2026

COLLEGE OF SCIENCE AND TECHNOLOGY

LEADERSHIP & RESEARCH SYMPOSIUM

FRIDAY, APRIL 10, 2026

10:00 AM - 3:50 PM

SCIENCE EDUCATION AND RESEARCH CENTER (SERC)

Temple University

College of Science and Technology

Welcome!

Research Scholars Program (RSP)
Our Research Scholars Program provides undergraduate students with a unique opportunity to interact with distinguished scientists and researchers in their respective fields. These opportunities allow undergraduate students to develop the skills and strategies quintessential for the 21st Century.

Summer Undergraduate Research Experience (SURE)
The CST SURE is a competitive program that provides students with funding and mentorship to pursue full-time research over the summer. The CST SURE is designed to foster scientific inquiry, professional development, and leadership skills through immersive, mentored research experiences.

STEM Leadership Fellows (SLF)
The Student Leadership Fellowship allows undergraduate students to develop leadership skills while working on unique project s with a CST staff member or faculty member.

Thank You

Special Thanks to Dean Miguel Mostafá
A special thank you to the College of Science and Technology Dean Miguel Mostafá for supporting the Research Scholars Program (RSP), Summer Undergraduate Research Experience (SURE), and STEM Leadership Fellows (SLF) Program.

Special Thanks to the Principal Investigators & Mentors
Thank you to the principal investigator, mentors, and faculty for supporting the CST SURE & RSP. You have demonstrated an outstanding commitment to supporting prospective up-and-coming scientists and researchers. Thank you for inspiring the future generation and for building a collaborative community.

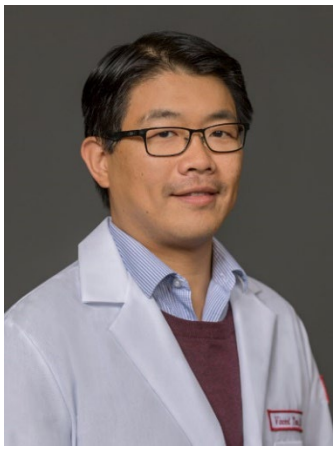
Agenda

Representatives from graduate programs, pre-professional health advising, CST professional development, and scholarly communications will be available throughout the day		
Time	**Description**	**Location**
9:50 AM - 10:00 AM	Poster Session 1 Setup & Check-in	SERC Lobby
10:00 AM - 10:50 AM	Poster Session 1	SERC Lobby
10:50 AM - 11:00 AM	Poster Session 2 Setup & Check-in	SERC Lobby
11:00 AM - 11:50 AM	Poster Session 2	SERC Lobby
12:00 PM - 12:50 PM	Lunch & Learns: Stephen MacNeil, Ph.D. *"Beyond the Benefits: Mapping the Cognitive, Metacognitive, and Social Harms in AI-Assisted Learning"* Vincent Tam, Ph.D. *"Fueling Infection: How Lipid Metabolism and PPARα Reshape Host Immunity"*	Gladfelter 21 Gladfelter 24
12:50 PM - 1:00 PM	Poster Session 3 Setup & Check-in	SERC Lobby
1:00 PM - 1:50 PM	Poster Session 3	SERC Lobby
2:00 PM – 2:50 PM	Keynote Speaker: Miguel A. Mostafá, Ph.D. *"High Energy Multi-Messenger Astrophysics"*	SERC 116
2:50 PM - 3:00 PM	Poster Session 4 Setup & Check-in	SERC Lobby
3:00 PM - 3:50 PM	Poster Session 4	SERC Lobby

Lunch & Learn Speakers

Stephen MacNeil, Ph.D.
Asst. Professor of Computer and Information Sciences & Director of the Human-Computer Interaction Lab
Temple University College of Science and Technology

Dr. Stephen McNeil's research primarily involves human computer interaction, focusing on how people interact with algorithms and technology. Dr MacNeil's explores how non-expert can participate in the design of algorithms, emphasizing human centered AI systems. His work involves assistive technologies, AI education, and computing education for the benefit of empowering users and making technology accessible, effective, and participatory.



Vincent Tam, Ph.D.
Assoc. Professor
Microbiology, Immunology & Inflammation
Center for Microbiology & Immunology
Medical Genetics &Molecular Biochemistry
Temple University Lewis Katz School of Medicine

Dr. Vincent Tam is an Associate Professor in the Department of Microbiology and Immunology at Temple University's Lewis Katz School of Medicine, focusing on the interaction between microbes and the host immune response. Dr. Tam's research investigates the interaction between microbes and the host immune system. Dr. Tam's research specifically examines how pathogens trigger inflammation, impact the cardiovascular system, and the immune response. His research contributes to advancing the understanding of microbial pathogenesis and host immune responses.

Keynote Speaker

Miguel A. Mostafá, Ph.D.
Dean & Professor of Physics
TU College of Science and Technology

Miguel Alejandro Mostafá is Dean of the College of Science and Technology and Professor of Physics at Temple University. He is an internationally recognized physicist and academic leader with more than two decades of experience advancing research excellence, student success, and institutional innovation across large, complex universities. As dean, he serves as the chief academic and financial officer of the college, overseeing strategic planning, budgeting, faculty recruitment and development, enrollment growth, research expansion, and external partnerships.

Dr. Mostafá is a Fellow of the American Physical Society and a leading figure in multimessenger astrophysics, with major leadership roles in international scientific collaborations including the Pierre Auger Observatory, the High Altitude Water Cherenkov (HAWC) Observatory, and the Astrophysical Multimessenger Observatory Network (AMON). Prior to joining Temple, he served as Director of the Center for Multimessenger Astrophysics and Associate Dean for Research and Innovation at Penn State, where he led research administration, innovation, and industry engagement initiatives. He is deeply committed to inclusive excellence, mentorship, and student access, and is widely recognized for building collaborative cultures that align academic mission, research impact, and societal engagement.

Student Researchers

Session 1: 10:00AM-10:50AM	Session 2: 11:00AM-11:50AM	Session 3: 1:00PM-1:50PM	Session 4: 3:00PM-3:50PM
Student Name (Last, First)	***Student Name (Last, First)***	***Student Name (Last, First)***	***Student Name (Last, First)***
Ahmer, Muhammad-Safwaan	Alexandre, Bryanna	Abusenenh, Marwa	Ahmed, Loujain
Balajikannan, Nitin	Autieri, Stephen	Amr, Maryam	Duru, Jennifer
Balde, Aissata	Balajikannan, Nitin	Barr, Harrinique	Elkind, Mia
Battista, Emma	Baughman, Tyler	Bhatnagar, Anika	Fajobi, Olufemi
Brown, Kaya	Beheshti, Behta	Black, Aloysia	Gunaydin, Selin
Endriss, Felix	Brown, Kaya	Bottoms, Justina	Han, Zachary
Gonzalez, Megan	Byrchak, Denys	Dansberger, Alisiya	Hartman, Samuel
Greer, Wesley	Gohil, Dhruvansh	Donde, Gargi	Huang, Roy
Gunaydin, Selin	Golugula, Shrihith	Eckert, Carlos	Lee, Daniel
Han, Ellie	Jordan, Elijah	Egwim, Amaranna	Martinez, Emily
John, Kesia	Joseph, Rosmy	Fisher, Whitney	McLaughlin, MaryKate
Kim, Joanne	Kimmel, Katherine	Gupta, Ayush	Merry, Mariza
Kim, Timothy	Kravchuk, Anna	Harraq, Othmane	Moghal, Shiza
Long, Trevor	Lin, Joyce	Huang, Eliza	Muthusekaran, Srishty
Mousseau, Finnian	Lopez, Jonatan	Karanam, Sai Nishanth	Mykhnych, Adrian
Okongwu, Ijenu	Maalouf, Patrick	Lafleur, Brianna	Porter, Sidney
Orekhova, Anastacia	Madhav, Kishore	Loder, David	Potluru, Tanishta
Osele, John-Paul	Miller, Isabella	Pasyar, Aryan	Rahat, Sadia
Pandey, Saumika	Pelletier, Nina	Patel, Kush	Rozman, Mariia
Porrecca, Katelyn	Sawant, Moulishka	Siwak, Megan	Smith, Oswayne
Sawant, Moulishka	Seaman, Emily	Sorathiya, Jeni	Sultanbekova, Leysan
Seaman, Emily	Swenson, Kyle	Sun, Sophia	Tahirova, Camilla
Shahriar, Mohammad Ahnaf	Tambo, Ariana	Tahirova, Camilla	Tobin, Keagan
Singh, Ria	Tanujaya, Michelle	Zhang, Salina	Verma, Trisha
	Wilkinson, Anya		Zelnick, Lila
			Zhang, Salina

Session 1
Abstracts

Ordered by Student Researcher Name (Last, First)

Student Name: Muhammad-Safwaan Ahmer
Student Email Address: Tup07791@temple.edu
Major: Biology
Minor/Certificate (If Applicable): Acting Certificate
Program Affiliation: Undergraduate Research Student

Faculty Mentor Name: Erik Cordes
Mentor Email Address: erik.cordes@temple.edu
Mentor Affiliation: Temple University College of Science and Technology

Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: The Significance of Deep-Sea Corals and Sponges within the Current Biomedical Context
Keywords: Ocean, deep-sea coral biology, coral-derived compounds, marine biomedicine, human health applications

Abstract: The Ocean is one of the Earth's most majestic and mysterious wonders, and there is evidence to make a compelling argument that the mysteries of that deep, unexplored world may hold a value towards human physiology. Based on a deep-dive analysis of multiple studies homing in on the origin, execution, and comprehension of biological amenities corals provide via consumption, the research presented found enough evidence to indicate a valuable correlation between deep-sea coral biology and human health applications [3]. Scholars such as Shirley Pomponi and collaborators argue that deep-sea coral ecosystems are not simply passive habitats, but dynamic biological events producing metabolites and frameworks capable of influencing human physiology. For example, skeletal matrices of bamboo corals have been explored as bone-graft analogues, and octocoral secondary metabolites (e.g., diterpenoids) show anti-inflammatory or anticancer properties [1]. Acknowledging the need for further research in the field, the lack of exploration in a frontier in which we know less than 20% becomes a clear hinderance. As this research narrows its scope to areas involving the Gulf of Mexico, Southeast U.S., Caribbean, Costa Rica, and the Phoenix Islands, much of the research remains pre-clinical, and considerable work remains to chart the durability, scalability, and safety of coral-derived medicines. Further research, especially in advanced drug-discovery pipelines, scaffold engineering, and translational clinical testing, is needed to map whether the coral-to-clinical pathway can maintain the engagement and functional impact seen in early assays.

Student Name: Nitin Balajikannan
Student Email Address: tus93256@temple.edu
Major: Biochemistry
Minor/Certificate (If Applicable):
Program Affiliation: CST Research Scholars Program (RSP)

Faculty Mentor Name: Robert Stanley
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Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Peer Laboratory Assistant Experience
Keywords: Peer Laboratory Assistant, biology, laboratory, students, leadership,

Abstract: Over the past year, I served as a Peer Laboratory Assistant (PLA) for introductory Biology 1112 labs, acting as a bridge between the professor's lectures and the students' hands-on work. My goal was to make the lab a less intimidating space where students felt comfortable asking questions and mastering scientific skills. In two semesters, I supported two different lab sections and ran office hours attended by students to aid with lab reports. I focused on being a reliable resource to the students and being dependable to the professor. Having a peer in the room made it so that the students were more comfortable asking questions. I saw a huge jump in student confidence, especially for those who were picking up a pipette for the first time. One of my challenges was knowing when to admit that I did not know an answer. I pride myself on being knowledgeable and prepared enough to answer any question, but I had to acknowledge that sometimes I may not be equipped to assist and that I needed guidance as well. It provided me with direction on how to handle those situations, and it was evident when comparing my performance in the fall semester to the spring semester. This role taught me that leadership isn't about knowing all the answers, it's about knowing how to communicate them clearly. I've come away with much stronger mentoring and instructional skills, which I know will be a massive asset as I move forward into a career in STEM.

Student Name: Aissata Balde
Student Email Address: tus59036@temple.edu
Major: Biology
Minor/Certificate (If Applicable): Genomic Medicine Certificate
Program Affiliation: Undergraduate Research Student

Faculty Mentor Name: Aissata Balde
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Mentor Affiliation: Temple University Lewis Katz School of Medicine

Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Exploring the effects of F. nucleatum and C. albicans on the growth of Oral squamous cell carcinoma tumors
Keywords: Tumor Microenvironment, Fusobacterium nucleatum, Candida albicans

Abstract: Background: Oral squamous cell carcinoma (OSCC) is composed of tumors and a diverse microenvironment (TME) in the oral cavity. F. nucleatum and C. albicans are a part of this TME. Previous studies suggest that F. nucleatum and C. albicans independently promote OSCC tumor growth. Objective: To assess if there is an additive or synergistic effect when C. albicans and F. nucleatum are co-infected on 4-nitroquinoline-1-oxide (4NQO) mouse models. Methods: Mice were divided into four treatment groups; control, F. nucleatum, C. albicans, and F.nucleatum + C. albicans. Mice were given 4NQO for 16 weeks to induce OSCC. After 16 weeks, 20µL of the assigned treatment were admistred into the oral cavity until the study's conclusion at 28 weeks. Results: Histopatholigist findings show that early squamous cell carcinoma (SCC) positives were highest in C. albicans (91.67%), F. nucleatum + C. albicans (87.50%), F. nucleatum (72.73%), and control (36.36%). Large SCC positives were (0.00%) in both control and F.nucleatum + C. albicans, F.nucleatum (9.09%), and C. albicans (16.67%). Conclusion: There appears to be no synergistic/additive effect of F. nucleatum and C. albicans on early-stage SCC, because C. albicans (91.67%) was higher than the co-infection (87.50%). Interestingly, the large SCC result for the co-infection F.nucleatum + C. albicans (0.00%) was the same as the control (0.00%). A result that suggests the co-infection may inhibit the progression of early-stage tumors to large-stage tumors. Further research is needed to explore the potential inhibiting effects of co-infection.

Student Name: Emma Battista
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Major: Biology & Anthropology
Minor/Certificate (If Applicable):
Program Affiliation: Undergraduate Research Student

Faculty Mentor Name: Eric Borguet
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Mentor Affiliation: Temple University College of Science and Technology

Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Cross-aldol Condensation of Benzaldehyde and Acetone to Benzalacetone Catalyzed by Metal Oxyhydroxides
Keywords: cross-aldol condensation, metal organic frameworks, metal oxyhydroxides, catalysis

Abstract: Cross-aldol condensation reactions play significant roles in pharmaceutical research, food production, and in the synthesis of biofuels from biomass-derived molecules. However, this type of reaction is often characterized with low selectivity due to a high susceptibility for reactants to undergo self-condensation. Metal-organic frameworks (MOF), such as UiO-66, can be utilized to drive this reaction for a desired result through their active metal nodes. Here, we aim to determine whether the MOF is even necessary to catalyze this reaction and to understand the relationship between Lewis acidity and conversion yield using just the metal salts (i.e. $ZrCl_4$, $HfCl_4$, $Ce(NH_4)_2(NO_3)_6$). Our hypothesis is that the catalytic sites in the metal nodes are more accessible to the substrate than the catalytic sites in the MOF, and therefore using just the metal nodes should improve catalytic efficiency and selectivity, and increase the yield of benzalacetone. To identify that the desired product was being produced, the reaction was analyzed through gas chromatography coupled with mass spectrometry. Subsequently, the reaction was monitored through ^{1}H-NMR. Based on previous research using MOF metal oxyhydroxide precursors as catalysts, increasing Lewis acidity is associated with increased catalytic efficiency. Thus we anticipate a comparable yield of conversion to benzalacetone to the UiO-66 MOFs. We hope to provide evidence supporting the use of more cost effective, efficient, and selective heterogeneous catalysts for cross-aldol condensation reactions.

