2025

COLLEGE OF SCIENCE AND TECHNOLOGY

LEADERSHIP & RESEARCH SYMPOSIUM

THURSDAY, MARCH 27, 2025

9:30 AM - 4:15 PM

SCIENCE EDUCATION AND RESEARCH CENTER (SERC)

Temple University

College of Science and Technology

Welcome!

Time	Description	Location
9:30 AM - 9:45 AM	Poster Session 1 Setup & Check-in	SERC Lobby
9:45 AM - 10:45 AM	Poster Session 1	SERC Lobby
10:45 AM - 11:00 AM	Poster Session 2 Setup & Check-in	SERC Lobby
11:00 AM - 12:00 NOON	Poster Session 2	SERC Lobby
12:00 NOON - 12:30 PM	Refreshments	SERC Mezzanine
12:30 PM - 1:45 PM	Keynote Speaker (SERC 116)	SERC 116
1:45 PM - 2:00 PM	Poster Session 3 Setup & Check-in	SERC Lobby
2:00 PM - 3:00 PM	Poster Session 3	SERC Lobby
3:00 PM - 3:15 PM	Poster Session 4 Setup & Check-in	SERC Lobby
3:15 PM - 4:15 PM	Poster Session 4	SERC Lobby

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

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

STELLAR

CST Spring Research and Leadership Symposium 2025 - Attending

Thank You

Special Thanks to Dean Miguel Mostafá
A special thank you to the College of Science and Technology Dean Miguel Mostafa for supporting the Research Scholars Program (RSP) 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 STEM Leadership Fellows Program & Research Scholars Program. 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.

Keynote Speaker

Robert DeSalle, Ph.D.
American Museum of Natural History
Curator, Molecular Systematics
Principal Investigator, Institute for Comparative Genomics
Professor, Richard Glider Graduate School

Dr. DeSalle works in molecular systematics, microbial evolution, and genomics. His current research concerns the development of bioinformatic tools to handle large-scale genomics problems using phylogenetic systematic approaches. Dr. DeSalle has worked closely with colleagues from Cold Spring Harbor Labs, New York University, and the New York Botanical Garden on seed plant genomics and development of tools to establish gene family membership on a genome- wide scale for plants. He has curated seven temporary exhibitions at the American Museum of Natural History (Epidemic!, The Genome Revolution, Our Senses, The Secret World, Brains, Natural World of Color, The World Inside You). He is the co-curator of the AMNHs immersive show called Invisible Worlds and is the curator of the AMNHs Hall of human origins.

Temple University
College of Science and Technology

Session 1 Abstracts

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Growing the Chemmunity

The Chem STEM Fellow leadership role aims to enhance collaborative learning and innovation within the STEM community. The purpose of this position is to create a new outlook of resources students can find useful to aid in some of their undergraduate courses such as Gen Chem I and II. By organizing a small group of tutors, and coordinating their schedules, I rebegan a source of one-on-one tutoring called the "Chem-Help Desk." The project's intent was to offer students seamless access to free tutoring services by students who have previously taken and succeeded in the offered courses. This project eliminates wait times, and the need for appointments. Initially set up as virtual resources during Covid-19 quarantine, the Chem Help Desk has since transitioned to an in-person format. By assuming a new team of tutors, we aim to provide valuable assistance for courses we support, making learning more accessible and effective for students. The Help Desk not only supports students by improving their academic performance, but it also benefits tutors. Many of whom are pre- professionals, reinforcing their own knowledge and staying sharp for their upcoming pre-entrance exams. I am to create a welcoming atmosphere where students find learning accessible and tutors enhance their skills, all while supporting each other. As we expand, we look forward to nurturing a community that inspires both current students and future STEM leaders.

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Bioluminescence Variability in Microbial Symbiont of Cardinal Fish

Photobacterium mandapamensis is a symbiotic microbial partner of the cardinal fish, *Siphamia*, forming a mutualistic relationship in which the fish utilize bacterial bioluminescence for counterillumination, while the bacteria receive nutrients. Strain-level diversity has been identified in these photobacterium, particularly within the lux-rib operon, which encodes key components of bioluminescence, including the *luxF* and *lumP* genes. The lux-rib operon is responsible for the bioluminescence produced by the bacteria.

To better understand these variations, we analyzed the and *lux-rib* operon content of multiple *P. mandapamensis* strains. Strains containing the *luxF* gene were predicted to emit more light than those lacking it. The luminescence from 37 *P. mandapamensis* strains were sampled and luminescence values differed significantly between experimental groups *Sc, Sr, and StP* ($F = 41.36$, $p < 0.0000001$). Post hoc comparisons revealed that *Sc* exhibited significantly different luminescence compared to *Sr* ($p = 0.0001$) and *StP* ($p = 0.0000343$), while *Sr* and *StP* did not differ significantly ($p = 0.9652$).

These findings provide deeper insight into the role of the *lux-rib* operon in bioluminescence and offer potential explanations for strain-specific symbiont selection.

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Spatial Distribution of Bacteria in Urban Environments

In many cities, microorganisms, especially bacteria, live on buildings and play important roles in the local environment. This study aims to explore how bacteria are spread across different areas of a rooftop and what environmental factors (e.g., sunlight, temperature, and pollution) affect their distribution. By collecting bacterial samples from different sites from the Lincoln Memorial and the Merchant's Exchange Building, we hope to identify which specific conditions shape the bacteria communities. Conducting DNA extraction, PCR to amplify the cDNA, Gel electrophoresis to separate the DNA bands and viewing the DNA bands under a transilluminator, we are learning more about the bacteria living in these urban spaces can give us insights into how city environments influence the communities. It could also guide decisions for city planning, building design, and public health measures, making cities healthier and more sustainable.

