR isoforms (isomiRs) silence mRNAs by preventing translation, and drive different mRNA expression signatures associated with invasiveness and metastasis. It is unknown if these transcriptomic signatures vary by race in RCC patients.

Hypothesis: Population-specific isomiRs are associated with racial differences in RCC survival.

Study Design: miR-seq, isomiR-seq, mRNA-seq, and clinical data were downloaded for AA and EA RCC patients in the pan-RCC TCGA discovery cohort (n = 117 AAs, 649 EAs). The PGS miR Expression Workflow, Prism, and cBioPortal were used to determine differentially expressed (DE) miRs, isomiRs, and mRNAs by race ($P < 0.05$). miR and isomiR expression inclusion criteria were≥3 reads per million (1: low specificity and high sensitivity; 5: high specificity and low sensitivity) and upregulation in AAs. Kaplan-Meier statistics were calculated for overall and disease-free patient survival.

Results: miR-1307 was significantly DE in AAs and EAs across two RCC subtypes (ccRCC: $P = 0.021$, pRCC: $P = 0.027$). A total of 7/15 miR-1307 isomiRs met the expression inclusion criteria. High miR-1307-3p|5'- G,3'- x| expression in EAs, and low expression in AAs, was associated with worse disease-free survival in ccRCC (EA $P = 0.011$, AA $P = 0.806$).

Conclusion: miR-1307-3p|5'- G,3'- x| may be a novel oncogenic isomiR and biomarker of poor prognosis in ccRCC patients. Clinical targeting via isomiR sponges could decrease expression in EAs while miR-mimics may be utilized to increase expression in AAs, potentially reducing racial disparities in survival.

Research Poster Abstracts

Determining yeast prion propagation abilities of *Arabidopsis thaliana* Sis1 and Hsp104 orthologs

Presenter: **Bridget Corpus '24**
Advisor: Dr. Justin Hines

Protein aggregation in the form of amyloid is associated with neurological diseases. Amyloids serve as the structural basis for mammalian prions, which are infectious, self-propagating ordered aggregates of functional protein. Prions are found in Saccharomyces cerevisiae, where they propagate through the action of molecular chaperone proteins. Three chaperones are required for the propagation of the prions [PSI+] and [RNQ+] in S. cerevisiae: Hsp104, Hsp70, and Sis1. In the model plant Arabidopsis thaliana, we identified six functional orthologs of Sis1 and demonstrated their differing abilities to propagate distinct yeast prions. The overall goal is to compare sequences and structural information between multiple orthologs to better understand the prion-specific propagating functions of chaperone proteins. Here we show that the J-domain and glycine-rich domains of these orthologs are fully sufficient for their prion-propagating properties. Additionally, we are examining the ability of the functional ortholog of Hsp104 found in A. thaliana, Hsp101, to replace Hsp104 in prion propagation. Prion propagation by Hsp101 has never been successfully demonstrated in the literature, which may be due to the sensitivity of prions to over- and underabundance of Hsp104 function. Here we examine three different expression systems with the intention to vary Hsp101 expression levels to determine if any amount is capable of stable prion propagation. Preliminary results indicate that Hsp101 may not be capable of replacing Hsp104 to propagate either [PSI+] or [RNQ+], although experiments are ongoing.

Imine, Nitrogen-containing Oligomers, and Heterocyclic Compound Formation in the Glycolaldehyde and Methylamine Reaction System

Presenter: **Camille Carthy '23**
Advisor: Dr. Melissa Galloway

Brown carbon compounds (BrC) in aerosol deteriorate air quality and have critical environmental health and climate change implications. Due to their brown color, particles containing BrC can absorb solar radiation over a broad range of wavelengths, subsequently warming the atmosphere, and contributing to climate effects. Substantial uncertainty exists concerning BrC formation and their mechanistic pathways, especially within the novel glycolaldehyde (GAld) and methylamine (MeAm) reaction system. Both GAld and MeAm are gaseous atmospheric constituents, with the primary emission of glycolaldehyde resulting from biomass combustion and secondary formation resulting from oxidation of other gas phase compounds. Products of the GAld+MeAm system were separated and identified using supercritical fluid chromatography-mass spectrometry (SFC-MS). Using tandem mass spectrometry to corroborate mechanistic pathways of proposed products, compelling evidence is provided for the formation of imines, nitrogen-containing oligomers, and heterocyclic compounds in the GAld+MeAm system. Identifying and characterizing GAld+MeAm products provides insight into the formation, properties, and reactivity of brown carbon compounds.