Student Name: Kaya Brown
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Major: Genomic Medicine
Minor/Certificate (If Applicable):
Program Affiliation:
CST STEM Leadership Fellows Program (SLF)

Faculty Mentor Name: Jay Lunden
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Mentor Affiliation: Temple University College of Science and Technology

Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Targeting TDG Links Epigenetic Homeostasis to Tumor Cell Fitness and Innate Immune Activation
Keywords: Melanoma, TDG, DNA repair, Non-Small Cell Lung Cancer, Methylation

Abstract: Human Thymine DNA Glycosylase (TDG) is a base excision repair enzyme that functions downstream of TET enzymes to excise 5-formylcytosine and 5-carboxylcytosine, thereby completing active DNA demethylation. TDG is required for tumor cell viability and proliferation, and maintenance of epigenetic homeostasis in select cancers. In melanoma models, TDG knockdown alters both the transcriptome and methylome, leading to activation of inflammatory and interferon responses. Here, we investigate whether pharmacologic TDG inhibition (see poster by Walsh et al.) in tumor cells alters epigenetic homeostasis in a manner that promotes accumulation of aberrant nucleic acid species and engages innate immune signaling pathways. Human melanoma and non-small cell lung cancer (NSCLC) cell lines were treated with a selective TDG inhibitor or vehicle control under optimized conditions. Functionally, TDG inhibition reduced clonogenic survival, decreased proliferation, and diminished cell viability, suggesting impaired tumor cell fitness following disruption of DNA methylation dynamics. Transcriptomic profiling demonstrated enrichment of innate immune and interferon-responsive gene signatures, which was validated by RT-qPCR analysis of multiple target genes. Collectively, these findings suggest that pharmacologic targeting of TDG may represent a novel strategy to simultaneously impair tumor cell fitness and enhance immune associated signaling, with potential therapeutic relevance in cancer treatment, particularly in the context of cancer immunotherapy

Student Name: Felix Endriss
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Faculty Mentor Name: Derek Isenberg
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Mentor Affiliation: Temple University Lewis Katz School of Medicine

Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: PREPARE: Pandemic Respiratory Emergency Preparedness and Response using Environmental Surveillance
Keywords: Wastewater, CDC, NWSS, surveillance, respiratory illness

Abstract: Respiratory illnesses such as influenza, RSV, and COVID-19 are responsible for millions of illnesses and hundreds of thousands of hospitalizations per year. Thus, being able to mitigate the impacts of both minor and major respiratory illnesses would have a large beneficial impact on not only communities but the healthcare systems that serve them as well. Wastewater testing and surveillance are valuable public health tools that can be used to both track and predict trends in viral pathogens within a population. Contaminants isolated and characterized in a community's wastewater can indicate the presence of a communicable virus in a population up to two weeks before symptoms are observed in any individuals. These early warning signs can give public health officials more time to form mitigation plans and inform the public about potential threats. By utilizing data on contaminant concentrations obtained through the Center for Disease Control (CDC) National Wastewater Surveillance System (NWSS) paired with samples obtained from emergency department patients, this project will aim to aid preparation for future respiratory viral threats to U.S. communities. The primary objective of the study is to identify and characterize respiratory viral infections among patients in U.S. urban emergency departments presenting with acute respiratory illnesses, doing so through in-hospital testing and lab cultures; the secondary objective is to examine and analyze associations between data collected from patients and NWSS data.

Student Name: Megan Gonzalez
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Major: Genomic Medicine
Minor/Certificate (If Applicable): Chemistry Minor
Program Affiliation: CST Summer Undergraduate Research Experience (SURE)

Faculty Mentor Name: Ananias Escalante
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Mentor Affiliation: Temple University College of Science and Technology

Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: An Integrated Bioinformatic Pipeline for Resolving the Structural Diversity and Synteny of Leptospira Interrogans Chromosome 1
Keywords: Leptospira, chromosome architecture, genomic diversity, strain-level variation, pangenome

Abstract: Leptospira is a diverse genus of spirochete bacteria that exhibits ecological and lifestyle diversity, reflected in its wide range of environmental and host-associated niches. To better understand the genetic basis of this diversity, this analysis focuses on Leptospira interrogans, a well-characterized pathogenic species often associated with human infection. Leptospira interrogans serves as a model for understanding strain-level variation through the lens of chromosome architecture. In this study, we investigated the structural diversity and synteny of chromosome 1, accounting for approximately 90% of the species' genomic content, across multiple strains using an integrated bioinformatic pipeline. Pairwise genomic similarity was first assessed using Mash, which utilizes MinHash dimensionality reduction to compress sequences into small representative k-mers. This enabled the estimation of genetic distances and clustering of strains based on Average Nucleotide Identity (ANI). To examine large-scale organization, progressive alignments were generated with Mauve, facilitating the identification of conserved Locally Collinear Blocks (LCBs) and structural rearrangements. Finally, a graph-based pangenome approach was implemented using the PanGenome Graph Builder (PGGB) to represent shared and strain-specific regions through a unified visualization. This framework reflects the evolutionary history of gene loss, gain, and structurization that may provide insight into the evolution of this genus from free-living saprophytes to vertebrate-adapted pathogens. Together, these approaches provide a clear view of chromosome 1 architecture, highlighting patterns of conservation and structural variation that potentially contribute to the pathogenicity and strain-level diversity found in Leptospira interrogans.

Student Name: Wesley Greer
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Major: Physics
Minor/Certificate (If Applicable):
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Faculty Mentor Name: Eli Alshanetsky
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Mentor Affiliation: Temple University College of Liberal Arts

Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Identity and the Structure of Cognitive Modeling
Keywords: Neuroscience, Psychology, Physics, Cognitive Modeling, Bayesian Modeling

Abstract: How can cognition be modeled in a way that reflects the lived complexity of human identity? Current dominant cognitive frameworks offer formal accounts of decision-making but rely on assumptions that break down when applied to temporally evolving agents. These models typically treat cognitive states as having stable preferences, consistent beliefs, rational updating, and linear development, which abstracts away the historically conditioned and recursively developing structure that constitutes identity. I argue that cognition cannot be adequately modeled without accounting for three structural constraints: the partial inaccessibility of internal states, the context-sensitive reorganization of evaluative hierarchies, and the temporal recursion through which decisions and their consequences reorganize future priorities. Through the metaphors of "plant and soil" and "predator and prey," I develop a philosophical foundation for an identity-conditioned model of cognition in which probabilistic representation, such as seen in Quantum Mechanics, reflects structural indeterminacy that arises from recursive self-modification rather than randomness. Rather than proposing a finalized mathematical theory, I establish the theoretical conditions any proposed model of human cognition must satisfy if it is to account for identity as lived and evolving through time.

Student Name: Selin Gunaydin
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Major: Biology
Minor/Certificate (If Applicable): Sociology of Health Minor, Genomic Medicine Certificate
Program Affiliation: CST STEM Leadership Fellows Program (SLF)

Faculty Mentor Name: George Mehler
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Mentor Affiliation: Temple University College of Science and Technology

Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Investigating Androgen Effects on Liver Metabolism in Polycystic Ovary Syndrome (PCOS)
Keywords: Androgen, dihydrotestosterone, hepatic, hyperandrogenemia, hyperinsulinemia, Metabolic Dysfunction-Associated Steatotic Liver Disease, serum free fatty acids, serum triglyceride

Abstract: Androgen-induced metabolic dysfunction occurs in states of elevated androgen in females. However, the mechanisms by which androgens in the liver/brain/ovary/pituitary contribute to metabolic dysfunction and/or fatty liver, and to reproductive function in states of androgen excess, such as polycystic ovary syndrome (PCOS), remain unknown. Hyperandrogenemia is one of the defining features of PCOS and is often accompanied by hyperinsulinemia and obesity. A model that isolates the pathophysiological effects of hyperandrogenemia from obesity-related metabolic changes is warranted. The project focuses on the role of pathophysiological androgen levels on the liver, brain, pituitary, and ovary. Methods included genetic deletion of AR developmentally or acutely (adenovirus-associated Cre) in vivo or ex vivo in tissues in elevated androgen, which were treated with or without a Western diet-induced obesity mouse model. Results found that DHT treatment protected western diet-fed mice from Metabolic Dysfunction-Associated Steatotic Liver Disease and did not alter serum triglyceride levels in regular diet-fed mice. However, DHT treatment increased serum free fatty acids in mice fed a Western diet. These results highlight that adult-onset AE differs fundamentally from early-onset AE in hepatic lipid regulation.

Student Name: Ellie Han
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Minor/Certificate (If Applicable):
Program Affiliation: CST STEM Leadership Fellows Program (SLF)

Faculty Mentor Name: Maria Iaravone
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Mentor Affiliation: Temple University College of Science and Technology

Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: STEM Leadership Fellow Captain/Physics Fellow
Keywords: SLF, Physics

Abstract: Placed as a Physics Fellow, my role as a STEM Leadership Fellow Captain position for PHYS 1061: Elementary Classical Physics I focused on providing academic support to students and professors by targeting student engagement and effective exposure in addition to mentoring other STEM Leadership Fellows. Through weekly one-hour long in-person office hours sessions, I helped students navigate coursework and exams by hosting reliable tutoring, exam reviews, and homework support in the lobby of SERC. This experience has strengthened my communication and leadership skills which translate directly into diverse applications, including my own next step into a PhD program in the fall where I am expected to serve as a Teaching Fellow for a year. By further prioritizing student engagement and enhancing direct communication lines between students and fellows, the STEM Leadership Fellows Program has the potential to foster an even more accessible and effective learning environment that serves students, fellows, and professors.

Student Name: Kesia John
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Major: Cybersecurity
Minor/Certificate (If Applicable):
Program Affiliation: CST STEM Leadership Fellows Program (SLF)

Faculty Mentor Name: Susan Varnum
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Mentor Affiliation: Temple University College of Science and Technology

Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Teaching Assistant Experience in the Journey to Algorithm Course
Keywords: Teaching Assistant, Undergraduate Learning, Academic Support, Student Success, STEM, Problem-Solving Skills, Leadership, Communication

Abstract: The STEM Leadership Fellow Program gave me the opportunity to work as a Teaching Assistant for the Journey to Algorithm course during the 2025 – 2026 academic year. In this role, I had the chance to support undergraduate students in CST, improving their algebraic and problem-solving skills. I provided assistance with coursework such as homework, quizzes, and exams. I hosted office hours which were outside of their class time, to offer additional support. I was able to create an environment where students felt comfortable seeking academic support. Through this experience, I was able to contribute to student success in CST while also strengthening my leadership, communication, and adaptability skills. I succeeded in adapting to diverse learners and supported them according to their needs. When students encountered difficult concepts, I broke them down into simple steps and provided problem-solving strategies to help them understand the concept. Moving forward, including structured review sessions prior to exams, interactive workshops for challenging concepts, and individual feedback can further enhance student learning. By integrating these in the future, more students will be able to succeed when taking this course. This experience allowed me to step out of my comfort zone and try something new in my academic journey. I look forward to applying the valuable skills I gained through this experience in my future career.

Student Name: Joanne Kim
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Major: Geology
Minor/Certificate (If Applicable): Environmental Professional Training Certificate
Program Affiliation: CST STEM Leadership Fellows Program (SLF)

Faculty Mentor Name: Karly Conner
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Mentor Affiliation: Temple University College of Science and Technology

Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Incentivizing Involvement: A Gamified Approach to Student Engagement through STELLAR
Keywords: Gamification, Student Engagement, Leadership Development, Student Organizations, Badge System, Campus Involvement, Motivation

Abstract: The STELLAR program is designed to enhance student engagement by creating a more interactive and supportive environment for student organizations and clubs. Rather than relying on passive participation, the program introduces an incentive-based system where organizations earn points for hosting events, collaborating with other groups, and maintaining consistent activity. This gamification transforms involvement into a more dynamic and motivating experience, encouraging organizations to be more intentional and creative in how they engage both their members and the broader student body. By framing involvement as a points-based system, STELLAR incorporates elements of competition and achievement that can drive higher levels of participation. Student organizations are not only encouraged to host more events, but also to diversify their programming and reach wider audiences to maximize their impact. As a result, the program contributes to a more vibrant campus environment where students have increased access to events and opportunities for involvement. Additionally, the structured system provides a clear and measurable way to track engagement, making it easier for both students and administrators to recognize active and impactful organizations. Another key benefit of the program is its focus on leadership development through a badge-based system. Students can complete tasks and milestones to earn badges aligned with their roles, such as Peer Leader or STEM Leadership Fellows. This approach makes leadership development more visible, goal-oriented, and accessible. Overall, STELLAR promotes a more engaged and interconnected campus by making participation both rewarding and visible.

Student Name: Timothy Kim
Student Email Address: tuq53302@temple.edu
Major: Chemsitry
Minor/Certificate (If Applicable):
Program Affiliation: CST Research Scholars Program (RSP)

Faculty Mentor Name: Michael Zdilla
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Mentor Affiliation: Temple University College of Science and Technology

Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Tailoring structural and electronic defects in layered-double-hydroxides (LDH); studying their role in boosting performance for advanced water splitting
Keywords: layered double hydroxide, oxygen vacancies, oxygen evolution reaction, defect engineering

Abstract: Due
to growing environmental concerns, the need for sustainable energy storage systems has grown considerably. Hydrogen is the leading answer to this need, but the sluggish oxygen evolution reaction (OER) restricts its use. The best catalysts developed to speed this process are composed of noble-metals such as iridium and ruthenium, which are limited by their cost. Therefore, development of efficient, cheaper catalysts is a priority. Layered-double-hydroxides (LDHs) made of plentiful metals such as cobalt, nickel, iron, and zinc are of particular interest, due to their low cost and ease in tuning the properties of the catalyst. However, LDHs made of these common metals perform poorly when compared to noble-metal catalysts, but it has been found that by modifying the structure through generating defects, such as oxygen vacancies, performance can be improved. To understand the role of synthesis conditions on catalytic performance and stability, we produced nickel-iron LDHs through a hydrothermal method and by co-precipitation at room temperature and while boiling. Powder X-Ray Diffraction (PXRD) patterns and Fourier-Transform Infrared Spectroscopy (FT-IR) spectra were consistent with literature, providing evidence to the desired LDH. Experiments with linear sweep voltammetry (LSV) revealed that the LDH synthesized with hydrothermal method performed the worst and LDH synthesized at room temperature had the greatest performance, but oxygen vacancy formation on the catalyst hindered performance. We agree with prior research showing that the amorphous catalysts exhibit higher activity than their crystalline counterparts but find potential disagreements with the benefits of defect generation.

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Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Low Energy Autoionization in N2 and Propylene Oxide
Keywords: photochemistry, pump probe spectroscopy, strong field ionization, autoionization

Abstract: Our group studies the interaction of light with molecules. These interactions are important in certain biological processes that involve light, such as vision and photosynthesis, in developing new imaging probes, and in photochemistry in general. Strong field lasers are often used experimentally to probe the behavior of molecules and their resulting photochemistry. Because of the high intensity of these lasers, the molecules are ionized, often losing more than one electron. The mechanisms for strong field ionization are not well understood and are studied extensively. In a recent experiment, our experimental collaborators observed electrons leaving the molecule with a kinetic energy very close to zero after strong field ionization. To understand how such a process can occur, we performed calculations on two of the molecules used in the experiment; N2 and propylene oxide. We calculated the various first ionization and double ionization states of both molecules using equation of motion coupled cluster (EOM-IP-CCSD) and the autoionization rate from singly to doubly ionized molecules. The hypothesis is that the process resulting in the low energy electrons involves a direct ionization from the incident laser leading to very high energy ionized states, and then a second electron leaving through autoionization. In this scenario, the second electron will have low energy.

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Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: The Role of Density vs. Sex Ratio in Courtship Behavior in Drosophila melanogaster
Keywords: Drosophila melanogaster, Courtship Behavior, Population Density, Sex-Ratio, Male-Male Competition, Female-Female Competition

Abstract: Courtship behavior in Drosophila melanogaster is strongly influenced by social and environmental factors, particularly population density and sex ratio. This study investigates how variations in these two parameters affect mating competition and the frequency and intensity of courtship behaviors. We hypothesize that increased population density will lead to heightened courtship activity due to greater competition for mating opportunities, with additional modulation by sex ratio biases (male-biased, balanced, and female-biased populations). Experimental groups will be established across low, medium, and high-density conditions combined with varying sex ratios. Courtship behaviors, including orientation, following, wing vibration (singing), tapping, licking, and attempted copulation, will be quantified using video analysis, employing both automated tracking and manual annotation to assess behavioral frequency, duration, and sequence patterns. We expect that higher densities and male-biased conditions will amplify competitive interactions and increase courtship intensity, while female-biased conditions may alter receptivity and reduce competition. These findings will provide insight into how ecological and social dynamics shape reproductive behaviors and mating strategies in Drosophila melanogaster.