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Enhancing First-Year Student Success through Peer Leadership: Insights from the First Year Experience Conference

This poster presentation highlights key insights gained from the First Year Experience, a conference hosted by the University of South Carolina, held this year in New Orleans, Louisiana. As Peer Leader Captains representing the College of Science and Technology, we explored innovative strategies to enhance the First-Year Seminar (FYS), Transfer Seminar, and Peer Leader programs with the ultimate goal of improving student engagement and retention. Common themes emerged from our findings, including the importance of structured self-reflection for Peer Leaders, the need for targeted training on boundary-setting and classroom challenges, and the integration of research-based projects to enhance the Peer Leader program. Notably, we identified the potential benefits of standardized self-assessment tools, such as "midpoint tickets," to encourage continuous Peer Leader improvement. Additionally, various universities emphasized equipping Peer Leaders with boundary-setting techniques and strategies to navigate difficult classroom situations, which could be incorporated into the Peer Leader Development Seminar. Further insights reinforced the value of Peer Leader Captains engaging in research-based projects to assess and enhance elements of FYS. Finally, the integration of workshops focusing on study techniques, stress management, and growth mindset development was identified as a crucial method to better prepare students for academic success. By implementing these insights, we aim to strengthen our Peer Leader and First-Year Seminar programs, ultimately fostering a more engaging and supportive environment for first-year students at Temple University.

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STEM Leadership Fellow: Study Sessions for First-Gen Biology Students

As a STEM Leadership Fellow working with first-generation students in the Introduction to Biology course at Temple University, my primary goal was to foster a supportive learning community where students could collaborate with each other and benefit from guidance provided by STEM leaders. In partnership with the CST office and First-Gen Initiatives, we aimed to provide students with the resources and support necessary to succeed both academically and professionally. I facilitated weekly study sessions to help first-generation students prepare for exams and quizzes, focusing on effective study tools such as Quizlet and practice problems. At the start of the semester, I distributed surveys to identify areas where students wanted additional support and incorporated their feedback into session planning. I also promoted First-Gen events and campus resources that could support students in their academic journeys. Student feedback highlighted the value of study sessions, such as “Review with tutor leaders was a great help” and “Studying from practice problems prepared me for exams.” This experience not only allowed me to strengthen my leadership and communication skills but also provided opportunities for professional development. By collaborating with organizations like Temple First and Tri-Alpha Society, we developed resources for first-generation students, such as resume-building workshops and interview preparation. These experiences will be invaluable in my future career, where leadership, communication, and collaboration with diverse teams will be essential for success.

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Heroin self-administration regulates expression of cholinergic pathway genes in the nucleus accumbens of rats.

Opioids are the leading cause of overdose deaths in the United States, accounting for over 70% of drug-related deaths. It is imperative that effective therapies and preventive measures can be generated for opioid addiction. The region of the brain that is responsible for drug reward and motivation is the nucleus accumbens (NAc). The Daws lab has recently reported that there are genes in the NAc of the rat brain that are dually regulated by opioid exposure and activation of inflammation following administration of lipopolysaccharide (LPS). Furthermore, pretreatment of rodents with LPS results in enhanced behavioral responses to the opioid heroin. Pathway analysis of the genes overlapping between human opioid-exposed datasets and the rat heroin and LPS datasets indicated that genes involved in cholinergic function were significantly regulated. Thus, three genes were selected that are related to cholinergic function for validation with quantitative PCR (qPCR): Ache terminates neural signal transmission. Samd14 plays a role in neuron projection development. Ppp1r14a inhibits smooth muscle myosin phosphatase. In preliminary experiments, qPCR reported that these genes were downregulated in the NAc of the rat models. We hypothesize that overexpression of these genes will lower heroin self-administration. Two more genes were tested to see if they were also regulated by heroin SA in the NAc of rats Chat is an enzyme which degrades acetylcholine, and Slc5a7 transports acetylcholine across the cell membrane. Future follow-up studies will target the gene's expressions to manipulate opioid-seeking behavior in the NAc of rats that undergo heroin SA.

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How Cannabidiol (CBD) Protects Against Chemotherapy-Induced Nerve Pain (CIPN) in Rats

Neuropathic pain is a form of chronic pain that develops because of damage to the nervous system. Treatment of neuropathic pain is often incompletely effective, and most available therapeutics have only moderate efficacy and present side effects that limit their use. This syndrome can be modeled in rats by repeated injections of the chemotherapeutic agent paclitaxel, and previous evidence from our lab and others suggests that the non-psychoactive cannabinoid cannabidiol can mitigate the development of neuropathy. This work will demonstrate the utility of this rat model of CIPN and display the utility of cannabinoids in this therapeutic space.

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Growth Kinetics and Long-Term Outcomes of cT1b and cT2 Renal Masses Under Active Surveillance

Renal cell carcinoma (RCC) accounts for a significant proportion of newly diagnosed cancers, with an increasing number of cases being detected incidentally due to the widespread use of cross-sectional imaging. While small renal masses (SRMs), defined as tumors less than 4 cm (cT1a), have been widely studied and shown to have slow growth rates and low metastatic potential, the natural history of larger renal tumors—specifically clinical stage T1b (4-7 cm) and T2 (greater than 7 cm) masses—remains less well characterized.

Traditionally, surgical excision (via partial or radical nephrectomy) has been the standard of care for localized renal masses. However, not all patients are ideal surgical candidates. Elderly patients or those with significant medical comorbidities may face higher surgical risks, which may outweigh the survival benefit of immediate intervention. In this context, Active Surveillance (AS) has emerged as an alternative management strategy. AS involves closely monitoring tumors over time using serial imaging and clinical evaluations, deferring surgery until there is evidence of tumor progression or patient preference dictates intervention.