Research Poster Abstracts

Reach-and-Grasp Using a Mechanical Device

Presenter: **Cuong Vu '23**
Advisor: Dr. Luis Schettino

The reach-to-grasp movement has been a topic of interest for neuroscientists studying movement neuroscience for a very long time. Such movement is necessary for daily functioning and object manipulation. Recent technological advances have allowed for remote control of the reach and grasp movement in hazardous environments or in high-precision procedures via a mirroring robotic apparatus. This brings into question the ability to design accurate control tools for human pilots. Through this study, we aim to explore the kinematic differences between normal hand grasping and grasping using a mechanical grasper, with and without previous practice.

Expression of the Apolipoprotein E (Apoe) Gene in the Murine Cingulate Cortex upon Activation of the Locus Coeruleus

Presenter: **Genevieve Craig '23**
Advisor: Dr. Henry Hallock

Apolipoprotein E (APOE) is a gene that encodes for a protein involved in lipid transportation in the central nervous system. APOE allele variants are commonly associated with differences in Alzheimer's disease progression and severity, as well as attentional performance, in humans. Despite this knowledge, how APOE expression affects brain function during attention remains unclear. In mice, Apoe expression is increased in cortical tissue after synthetic activation of two brain regions that are associated with attention: The cingulate cortex (CC), and the locus coeruleus (LC). Deficits in attentional function associated with differences in activity in these brain regions are also implicated in neuropsychiatric disorders such as schizophrenia, attentional deficit hyperactivity disorder, and major depressive disorder. An understanding of which brain regions and cell types Apoe is expressed upon activation of the attentional circuit could inform treatment approaches for these disorders that target this molecule. Using a cohort of 24 mice (12 male and 12 female), we examined cell type-specific expression of Apoe in the CC following DREADD-mediated excitation of LC inputs. We performed viral injections, single-molecule fluorescence in situ hybridization, and subsequent analysis of gene expression to determine in which cell types (neurons vs. astrocytes, and glutamatergic neurons vs. inhibitory neurons) Apoe is expressed in the CC. The results from these experiments will yield insight into how Apoe expression affects function in cortical microcircuits that are important for attention-guided behavior.

Research Poster Abstracts

Impacting Cervical Cancer Disparities in Hispanic Women in the Lehigh Valley

Presenter: **Jaskaran Grewal '23**
Advisor: Lehigh Valley Health Network

Cervical cancer is both preventable and curable. HPV vaccination in adolescents and young adults can prevent the development of cervical cancer. Early and timely screening with PAP smears, alongside early treatment of non-invasive cervical cancer can cure a woman of the disease. Without prevention, screening and early treatment, however, invasive cervical cancer can develop. Invasive cervical cancer is deadly; the United States 5-year national survival rate averages only 70%. Alarming invasive cervical cancer incidence and mortality rate differences exist by race, ethnicity, and geographic location. Hispanic populations in particular have higher mortality from invasive cervical cancer compared to non-Hispanic whites. Pennsylvania Department of Health most recent cancer registry data showed that Hispanic women in our state have the highest incidence of cervical cancer (10.6/100,000 compared with white 7.5/100,000 and black women 10.1/100,000), and have the highest rate of cervical cancer death comparatively (5.5/100,000 compared with 1.8/100,000 for white and 2.5/100,000 for black women). Substantial evidence shows that social determinants of health, such as SES, education, or access to primary care and medical insurance, are contributing to invasive cervical cancer mortality differences seen in Hispanic women. To address this disparity, the novel tool, focused rapid assessment process (fRAP) was utilized in which publicly available data was used to map areas within the Lehigh Valley where cervical cancer disparities may be most prevalent, and then the next phase involved conducting qualitative, ethnographic observation at the community, medical, and policy levels in those high priority areas to identify avenues to go about addressing these disparities. It was determined that a loss of funding for state-supported screening programs was evident in the Allentown zip-codes. Additionally, in some areas, a Federally Qualified Health Center was not present which could have limited access to screening and treatments for minority populations. The final step will be to integrate quantitative and qualitative outcomes to identify policy or environmental intervention. By putting the pieces together and drawing up a contextual map of key players, geographic issues, policy and regulatory issues, the process of how to enact the policy or environmental change will be prepared in a one-page policy brief. This document will be disseminated to key stakeholders in communities of high need for collective discussion on possible first best advocacy and action steps.