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Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Trigonometric series of an Analytic Function
Keywords: real analysis, complex analysis, power series, complex exponentials, Fourier series

Abstract: This poster illustrates a classical connection between complex analysis and trigonometric series. Starting with an analytic function and its power series expansion, one can substitute z = e^{ix} to obtain representations involving complex exponentials. By separating real and imaginary parts, explicit formulas for corresponding trigonometric series are obtained. This approach provides a clear and elegant method for generating and understanding identities and convergence properties of Fourier-type series using basic tools from complex analysis. This project is at the interface of two courses I am currently taking: Math 3132 Topics in Real Analysis and Math 3151 Complex Analysis.

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Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Investigating the effectiveness of split-GAL4 labeling in Lpi3-4 neuron during development in Drosophila melanogaster
Keywords: Neuron labeling, visual system, Drosophila Melanogaster, split-GAL4, LPi3-4

Abstract: Different types of neurons express distinct sets of genes, and these molecular identities play critical roles in shaping neuronal morphology, connectivity, and function. Understanding the genetic steps that guide neuronal development can provide important insights into brain disorders, as disruptions at specific stages may lead to abnormal neural circuit formation. To study these processes in a tractable system, we use the visual system of Drosophila melanogaster as a model. Compared to the human brain, which contains billions of neurons that are difficult to label and analyze individually, the Drosophila brain offers a simpler, highly organized system with many identifiable neuron types in the optic lobes. Recent advances in single-cell RNA sequencing (scRNA-seq) allow researchers to analyze gene expression patterns in thousands of individual neurons. Computational analysis of these datasets can identify pairs of genes uniquely expressed in specific neuron types. These gene pairs can be used to generate gene-specific split-GAL4 "half drivers," which enable precise labeling of defined neuronal populations. In the split-GAL4 system, the GAL4 transcription factor is divided into two inactive halves that only reassemble into a functional protein in cells expressing both gene elements, allowing highly specific targeting of particular neurons. Using this strategy, previous studies identified a neuron type called Lpi3-4 and candidate transcription factors that may regulate its development, including Awh and CG32532. The future project aims to test the implementation of the Recombination-mediated cassette exchange (RMCE) to produce split-GAL4 lines that will target Lpi3-4 cell type with improved specificity.

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Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: SLF Abstract 2025-2026
Keywords: CIS 1068 Fellow

Abstract: I served as a CIS 1068 Fellow, where I supported introductory programming labs, helping students to strengthen their fundamental programming skills I provided regular online tutoring for students, supported lab instruction and developed new communication and help seeking tools, via a Discord server. The Discord server which currently has 68 student members has helped students ease into learning a programming language, which for a lot of them, was their first. I adapted my speaking speed and vocabulary, ensuring I was as non-technical as I could when explaining difficult concepts to students. This Role has strengthened my communication, mentoring, and planning skills, preparing me for future roles within and beyond STEM education.

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Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Student Success Fellow:The Role of Peer Support in First-Year Student Success
Keywords: peer support, first-year experience, one-on-one tutoring, resource navigation, student success, STEM, academic mentorship, CST

Abstract: As a Student Success Fellow (SSF) in Temple University's College of Science and Technology, my role focused on supporting students academically and helping them navigate the many resources available on campus. Through one-on-one tutoring sessions, I worked closely with students to understand the specific challenges they were facing in their coursework. These conversations allowed me to identify gaps early and help students build confidence in their abilities. Another important part of my role was connecting students to resources beyond tutoring. I often guided them toward academic support services, CST programs, and campus opportunities that could help them succeed. My experience working in other student-facing roles, such as being a Resident Advisor and a CST Ambassador, helped me better understand what resources were available and how to connect students with the right support. One challenge I noticed was that students came in with very different levels of academic preparedness, and some were initially hesitant to ask for help. I tried to address this by creating a supportive and low-pressure environment, regularly checking in with students and encouraging them to reach out when they needed support. I also maintained updated materials on Canvas so students could review key concepts between sessions. Overall, this experience strengthened my mentoring and communication skills and helped me better understand how different parts of the university work together to support student success.

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Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Building Affordable Neurogenetic Tools in Drosophila
Keywords: Neural development, Drosophila melanogaster, gene-specific reporter lines, cost-effective, recombination-mediated cassette exchange (RMCE), donor plasmids, split-GAL4 reporter lines, attP docking site, circuit activity

Abstract: Understanding how genes shape neural development and function is a key question in neuroscience. Drosophila melanogaster serves as an ideal model due to its well-characterized genetics, short life cycle, and conservation of neural pathways found in humans. However, many state-of-the-art genetic tools remain costly and resource-intensive, limiting widespread functional studies for generating gene-specific reporter lines. This project aims to develop a cost-effective and scalable pipeline for generating gene-specific reporter lines in Drosophila using recombination-mediated cassette exchange (RMCE). I will construct donor plasmids targeting 49 neurotransmission-related genes and generate split-GAL4 reporter lines through precise RMCE insertion into existing transgenic flies bearing an attP docking site. This approach will expand the genetic toolkit available for mapping and manipulating neuronal populations. The resulting resource will facilitate efficient characterization of cell-type-specific genetic manipulations and enable functional studies of molecular players in controlling brain development and circuit activity.

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Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Multi-Decadal Retreat of the Sargent Icefield, Southcentral Alaska, Revealed with Landsat Imagery
Keywords: Computer Science B.S, Earth and Environment Science, Glaciers, Alaska

Abstract: Glaciers in Alaska are experiencing continued retreat driven by sustained climatic warming, contributing to global sea-level rise while influencing regional hydrology and ecosystems. This study examines the multi-decadal area change of the Sargent Icefield in southcentral Alaska over the period 1986–2025. Using atmospherically corrected Landsat Level-2 Collection 2 imagery, glacier boundaries were delineated using band ratio techniques between the green and shortwave infrared bands applied to late summer imagery to minimize seasonal snow interference. Manual post-processing in Quantum Geographic Information System (QGIS) ensured accurate mapping of glacier extents, including refinement of debris-covered ice and removal of non-glacial snow patches. The derived glacier outlines were used to calculate total glacier area for each observation year, generating a multi-decadal time series of icefield extent. Results show a substantial long-term decrease in glacier area representing an overall reduction over the 39-year-long study period. While the overall trend shows significant retreat, short-term variability is observed between some consecutive years, likely reflecting differences in seasonal conditions, image timing, or delineation uncertainty. The 1986 value appears notably higher than subsequent years and may require additional verification. This study provides a quantitative assessment of long-term glacier area change in the Sargent Icefield. It contributes to broader efforts to monitor glacier dynamics and understand the response of Alaskan icefields to ongoing climatic change.

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Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Student Leadership Fellow
Keywords: PLA, SLF

Abstract: As a Peer Lab Assistant (PLA) for BIOL 1112, I help keep lab sessions running smoothly by guiding students through each step of the experiments and maintaining overall workflow in a high-volume setting. I act as a liaison between students and the instructor, helping communicate questions, clarify protocols, and ensure everyone stays on track. I also work to alleviate stress in the lab by creating a supportive environment where students feel comfortable asking questions. In addition, I demonstrate key laboratory techniques and reinforce proper methods so students can confidently and accurately complete their experiments.

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Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: Data Science Fellow: SCTC 1013
Keywords: Data Science, STEM Leadership, Peer Mentoring, Student Engagement, Python.

Abstract: I served as a STEM Leadership Fellow for SCTC 1013: Elements of Data Science for the Physical and Life Sciences under the supervision of Dr. Smith. In this role, I provided technical laboratory assistance to students from non-computer science backgrounds, helping them navigate complex statistical concepts and programming tasks using data science tools. My responsibilities included supporting in-class activities, troubleshooting coding issues, and guiding students through data analysis assignments. Beyond the classroom, I conducted both remote and in-person office hours, offering individualized support tailored to each student's learning pace and academic needs. I worked with a diverse group of students across various STEM disciplines, many of whom initially had limited exposure to programming and data analysis. One of the primary challenges I encountered was maintaining student engagement and motivation, particularly among those who did not immediately see the relevance of data science to their fields. To address this, I incorporated real-world examples and applications specific to students' academic and career interests, such as healthcare data, environmental analysis, and biological research. This approach significantly improved student participation and confidence in applying data-driven methods. Through this experience, I developed strong communication, mentoring, and time management skills. Additionally, I strengthened my ability to adapt explanations to different learning styles. This role also allowed me to build meaningful connections with faculty and students at Temple University, further enhancing my professional growth and leadership development.

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Presentation Time: Session 1: 10:00AM-10:50AM (check-in starts at 9:50AM)

Abstract Title: The PEGylation of Anticoagulants
Keywords: Bivalirudin, conjugation, PEG-5K, PEG-20K, thrombosis

Abstract: Thrombosis is a significant global health issue, contributing to about ~25% of deaths. Thrombin cleaves fibrinogen into fibrin, promoting stable clot formation. Bivalirudin directly inhibits thrombin by binding to the catalytic site and the anion-binding site. Due to the small size of bivalirudin, the half-life is 25 minutes in humans as it is quickly eliminated in urine. We hypothesize conjugating bivalirudin to polyethylene glycol (PEG) will prolong its circulation time, preventing renal filtration. To test this hypothesis, we will investigate the potency, safety, and pharmacokinetics of bivalirudin conjugated to 5 kDa PEG (PEG-5K) and compare it to our previously developed conjugates with 20 kDa PEG (PEG-20K). Conjugation was confirmed and the optimal conditions for complete derivatization of bivalirudin were identified using high performance liquid chromatography. We established that an hour-long reaction with an 8-fold molar excess of NHS-ester PEG-5K relative to bivalirudin provided complete reaction of bivalirudin. Concentration-effect assays testing thrombin activity and clot formation confirmed in vitro activity of bivalirudin PEG-5K. The concentration providing 50% inhibition (IC50) in each assay was determined to be 1.61 uM (thrombin inhibition) and 1.21 uM (clot formation), suggesting potent conjugate activity. Conjugates were intravenously injected into mice and no significant differences in blood loss were detected versus either vehicle control or free bivalirudin ($p>0.8$ by 1-way ANOVA with Tukey's post-hoc test), suggesting that bleeding risk of conjugates is insignificant. The pharmacokinetics of both bivalirudin-PEG-5K and bivalirudin-PEG-20K conjugates are currently being investigated to elucidate how conjugation affects circulation time.

Session 2
Abstracts

Ordered by Student Researcher Name (Last, First)

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: STEM Leadership Fellow
Keywords: Individual Contributions, Future Program Development, and Professional Development

Abstract: My role was working both virtually and in Gladfelter 665, providing one-on-one and small group tutoring for the Journey of the Algorithm course, I assisted students with homework, test corrections, and concept clarification to help them stay on track throughout the course. I worked closely with Professor Susan Varnum and Dr. Harker Ibarrola to help reinforce course material and support student learning.This role contributes to CST's mission by helping students succeed in foundational math courses and build problem-solving skills needed for future STEM classes. I provided individualized support by breaking down complex algebra concepts into clear, step-by-step explanations tailored to each learning style. I was able to reinforce lecture material while helping students correct their mistakes and better understand problem-solving strategies. I also have helped students build up their confidence in their math skills and help create study plans and tips to further their progress in the course

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Investigating Metal Oxyhydroxides as Nanozymes for Epoxide Ring-Opening Reactions
Keywords: Epoxides, MOFs, Metal Oxyhydroxides, Catalysis

Abstract: Epoxides are crucial compounds in organic synthesis and biosynthesis, often being used in pharmaceutical development. These compounds are volatile due to ring strain and are carcinogens in humans. Epoxide ring-opening reactions are acid/base-catalyzed via nucleophilic addition, yielding 1,2-disubstituted systems. Under physiological conditions, this reaction is catalyzed by enzymes, namely epoxide hydrolases and oxidoreductases, producing less reactive alcohols. The active centers of enzymes can be mimicked by nanozymes, including metal-organic frameworks (MOFs), where Zr and Hf-based MOFs have been extensively shown to efficiently catalyze epoxide ring-opening reactions. The catalytic centers of MOFs are hypothesized to be the metal nodes, specifically metal oxyhydroxides, which have shown similar catalytic activities to MOFs in various reactions. In this context, the metal ions can act as Lewis acids, making the oxyhydroxides excellent for catalyzing epoxide ring-opening reactions. We hypothesized that metal oxyhydroxides made up of Ce^{4+} and Zr^{4+} ions would be particularly effective due to the strong Lewis acidity of the metal ions. These oxyhydroxides were also put on a covalent-organic framework (COF) support due to polycondensation of the metal oxyhydroxides in solution and restricting active sites. In this study, we used propylene oxide as the epoxide substrate, methanol as the nucleophile, and cerium/zirconium oxyhydroxide & 8% metal oxyhydroxide-loaded COFs as the catalyst to study epoxide ring-opening reactions. The reaction was monitored using ^{1}H (proton) NMR at various time intervals. This study shows that metal oxyhydroxides are as effective as their more complex parent MOFs and show potential in catalysis.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Synthesis and Analysis of Salt Bridge Mutants in DNA Photolyase
Keywords: E.coli, photolyase, DNA repair, amino acids, salt bridge, electron transfer, plasmids, FAD, mutagenesis

Abstract: Ultraviolet (UV) radiation induces the formation of cyclobutane pyrimidine dimers (CPD), which is a major threat to DNA and genomic stability. DNA photolyase is a flavoprotein enzyme that uses visible light and a flavin adenine dinucleotide (FAD) cofactor to repair these lesions. The catalytic mechanism of DNA photolyase has been described extensively, however, the influence of electrostatic interactions between the flavin with nearby amino acid residues on DNA photolyase's catalytic efficiency remains unclear.
This study employs site-directed mutagenesis to change the magnitude and direction of the electric field emanating from the Arg 344/Asp 372 salt bridge. We will specifically focus on the substitution of arginine to histidine at position 344, to make the R334H mutant. The mutagenesis causes a rearrangement of the overall charge distribution around the active site of the enzyme, and renders the salt bridge pH-sensitive. We expect this to affect the FAD-binding pocket and the electron transfer rates in the system. After expressing the protein in E. coli BL21 and purifying the sample, the R334H variant's kinetic rates will be analyzed to explore how modulating the salt bridge electric field by pH changes the photoinduced electron rate, the first step in CPD repair (after binding).
The experiment's findings will clarify the importance of this specific salt bridge in light-driven DNA repair. These insights can be further used to develop photolyase variants with enhanced capabilities for biotechnological and therapeutic applications, particularly in preventing skin cancers and genetic disorders linked to UV-affected chromosomal defects and DNA damage.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Turning Code into Confidence: Peer-led support in Data Science education
Keywords: Python, Data Science, Technical Communication, STEM accessibility

Abstract: I served as a Peer Leader for the Elements of Data Science course under the supervision of Jonathan Smith within the college of Science and Technology. The primary Objective of this role was to bridge the gap for students from non-technical backgrounds who may feel intimidated by coding and/or data science. My responsibilities included facilitating weekly technical labs, debugging python code, and translating complex data principles into real world concepts to help with comprehension. By providing direct support to a diverse group of students, I was able to help increase student confidence and independent problem-solving skills in programming. This experience faced the unique challenge of adapting technical instruction for true beginners, which I addressed by learning to constantly relate code to real life encounters I have had. Through this fellowship, I have significantly strengthened my technical communications and instructional design skills. This role helped shape my approach to making data science an inclusive field for all disciplines.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Making Intro Biology Labs Less Intimidating: The Impact of Peer Lab Assistants on Student Confidence and Learning
Keywords: peer learning, biology education, student confidence, undergraduate teaching, lab support, mentorship

Abstract: Introductory biology labs can feel overwhelming for a lot of students at first, specially when they're adjusting to new concepts, fast-paced procedures, and the pressure of getting everything right. This project focuses on my experience as a Peer Lab Assistant (PLA) in BIO1911 and how peer support can make a real difference in how students experience lab. In my role, I worked closely with students during lab to help them understand both the "how" and the "why" behind what they were doing. Instead of just giving answers, I focused on breaking concepts down in a simple, approachable way and encouraging students to ask questions without feeling judged. A big part of my goal was creating a chill, supportive environment where students felt comfortable making mistakes and learning from them.
I also helped keep labs running smoothly by assisting with setup, troubleshooting problems in real time, and offering one-on-one help when students needed extra support. Over time, I noticed that students became more confident, more willing to participate, and better able to connect lab work to bigger biological ideas. This experience highlights how valuable peer-led support can be in STEM education. Not only does it improve student confidence and engagement, but it also helps PLAs develop strong communication and leadership skills. Moving forward, incorporating more structured feedback and stronger communication between PLAs and faculty could make this support even more effective.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Peer Lab Assistant Experience as a STEM Leadership Fellow
Keywords: Peer Mentorship, Assistant Teaching, Intro Biology Lab