While AS is widely accepted for small renal masses, its role in managing larger renal tumors (≥cT1b/cT2) is less clearly defined, due to limited data on long-term growth kinetics and oncologic outcomes. Some evidence suggests that even larger tumors may demonstrate indolent growth and low rates of metastasis, making AS a potentially safe option in select high-risk populations.

Given this uncertainty, we aimed to evaluate the long-term outcomes and growth kinetics of cT1b and cT2 renal masses managed with AS at our institution and compare clinical characteristics and growth rates between patients who remained on AS and those who eventually underwent delayed surgical intervention (DSI).

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Investigation of Compound Transport in Sulfolobus acidocaldarius Membranes Using Second-Harmonic Spectroscopy and Fluorescence Spectroscopy

Archaea, such as *Sulfolobus acidocaldarius*, possess unique tetraether lipid membranes that enable survival in extreme environments such as high temperatures and acidity. These membranes differ fundamentally from bacterial and eukaryotic membranes due to their tightly packed ether-linked lipid monolayers, which confer exceptional thermal stability and chemical resistance. However, their structural organization, stability, and permeability are not characterized completely, so this study investigates the physical properties of tetraether lipid-based membranes, focusing on their organizational response to compound transport.

Using second-harmonic spectroscopy (SHS) and fluorescence spectrophotometry, we analyzed the monolayer structure of tetraether lipid-based liposomes and assessed their permeability compared to conventional phospholipid-based liposomes. SHS, which is highly sensitive to surface and interface properties, will provide insights into the lipid arrangement, thickness, and fluidity of the membrane. Additionally, fluorescence spectrophotometry will measure liposome concentration and turbidity, aiding in the evaluation of membrane homogeneity and stability. We hypothesized that the rigid organization of tetraether lipid membranes would make compound transport more difficult than in conventional membranes.

The findings of this study have significant implications for both pure biology and applied sciences since understanding the stability and permeability of archaeal membranes can provide insights into extremophile survival mechanisms. Furthermore, tetraether lipid-based liposomes hold potential for biotechnological applications, including drug delivery systems requiring high stability, such as slow-release insulin delivery, meaning this research contributes to the broader understanding of archaeal membrane properties and their potential applications in biomedical and industrial fields.

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Peer Lab Assistant - Bio 1111

As first-year student taking STEM courses can be challenging at times, especially when it might be a student's first time in a lab setting. The Biology 1111 lab is one of the first biology labs that a CST student may be presented with. The following Peer Lab Assistant (PLA) role is designated to help students ease into a biology lab as well as a support system that they can rely on if they have any questions. The last two semesters Peer Lab Assistants have been given the opportunity to engage in a leadership role in the biology 1111 and 1112 labs to help engage and guide students in lab. There has been given positive feedback from students in the biology 1111 lab that PLA have been helpful and have bettered their performance in lab, highlighting how valuable the support of a PLA can present in a lab setting.

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SLF Journey of the Algorithm

As a STEM Leadership Fellow, I assisted students in the “Journey of the Algorithm” course. I explained math concepts, showcased the concepts in real life examples, and helped students with coursework and examination preparation. This assistance was provided through out of class coaching sessions where I acted as a peer guide, mentoring students through the coursework.

Throughout sessions, I emphasized the use of graphical tools and real world examples to help students visualize and resonate with the concepts. Graphical tools that facilitate exploration allow students to see the impact each value makes in the common equations and questions given in class. Additionally, I often made scenarios where money was involved as I felt students had strong intuition when doing mathematical operations in those scenarios. Then they could connect and apply their intuition to the concepts at hand.

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Contrasting Exotic and Native Geckos to Explore Drivers of Caribbean Homogenization

The Anthropocene era, marked by increased human globalization, has drastically impacted global ecosystems and climate stability. The biodiversity hotspot of the Caribbean is threatened by invasive herpetofauna via unintentional maritime transportation causing competition with native species, extinctions, and overall loss of biodiversity. Invasive herpetofauna contributes significantly to the ecological homogenization of Caribbean islands, increasing species overlap across islands and thus reducing the uniqueness of local ecosystems. In our study we addressed this issue by compiling available records of invasive species. By focusing on exotic and native geckos as a representative subgroup of herpetofauna, we aim to identify variations in the homogenization of island ecosystems across the Caribbean. We find that the distribution of exotic species is strongly influenced by anthropogenic factors, including habitat modification. Specifically, islands with higher levels of human-modified habitats tend to share more exotic gecko species. In contrast, native gecko species are more likely to be similar on islands with comparable green habitat, precipitation and in close geographic proximity. Understanding the distribution dynamics and ecological effects of non-native species will support future conservation efforts and may mitigate ecological impacts of invasive species.

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Examining Ground Arthropod Diversity and Varying Vegetation Cover Across a Disturbance Gradient

Arthropods, including insects, arachnids, and crustaceans, are important for ecosystem recovery as they contribute to nutrient cycling and ecosystem development. According to the Intermediate Disturbance Hypothesis, areas with higher plant cover are expected to occur in areas of medium disturbance because moderate disturbances establish a balance between new species colonizing the environment and preexisting species survival following the disturbance, further promoting greater diversity. In this experiment, pitfall traps across three disturbance levels were deployed to capture forest arthropods and plant percent cover was measured. The Shannon Diversity Index was calculated across disturbance gradient considering species richness and evenness. Medium disturbed forest ecosystems showed the greatest species. Across all disturbance levels, a total of 57 unique species were identified, varying in abundance, including arachnids, flying insects, and other ground arthropods with 279 samples collected and identified.