Research Poster Abstracts

Using Community Cultural Wealth to Understand Experiences in Physics Bridge Programs

Presenter: **Jenna Tempkin '24**
Advisor: Dr. Geraldine Cochran, Rutgers University

Many conceptual and theoretical frameworks in education research tend to value social capital and cultural capital from the most privileged groups and focus on what underrepresented groups are "lacking." This research often employs a deficit model of understanding the experiences of people marginalized in education. To fully understand the academic experiences of students from minoritized groups it is important to instead focus on what skills these groups use to overcome challenges. Community Cultural Wealth (CCW) is a framework created by Tara J. Yosso that is used to highlight the valuable resources Communities of Color have to help them through certain systems such as education. The goal of this portion of the project is to understand which forms of Community Cultural Wealth influence the experiences of students in physics bridge programs affiliated with the American Physical Society's Bridge Program. Specifically, we want to understand which forms of CCW are most influential in a student's decision to apply to graduate school, and support students in overcoming challenges that arise in their experiences as graduate students. To do so, we conducted 1 hour, semi-structured interviews with various Bridge Program participants and used qualitative coding to code for examples of each of the 6 types of CCW.

Feeling The Distance: Exploring Novice Designers' Perceptions of the Psychological Distance Towards and Empathy Induced by Problem Variations

Presenter: **Jenna Herzog '24**
Advisor: Dr. Rohan Prabhu

The accelerating depletion of natural resources has necessitated the design of environmentally sustainable engineering solutions. To meet this need, designers must actively incorporate considerations of environmental impact in their design decisions. Prior research suggests that the effects of climate change are often perceived to be psychologically distant, and this distance could inhibit individuals from actively engaging in environmentally sustainable behavior. Little research has investigated the impact of problem framing based on designers' psychological distance on design performance, especially in environmentally sustainable design. Furthermore, research suggests that empathy development could be an effective mechanism for bridging psychological distance. However, little research has assessed the utility of empathy-invoking problem framing in sustainable engineering design practice and education. Our aim in this study is to explore this research gap by comparing student designers' perceptions of different problem formulations. Specifically, we tested the effects of variations in (1) the socio-spatial context and (2) the empathy focus of a similar design problem. The effects of these variations on the perceived psychological distance and empathy-invoking nature were tested through a 2x2 between-subjects experiment. From the results, we see that the variations in the problem formulation did not relate to either the perceived psychological distance or the perceived empathy-invoking nature. These findings suggest that issues related to environmental sustainability tend to be perceived similarly, despite differences in their socio-spatial context and empathy-invoking nature.

Research Poster Abstracts

Optimizing Zinc Oxide Nanorod Growth for Perovskite Solar Cell Applications

Presenter: **Jessica McDivitt '24**
Advisor: Dr. Wendifer Reyes-Ramos, Binghamton University

The development of renewable energy resources is vital to counteract the increasingly dire effects of climate change. Solar cells are a promising fossil fuel alternative, but traditional silicon cells have their limitations, incentivizing the development of alternative solar cells. Perovskite solar cells (PSCs) show promising conversion efficiencies. PSCs contain an electron transport layer (ETL) and a hole transport layer (HTL). Within a PSC, photons of sunlight excite electrons, leaving an electron-hole pair. Ideally, electrons will make contact with the ETL, creating a current. However, if electrons do not quickly make contact with the ETL, the electron and hole will recombine, reducing the efficiency of the solar cell. To improve efficiency, the ETL can be constructed into nanorods. With a nanorod array, surface contact increases, reducing the recombination rate and increasing the PCE. In this project, I created zinc oxide nanorods for use in perovskite solar cells. I tested the impact of growth temperature, growth duration, and content of the precursor solution on nanorod growth. I found that higher temperatures, shorter growth times, and lower alkali concentrations contributed to better nanorod growth. I also found that the addition of aluminum in the precursor solution increased the conductivity of the nanorods.