Abstract: Undergraduate laboratory courses are often fast-paced and can present challenges that require additional support for students to fully engage with experimental concepts and procedures. The role of a Peer Laboratory Assistant (PLA) extended beyond providing logistical assistance to identifying when students were hesitant to seek help, adapting explanations to accommodate different learning needs, and supporting group collaboration while maintaining lab flow. Guiding students through protocols strengthened clear and effective communication under pressure, while supporting less engaged students within group settings required a thoughtful and intentional approach to encouraging participation. This experience highlighted that effective leadership in a learning environment is often demonstrated through consistency, patience, and the ability to build confidence in others. Over time, the role fostered greater confidence and accountability, reinforcing the value of mentorship, adaptability, and collaborative problem-solving within STEM environments.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Biofilm Imaging Library
Keywords: Biofilm, Image Segmentation, Microbiology, Machine Learning, StarDist

Abstract: Microbial biofilms can be found in diverse environments, including industrial facilities, natural ecosystems, and the human body, where they contribute to persistent infections, equipment degradation, and agricultural losses. The Biofilm Imaging Library is an ongoing project designed to support researchers in studying microbial biofilms across these varied contexts. As part of this research, I am developing a machine learning-based tool to automatically segment bacteria in microscopy images that can be used to quantitate the bacteria and, eventually, look for the higher order organizational patterns. I am using existing 3D machine learning model segmentation architecture called StarDist, which has been adapted to suit our specific dataset. I have trained and evaluated multiple model configurations to optimize performance. In parallel, I have developed a conversion tool capable of extracting object outlines from model predictions and exporting them as structured CSV files for further analysis. In its current state, the model successfully detects approximately 30% of the target objects and demonstrates strong shape resemblance in its predictions. The conversion tool is fully functional, reliably extracting and recording object contours. While the model's performance is promising, there remains meaningful room for improvement. In the coming months, I plan to explore the full potential of the StarDist architecture before transitioning to the development of a custom model architecture tailored to the unique characteristics of our data.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Pharmacological characterization of 10-furan-akuammicine (10-furan-AKC), a novel agonist at the kappa opioid receptor (KOR)
Keywords: Kappa opioid receptor (KOR), 10-furan-akuammicine, Akuammicine, Opioid agonist, Anti-pruritic, Dose-response, ED50, CD-1 mice

Abstract: Activation of the KOR produces analgesic and anti-pruritic effects and water diuresis. However, clinical development of KOR agonists was limited by their side effects, including psychotomimesis, dysphoria, and sedation, except nalfurafine. Nalfurafine was approved for clinical use in Japan for treatment of systemic itch in kidney dialysis patients without producing side effects mentioned above. Akuammicine (AKC), an indole alkaloid AKC purified from seeds of Picralima nitida, had moderate affinity for the KOR and was a full agonist at the KOR. 10-furan-AKC, synthesized by Dr. Riley's group, showed higher affinities for the KOR with Ki values of 2.1 nM and 65x and 73x selectivity for the KOR over the mu and delta opioid receptors. As AKC and derivatives have distinct chemical structures from other KOR agonists, Liu-Chen lab will characterize pharmacological profile of 10-furan-AKC in KOR-mediated behavioral models in mice. For the CST-RSP work, I will characterize the anti-itch effect of 10-furan-AKC in male CD-1 mice by examining its ability to inhibit compound 48/80-induced scratching. Different doses of 10-furan-AKC will be investigated, dose-response relationship will be established, and its ED50 value will be determined. ED50 value, the dose that produces 50% of the maximal response, is an indicator of potency of the compound. Future work will examine whether 10-furan-AKC produces analgesia, hypolocomotion, and motor incoordination.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: phyloDIVaS: An Integrated Workflow for Genome-Wide Detection of Divergence and Selection in Comparative Genomics
Keywords: comparative genomics, molecular evolution, dN/dS, HyPhy, codon models, ortholog analysis, multiple sequence alignment

Abstract: The rapid increase in publicly available genomic data has allowed for large-scale analyses in comparative genomics, yet the computational workflows required for such analyses remain fragmented and technically demanding. Here, we present an update on our ongoing development of phyloDIVaS, an integrated bioinformatics pipeline designed to facilitate genome-wide evolutionary analysis through a unified framework. phyloDIVaS streamlines key steps in comparative genomics pipelines, including retrieval of publicly available genomic datasets from the NCBI Datasets database, ortholog identification, multiple sequence alignment, codon-aware alignment generation, and statistical testing for selection using a dN/dS framework implemented with HyPhy. By incorporating established tools into a single workflow, the pipeline enables efficient detection of gene-wide, branch-specific, and site-level selection signals across large datasets. Designed with scalability and accessibility in mind, phyloDIVaS supports genome-scale analyses while remaining adaptable to user-defined hypotheses and datasets. This streamlined framework significantly lowers the barrier to entry for complex genomic analyses. As a demonstration of its utility, phyloDIVaS was applied to a primate dataset to investigate evolutionary patterns in genes associated with hemoglobinopathies, demonstrating its ability to identify genes under selection in biologically relevant systems. phyloDIVaS provides a user-friendly and comprehensive framework for investigating patterns of molecular evolution and identifying candidate genes under selection, with broad applications in evolutionary biology, functional genomics, and biomedical research.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: A Social-Force Framework for Collective Dynamics in Soccer
Keywords: agent-based modeling, physics, simulation, soccer, social force

Abstract: We investigate the application of the social force model (SFM), originally developed for pedestrian dynamics, to the collective motion of soccer players. In the SFM framework, each agent's movement is governed by a superposition of forces: a self-propulsion term driving agents toward a desired velocity, pairwise repulsive interactions encoding personal space, and cohesion forces maintaining group structure. We adapt this framework to a line drill formation, where the primary objectives are lateral spacing regulation and coordinated forward motion. Agent trajectories are evolved via an Euler–Maruyama discretization of the underlying Langevin equation, and model parameters are calibrated relative to the natural driving force scale. We discuss the challenges of porting pedestrian-derived parameters to a sports context and present simulation results illustrating emergent formation behavior under perturbed initial conditions.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Investigating the Effects of Nicotine and Vitamin C on Human Microglial Cells: Implications for Alzheimer's and Parkinson's Disease
Keywords: Neurodegenerative Disease, Nicotine, Vitamin C, Microglia

Abstract: Neurodegenerative diseases such as Alzheimer's and Parkinson's affect 8.3 million elderly Americans annually. While they have no current treatments, by studying neural immune cells that are activated under certain conditions, one can understand how to better regulate neuroinflammation to reduce the likelihood of neurodegenerative disease progression. This research aims to focus on how microglial cells survive and respond to various treatments using Vitamin C, nicotine, and a combination. The ideal concentrations of Vitamin C, nicotine, and their combination to determine what helps microglia thrive will be optimized by assessing microglial cell viability using MTS assays. To examine the function of microglia cells after the treatments, a phagocytosis assay will be conducted by assessing the engulfing of fluorescence beads of HMC3 cells. Based on previous research, it is expected to see the combination of an antioxidant like Vitamin C and nicotine's unique structure to positively impact the microglial cells by increasing cell viability and reducing inflammation. More viable cells will indicate better microglial cell health, and a lower rate of engulfment will indicate that the microglia are not hyperactive. Through these two experiments, the concentrations of nicotine, Vitamin C, and their combination to improve microglia viability and functioning will be determined. By ensuring that microglia are both living and functioning without producing an excessive immune response, this can help identify which treatment (Vitamin C, nicotine, or a combination compared to the control) is best suited when considering pharmacological interventions for patients.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: STEM Peer Teaching Fellow
Keywords: Chemistry, Teaching

Abstract: I served as the Peer Teaching Fellow for CHEM 1027 in both spring and fall semesters. CHEM 1027 is an introductory chemistry course designed for students who don't meet the requirements for General Chemistry I. My main responsibility was to act as a secondary resource to the professor and TA in lectures and in lab. This included assisting students with in-class assignments, guiding students through lab experiments, aiding in lab set-up and clean-up, and providing one on one instruction. Through this experience, I've been able to improve my time management, communication and leadership skills. This opportunity has allowed me to become more confident in myself both as a student and as a teacher. As a student who previously took this class, I felt that this was an especially valuable experience that allowed me to reflect on my own personal growth and the value that a strong pre-requisite basis can provide for future STEM education. My biggest challenge was in balancing these two conflicting roles of instructor and student, especially with my own coursework and in my relationships with my students and professors. In the future, I would like to see more opportunities for the STEM fellows to network and collaborate with each other. I believe this will create a more interdisciplinary environment within the program, benefiting both the fellows and their students.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Stem Leadership Fellow, Mathematics Department
Keywords: Math Tutor, Teaching Assistant, Math Consulting Center

Abstract: The SLF position within the math department was created to bridge the gap between students and professors within the lower levels of mathematics. Many students arrive at college with preexisting notions about their mathematical capabilities, often lacking confidence thus preventing them from reaching their full potential. The Temple Mathematics Department offers support to students within all levels, especially those at the pre-algebra level. Within my position I graded homework for three sections of intermediate algebra, led weekly review sessions, and tutored at the MCC. I was able to build connections and foster a welcoming learning environment that encouraged curiosity and learning. This paper discusses my experience within the program and potential improvements.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Studying Dye–Membrane Interactions in Living Cells Using Second Harmonic Light Scattering
Keywords: Adsorption, Bacteria, Malachite green, Membrane transport, Molecules, Second Harmonic Light Scattering

Abstract: Understanding how small molecules interact with and move across membranes is important for improving drug delivery and developing better antimicrobial treatments. However, many current methods require fluorescent labels or cannot clearly distinguish interaction at specific membranes. This project uses Second Harmonic Light Scattering (SHS), a label free and surface sensitive technique, to directly measure how molecules adsorb to and cross living cell membranes in real time. By studying the interaction of malachite green dye with a model with living cell membrane, this research aims to determine how quickly the dye binds to the membranes and how it moves across it.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Solving for Confidence: Empowering Students in Math 0702 & 1021
Keywords: math tutoring, STEM leadership, peer mentorship, problem-solving, student confidence, algebra skills, academic success, tutoring strategies, learning outcomes, student engagement

Abstract: Tutored students in Math 0702 and 1021 through weekly, biweekly, and one time sessions to support problem solving and build confidence. Students showed improved accuracy, independence, and engagement over time. This experience strengthened my communication and leadership skills and highlighted the importance of consistent support, and moving forward I propose exam preparation sessions to improve student readiness.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Peer-Led Learning in General Chemistry
Keywords: General Chemistry, Peer Mentoring, Student Engagement

Abstract: As a Student Fellow Leader for General Chemistry, I support students in understanding challenging course concepts through peer guidance, exam preparation, and review of lecture material. Because General Chemistry is a foundational course for students in biology, chemistry, and many pre-health majors, I work to create a learning environment that is supportive, clear, and encouraging. In this role, I help organize study groups around course chapters and strengthen communication between students and professors, giving students additional opportunities to engage with the material outside of class. These study groups have helped students become more comfortable asking questions, collaborate with one another, and develop greater curiosity about chemistry. This experience has also contributed to my own personal and professional development by teaching me to better understand different perspectives and to be more patient when explaining difficult concepts. Since chemistry can be frustrating to learn, I have learned how to listen carefully, adapt my explanations, and support students in ways that build confidence and reduce discouragement. The communication, empathy, leadership, and problem-solving skills I have gained through this role will be valuable in future jobs and internships that require teamwork, mentorship, and clear communication.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: The role of MOR and CB1R in JZL184 mediated reduction of opioid reward through GABAergic RMTG->VTA projections
Keywords: Opioids, Endocannabinoid, RMTg, VTA, JZL184, Addiction,

Abstract: Opioid use disorder continues to be a major public health issue. Research continues to be performed to develop better ways of addressing this concern. The endocannabinoid 2-AG (2-arachidonoylglycerol) is found in the body and works as an agonist at the cannabinoid receptor 1, (CB1) which regulates the dopaminergic pathway. 2-AG is primarily hydrolyzed by the enzyme monoacylglycerol lipase (MAGL). As previously published, JZL 184, a pharmacological inhibitor of MAGL, increases 2-AG and reduces opioid reward while still maintaining analgesic effects. This research focused on the rostromedial tegmental area (RMTg) and the ventral tegmental area (VTA). Mu opioid receptors (MORs) on GABAergic interneurons within the VTA and its neuronal projections within the RMTg are a key factor in opioid reward. In this study, we tested whether MORs and CB1s in RMTg→VTA projections are necessary to see the effects of JZL 184. Conditional viral knockout mice were used to test morphine reward. These mice were assessed through the conditional place preference (CPP) behavioral assay, and it was found that the mice lacking MORs (Oprm1) failed to develop morphine CPP, confirming their essential role in reward. In CB1 knockout JZL 184 failed to attenuate CPP. With these results, it was identified that CB1 receptors play a role for MAGL inhibition within the RMTg→VTA pathway when attenuating opioid reward.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Arthropod Community Assembly Response to Microclimates Caused by Wind-throw Disturbance Event
Keywords: Arthropods, abundance, biodiversity, climate change, community, disturbance, ecology, ecosystem, forest, microclimate, pitfall traps, recovery, richness

Abstract: Climate change intensifies the frequency and severity of storm events causing environmental disturbances, such as tornadoes, that leave cascading effects on biodiversity and ecosystem functioning. Arthropods are drivers of nutrient cycling and play a central role in forest recovery as ecosystem health indicators. We examined how arthropod communities respond to a tornado-induced disturbance gradient at the Temple Forest Observatory (TFO), an old-growth forest that experienced an unprecedented windthrow event in 2021, and nearby Robbin's Park (RBP), acting as a control. To investigate whether canopy cover and variable microclimates alter arthropod diversity, we collected arthropods over three seasons from 2023 to 2025 using pitfall traps across low-, intermediate-, and high-disturbance plots in TFO and RBP. Disturbance levels were classified by canopy loss derived from pre- and post-tornado remote sensing imagery. Each plot was paired with seasonal measurements of vegetation cover, dew point, temperature, and carbon-to-nitrogen ratios to assess environmental drivers of community composition. We found that arthropod abundance and richness were highest in low-disturbance plots. Diversity, however, was the highest at intermediate disturbance levels, suggesting that some disturbance may promote species turnover without causing local extinctions. Consistent with seasonal shifts, we collected over 1,800 specimens, with peak collections during the summer. Our findings highlight the role of microclimate and canopy structure in shaping arthropod community resilience following a novel disturbance. As climate-driven disturbances become more common, understanding these dynamics is essential for predicting ecological responses and guiding forest management. Results can structure global conservation efforts towards sustainable systems and ecosystem preservation.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Genetic and Morphological Characterization of a New Deep-Sea Cnidarian Species
Keywords: Cnidaria, Hydroid, Anthoathecata, Tubiclavoides, Methane seep, Costa Rica

Abstract: The deep sea is considered the largest habitable space on Earth, yet much remains unexplored. With such vast unexplored areas, there is an incredible amount of biodiversity that is still unknown. With ocean exploration technologies advancing, scientists now have the tools to explore uncharted areas of the deep sea, including areas where the release of subsurface gases creates environments that sustain dense and diverse chemosynthetic communities called methane seeps. Lacking sunlight, these areas house unique fauna whose source of energy is derived from the oxidation of chemical species. In particular, the subducting seamounts along the convergent Costa Rica margin facilitated by tectonic interactions result in methane seep communities that have yielded a considerable number of previously unknown species. Here, a new species of Anthoethecate hydroid is described from the periphery of these methane seep communities, found during the exploratory expedition by the R/V Falkor in 2019. Found at the deepest location sampled during this expedition, this species was found attached to the outside of a vestimentiferan tubeworm. Although the discovery of novel deep-sea taxa is anticipated due to largely unmapped biodiversity, this specific find potentially warrants the establishment of a new genus in the Tubiclavoidae family. It is crucial to understand deep-sea biodiversity to protect these communities as they are increasingly targeted and exploited for resources.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Enhancing Student Engagement through Scalable Systems: A STELLAR Program Initiative
Keywords: Student Engagement, STEM Education, Program Management, Higher Education, Student Success, Digital Tracking, Leadership, Co-curricular Activities

Abstract: As a STEM Student Engagement Leadership Fellow within the STELLAR (Student Engagement, Leadership, Learning, and Achievement Resource) program at Temple University's College of Science and Technology, this project focused on improving student participation through structured and scalable engagement systems. In collaboration with the Center for Academic Advising and Professional Development, the initiative aimed to design, implement, and manage processes that encourage consistent student involvement in academic and co-curricular activities.
Key responsibilities included developing task-based engagement activities, reviewing and approving student submissions, and maintaining accountability across participants. Regular meetings with administrative leadership informed iterative improvements to program structure and execution. A digital tracking system was implemented using QR-code-based event check-ins and a points-based incentive model ("STELLAR points") to monitor and reward participation. Additionally, collaboration with university organizations expanded opportunities for students to engage in recognized activities beyond traditional advising frameworks.
This work contributed to creating a more accessible and organized engagement ecosystem, supporting student motivation and participation. The experience provided insights into program coordination, student behavior, and the role of structured systems in driving engagement. Overall, the project demonstrates how intentional design and consistent management of engagement initiatives can enhance student involvement and support student success within STEM education environments.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: TDG as a Potential Epigenetic Therapeutic Target in Uveal Melanoma
Keywords: Cancer, immune checkpoint inhibitor, melanoma, methylation, SF3B1, thymine DNA glycosylase.