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Peer Lab Assistant | BIOL 1111/1911

As a STEM Leadership Fellow (SLF), I served as a Peer Lab Assistant (PLA) for Introductory Biology (BIOL 1111/1911), guiding students through laboratory techniques and creating a supportive learning environment. The program's effectiveness was demonstrated through survey results, with nearly 80% of the 411 respondents reporting enhanced lab performance attributed to PLA support. My contributions involved assisting students with lab techniques, clarifying concepts, and encouraging collaborative work. This experience strengthened my communication, problem-solving, and leadership skills—capabilities valuable for my future in healthcare and research. To further strengthen the program, I proposed implementing a formal training structure, establishing systems for peer feedback and mentorship, enhancing faculty-PLA collaboration, and offering professional development opportunities. These experiences highlight peer leadership's significance in STEM education and provide a framework for enhancing undergraduate learning and leadership development at Temple University.

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Undergraduate Mathematics Fellow

As a STEM Leadership Captain in Mathematics, I have provided 100+ hours of one-on-one tutoring for students in Pre-Calculus, Calculus I, Calculus II, and more advanced courses. Additionally, I have led 15+ hours of review sessions for Calculus I and II, where I designed and customized study guides summarizing key formulas, problem patterns, and effective strategies to help students better prepare for exams. My leadership approach starts with identifying student challenges, tailoring my teaching to different learning styles, and guiding students through problem-solving strategies to build confidence and improve academic performance. My study guides have been instrumental in helping students understand and organize complex material more effectively. To support the program's success, I help track and maintain attendance records for tutoring sessions and report this data to Dr. Maria Lorenz, Dr. Brian Rider, and Dr. Charles Osborne as evidence of the program's impact. This data is essential for securing continuous funding and identifying trends in student participation and performance. To further improve the program, I would love to implement a structured feedback system where students can provide input on tutoring and review sessions to create a more effective learning environment. Many students have expressed appreciation for my support, sharing that they feel more confident tackling math problems and have casually returned for more help. Seeing their progress and hearing that my guidance helped them pass their courses has been incredibly rewarding. I'm honored to contribute to student success and enhance the overall leadership experience within CST.

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Biology First-Generation Learning Community Fellow: Resource Development for First-Gen Biology Students

Navigating the transition to college is a difficult process, particularly for first-generation college students, who lack access to the same resources and/or funds as their peers. In response to this need, I developed a website to empower first-generation biology students throughout their first semester at Temple. The website consists of resources, including scholarships, research opportunities and personalized advice from upperclassmen, and incorporates website analytics to track student engagement. This project supports Temple's commitment to support under-resourced communities and to help students thrive academically and professionally.

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Enhancing STEM Education Through Leadership and Digital Engagement

The role of CST STEM Leadership Fellow allowed me to establish academic support systems while building student engagement programs alongside outreach for STEM subjects at Temple University. Through my work I help students in basic STEM classes and run educational workshops while creating team-oriented teaching methods that boost analytical thinking skills. My work in this position helped establish an accommodating learning environment which supports all of my peers.

I participated in the Temple University STEM summer camp where I worked as a middle school summer camp tutor. I combined instruction design work with leadership of hands-on STEM activities, and I also adapted plans for different learners while providing mentoring support to students for their development of problem solving and critical thinking capabilities. The program made me more dedicated than ever to making STEM education accessible and exciting to younger students.

The editorial work and social media management responsibilities I perform at Fun Science Demos contribute to increasing accessibility to STEM education beyond conventional learning environments. My work focuses on selecting and improving scientific videos of high quality which creates exciting learning opportunities for different students at every level of education.

The leadership positions I took on have boosted my abilities to spread scientific knowledge and guide others while designing organized programs. The upcoming development of my STEM Leadership Fellow Program includes digital outreach development together with hands on STEM engagement expansion and peer mentoring system creation. The initiatives will build support for students while maintaining their interest in STEM education throughout their academic trajectory.

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Peer Laboratory Assistant Captain

The Peer Laboratory Assistant (PLA) program at Temple University plays a vital role in supporting student success in the introductory biology laboratory courses. PLAs assist students as they develop essential laboratory skills and strengthen their scientific communication. In collaboration with instructors, PLAs foster an inclusive, student-centered learning environment that prioritizes academic excellence and skill development.

As a PLA Captain, I have expanded my leadership capabilities while refining my technical skills. My responsibilities include providing direct support to students during lab sessions, clarifying complex concepts, demonstrating laboratory techniques, and offering tailored advice to support both academic progress and career aspirations. I also help in assisting fellow PLAs, ensuring they are well-equipped to assist students and feel supported in their roles.

Through collaboration with instructors and other PLAs, I have gained a deeper appreciation for teamwork and collective problem-solving. This experience has not only enhanced my organizational and communication abilities but has also provided me with the confidence to take initiative and lead with empathy.

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A Fluorescent Assay for the Enzymatic Synthesis of Dually Fluorescent Flavin Adenine Dinucleotide Analogs

The vitamin B2 derivative Flavin Adenine Dinucleotide (FAD) is a crucial enzymatic cofactor for myriad redox metabolic reactions in the cell in which one or two electrons are transferred to or from FAD. The fluorescence of oxidized FAD has been exploited to optically image redox metabolism in cells in real-time. However, the two forms of reduced FAD have either very minimal or no fluorescence, limiting the information content of this approach. The Stanley Laboratory has developed an enzymatic method to substitute the non-fluorescent adenine moiety with a fluorescent analog in which dual fluorescence ratios of the two fluorophores provide information on the oxidation state of FAD.