The reactivity of [M(PP)Cl2] (M = Ni or Pt; PP = 1,1'-bis(phosphino)metallocene) with Na[BArF24] (BArF24 = tetrakis(3,5-bis(trifluoromethyl)phenyl)borate)) and reactions of the subsequent products

Presenter: **Kelsey Wong '25**
Advisor: Dr. Chip Nataro

The heterobimetallic dimers [Pt2(PP)2(μ-Cl)2][BArF24]2 (PP = 1,1′ -bis(phosphino)ferrocene ligands; BArF24 = tetrakis(3,5-bis(trifluoromethyl)phenyl)borate) were prepared by the reaction of the corresponding dichlorides, [Pt(PP)Cl2] with Na[BArF24]. The compounds were characterized by NMR spectroscopy and in some cases, X-ray crystallography. Addition of a variety of monodentate phosphines (PR3) resulted in the formation of new [Pt(PP)(PR3)Cl][BArF24] compounds. The new compounds were characterized by NMR and the X-ray crystal structures of several of these compounds were obtained. The oxidative electrochemistry of these compounds was also examined using cyclic voltammetry to determine the effect of the different PP and PR3 ligands on the potential at which these compounds undergo oxidation. In the case of [Ni(PP)Cl2], the reaction with Na[BArF24] does not appear to cleanly yield the corresponding dimeric species, [Pt2(PP)2(μ-Cl)2][BArF24]2, but rather results in the formation of several unexpected products that have been characterized by NMR spectroscopy and X-ray crystallography.

Research Poster Abstracts

Exploring Drug Resistance Gene Expression Patterns Associated with Lung Cancer Survival in African Americans and European Americans

Presenter: **Marisa Reibesell '24**
Advisor: Dr. Khadijah Mitchell

Lung cancer is the leading cause of cancer-related deaths in the US with one of the lowest five-year survival rates. African Americans (AAs) have lower 5-year survival rates of non-small cell lung cancer (NSCLC) compared to European Americans (EAs). Six determinants of drug resistance are responsible for ~90% of cancer-related deaths (tumor mutation burden and growth kinetics, tumor heterogeneity, physical barriers, immune system and tumor microenvironment, undruggable genomic drivers, and selective therapeutic pressure). This study compared differentially expressed drug resistance genes (DRGs) in AAs and EAs with NSCLC. In total, 35 DRGs were identified from PubMed. mRNA expression was compared in the two most common NSCLC subtypes, lung adenocarcinoma (LUAD) and lung squamous cell carcinoma (LUSC), using TCGA patients in the TSV Database. 6/35 DRGs had significantly higher expression in AAs (n = 1 LUAD + LUSC, 5 LUSC only) and corresponded with various drug resistance determinants. GraphPad Prism was used to generate Kaplan-Meier curves and plot disease-free patient survival. High MALAT1, PTEN, PVT1, KDR, AURKA, and GSTT2 (pan-cancer markers of drug resistance) were associated with lower survival in AAs with LUSC. DRG expression may be used as a promising clinical prognostic and treatment biomarker to reduce survival disparities in AAs.

Can we predict flash flooding? Metrics and Models for predicting stream flashiness in the mid atlantic region

Presenter: **Rachel Hurley '23**
Advisor: Dr. David Brandes and Dr. Christa Kelleher

Flashiness is a key metric used to describe the responsiveness (or stability) of streamflow regimes. In existing studies, streamflow flashiness has most often been positively correlated with the presence of urban land cover or imperviousness. However, myriad watershed characteristics can influence streamflow flashiness, necessitating further investigation of how flashiness and its associated drivers vary at regional scales. We investigate how eleven different watershed parameters impact the flashiness of 195 sites in the Mid-Atlantic region using linear regression analysis. While most studies have focused on regional or even continental scale drivers, we sought to explore the drivers of flashiness and whether they vary within physiographic regions. To determine this, we evaluated empirical relationships between watershed characteristics and multiple flashiness metrics at the regional and sub-regional scale, splitting the mid-Atlantic region by physiographic regions. For the full region and sub-regions, we identified up to the four most important empirical predictors. Overall, influential predictors of stream flashiness varied among regions. As found in other studies, development remained an influential factor in determining stream flashiness. However, several other watershed characteristics also played an important role. For instance, wetland cover (%) was a universal buffer of flashiness for all sub-regions. Our findings also showed that differences in flashiness behavior between rural and suburban watersheds were negligible ($p>0.05$), with significant variations in behaviors between rural and urban watersheds ($p=0.0037$) occurring at 80% development. Our findings suggest the potential for improvements to operational flood forecasting using terrestrial drivers of flashiness in addition to real-time radar rainfall estimates.