Abstract: Uveal melanoma (UM) is the most aggressive subtype of ocular melanoma, with the primary tumor forming in the pigmented structures of the eye. UM responds poorly to both chemotherapy and immune checkpoint inhibitors. Methylation clusters are heavily concentrated in several profiles of UM, pointing to a strong link between methylation and UM progression. This connection suggests that targeting DNA methylation could be a promising therapeutic approach. Thymine DNA Glycosylase (TDG) is a dual-function enzyme that plays a critical role in active DNA demethylation and in repairing G/T mismatches. In melanoma, TDG represents a key vulnerability because it influences metastatic potential. Our findings show that knockdown of TDG in UM cells induces cell cycle arrest and senescence, while treatment with the small-molecule inhibitor closely mimics these effects both in vitro and at the biochemical level. Importantly, the role of methylation emerges as a defining feature of UM biology: monosomy 3 cases, with or without BAP1 mutations, exhibit methylation patterns that strongly promote metastasis, while distinct methylation clusters are concentrated in SF3B1-mutant and disomy 3 (D3-UM) profiles. Together, these observations underscore that aberrant methylation not only shapes UM progression but also positions TDG as a central regulator whose disruption reveals therapeutic vulnerabilities.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Understanding allostery in proteasome subunit hRpn13 through molecular simulation with peptide and peptoid binders
Keywords: Molecular dynamics simulations, Peptoids, Ubiquitin Proteasome System, Conformational dynamics, Allostery

Abstract: Molecular dynamics (MD) simulations have provided a framework for analyzing complex macromolecular systems at atomic resolution. The proteasome subunit hRpn13 is a critical component of cell maintenance and reproduction, serving to help recruit ubiquitinated targets for protein degradation. The Pru domain of hRpn13 is particularly versatile, containing many different surfaces at which interactions with proteins and peptides occur. Co-crystal structures of hRpn13 Pru domain with these binding partners show broad conformational diversity, suggesting allosteric regulation. Recently, an NMR-guided structural model of hRpn13 Pru domain in complex with a five-residue peptoid (N-substituted oligoglycine) called KDT-11 was published, proposing yet another binding interface (Muli et al. JACS 2025). To characterize and analyze how hRpn13 binds multiple partners, and how this plasticity might be targeted for drug discovery, we performed numerous MD simulations of multiple conformations of hRpn13 in apo, holo, and pseudo-holo conformations. Initial structures of the hRpn13 Pru domain were taken from the RCSB Protein Data Bank (PDB), solvated with counterions, energy-minimized and equilibrated at constant temperature and pressure using the GROMACS simulation package. Large-scale production simulations were performed on the Folding@Home distributed computing platform. Analysis of the trajectory ensembles collected give information about Pru domain conformational dynamics in the presence and absence of binders, and provide insight into the rational design of new hRpn13 inhibitors for cancer therapeutics.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: First Year Advising Fellowship Abstract
Keywords: mentorship, first-year students, STEM, academic support, leadership, student transition, time management, campus resources

Abstract: Through my involvement in the CST FYA Fellowship, I have supported first-year STEM students by organizing and facilitating monthly programming designed to ease their transition into college. These events were run twice each week and focused on different themes throughout the year, including social adjustment, using office hours, campus resources, time/stress management, exam preparation, applying for on-campus jobs, summer planning, scholarships, and resume building.In addition to planning and advertising these meetings, I followed up with students through post-event communication to reinforce key concepts and ensure continued support beyond the one-hour sessions. Through these efforts, I have been able to guide and mentor over 50 first-year students by offering both group support and individualized advice.One of the biggest challenges I faced was supporting a wide range of students across different CST majors. While I am more familiar with certain areas within STEM, I often worked with students in fields I was less experienced in, which pushed me to become more adaptable and resourceful. I learned how to guide students effectively even when I did not have all the answers, whether that meant helping them find the right campus resources, encouraging them to attend office hours, or connecting them with other support systems.Another challenge was balancing this leadership role with my responsibilities as a full-time pre-med student managing multiple jobs and extracurricular commitments. This required strong time management and consistency. This experience strengthened my leadership, communication, and mentorship skills while reinforcing my commitment to supporting students in STEM.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Supporting Student Learning as a Peer Laboratory Assistant for BIO 1112
Keywords: Leadership development, Student mentorship, Peer-assisted learning, Academic support

Abstract: For the past two semesters, I have served as a Peer Lab Assistant through the CST STEM Leadership Fellowship for BIO 1112, an essential course for Biology, CST, and many pre-health students. In this role, I supported first-year and sophomore students as they built foundational laboratory and analytical skills. I attended weekly PLA preparation meetings and my assigned lab section. I connected with 41 underclassmen and supported them as they navigated foundational STEM classes. I was able to guide students through each lab, encourage them when challenges arise, and help create a supportive learning environment while increasing engagement. I held office hours to support students who needed additional guidance with their lab reports. I answered questions, demonstrated experimental techniques, and explained not only how we conduct experiments, but why they matter and how they connect to broader scientific and real-world applications. Beyond the classroom, I was also a resource for students by offering advice, sharing opportunities, and helping them feel more confident. The program has allowed me to build meaningful connections with students, peers, and faculty across the STEM community. I wanted to develop my own leadership skills and learn how to better mentor students in an academic setting. I created a mentoring environment where students feel respected and never judged, which is crucial in scientific research as it brings a range of perspectives that foster diverse critical thinking and problem-solving.

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Presentation Time: Session 2: 11:00AM-11:50AM (check-in starts at 10:50AM)

Abstract Title: Characterization of Metabolic Phenotypes in Acute Myeloid Leukemia
Keywords: mitochondria, metabolism, leukemia, MICU2, C-II

Abstract: The mitochondria is an essential cellular organelle that regulates metabolism and produces ATP for the cell, primarily by the electron transport chain (ETC). Recently, our lab proposed a novel metabolon of Complex II (C-II) of the ETC as regulated by MICU2, a calcium-sensing protein part of the mitochondrial calcium uniporter complex (mtCU). Also, it has recently been shown that acute myeloid leukemia (AML) cell lines are sensitive to C-II inhibition. Therefore, we hypothesize that knocking down MICU2 in AML cells will reduce C-II activity, increase cell death, and alter metabolism. Our preliminary results shown here indicate that knocking down MICU2 ($MICU2^{KD}$) in AML cells decreases viability and C-II activity. These preliminary conclusions support that a MICU2/C-II interaction is required to maintain cellular metabolism, and that MICU2 can function independent of calcium and the mtCU. Investigating the metabolic character of AML cells will improve our understanding of a metabolic weak point in an aggressive cancer, potentially leading to novel therapeutic research.

Session 3
Abstracts

Ordered by Student Researcher Name (Last, First)

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Oxygen-Vacancy-Enhanced Visible-Light Photocatalysis for Alcohol Oxidation and hydrodeoxygenation with WO_3
Keywords: hydrodeoxygenation, WO3, UV-Vis, Photocatalytic, Lewis-Bronsted-Acid-Sites

Abstract: Photocatalytic hydrodeoxygenation (PHO) is an important reaction for removing hydroxyl groups from alkanes under driven harsh conditions with toxic reagents. Recent studies have shown that oxygen-deficient tungsten oxide catalysts can promote hydrodeoxygenation under UV light due to the presence of Lewis and Bronsted acid sites, which allows for the catalyzation of alcohol, providing a potential pathway for achieving hydroxyl group removal without the need for extreme conditions. Here, we investigate how varying concentrations of oxygen vacancies in WO_3, introduced by reduction under 3% H_2 at 350, 400, 450 and 500 °C, influence the reaction under visible-light irradiation. The increasing concentration of oxygen vacancies gives rise to a broad visible–NIR absorption band in the UV–Vis spectra, indicating enhanced light harvesting in the visible and near-infrared regions. This extended absorption may promote the generation of electron–hole pairs under visible-light irradiation, facilitating alcohol oxidation. These defect sites can act as adsorption centers, Lewis-acidic-sites, and Bronsted-acidic-sites, which may enhance substrate activation and promote PHO. The reaction was observed over time using proton nuclear magnetic resonance (1H-NMR) at 0,4,8,16, and 24 hours to identify changes in chemical structure of the alcohol. 1H-NMR analysis showed the formation of new aldehydes after 4h time resulted in conversion after 24 h. These results suggest that tungsten oxide catalyst can catalyze the alcohol oxidation/hydrodeoxygenation under visible light and support hydrodeoxygenation without extreme harsh conditions being added. This contributes to the development of catalytic systems for hydrodeoxygenation and provides insight into reaction pathways that can be studied further.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Intuitive Visualization of Synapse Activity in Real-Time Neuroscience Simulations
Keywords: Computational Neuroscience, Virtual Reality, Synapse Activity, Real-time

Abstract: Neuro-VISOR is an interactive virtual reality (VR) application that allows users to conduct real-time neuroscience simulations by applying voltage to neurons and connecting them with synapses. While the current version of Neuro-VISOR visualizes neuron activity (voltage), there is no visualization of synapse activity (current). This project addresses this shortcoming in a way to be intuitive to the user, particularly users from the non-computational neuroscience community. Synapses are designed to possess a synaptic cleft, and neurotransmitters move from presynaptic to postsynaptic terminal, visualized in ways resembling depictions in neuroscience literature (sketches and animations). The emission rate of neurotransmitter particles is scaled with the synaptic current, where positive and negative currents are distinguished, as typical for excitatory versus inhibitory synapse types.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Student Success in General Chemistry
Keywords: General Chemistry, Student Success,

Abstract: As a CST STEM Leadership Fellow, I aided General Chemistry students in forming study groups to enhance community engagement and student success. Through these groups, students collaborated with classmates and Peer Learning Assistants to review course material and work through practice problems. Benefits of these sessions included fostering a sense of community, as well as improving student learning, collaboration, and study habits. Challenges included gaining and maintaining consistent student interest, along with coordinating with PLAs willing to facilitate sessions. Despite these obstacles, the initiative successfully supported more than 100 General Chemistry students. Overall, this experience strengthened my ability to lead, organize, and create inclusive academic spaces, and it has the potential to expand and impact even more students in the future.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Quantitative Studies of Heme Metabolism via Tracing of Succinyl CoA
Keywords: aminolevulinic acid, biliverdin, cancer, heme, hemin chloride, isotope tracing, mass spectroscopy, liquid chromatography, succinyl-CoA

Abstract: In certain diseases, the enzyme succinate dehydrogenate (SDH) is inactive, impairing its ability to oxidize succinate to fumarate. The resulting buildup of succinate shifts the reversible reaction catalyzed by succinyl-CoA synthetase backwards, causing a backup of succinyl-CoA. Because succinyl-CoA is a key intermediate in heme synthesis, which is necessary for functions such as oxygen transport and multiple metabolic reactions, its accumulation can disrupt normal metabolic regulation. Alterations in heme synthesis and degradation pathways are especially relevant in cancer, since increased heme production can support enhanced oxygen use and mitochondrial activity, therefore promoting tumor survival. We hypothesize that increased levels of the succinyl-CoA intermediate drive increased heme synthesis in SDH-deficient cancer cells. To test this hypothesis, we are developing a high resolution liquid chromatography/mass spectroscopy (LC/MS) tracing method to monitor the progression and fate of succinyl-CoA in-vitro in SDH-deficient cells. We are specifically interested in investigating the heme synthesis and degradation pathways by detecting aminolevulinic acid, hemin chloride, biliverdin, and heme using our isotopic labeling and tracing methods. As of now, we have been able to detect the heme intermediates by LC/MS and successfully culture a SDH-deficient cell line. We have worked on optimizing this method to improve and quantify our results.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Determining Properties of Stellar Clusters Using Gaia Data and Bayesian Models
Keywords: Stellar clusters, Globular clusters, Isochrone fitting, Bayesian methods, Color–magnitude diagram (CMD), Gaia DR3, Proper motion, Probabilistic modeling

Abstract: In astronomy, isochrones are tracks of theoretical stellar models that predict the properties of clusters of stars. Fitting these models to stellar cluster color–magnitude diagrams (CMDs) uncovers properties that can not be determined from direct measurement. This fitting process is often done by eye, which introduces bias, limits precision, and obfuscates uncertainties. How these uncertainties impact existing research remains poorly understood. To address these limitations, we aim to develop a probability-based framework for statistically fitting these isochrones to cluster data. This requires first obtaining a clean and reliable sample of the cluster population. By using stellar data from Gaia's (ESA) Data Release 3 (DR3), we can analyze a broad sample of globular clusters using proper motion (PM) filtering as a primary method for isolating cluster members. By filtering based on their tangential motion across the sky, we can often directly separate cluster populations from background stars. Once data is sufficiently filtered and isolated, we will then craft the probability-based Bayesian model to conduct a more mathematical and statistical fit.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Finding My Purpose Through Leadership and Teaching
Keywords: Leadership, Teaching, Mentorship, Student Engagement, STEM Education, Early Childhood Education, Community Impact, Personal Growth

Abstract: My academic and career goals have developed through leadership, teaching experiences, and a deeper understanding of the impact I want to have on others. I began my time at Temple University as a Biology major on a pre-dental track, but my involvement in student leadership and education-based roles helped me realize that my true passion lies in teaching. Through my roles as a CST Peer Leader and STEM Leadership Fellow Captain, I have worked closely with first-year students as they navigate the challenges of college-level math and science. Leading small group discussions, holding office hours, and mentoring students has allowed me to support not only their academic success but also their confidence. These experiences have shown me the importance of creating environments where students feel comfortable asking questions and engaging with difficult material. In addition to my teaching roles, I am deeply involved in student engagement and wellness initiatives across campus. As an Operations Assistant and Peer Educator at the Wellness Resource Center, I promote mental health awareness and connect students to resources. After graduating, I plan to pursue a Master's degree in Early Childhood Education and become a science teacher in the Philadelphia area. My goal is to help young students build confidence in STEM and develop a positive relationship with learning. My commitment to leadership, service, and growth makes me a strong candidate for this scholarship.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Pathway to progress: epigenetic profiles in blood and colon tissue illuminate vital pathways in colorectal cancer.
Keywords: Colorectal cancer, cpg sites, dna methylation, illumina epic array, organoids, pathway enrichment analysis

Abstract: Colorectal
cancer (CRC) is the second leading cause of cancer-related deaths among men and women combined in the United States. CRC risk is uniquely complicated by interactions between genetic and environmental factors. This could include diet, lifestyle, and the intestinal microbiome. These interactions shape the epigenome, particularly DNA methylation, which may contribute to CRC predisposition and disease progression. In this study, blood samples along with normal colon and colon tumor biopsy samples were collected from consenting adults with and without CRC of diverse sex, race, and age groups to provide a representative sample. DNA was extracted and will be subjected to DNA methylation profiling using the Illumina EPIC array. Differential methylation analysis will be performed to identify CpG sites exhibiting statistically significant methylation differences between CRC cases and controls. Identified CpG sites will be mapped to genes, and pathway enrichment analyses will be conducted to identify biological pathways associated with CRC tumor progression. Additionally, normal and tumor organoids are in development with the potential to be used for drug and treatment testing. Primary outcomes could include the discovery of molecular pathways linked to CRC tumor progression and inform treatment development that could slow or prevent disease progression. This information may advance our understanding of early CRC pathogenesis and inform the development of targeted prevention and therapeutic strategies.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Quantum Network Throughput Analysis and Approximation
Keywords: quantum networks, entanglement swapping, throughput analysis, normal distribution approximation, quantum repeater chains

Abstract: Quantum networks use entanglement swapping to transmit quantum states across multiple nodes, enabling long-distance quantum communication. However, computing accurate throughput for multi-hop quantum repeater chains is computationally expensive due to complex probability distributions involved in entanglement generation and swapping. We investigate whether normal distribution approximations can efficiently model the binomial processes underlying these operations while maintaining accuracy comparable to exact calculations. Our method approximates the binomial distributions for entanglement generation and swapping using normal distributions to reduce computational complexity. Preliminary evaluations suggest that this approach can achieve near-identical throughput estimates while providing significant computational speedup compared to exact methods. This enables scalable analysis of larger quantum networks that are otherwise impractical to evaluate with exact probabilistic models.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Ion Channels in NeuroVISOR
Keywords: Awesome, neuroscience, VR, partial differential equations, math simulations

Abstract: NeuroVISOR is a VR application that simulates how action potentials fire within neurons. Currently, NeuroVISOR is fully functioning as an application and showcases impressive visualizations for how neurons react to select stimuli. Although the program is fully functional, it suffers limitations when a user attempts to modify the biological properties of the neurons. This limitation is my area of research. Over the past year, I adjusted the software to allow users to adjust the biological parameters of a neuron, enabling users to change the ionic structure within the neuron. Over the course of this semester, I improved my code, giving users a seamless experience when modifying the biology of the neuron and ensuring numerical stability within NeuroVISOR's solver. My methods include creating an ODE solver apart from NeuroVISOR, matching the biology of the neurons, and ascertaining where instabilities may arise.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Optimizing Germination Protocols for Small
Keywords: Asabatia angluarius, agar, germination, seedling size, seed viability, sucrose, Murashige & Skoog (MS).