In bacteria and archaea, FAD is synthesized by FAD synthase (FS). We have shown this enzyme to be promiscuous to fluorescent adenine analog substitutions, which has not been reported previously. One particularly useful fluorescent analog is 2-aminopurine. We observed that FS synthesizes F2ApD (Flavin 2-aminopurine dinucleotide) at 1/10th the rate compared to FAD with its cognate ATP substrate.

We hypothesize that these differential kinetics are due to different binding affinities of FS to ATP and 2-Aminopurine Triphosphate (2ApTP). Fluorescence spectroscopic assays provide a highly effective and precise method for evaluating these binding interactions. To understand the distinctions between 2ApTP and ATP in the enzymatic synthesis of the dinucleotide, we conducted pseudo-first-order rate measurements to obtain the Michaelis-Menten constants KM and VMAX. Variations in fluorescence intensity as a function of time are shown and a preliminary analysis of the results is given.

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STEM Leadership Fellow Captain: STEM Education

As a Captain of the STEM Leadership Fellowship, I worked underneath Dr. Mehler's STEM education initiative which included The Fun Science Network Project, The Biology Workshop Project, and support for SCTC 1502 STEM Challenge: The World Within. Our goal through this fellowship was to support STEM education at various learning levels through research and content development for The Fun Science Network, and engaging with College of Science and Technology underclassmen in the STEM Challenge course through learning demonstrations and peer support.

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Investigating PIP5K as a Therapeutic Target in Airway Smooth Muscle Dysfunction in Asthma

Asthma, a chronic airway disease affecting over 330 million people worldwide, is marked by airway inflammation, airway hyperresponsiveness (AHR), and airway remodeling (AR). A key feature of AR is the excessive growth and proliferation of ASM cells, along with increased production of extracellular matrix proteins like collagen, which contribute to airway narrowing. Current asthma treatments do not prevent AR, highlighting an urgent need for new therapeutic strategies targeting ASM dysfunction.

Phosphatidylinositol-4-phosphate 5-kinase (PIP5K) is an enzyme that synthesizes phosphatidylinositol 4,5-bisphosphate (PIP2), a lipid essential for intracellular signaling, membrane trafficking, and cytoskeletal organization via the IP3-DAG signaling axis. Given its role in cellular processes, we hypothesize that PIP5K regulates mitogen-induced ASM proliferation and growth.

To test this, we will use immortalized human ASM cells derived from healthy donors, we will induce cell proliferation with mitogens (10% FBS or 10 ng/ml PDGF). Cell growth will be measured using manual cell counting (hematocytometer) and CyQuant fluorescence assay. We will employ both pharmacological inhibition and siRNA-based molecular approaches to selectively target PIP5K isoforms (α and β).

This study will provide new insights into PIP5K's role in ASM dysfunction and may establish it as a potential therapeutic target in asthma. By addressing the gap in current treatments, our findings could pave the way for novel drug development aimed at preventing airway remodeling and improving asthma management in the future.

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CST | Department of Chemistry & First Year Data Science Program

Data Science Leadership Fellow

As a Data Science Fellow, I have played a key role in supporting both students and faculty throughout the course. My responsibilities include assisting the professor during lectures by sharing materials, clarifying concepts, and ensuring students have access to essential resources. Beyond the classroom, I provide academic support by helping students with coursework, answering questions, and offering guidance on complex topics. Additionally, I have developed and presented study tips to enhance student learning, equipping them with effective strategies for success. Through this role, I have gained valuable experience in academic mentorship, communication, and fostering an engaging learning environment.

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Administrative Captain

My time as the STEM Leadership Fellows Administrative Captain has been extremely fulfilling. This experience has granted me the opportunity to develop both personally and professionally. Leadership, communication, program management, time management, and problem solving are just a few of the many skills that this role has sharpened for me. During my time, I was granted the immensely important opportunity of ensuring that this program continues to grow into being one of the many important elements of the College of Science and Technology. The key contribution to ensure the continued growth and development of this program was the creation of a sustainability plan which put systems in place to ensure that incoming STEM Leadership Fellows and Captains will have access to the knowledge and resources of those who served before them. Another important contribution was ensuring that this program ran as smoothly as possible during my term, this was done by consistent check-ins with fellows to measure satisfaction, progress and goals, staying available around the clock to assist with any problems fellows and captains faced, streamlining communication by introducing our canvas page as a hub for program information and ensuring that fellows could connect with those in similar roles to them by debuting the mentor/mentee assignments for fellows and captains. I am grateful for the opportunity I was given to serve the CST community and for the honor of working with all the wonderful fellows, captains and faculty and I cannot wait to see what the future holds.

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Undergraduate Data Science Fellowship

As a Data Science Fellow in the College of Science and Technology (CST) at Temple University, I've had the opportunity to significantly impact how students approach data science. By helping in classes, conducting tutoring sessions twice a week to enhance Python learning, and collaborating with course assistants to create helpful learning materials, my job enables me to guide students through challenging subjects.

Developing weekly YouTube films that breakdown each lab has been one of my most fulfilling projects. With the help of these videos, students may easily review content at their own pace and strengthen important ideas outside of the classroom. I want to make data science less scary and more approachable by giving concise explanations and breaking down issues step-by-step.

My ability to effectively mentor students, explain technical ideas in a way that makes sense to many learners, and produce captivating digital content has all improved as a result of this experience. I'll carry these abilities into my future positions in research, industry, or education. More significantly, it has demonstrated to me the importance of easily accessible learning materials for STEM student achievement. In the future, I anticipate even more opportunities to enhance the STEM Leadership Fellow Program through the addition of interactive learning tools, the development of a more robust peer support system, and the expansion of digital materials. We can assist more students in acquiring the self-assurance and abilities necessary for success by making data science more interesting and accessible.