Research Poster Abstracts

Investigating differentially expressed genes, functional immunobiology differences, and survival in African Americans and European Americans with renal cell carcinoma subtypes

Presenter: **Samantha Greenberg '24**
Advisor: Dr. Khadijah Mitchell

Background: African Americans (AAs) have lower clear cell renal cell carcinoma (ccRCC) survival rates than European Americans (EAs). Checkpoint inhibitor immunotherapy (CII) produces unpredictable responses for ccRCC, which may explain racial survival disparities. A gene expression profile distinguishes ccA and ccB (lower survival, aggressive tumor biology) ccRCC subtypes. AAs get ccB more, but survival and immunobiology differences within subtypes are unknown. Hypothesis: AA and EA ccA/ccB patients have different survival and immunobiology profiles.

Methods: Clinico-demographic and mRNA expression data were downloaded from Broad GDAC Firehose. Prediction Analysis of Microarray in R classified ccRCC subtypes. GraphPad Prism performed Kaplan-Meier survival analysis. Partek Genomics Suite found differentially expressed genes (DEGs) from CII, cancer immunotherapy resistance and response (CIRR), and novel immunobiology (NIB) genes by race. Gene Set Enrichment Analysis found enriched immunobiological pathways.

Results: In ccB patients, AAs had significantly higher survival, but significantly lower expression of PDCD1, a CII gene. There were six CIRR and 138 NIB DEGs in ccA patients and 15 CIRR and 172 NIB DEGs in ccB patients. Significantly enriched immunobiological pathways were shown by race.

Conclusion: Combination therapy targeting CII, CIRR, and NIB genes in ccRCC subtypes by race may reduce survival disparities through precision medicine.

Reversible CO2-Controlled Volume Phase Transitions and Swelling in Hydrogels

Presenter: **Sophia Kosednar '24**
Advisor: Dr. Melissa Gordon

Smart materials are often inspired by systems or processes in nature which respond to environmental stimuli. CO2 has garnered interest as a stimulus as it is abundant, inexpensive, and non-toxic. Swelling, or the process of absorbing water, is a fundamental property of hydrogels yet is often not controlled using an environmental stimulus. In this work, CO2 is used to trigger pronounced, reversible swelling of a crosslinked hydrogel. Specifically, CO2 responsivity was conferred to hydrogels with a volume phase transition temperature (VPTT), which demarcates the transition from a collapsed to swollen state. We show that these gels display a CO2-switchable volume phase transition that enables isothermal gas-triggered swelling. Compositional studies were conducted to determine the effect of varying co-monomer content on the resulting VPTT shifts in these samples. Increasing the concentration of the CO2-responsive moiety resulted in an increase in the initial VPTT as well as a greater shift in the VPTT after CO2 exposure. Isothermal swelling studies were conducted at a temperature between the VPTTs before and after CO2 exposure. These studies show that CO2 triggers a reversible volume transition and controls the extent of swelling. The results presented here demonstrate the promise of CO2 as a stimulus for the design and study of smart materials, which are suitable for applications in drug delivery, microfluidics, and soft actuators.

Research Poster Abstracts

Story of Life Interviews with Aging Adults in Easton

Presenter: **Sydney Leibovitz '23**
Advisor: Dr. Elaine Reynolds

Reminiscing about the past has been found to provide older adults with comfort and a sense of fulfillment as they reflect on their life experiences (Klever 2013). The concept of a Life Story as a form of reminiscence therapy and its benefits has gained respect in multiple scientific fields including social psychology. It is an easily applicable and cost free method of treating common geriatric mental health issues such as depression, and can improve quality of life. We conducted a series of Story of Life interviews as a form of reminiscence therapy with two participants at Gracedale Nursing Home in Nazareth, Pennsylvania. Through this interview process, close bonds were formed with the participants and provided them with a feeling of importance and something to look forward to each week. A biography about the participants will be written and distributed to Gracedale Nursing Home. Ultimately, conducting Story of Life interviews is something many people can easily continue to do, not only to benefit the elderly, but to take a moment to listen and learn from the experiences of family members and friends, keeping their stories and memories alive.

Drug Delivery Applications of Carbon Dioxide Responsive Hydrogels

Presenter: **Youmin Park '24**
Advisor: Dr. Lauren Anderson

Stimuli-responsive hydrogels are polymers that swell in the presence of water and alter their properties based on environmental conditions. Hydrogel applications utilize this ability to encapsulate and release a drug on command. In this study, we used a NIPAM-co-VI polymer to create a hydrogel that responds independently to temperature and CO2. By sparging (bubbling gas through) hydrogels with CO2, we are able to increase the rate and final amount of drug release from a hydrogel.