Abstract: The germination stage is critical in a plant's life history. Though a key component of fitness, this phase is frequently overlooked in evolutionary biology studies, largely because closely monitoring germination rates and viability of small seeds is difficult within a soil based growth environment. To address this gap, this study will develop standardized methodology for monitoring germination of small seeds of the biennial plant Sabatia angularis. This species has been the focus of phenotypic selection studies in The Spigler Lab, with seed diameter measured to evaluate seed quality. Given each plant produces an average of 40 fruits with up to ~1000 seeds that are ~0.3mm in diameter, past studies of germination have been difficult and imprecise. Seeds were germinated in agar plates with two different concentrations of Murashige & Skoog (MS) basal salt in the presence or absence of sucrose. Quantifying the germination stage provides a more comprehensive view of plant fitness. Our optimized agar-based protocol can offer a reliable, repeatable method for recording germination rates in S. angularius that can serve as the foundation for future research into how parental factors, such as flower age, influence seed viability.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Peer Laboratory Assistant Captain
Keywords: Peer Laboratory Assistant (PLA), mentorship, leadership

Abstract: As a STEM Leadership Fellow, I served as a Peer Laboratory Assistant Captain for BIOL 1112, where I supported student learning in introductory biology laboratories while also mentoring fellow PLAs. I worked closely with instructors to facilitate an interactive and inclusive lab environment by answering student questions, demonstrating experimental techniques and guiding students through complex biological concepts. By acting as a bridge between students and instructors, I helped foster a space where students could feel more comfortable seeking clarification and engaging with the material.
In addition to my responsibilities in the laboratory environment, my role as a PLA Captain involved leading and mentoring a small group of PLAs. I conducted weekly meetings to review upcoming lab material and provide guidance on effectively supporting students. This leadership experience strengthened my ability to communicate scientific concepts clearly, adapt to diverse learning styles, and support my peers in becoming more confident and effective educators. Through this experience, I developed key skills in mentorship, collaboration, and scientific communication. I also gained a deeper appreciation for peer-led learning in improving student comprehension and confidence. This presentation will highlight the impact of the PLA and SLF program on both student success and my own professional development, as well as the broader significance within the College of Science and Technology. Overall, my experience as a PLA Captain has prepared me with essential skills that will support my further career in healthcare and science.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Enhancing Student Support and Engagement as a STEM Leadership Fellow
Keywords: STEM leadership, peer mentoring, student support, lab assistance, communication skills, student engagement, academic success

Abstract: As a STEM Leadership Fellow, I worked as a Lab Assistant, where I supported students during lab sessions and helped the professor. My goal was to help students stay focused, understand the material, and complete their work with confidence.During labs, I answered questions, explained concepts, and guided students step by step. Outside of class, I created and managed a Discord server so students could ask questions and get help anytime. I also took part in Experience Temple Day, where I spoke with prospective students and shared my experience in the College of Science and Technology.Through this work, I supported many students both in and outside the classroom. Having an online space made it easier for students to ask questions and get quick help. This improved their understanding and helped them feel more comfortable asking for support.One challenge I faced was working with students who had different learning styles and levels of understanding. I handled this by adjusting how I explained things and by being patient and flexible in my approach.This experience helped me improve my communication, organization, and teamwork skills. It also taught me how to better support others and adapt to different situations.The STEM Leadership Fellow Program matters because it helps students support each other while building important leadership skills. I would have liked more chances to work with other fellows through group meetings or shared projects. In the future, adding more structure and collaboration could make the program even stronger.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: STEM Leadership Fellow
Keywords: Guide, leadership, programming, STEM,

Abstract: The STEM Leadership Fellow Program (SLF) is an additional peer-led resource for students to learn. As a STEM Leadership Fellow for Program Design and Abstraction (CIS 1068), I provided support for students by helping them master Java. Beyond traditional office hours and exam reviews, I implemented asynchronous screencasts to assist students with problem-solving logic over basic syntax. This role helped me significantly grow professionally, particularly in communication and public speaking, by leading labs and exam review sessions. Moreover, I enhanced my critical thinking skills by guiding students through environment setups, debugging, and narrowing difficult programming problems into easier ones.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Investigating the Microbiome and Social Barriers that Impact Health Disparities in Esophageal Cancer
Keywords: Esophagus cancer, social barriers, disparities

Abstract: With esophageal squamous cell carcinoma (ESCC), it can be found more commonly in African Ancestry (AA) while in Caucasian Ancestry (CA), esophageal adenocarcinoma (EAC) is more common. In the esophagus, there are studies showing a possibility of molecular and cellular heterogeneity between AA and CA individuals. With our understanding of molecular mechanisms, supporting such disparities is limited due to the impact of social determinants of health (SDH). To examine such disparities, we will perform single cell RNA Sequencing (scRNA-Seq) on esophageal specimens received from AA and CA participants to examine the hypothesis that differences in microbiomes will change the populations of cells in the esophagus, as evaluated by RNA sequencing. These scRNA-Seq data will be analyzed to further understand cell cluster identities and molecular features in esophagus cell types to compare with self-reported race. We will use 16S RNA sequencing techniques to analyze the microbiome and connect a patient's questionnaire in relation to SDH. In examining and identifying cell types/pathways that differ in AA or CA subjects, a correlation can be made between SDH and microbiomes, allowing us to further examine racial disparities in esophageal cancer. Such investigations will be crucial in allowing for further improvement in examining esophageal cancer, while also bringing awareness to disparities that can possibly be present.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: iFADs - redox sensitive FAD analogs for probing FAD-based metabolism
Keywords: iFADs, FAD, redox, fluorescence

Abstract: Our research is a biophysical chemistry study regarding FADs and fluorescence. FAD, which stands for flavin adenine dinucleotide, is a form of vitamin B2 and is commonly found and used in living cells. We currently use enzymatic synthesis to construct redox-fluorescent and bifluorescent FAD analogs, which need to be characterized using various spectroscopy methods, such as fluorescence spectroscopy or ultrafast laser spectroscopy. We are specifically studying F2ApD (flavin 2-aminopurine dinucleotide), a unique analog of FAD, has the potential to sense and report on the redox state of FAD-dependent proteins. Since these proteins are deeply embedded in many metabolic pathways, replacing FAD with F2ApD will open new lines of biophysical and biomedical investigation with the potential to provide real-time information on the oxidative stress in live tissue. Before this goal is realized, F2ApD optical properties must be well characterized.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Repurposing PARP Inhibitors to Target Homologous Recombination Repair Deficient Lung Cancers
Keywords: Drug Repurposing, PARPi, Lung Cancer

Abstract: Background: Lung cancer is the leading cause of cancer death in the US. Non-small cell lung cancer (NSCLC) is the most common (~85%), including lung adenocarcinoma (LUAD, ~40%) and lung squamous cell carcinoma (LUSC, ~25-30%). Homologous Recombination Repair (HRR) deficiency (HRD) is a feature across cancer types. HRD sensitizes tumors to PARP inhibitors (PARPi) and is predictive in several cancers but underexplored in NSCLC. We hypothesize HRD+ NSCLC depends on PARP gene upregulation and is sensitive to PARPi.Methods: The DepMap Portal Data Explorer 2.0 was used to categorize NSCLC cell lines as HRD-High or HRD-Low based on median CRISPR knockout (KO) gene effect. A biomarker relationship analysis assessed (1) gene dependency after HRR pathway gene KO (N = 86) and its relationship with PARP (N = 4) mRNA and protein expression, and (2) drug sensitivity to PARPi (N = 7) in NSCLC patient cell lines (N = 123; LUAD = 91; LUSC = 32).Results: HRR gene KO was associated with positive PARP1-3 and PARP7 mRNA expression and variable PARP1-2 protein expression in LUAD and LUSC cell lines. Positive PARP1-3 mRNA expression and positive PARP1-2 protein expression were associated with sensitivity to PARPi in LUAD and LUSC cell lines. HRR KO showed sensitivity to 6/7 inhibitors, with Senaparib, Talazoparib, and Atamparib having the highest response in HRD+ NSCLC cell lines.Conclusion: HRR loss is associated with gene dependency in NSCLC cell lines, suggesting synthetic lethality with PARP expression, and correlated with PARPi sensitivity.Future Direction: Validate computational results using wet lab experiments.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Enhancing Student Success Through Peer Tutoring and Mentorship in CIS 1068
Keywords: peer mentorship, STEM education, tutoring, student success, programming education, leadership

Abstract: As a STEM Leadership Fellow in the College of Science and Technology at Temple University, I served as a peer tutor and mentor for CIS 1068: Program Design and Abstraction, an introductory programming course for students in computer science and information science disciplines. This role focused on supporting student success in a critical gateway course by providing individualized and group-based academic assistance.
Through tutoring sessions, instructional video content, and structured study support, I helped students develop foundational programming skills, including object-oriented design, problem-solving strategies, and debugging techniques. In addition to technical instruction, I provided mentorship and academic guidance to help students build confidence and navigate their academic paths within STEM.
This experience highlights the impact of peer-led learning environments in improving student engagement, comprehension, and retention in challenging technical courses. It also demonstrates how leadership roles within academic programs can foster both student success and the professional development of mentors.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Peer Mentorship and Leadership as a BIOL 1112 Peer Laboratory Assistant
Keywords: Peer mentorship, leadership, biology laboratory education, BIOL 1112, peer laboratory assistant, science communication, student support, pre-med mentoring, laboratory techniques, active learning, undergraduate leadership, STEM education

Abstract: Serving as a Peer Laboratory Assistant (PLA) in BIOL 1112 for two semesters was a valuable academic and leadership experience that strengthened both my communication skills and my understanding of biology laboratory methods. In this role, I worked closely with the instructor to support students during lab sessions by clarifying procedures, answering questions, and reinforcing key biological concepts.A major benefit of this experience was learning how to communicate scientific ideas more clearly and effectively. Since students had different levels of confidence and understanding, I had to adapt my explanations to meet their needs and help make the lab environment more approachable. This role also allowed me to grow as a mentor by encouraging students to ask questions and engage more confidently with the material.In addition to assisting with lab-related topics, I often shared information with students interested in pre-med pathways, including research opportunities, shadowing, volunteering, and MCAT preparation. This made the experience especially meaningful because I was able to support students not only academically, but also by offering guidance based on my own experiences.
Overall, being a PLA deepened my understanding of laboratory techniques, improved my ability to work with others, and showed me the importance of peer mentorship in science education. This experience demonstrated how leadership in an academic setting can positively influence both student learning and personal growth.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: From Answers to Understanding: Guiding Students Toward Deeper Learning
Keywords: Student Reasoning, Active Learning, Code Tracing, Artificial Intelligence

Abstract: As a STEM Leadership Fellow, I supported students in the introductory programming course, Program, Design, and Abstraction, while simultaneously conducting research on how generative AI influences learning, reasoning, and engagement. I introduced students to emerging AI-powered learning and programming tools, facilitated studies around responsible AI use, and provided individualized support through one-on-one interactions. Through this experience, I used the classroom as a space for both teaching and formal research, helping students understand how to responsibly use AI tools in their education rather than over-relying on them. By introducing alternative tools such as CodeLens, I encouraged students to reflect on how they learn, rather than just finding the correct answer. My time in this role has strengthened my ability to mentor students at varying skill levels, communicate complex ideas clearly, and design learning experiences that promote deeper engagement.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Evaluating Representation of Surface Winds along the Coast of Ghana
Keywords: Ghana, coast, margins, ocean, wind, climate, model, data

Abstract: The Gulf of Guinea is a major region of ocean upwelling, but has historically been overlooked by scientific studies. An understanding of winds in this region is crucial to better understand coastal processes that have widespread implications ranging from the local fishing industry to the global climate cycle. Here, we investigate the representation of winds from a variety of sources including observational data, satellite-based wind products, and output from a global model reanalysis.For our analysis, we first investigated wind representation inland by comparing data from four stationary meteorological towers situated along the coast, to the ERA5 reanalysis product, and the CCMP wind vector analysis. We also investigated wind representation offshore by comparing ERA5 and CCMP along a transect located at the prime meridian from land to the open ocean. Moored buoy data from the PIRATA project was used to analyze accuracy of ERA5 and CCMP above the open ocean. All comparisons were conducted on daily, monthly, seasonal, and annual timescales to better understand representation on intra- and interannual levels.To promote further studies of wind representation in this region, we are creating a dashboard designed for easy comparison of observations to other products. Users can upload data to the tool to automatically generate timeseries comparing uploaded data to observational data. Studying wind representation by a variety of analysis products and climate models is imperative for contextualizing our predictions about coastal processes as the climate continues to warm.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Undergraduate Data Science Fellowship
Keywords: Data Science, Mentorship, Student Leadership, Python, Programming, Analytics, Data Analysis, Peer Learning, Technical Skill Development, Academic Support, STEM Education, Data Literacy, Tutoring and Instruction, Leadership Development, Collaborative Learn

Abstract: As a second-year Data Science Fellow and current Captain, I have taken on an expanded leadership role focused on mentorship, instruction, and student support in foundational data science skills. Throughout the year, I have guided students in developing proficiency in Python, emphasizing practical applications in data analysis, visualization, and problem-solving. By holding office hours three times per week, I provided consistent, accessible support to help students overcome challenges and build confidence in their technical abilities. In addition to one-on-one mentoring, I contributed to fostering a collaborative learning environment that encourages curiosity and peer engagement. This experience has strengthened my leadership, communication, and technical skills while allowing me to make a meaningful impact on students' learning journeys in data science.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Optimization of High-Performance Liquid Chromatography in Drug Metabolism Studies: Investigation of S9 Liver Cells Across Three Species
Keywords: Drug Metabolism, liver cell, High performance liquid chromatography(HPLC)

Abstract: Traditionally Liquid chromatography-mass spectrometry (LC-MS) is the laboratory method utilized to analyze the separation of small molecules in a chemical mixture. However, albeit its precision, the mass spectrometry portion of LC-MS is expensive, time intensive and incapable of being performed in house. Thus, in order to increase the reliability of my data collected using High performance liquid chromatography (HPLC). The purpose of my project aims to create an easy, affordable, reliable, and reproducible method for detection of investigational molecules during the drug discovery process using High Performance Liquid Chromatography (HPLC) which will facilitate drug discovery for many diseases, including sickle cell disease. I optimized different aspects of the method including the column that was used, and the concentrations of drugs that would be used in the experiment to determine the optimal condition for the HPLC run. In conclusion, I established a reliable and reproducible method that can be used to determine drug metabolism in vitro. This method can also be adapted to test drug concentrations in blood from treated experimental animals.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Promoting Classroom Success in Organic Chemistry with Undergraduate Teaching Assistant Initiative
Keywords: organic chemistry, undergraduate teaching assistants, tutoring sessions, review sessions, student engagement, classroom success

Abstract: Organic Chemistry courses are notoriously challenging for many STEM students due to the shift from the mathematical approaches of general chemistry to a focus on conceptual and spatial thinking. As a Chemistry Leadership Fellow working with Dr. Fleming, Temple's renowned organic chemistry professor, we established an undergraduate teaching assistant (UTA) initiative to improve student success in the course. With recruitment of a group of 20 undergraduates who have excelled in organic chemistry as UTAs, we organize Help/review sessions run by the UTAs at allotted times each week. Alongside Help sessions, the initiative offers one-on-one tutoring for students seeking further aid in the class, where UTAs interested in tutoring are matched according to their availability with the student in need. My contributions with establishing this foundation as the head UTA consist of coordination of UTAs to specific classes for all organic chemistry courses in the spring 2026 semester. I have created official UTA Help session schedules, alongside topic discussion boards for online questions. I have personally run my own Help session and recurring one-on-one tutoring sessions throughout the semester. During the Fall semester I ran a PollEverywhere polling at the beginning of each class period to improve student engagement and encourage attendance. During my time as a STEM leadership fellow, I have sharpened my problem-solving skills, developed communication and teamwork skills through my collaboration with my UTA peers and Dr. Fleming, and improved my time management abilities, learning how to tackle my new responsibilities as the Head UTA for organic chemistry.