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Integration of epitope tags into the smad5 gene of zebrafish

An epitope is the region of an antigen to which an individual antibody binds. Epitope tagging, first introduced in 1984 by Munro and Pelham, is a commonly used method in which a known epitope is fused to a target protein through recombinant DNA techniques. This epitope-tagged protein is then expressed by the organism and can be recognized by specific antibodies allowing it to be analyzed through various applications such as immunohistochemistry. Researchers using this technique must consider the ideal position to insert the tag as the epitope must be at a position on the protein that is readily accessible to the antibody, while also not interfering with the protein's function. EpicTope is a newly developed method that considers a protein's sequence and structure to determine epitope insertion locations least disruptive to the protein's function. In this project, EpicTope technology was used to identify two internal amino acid positions ideal for tag insertion in the zebrafish *smad5* gene: S181 and S247. Described here is the approach used for integrating the ALFA tag coding sequences into positions S181 and S247 of the *smad5* gene via CRISPR/Cas9 and homology-directed repair techniques.

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BIOL 1111 Peer Laboratory Assistant Captain

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 for 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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Evaluate the Environmental Impact of Cigarette Butts Using Cultured Cells

Cigarette butts are the most prevalent form of tobacco waste and pose significant environmental and public health risks due to their toxic chemical composition. Cigarette butts may end up in water bodies, where toxins from their leachates can harm aquatic life and impact human health through the food chain. This study investigates the impact of cigarette butt leachates on human (H-6044) and zebrafish (CRL-2643) primary liver epithelial cells, focusing on cytotoxicity, inflammatory responses, and potential oxidative and epigenetic effects. Leachates from different sources and locations, including aged and recently discarded cigarette butts, were compared to those from research-grade cigarette smoked by a smoking machine.

MTS and NRU assays revealed a concentration-dependent reduction in cell viability, with increased cytotoxicity observed in specific leachates. Inflammatory gene expression was assessed using quantitative real-time PCR, demonstrating significant upregulation of inflammatory cytokines, suggesting activation of inflammatory pathways. Ongoing analyses aim to assess reactive oxygen species (ROS) activity and DNA methylation patterns to further elucidate potential oxidative stress and epigenetic modifications induced by cigarette butt exposure.

These findings highlight the harmful biological effects of cigarette butt pollution, with variations in toxicity indicating that environmental conditions and cigarette composition influence their impact. Given the ubiquity of cigarette waste, stricter disposal regulations and targeted public health initiatives are critical to mitigating their environmental burden. This study underscores the necessity of identifying and regulating toxic components in cigarette leachates to reduce their ecological and human health risks.

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Session 2 Abstracts

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Evaluating Drinking Water Safety in Schools: Fieldwork and Environmental Sampling

This research project involves the assessment of drinking water quality in local high schools and addresses important water safety issues for improvement and awareness. High school teachers reported that several drinking water faucets were left unused without explanation. We initiated this investigation to determine why water from these faucets is not allowed for high school students and teachers/staff members to drink. This study primarily focused on the presence of heavy metal contaminants, including lead and copper, as well as bacterial presence in stagnant water from unused school faucets. Given the serious public health concerns related to water contamination, especially for children, the research analyzed these samples for compliance with regulations such as the Safe Drinking Water Act (SDWA) and the Lead and Copper Rule (LCR). This project is part of ongoing outreach efforts with local high school students on urban environmental issues. The findings will contribute to improving school water safety and raising awareness of environmental contaminants in drinking water.

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User-Intuitive Visualization of Real-Time Synaptic Current Activity

This research investigates various methods of representing synaptic current activity for the purposes of user-intuitive visualization in the software Neuro-VISOR, a real-time virtual reality (VR) simulation for computational neuroscience. Three different approaches have been explored thus far: a color-changing gradient system, spinning textures, and a particle system. These methods of visualization react based on the real-time strength of synaptic activity, creating distinct visualization experiences. Real-time visual feedback enables users to easily distinguish varying levels of synaptic excitation and inhibition across the network at a glance.

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Glycosidic Bond Hydrolysis with Lewis Acidic Metal Oxyhydroxides

Sugar hydrolysis, specifically glycosidic bond hydrolysis, is crucial to both biological and industrial systems, with sugars providing energy to cells and many hydrolysis products having applications in the food, pharmaceutical, and chemical industries. The reaction benefits from high temperature and low pH and is often catalyzed by enzymes such as hydrolase and invertase at neutral pH, but their high cost in large quantities and possible microbial contamination are issues, making it important to develop a non-enzyme catalyst that is effective at neutral pH.[1,2] The catalytic properties of enzymes can be mimicked by materials such as metal-organic frameworks (MOFs), which were shown to hydrolyze glycosyl bonds.[3] The active metal centers of MOFs are often made up of metal oxyhydroxides formed by metal salt hydrolysis, whose abundant hydroxyl groups and metal ion Lewis acidity make them excellent catalysts for glycosidic bond hydrolysis. We hypothesize metal oxyhydroxides made from metal ions such as Ce^{4+} and Zr^{4+} are particularly effective in this reaction due to their strong Lewis acidity.[4] In this study, we used sucrose, a stable sugar composed of one glucose and fructose moiety bound via a glycosidic oxygen atom, as a benchmark sugar to study sugar hydrolysis. The reaction progress was monitored using ^{1}H nuclear magnetic resonance (NMR) spectroscopy at varying pH levels. Using this system, we found that cerium and zirconium oxyhydroxides achieved a 1-5% yield of hydrolysis products within 5 hours. This study aims to establish an efficient and cost-effective catalyst for widespread use in glycosidic bond hydrolysis.