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Presentation Time: Session 3: 1:00PM-1:50PM (check-in starts at 12:50PM)

Abstract Title: Access to Fluorinated Motifs Via a Lithium Halogen Exchange-Decarboxylation Sequence
Keywords: Decarboxylation, Fluorine Chemistry, Heterocycles

Abstract: Fluorinated motifs, such as trifluoromethyl ketones, alcohols, and difluoromethyl ketones, are of great interest to synthetic chemists because of their ability to modify the physicochemical properties of their parent molecules. Traditionally, these functional groups are synthesized from directly manipulating the oxidation state of trifluoromethyl ketones. Thus, a tandem decarboxylation-silylation of α-trifluoromethyl(hydroxy) esters via a Krapcho-type mechanism is disclosed. The resulting silyl ether products can be deprotected in the same pot to yield trifluoromethyl carbinols or further elaborated toward the synthesis of difluoromethyl ketones, chlorodifluoromethyl carbinols, and fluorinated aldol products.

Session 4
Abstracts

Ordered by Student Researcher Name (Last, First)

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Did Summer 2025 Glitches Change the Pulses Detected from the Crab Pulsar?
Keywords: Astrophysics, Radio Astronomy, Neutron Stars, Crab Pulsar, Signal Processing, Statistics

Abstract: Pulsars are remnants of stars that rapidly rotate and emit beams of electromagnetic radiation such as radio waves that can be detected on Earth. These rotations are extremely periodic and precise. Glitches are sudden increases in rotation speed caused by internal changes in the pulsar. On July 17 and August 6 in 2025, minor glitches were detected in the Crab Pulsar. The purpose of this analysis is to see if the glitches changed any properties of the pulse rate and pulse profile.
We investigated whether the glitches of pulsar J0534+2200 (Crab Pulsar) observed through July 2025-September 2025 produced measurable changes in the profile of the pulsar by examining variations in the giant pulse rate and the ratio of the inter-pulse to main pulse peak heights.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Investigation of Relationship Between Oxytocin Levels and Socioeconomic Strain in Patients with Post-bariatric Weight Regain
Keywords: Oxytocin, obesity, bariatric surgery, weight regain, socioeconomic strain

Abstract: Bariatric surgery is a procedure done to manage severe obesity and its related conditions. Although it is one of the most effective long-term treatments, around 20 - 30% of patients experience significant weight regain in which >5% of pre-surgical weight is regained. Oxytocin, a hormone involved in appetite and stress regulation, may play a role in post-surgical weight regain and be affected by socioeconomic stressors such as income instability and housing insecurity. This study seeks to investigate the potential relationship between oxytocin levels, weight regain status, and socioeconomic stress factors. We will compare oxytocin levels in patients who have experienced significant weight regain at least 2 years after bariatric surgery to those who have maintained their weight loss. Questionnaires will also be completed by participants to assess adverse childhood experience and socioeconomic stress as potential mediators upon statistical analysis. Data collection is ongoing and findings may contribute to future developments aimed at improving long-term weight maintenance and supporting patients after surgery.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Short Term and Long Term Effect of Mutations
Keywords: gene expression evolution, probabilistic simulation, population genetics, molecular evolution

Abstract: The expression level of a given gene has been shaped by natural selection acting on regulatory units over evolutionary time. As a result, gene expression levels are typically higher than those expected from random regulatory sequences. However, experimental studies have shown that mutations that randomize regulatory regions produce, on average, symmetrical effects on gene expression levels. These two observations appear contradictory. This project aims to reconcile them through a mechanistic, process-based framework. To address this question, mock genes and their regulatory environments have been generated and evolved in a Wright-Fisher style forward time simulation to characterize what scenarios give rise to the contradictory short term and long term effects of mutation.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Emerging Adulterant Medetomidine Modulates Methamphetamine-Induced Behavioral Responses in Planaria
Keywords: medetomidine, methamphetamine, planaria, α_2-adrenergic agonists, polysubstance exposure

Abstract: Medetomidine, a veterinary α_2-adrenergic agonist, has recently emerged as an adulterant in the illicit drug supply, particularly in Philadelphia. This study examined the effects of medetomidine (0.01–100 nM) and methamphetamine, alone and in combination, on defensive responding, stereotypy, and motility in planaria. Planaria were exposed to each drug condition, and behavioral responses were assessed using motility measures and a light–dark assay. Medetomidine reduced defensive responding without impairing motility, and dexmedetomidine (Precedex™) produced similar effects. In contrast, methamphetamine induced dose-dependent c-shape stereotypy and decreased motility. Co-exposure with medetomidine normalized light–dark responding and reduced methamphetamine-induced stereotypy. These findings suggest that α_2-adrenergic agonists suppress defensive behavior while modulating stimulant-induced effects. This has important implications for polysubstance exposure, as adrenergic sedatives may alter the behavioral and toxicological effects of stimulants. This work was supported in part by NIDA grant R21DA062400 (SMR).

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: STEM Challenge
Keywords: EEG, literature review, STEM education, underrepresented youth

Abstract: As a STEM Challenge Fellow, I explored and demonstrated emerging STEM tools in Dr. Mehler's STEM Challenge course. I demonstrated the use of EEG brain sensors and filmed a demonstration video for use in future classes. My research on the importance of STEM education for students in elementary school, under the guidance of Dr. Mehler, allowed me to get in contact with the National Academy of Engineering, where I am currently working on literature reviews focusing on STEM education for underrepresented youth. Participation in the STEM Leadership Fellows program has unlocked many opportunities for me and allowed me to discover passions I previously was unaware of. This experience has been pivotal in shaping my commitment to dismantling institutional barriers for marginalized students in STEM.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Numerical Simulation of Interface SHG Theoretical Models
Keywords: Second harmonic generation, Mathematica, Numerical simulation, Molecular orientation, Nonlinear susceptibility

Abstract: Second harmonic generation (SHG) is a surface-specific nonlinear optical technique widely used to characterize molecular orientation at interfaces. The detected SHG intensity is determined by the effective second-order susceptibility of the interface, which is governed by the molecular orientation angle and the polarization geometry. In this study, we utilize the Mathematica platform to perform numerical simulations of the mathematical models describing the relationship between SHG intensity and molecular orientation. The results are compared with previously published data to validate the approach. Additionally, the relationships between susceptibility components, reflection angle, and molecular orientation are analyzed to identify configurations that maximize signal intensity. These findings enable more precise characterization of interfacial molecular systems and provide a framework for optimizing experimental geometries. This approach has potential applications in the study of aerosols, biological membranes, and drug or dye transport, where interfacial orientation plays a critical role.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Simulating the Stability of Operon Evolution Under Various Conditions
Keywords: Operons, Molecular Evolution, Evolution, Genetics, Simulation, Gene Regulation,

Abstract: Operonsare clusters of genes that function together under the control of a single promoter. They are classically found in bacteria, although they may be more common in eukaryotes with diverse genomic architectures than previously recognized. Understanding the biological conditions under which operons evolve is important for understanding the regulation of gene expression and how it evolves. This study investigates what conditions allow for the evolution of stable operon gene clusters. To answer this question, we are developing computational models using python in order to simulate operon evolution. This model will test various conditions of operon evolution including, mutation and recombination rates, reproductive mode, effective population size, ploidy, dosage balance constraints of different types, different types of selection on gene expression, and pleiotropic constraints on genes of different types. Currently the foundational model for simulating this evolution is being developed.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Does bacteria density matter for mixotrophic algae growth?
Keywords: Bottle effect, grazing, plankton ecology, food web, experimental ecology, bacteria density

Abstract: Mixotrophs are able to perform both photosynthesis as well as consume other organisms. For phytoplankton, it was observed that the culture size (the bottle effect) did not impact their growth rate, but is it the same for mixotrophs? For the marine chlorophyte Micromonas polaris, culture size (50 mL vs 150 mL) did not show a significant impact on its growth. In contrast, the experiment carried with the freshwater chrysophyte C. dendrolepidota showed a statistically significant difference ($p=2.46x10-7$), with a greater growth rate observed for the smaller incubation volume ($p=1.23x10-7$). Because bacterial abundance was higher in the small culture flasks, we hypothesized that algae in the smaller flasks tend to graze more on bacteria compared to those in the larger bottles. To test this, cultures were grown in two sizes, small and large , with three replicates each. Grazing rate was then assessed using fluorescent beads as bacteria analogs and analyzed by epifluorescence microscopy. This study is ongoing, and further analyses are currently in progress.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Taste Perception in the Human Oral Cavity
Keywords: Taste perception, tannic acid, neotame, edible films, bitterness reduction, sensory evaluation, gLMS

Abstract: The purpose of this study is to identify the underlying mechanisms of taste perception in the human oral cavity and examine different methods for reducing bitter taste qualities from tannic acid. In this study, tannic acid was used as a model for an astringent taste that produces a bitter off taste. Over the 2 semesters, rapidly dissolving edible films have been prepared where films uniformly incorporated four micromoles of tannic acid within a hexagonal-shaped film. To achieve uniform films, coconut oil was added as a plasticizer to the film solution, and sonicated and vortexed to ensure even distribution of coconut oil as well as tannic acid.
The edible films have been prepared containing 1.63 grams of pullulan powder, 0.1161 grams of tannic acid and 475 ul of a 2% solution of neotame with a 3:7 ratio of neotame to water. Taste intensity was evaluated using the general Labeled Magnitude Scale (gLMS) where the scale goes from 0 to 100, 0 is No Taste while 100 reaches up to the most intense ever felt. The gLMS was used to compare blank films (pullulan), control films (pullulan + coconut oil), tannic acid films, and neotame- tannic films. In addition, a bipolar hedonics scale (-100 to +100) is used to measure pleasantness of the film. This study contributes to taste interactions in the oral cavity and different delivery methods for sensory perceptions. The results from twenty participants have shown that neotame significantly diminished the bitter taste of tannic acid.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Elements of Data Science Fellow
Keywords: Leadership

Abstract: Student leadership in undergraduate spaces offers an invaluable opportunity for young professionals to develop their skills through real-world experience. The goal of the STEM Leadership Fellows Program (SLF) is to provide leadership opportunities for accomplished undergraduates in STEM programs. For this experience, the focus was on the success of student leadership in the course Elements of Data Science, a Python course that covers foundational data science skills (such as statistical testing, exploratory data analysis, machine learning, etc.) for physical science majors. This course was assisted by students in both the Fall and Spring semesters, resulting in a reflection from the student leader's perspective. Through this experience, we better understand 1) the individual contributions involved with continuing a successful program (both for STEM Fellows and students), 2) the opportunities for professional development provided throughout the course, and 3) the possible avenues available for the betterment of the program.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: CST Study Abroad Fellow
Keywords: study abroad, leadership

Abstract: There is a common belief that if a person majors in a STEM discipline, they are signing away any opportunity to travel abroad and see the world for at least the next four years. While the belief is common, it certainly isn't true. As the STEM Leadership Fellow (SLF) for Study Abroad, I sought to eliminate the misconceptions about studying abroad for CST students at Temple. Through creating events and developing outreach efforts, more science and technology majors are realizing the global opportunities that are available to them. Major success came from hosting welcoming, casual events where students were able to converse with CST Academic Advisors, the Temple Education Abroad Advising team, and students who have studied abroad in the past, all in one setting. The SLF position built upon my event planning, coordination, and communication skills, as I tackled working both in collaboration with my mentors and independently. The largest area of growth for future development is perfecting social media traction, since students will not be able to use our resources if they are not aware they exist. As abroad opportunities for CST students continue to grow each year, the SLF Study Abroad role will show itself to be increasingly helpful.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Inhibition of TGF-β Signaling by ALK5 Inhibitor BI-4659 Reduces Human Airway Smooth Muscle Cell Proliferation
Keywords: Asthma, Airway remodeling, Airway smooth muscle (ASM), TGF-β signaling, ALK5 inhibitor (BI-4659), Cell proliferation, and Fibrosis

Abstract: Background: Asthma is a chronic respiratory disease characterized by airway inflammation, bronchoconstriction, and airway remodeling. A key contributor to airway remodeling is the excessive proliferation of airway smooth muscle (ASM) cells and deposition of extracellular matrix (ECM) proteins, processes largely driven by transforming growth factor-beta (TGF-β). Activin receptor-like kinase 5 (ALK5), a TGF-β receptor type I, plays a central role in mediating this signaling pathway and represents a potential therapeutic target.Methods: Human ASM cells (hTERT D9) were cultured in 12-well plates and subjected to a 48-72 hour serum starvation period using serum-free medium supplemented with 1% Insulin-Transferrin-Selenium (ITS). Control conditions included serum-free (1% ITS) and fetal bovine serum (FBS)-containing media. Cells were treated with increasing concentrations of the ALK5 inhibitor BI-4659 (100 nM to 30 μM) in FBS-containing medium. After 48 hours of treatment, cells were trypsinized and manually counted to assess proliferation.Results: Treatment with BI-4659 resulted in a concentration-dependent decrease in ASM cell proliferation. Higher concentrations of the inhibitor significantly reduced cell counts compared to both serum-free and FBS control groups, indicating effective suppression of growth-promoting signaling pathways.Conclusion: These findings demonstrate that inhibition of ALK5 effectively reduces airway smooth muscle cell proliferation, suggesting disruption of TGF-β-mediated fibrotic signaling. BI-4659 shows potential as a therapeutic agent for mitigating airway remodeling and improving clinical outcomes in asthma.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Quantification of Heme Through Its Metabolic Pathways of Synthesis and Degradation
Keywords: Keywords: 5-aminoluvelinic acid, biliverdin, ferroprotoporphyrin IX, heme, hemin chloride, liquid chromatography-mass spectrometry

Abstract: Succinate dehydrogenase (SDH) is a mitochondrial enzyme linking the Krebs cycle in the mitochondrial matrix to the electron transport chain in the inner mitochondrial membrane. In certain cancer cells, it may be deficient due to inherited or acquired mutations. In SDH deficient cancer cells, a buildup of succinyl-CoA may be observed. Succinyl-CoA is an intermediate in the Krebs cycle before SDH comes into play. In previous experiments, 143B cancer cells were genetically modified to have a deficiency in SDH, increasing succinyl-CoA. This excess of succinyl-CoA may participate in heme synthesis/degradation as it plays an essential role in these pathways. Heme is an iron-containing compound which is the vital component of hemoglobin in red blood cells. To quantify intermediate precursors in the heme synthesis (such as 5-aminoluvelinic acid, ferroprotoporphyrin IX (PP IX), and hemin chloride) and degradation pathways (such as biliverdin), liquid chromatography-mass spectrometry will be utilized. LCMS is an analytical technique which combines the physical separation of liquid chromatography with the mass analysis of mass spectrometry to identify and quantify molecules in complex mixtures. The lower limit of detection was identified. This is the lowest concentration at which heme and its intermediates can be distinguished from the background. The lower limit of quantification was also identified. This is the lowest concentration of heme and its intermediates that can be measured with precision and accuracy. Further analysis was completed by comparing how close heme and its intermediates were to the theoretical quantified values and how consistently these values were being repeated.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Where Students Find Career Information: Sources and Perspectives
Keywords: Career, GenAI

Abstract: As the introduction of artificial intelligence continues to alter job prospects in the current labor market, students are forced to navigate an increasingly uncertain career landscape. This issue is particularly relevant for computing students, who face specific concerns around skill relevance and job stability. In our study we examine where students in computing-related fields are turning to for career information, and how trust in those various sources has evolved. Students are also increasingly relying on unconventional sources over traditional career information guidance. Through utilizing a mixed-methods approach involving surveys and semi-structured interviews of undergraduate computing students, we hope to gain further insight on student information-seeking behaviors to inform educators and institutions on how to better support their students.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Ester bond hydrolysis by polyoxometalates as biomimetic catalysts
Keywords: biomimetic, MOFs, catalysis

Abstract: Ester bonds are found in numerous biologically important molecules, such as neurotransmitters, bile acids, and in lipids composing cellular membranes. Though ester hydrolysis is readily catalyzed by various hydrolases, to date, the feasibility of synthetic catalysts has been scarcely studied. Inspired by the efficient catalysis of phosphate ester bond hydrolysis by the Zr-based UiO-66 metal-organic frameworks (MOFs) and metal oxyhydroxides, we hypothesized that hydrolysis products of metal salts can catalyze carboxylic ester hydrolysis. The current project involves zirconium oxyhydroxide as a potential biomimetic catalyst for ester bond hydrolysis. Soluble zirconium salts, such as zirconium chloride, generate metal-oxo-clusters in aqueous solutions that undergo polycondensation to form polyoxometalates (POMs). Being insoluble in water, POMs are in principle separable and reusable. Using ethyl acetate as a substrate, we are studying POMs' catalytic properties and possible ways to enhance them. ZrCl4 drives 30% conversion of esters after 30 hours. The catalytic activity can be improved by using metals with lower affinity for acetate, such as cerium. Metal precursors were found to be as effective as MOFs; however, both of them lag behind the natural enzyme by orders of magnitude. At the same time, metal salts possess such invaluable upsides as facile preparation, reusability, and ability to withstand harsh conditions, providing a cost-effective, robust solution for mimicking acetylcholinesterase in cases where the use of enzymes is impractical.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: STEM Leadership Fellowship: Introductory Biology Lab Course Peer Fellow
Keywords: Peer Laboratory Assistant, Undergraduate Biology Education, Peer Mentorship, STEM Leadership, Laboratory Instruction, Professional Development

Abstract: This poster highlights my experience as a member of the STEM Leadership Fellowship Program. Specifically, my time over the course of this year has been spent as a Peer Laboratory Assistant helping teach the introductory biology lab course BIOL 1112. While in this role, I supported students through guidance and assistance while they worked on their experiments and helped them develop proficiency in basic laboratory techniques and tools. On top of that, I helped my instructors showcase different techniques and perform other tasks. This experience strengthened my leadership and public speaking skills and enabled me to teach other students and build their confidence in the lab. This poster also includes a recommendation as to one thing to further improve the program.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Enterococcus faecalis–Candida albicans Biofilms Under Low Iron: Hyphal Induction and Computational Quantification
Keywords: Biofilms, Candida albicans, endodontic infections, Enterococcus faecalis, hyphae

Abstract: Candida albicans is a fungal opportunist that is commonly found in the gastrointestinal tract and oral cavity. Enterococcus faecalis is a gram-positive bacterium that is commensal to the human gastrointestinal tract. When it gains virulence factors on plasmids, it becomes pathogenic and is able to cause urinary tract infections, endocarditis, as well as endodontic infections. C. albicans has the ability to grow hyphae after transitioning from yeast, and the availability of iron in its environment influences its ability to grow hyphae. As C. albicans and E. faecalis are both commonly found together in their natural environments and can both be isolated from infections, the interactions between them and the effect on Candida hyphal growth was investigated in iron restricted conditions. A strain of Candida albicans was mixed with three strains of Enterococcus faecalis, which were commensal OG1RF, OG1RF containing a plasmid pCF10, and an oral clinical isolate with a plasmid. Biofilms were established in plates in low-iron medium, stained with Syto9 and Calcofluor White dyes, and analyzed through confocal microscopy. While the low iron conditions alone limited hyphal growth, culturing C. albicans along with the E. faecalis strains increased hyphae. A new program being developed in collaboration with the Queisser laboratory (Mathematics) is being tested for the ability to automatically count hyphae and yeast cells.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: From Chaos to Cure: Clonal Targeting through DNA Damage Response - Guided Combinatorial Therapy
Keywords: Acute Myeloid Leukemia, Clonal properties of cancer, DNA Damage Response Pathway, DNA Double-strand breaks, Myeloproliferative neoplasms, Single cell sequencing.

Abstract: Acute myeloid leukemia (AML) and myeloproliferative neoplasms (MPNs) are diseases characterized by pronounced clonal heterogeneity and different clonal responses to standard treatment. The prognosis of the disease is highly dependent on the molecular heterogeneity of the cancer, also known as the clonal diversity.We reported that leukemic cells accumulate endogenous DNA double-strand breaks (DSBs - a consequence of elevated metabolic activity and replication stress. To survive, AML and MPN clones become dependent on DNA damage response (DDR) pathways) non-homologous end-joining (DNA-PK), as well as microhomology-mediated end-joining (PARP1/Polθ-dependent MMEJ). We have previously devised a patient-tailored “clonal attack” strategy that integrates single-cell targeted DNA sequencing (sctDNA seq) profiling up to 1,394 variants across 54 leukemia - driver genes - with in vitro sensitivity testing to DDR inhibitors (DDRi).The standard drug treatment can reduce some of the clones, but some survive and continue the cancer. However, the clonal attack can target all the clones at once, destroying the cancer altogether. In the new approach, we are combining DDRis with standard treatment to initiate the clonal sensitivity, achieving synergistic elimination of all clones in vitro.The clonal medicine paradigm shifts leukemia treatment toward precision targeting of DDR vulnerabilities unique to individual clones, offering a powerful means to overcome therapeutic resistance while sparing normal cells. Now we propose that the combination of standard treatment with DDRis will be able to eradicate the leukemic clones even more robustly. This approach also proposes broad applicability across cancers marked by genomic heterogeneity and elevated DNA damage.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Quantitative Stern-Volmer Analysis of Acrylamide Quenching of DPA-Cy3 in DPAL Liposomes.
Keywords: Fluorescence quenching, Cy3 dye, DPAL liposomes, Acrylamide, Stern–Volmer analysis

Abstract: DPAL is a liposomal system consisting of a phospholipid bilayer, a structural component, and a functional lipid DPA-Cy3[22,22]. DPA is the active part of the molecule and is responsible for binding to PS-rich surfaces, in particular to stimulated platelets, which provides an antithrombotic effect. To implement this function, DPA-Cy3 must be localized in the outer monolayer of the liposome with the orientation of DPA in the extravesicular space. The aim of the work was to determine what percent of the DPA-Cy3 molecules is in the outer layer and is accessible from the aqueous environment outside the liposome.For this purpose, the method of fluorescence quenching of Cy3 with acrylamide was used. Acrylamide serves as a water-soluble quencher that interacts only with fluorophores accessible from the extravesicular environment. The fluorescence intensity was measured at different concentrations of acrylamide, taking into account the sample dilution. A plot of $\Delta F/F_0$ versus 1/[acrylamide] was constructed, where the Y-intercept corresponds to $1/f_a$. The resulting f_a value ~70% reflects the fraction of DPA-Cy3 molecules available for quenching, localized in the outer monolayer. The results showed a partial asymmetry of the DPA-Cy3 distribution in DPAL, which is important for assessing the functional efficiency of the system.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: STEM Leadership Fellows Administrative Captain
Keywords: SLF, STEM, STEM Leadership Fellows

Abstract: This year, I had the privilege of continuing to lead the STEM Leadership Fellows program, and it proved to be another rewarding chapter in the program's ongoing growth and evolution. Watching the program take deeper root as a CST staple has been incredibly fulfilling. This year brought with it new faces eager to contribute, new roles that expanded the scope of what our fellows can offer, and fresh perspectives that pushed us to think creatively about how we engage with the broader CST community.Our primary objectives for the year were to preserve the systems and structures we worked so hard to establish in previous years and to shift some of our attention to actively amplifying the program's visibility to sustain growth going forward. Finding that balance between maintenance and momentum is never easy, but I'm proud of how Tom and I were able to navigate it.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Effect of Cholesterol on Spontaneous Phospholipid Hydrolysis in Treatment of Thrombosis
Keywords: Thrombosis, DPA-harboring Liposome (DPAL), Fluorescence, Aggregates, PS-targeted binding

Abstract: Thrombosis remains a leading cause of cardiovascular morbidity and mortality. During thrombosis, activated platelets and endothelial cells expose phosphatidylserine (PS) on their outer membranes, creating a surface that accelerates clot formation. Current anti-thrombotic therapies, such as heparin and warfarin, carry significant bleeding risks, highlighting the need for safer alternatives. In response, we developed a PS-targeting liposomal formulation composed of Zn-dipicolylamine (DPA)-cyanine-3[C22,22] and j1-palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine (molar ratio 3:97). This DPA-harboring liposome (DPAL) binds selectively to PS-rich surfaces such as activated platelets and has demonstrated efficacy in reducing thrombosis in mouse models, with minimal bleeding. In the present study, we examine the effects of cholesterol on spontaneous phospholipid hydrolysis in the DPAL formulations. This work is helping us determine whether these stabilizing components are able to reduce liposomal degradation during circulation while preserving PS-targeted binding to activated platelets. These findings will inform the rational design of more stable, targeted liposomal anti-thrombotic therapies with greater safety and efficiency.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Utilization of Metal Oxyhydroxides as Biomimetic Enzymes for Catalytic ATP Hydrolysis
Keywords: Metal oxyhydroxides, ATP hydrolysis, Metal Organic Frameworks, biomimetic enzymes, catalysis, metal salts

Abstract: ATP (adenosine triphosphate) hydrolysis is a significant enzyme-catalyzed reaction which drives many cellular processes such as muscle contraction and cellular signaling. ATP hydrolysis can effectively be catalyzed by metal-organic frameworks (MOFs) which achieve enzyme-like activity. MOFs, such as the Ce-UiO-66, are reliable biomimetic catalysts due to their temperature and pH stability past the physiological limits of apyrase, the ATP-hydrolyzing enzyme. Because of the costly synthesis of MOFs, metal oxyhydroxides are proposed as alternative catalysts with catalytic functionality comparable to MOFs and without the need for complex synthesis. Metal oxyhydroxides form through the hydrolysis of metal salts in water, as revealed by pH reduction of the solution. We hypothesize that metal oxyhydroxides are efficient, cost–effective alternatives to MOFs for the catalysis of ATP dephosphorylation. This hypothesis was tested with zirconium and cerium salts. The rate of hydrolysis, monitored via 31P NMR, reveals that Ce4+ of Ce(NH4)2(NO3)6 fully hydrolyzes ATP within 2 hours and at a faster rate than Zr4+ of ZrCl4, which attained 64% conversion after 2 hours. The catalytic activity of the Ce(NH4)2(NO3)6 metal salt surpasses the reported Ce-UiO-66 MOF, which shows only 70% conversion in 2 hours, under comparable conditions. Evidence supports the ability of metal oxyhydroxides to function as efficient and cost-effective biomimetic catalysts over MOFs for ATP hydrolysis. Metal oxyhydroxides, with their superior robustness, low production cost, and biomimetic function lead to possible applications in advancement of therapeutic modulation for defective physiological processes.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Fostering Scientific Inquiry: A Reflective Analysis of the Role and Impact of the Peer Laboratory Assistant Lead Captain
Keywords: Peer Laboratory Assistant, STEM leadership, pedagogical development, organismal biology, mentorship, active learning

Abstract: During my time as a STEM Leadership Fellow Captain, I was placed into a position as a Peer Laboratory Assistant for the Introduction to Organismal Biology labs, with Dr. Jay Lunden serving as my mentor. Within this role I collaborated closely with lab instructors with the ultimate goal of supporting student success in introductory biology labs. To accomplish this, I mainly answered student inquiries and assisted in identifying struggles that students faced during the completion of their lab activities and assignments. Rather than simply providing the students with the answers, I worked to guide students through a thought process that would lead them to the solution via a question-and-answer format to identify areas of content with reduced comprehension. Additionally, at least once per lab section I would perform select instructional activities to provide technical support via demonstration and guidance in implementation of lab techniques. These opportunities also allowed me to develop my own pedagogical skills. Additionally, through encouragement and recommendations to students I worked to assist in the development of productive student study habits to promote student success in their future college courses. Overall, my collegiate experience has been greatly improved by my participation in this program. This experience was instrumental in providing me with a chance to become more involved in the community and exercise my potential for leadership, advocacy, and empathy on behalf of my own education and others.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Modeling Estradiol Influence on Fatty Acid Metabolism in 3D-Engineered Human Adipose Tissues
Keywords: estrogen, fatty acids, adipose tissue, 3D tissue constructs

Abstract: During the menopausal transition, women experience a gradual increase in body weight, averaging approximately 1 pound per year, with about 20% gaining over 10 pounds. This transition contributes to heightened metabolic disease risk, yet the biological mechanisms remain poorly understood. Estradiol declines sharply at menopause. Before menopause, the ovaries are the primary site of estrogen biosynthesis. Afterward, production shifts largely to adipose tissue. Understanding how estrogen regulates adipocyte function is essential to uncovering mechanisms driving postmenopausal obesity. Adipose tissue regulates the uptake, storage, and metabolism of fatty acids, which may be stored as triglycerides or oxidized for immediate energy. Excessive triglyceride storage drives adipose tissue expansion, implicating dysregulated fatty acid uptake as a key driver of obesity. However, the relationship between estradiol and fatty acids remains poorly understood and is critical for preventing and treating postmenopausal weight gain. This study investigated the role of varying β-estradiol levels–chosen to reflect different stages of a woman's reproductive life–and the presence of oleic and palmitic acid on adipose tissue, using a three-dimensional to mimic the natural adipocyte microenvironment. Preliminary results show that β-estradiol differentially regulates fatty acid uptake, with higher levels increasing oleic acid uptake and promoting palmitic acid storage as triglycerides. Analysis of lipolysis revealed a divergence between functional and transcriptional responses: high β-estradiol decreased functional lipolysis, consistent with increased perilipin-1 expression, suggesting a protective coating the inhibits triglyceride breakdown. These findings may inform dietary modifications for postmenopausal women struggling with obesity.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Reinforcing Students' Knowledge of Mathematics
Keywords: Mathematics, Math Tutoring, Course Assistant, CST

Abstract: During the Fall 2025 and Spring 2026 semesters, I contributed approximately 200 hours to academic support in mathematics through roles as a Course Coach for MATH 1015: Introduction to Numbers and Figures and as a tutor at the Math Consulting Center (MCC). Under the supervision of Meredith M. Hegg and Charles Osborne, I provided individualized and small-group instruction to students in courses ranging from foundational mathematics to Calculus II and beyond. My responsibilities included facilitating group discussions, leading weekly office hours and review sessions, and designing supplemental learning materials to reinforce course concepts. As a Course Coach, I actively monitored class progression, supported student engagement, and independently led multiple office hour sessions each week, with consistent student attendance. In the MCC, I tutored students in one-on-one and small-group settings, averaging two to three students per session, while also contributing to departmental outreach by creating educational content for Temple University's Math Instagram. Overall, this role enhanced both my technical proficiency and my capacity to foster student confidence and academic success in mathematics.

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Presentation Time: Session 4: 3:00PM-3:50PM (check-in starts at 2:50PM)

Abstract Title: Advancement of Mathematical Community at Temple via the STEM Leadership Fellow Program
Keywords: Math Tutor, Math Consulting Center (MCC), Math learning environment

Abstract: The promotion of mathematical education has always been a significant concern for higher education as most STEM majors require a strong basis in math. At Temple, many high school students arrive at college with a stigmatized perception toward math even at the pre-algebra level. Especially in the College of Science and Technology, the mathematical department strives to promote the learning environment and resources available to undergraduates who are transitioning from their high school education. The mathematical STEM Leadership Fellow(SLF) program is one initiative that fosters and encourages students to explore, thrive, and succeed for their mathematical career at Temple. As a mathematical SLF, I have promoted the mathematical community at Temple via grading math homework for over 90 students, offering weekly problem-solving sessions, and tutoring for 6 hours per week at the Math Consulting Center. Herein, discussions of my experience and further analysis of how the program and math education at Temple could be improved are disclosed.