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STAT2 Promotes Colorectal Cancer Independently of Type I IFN Receptor Signaling

The role of Signal Transducer and Activator of Transcription 2 (STAT2) in cancer is poorly characterized. STAT2 is a critical mediator of the Type I Interferon (IFN) signaling pathway, activating robust expression of IFN-stimulated genes with anti-viral and anti-proliferative effects. Surging evidence indicates that STAT2 can also promote colorectal cancer, indicating its dual role in cancer. Our study shows that high STAT2 expression levels in tumors from colorectal cancer patients correlates with worse overall survival. In addition, we provide evidence that STAT2 is pro-tumorigenic in pre-clinical models of colorectal cancer. What is unclear is whether activation of the IFN receptor is required for STAT2's tumorigenic activity. We hypothesize that STAT2 is a tumor promoter that functions independently of the IFN signaling pathway in colorectal cancer. We generated human colon carcinoma cells (HCT116) with IFN receptor deletion via CRISPR/Cas9 approach and compared growth rates with STAT2 deficient HCT116 cells. The receptor knockout (KO) clones were confirmed to be IFN receptor signaling deficient by western blot and qPCR analysis. We found that IFN receptor KO cells proliferated similarly to that of STAT2KO cells *in vitro*. However, in tumor xenograft models, IFN receptor KO cells formed larger tumors compared to parental HCT116 cells, and STAT2KO cells generated smaller tumors. These findings are currently being validated in mouse colon carcinoma MC38 cells. Such striking difference suggests that STAT2 functions independently of the type I IFN signaling pathway and that the tumor promoting effects of STAT2 do not rely on IFN receptor activation.

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Interaction of Circhomer1 with RNA binding Proteins

Opioids are involved in more than 75% of all drug-related overdose deaths [1,2], which necessitates prioritizing research to understand the neurobiological underpinnings of chronic opioid use. Medication-assisted therapies (MATs) that are FDA-approved to treat opioid use disorder (OUD) are currently focused exclusively on mu-opioid receptor (MOR) pharmacology [3,4]. A key challenge in combating OUD is incorporating this extensive preclinical and clinical data to develop treatments that target mechanisms beyond Mors. The Daws lab addresses this gap by studying circular RNAs (circRNAs) using a rat heroin self-administration (SA) model. circRNAs are conserved RNAs that interact with noncoding RNAs and RNA-binding proteins to regulate gene expression, neuroplasticity, and behavior [5,-11]. The Daws lab reports that a circRNA derived from the Homer1 gene, circHomer1, reduces heroin SA and is predicted to interact with the RNA-binding protein Eif4a3, a translation initiation factor in the orbitofrontal cortex (OFC), a brain region critical for long-lasting opioid seeking [12-16]. This study will test the hypothesis that circHomer1 associates with Eif4a3 in the OFC during heroin SA. OFC tissue from rats previously exposed to 10 days of heroin SA (0.075 mg/kg/infusion, 6 h/day) in the Daws lab will be analyzed. No additional rats are required for this study. An RNA-immunoprecipitation experiment will be done to demonstrate that Eif4a3 binds circHomer1 in the OFC. qPCR will be performed on immunoprecipitated RNA to measure differential expression of circHomer1. Data will be analyzed using one-way ANOVA with post hoc Tukey tests.

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Peer Laboratory Assistant Fellow

Peer Laboratory Assistants (PLAs) bridge the gap between learning in STEM education by providing hands-on guidance and mentorship in undergraduate biology labs. As a PLA for BIOL 1112, I worked alongside the laboratory instructor to run experiments on cell and molecular biology during weekly three-hour lab sessions. I demonstrated experiments and essential lab skills such as pipetting and using equipment such as the microscope and the spectrophotometer. I answered questions that students had regarding the material and experiments during lab time and held virtual office hours outside of lab. I also helped troubleshoot experiments when the results didn't come out as expected. In addition to helping experiments run smoothly, I served as an upperclassman mentor, frequently advising students on upper-level coursework, research opportunities, and careers in STEM. As a captain, I led weekly meetings with fellow PLAs to review upcoming experiments, discuss demonstrations and responsibilities, and troubleshoot potential challenges in lab. These meetings ensured that the PLAs are well-prepared to assist students. Being a PLA has strengthened my leadership, public speaking, and communication skills while reinforcing my understanding of basic biology topics. This experience has prepared me to be more competitive in the workforce and allowed me to gain transferable skills for my future career.

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Undergraduate Mathematics Fellow

As an Undergraduate Mathematics Fellow in the STEM Leader Fellowship Program, my project has been to lead weekly review sessions for foundational math classes to deepen student understanding. In the fall, I led sessions for MATH 1021 (College Algebra), and in the spring, I have been leading sessions for MATH 1041 (Calculus I). My role has involved leading interactive sessions to address gaps in student comprehension, ultimately aiming to improve mastery and performance. I tailored my approach to respond to students' needs, balancing flexibility in a dynamic setting with alignment to course structures. This experience has allowed me to develop my pedagogical skills in a collaborative learning environment, refine my mathematical communication techniques, and deepen my own understanding of the course material. My time as an SLF has given me the invaluable opportunity to contribute to student success in courses that are gateways to a plethora of courses of study.

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Transfer STEM Leadership Fellow

The goal of this project is to boost campus engagement among transfer students within the College of Science and Technology (CST). Throughout the academic year, I organized and hosted monthly events specifically aimed at both new and continuing CST transfer students. The majority of the events hosted were social gatherings. The focus of these events was to create opportunities for transfer students to build personal connections with each other and integrate into the CST community, as well as Temple University overall. To make events more accessible to the whole transfer student population, including commuter students, events were typically held in the morning or early afternoon. Some events involved faculty members and STEM student organizations to further encourage student involvement and campus engagement.

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Binding of DPAL Liposomes to Serum Albumin and Its Impact on Thrombogenesis

This project focused on investigating whether DPAL, a cationic liposome formulation, would interact negatively with albumin proteins, as it is being considered for treating thrombosis within the vasculature, where charge interactions could play a significant role. Specifically, we examined the binding interactions between DPAL (Zinc-dipicolylamine-cyanine-3[22,22]/1-palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine) and anionic globular proteins, bovine serum albumin (BSA) and human serum albumin (HSA). Serum albumin, synthesized in the liver by hepatocytes, plays a crucial role in modulating intravascular oncotic pressure and serves as a carrier for various compounds, including hydrophobic drugs. Given their importance in transporting molecules in the bloodstream, the interaction between DPAL liposomes (150–170 nm in size) and albumin proteins was analyzed to assess whether charge differences between the two would result in the formation of harmful aggregates. The results demonstrated that DPAL liposomes successfully bound to both BSA and HSA without causing any aggregate formation, indicating stability and biocompatibility. Additionally, previous studies have shown that DPAL liposomes reduced thrombogenesis in mouse models with minimal effects on bleeding, underscoring their potential for selective modulation of thrombin generation. These findings suggest that DPAL could offer a promising new approach to modulating harmful coagulation pathways, providing a targeted therapeutic strategy with potential for a wide range of clinical applications. It presents a safer alternative for managing thrombotic disorders and improving patient outcomes.

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Dynamic Modeling of Ion Channels in NeuroVISOR

NeuroVISOR is a virtual reality software application designed to allow users to simulate and interact with mathematically validated neuron models. Developed collaboratively by multiple undergraduate students over several years, NeuroVISOR initially employed a fixed two-ion-channel Hodgkin-Huxley neuron model. My primary contribution has been expanding this rigid architecture into a flexible framework capable of incorporating and simulating an arbitrary number of ion channels.

In addition to increasing model flexibility, I developed a user-friendly graphical interface within the VR environment, enabling users to dynamically add or remove ion channels. Furthermore, I incorporated several established neuronal models into the software, providing users with a diverse array of ready-to-use simulations.

Ensuring mathematical accuracy and validity was critical. To this end, I validated my implementation against Yale University's NEURON software, the established benchmark in computational neuroscience. I integrated a representative model from NEURON into NeuroVISOR and conducted an L2 error analysis to quantify simulation accuracy. This validation is currently underway and will be completed by the end of the semester.

With this validation complete and the software's enhanced modularity, NeuroVISOR will be capable of simulating a wide variety of Hodgkin-Huxley neuron models. It will serve as a platform for neuro-experimentalists to rapidly test hypotheses and provide students with an engaging, accurate, and interactive environment to explore neuronal dynamics.

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Binding of DPAL Liposomes to Serum Albumin and Its Impact on Thrombogenesis

This project focused on investigating whether DPAL, a cationic liposome formulation, would interact negatively with albumin proteins, as it is being considered for treating thrombosis within the vasculature, where charge interactions could play a significant role. Specifically, we examined the binding interactions between DPAL (Zinc-dipicolylamine-cyanine-3[22,22]/1-palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine) and anionic globular proteins, bovine serum albumin (BSA) and human serum albumin (HSA). Serum albumin, synthesized in the liver by hepatocytes, plays a crucial role in modulating intravascular oncotic pressure and serves as a carrier for various compounds, including hydrophobic drugs. Given their importance in transporting molecules in the bloodstream, the interaction between DPAL liposomes (150–170 nm in size) and albumin proteins was analyzed to assess whether charge differences between the two would result in the formation of harmful aggregates. The results demonstrated that DPAL liposomes successfully bound to both BSA and HSA without causing any aggregate formation, indicating stability and biocompatibility. Additionally, previous studies have shown that DPAL liposomes reduced thrombogenesis in mouse models with minimal effects on bleeding, underscoring their potential for selective modulation of thrombin generation. These findings suggest that DPAL could offer a promising new approach to modulating harmful coagulation pathways, providing a targeted therapeutic strategy with potential for a wide range of clinical applications. It presents a safer alternative for managing thrombotic disorders and improving patient outcomes.

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Catalytic Role of Transition Metals in ATP Hydrolysis

Hydrolytic cleavage of adenosine triphosphate (ATP) is a crucial biochemical, exergonic reaction which cells use to power many biological processes.[1] Polyoxometalates (POMs) are nanosized metal-oxygen clusters that have been shown to catalyze the hydrolysis of phosphoanhydride bonds.[2] POMs have limitations, such as a potential change in the oxidation state of the metal species of the POM, which changes the rate of catalysis.[3] Furthermore, the catalytic activity of Metal Organic Frameworks (MOFs), a porous material composed of metal ions coordinated through organic linkers, is associated with the metal nodes of the cluster.[4] Therefore, we hypothesized that the precursor metal salts of zirconium- and cerium-POMs are powerful enough to catalyze phosphoanhydride bond hydrolysis. This hypothesis was tested by using the following metal catalysts in a solution ATP and H_2O: $ZrCl_4$, ZrOOH@COF, $CeCl_3$, $Ce(SO_4)_2$, $Ce(NH_4)_2(NO_3)_6$, and CeOOH@COF. The ATP hydrolysis reaction to form either adenosine diphosphate (ADP) or adenosine monophosphate (AMP) was monitored via ^{31}P NMR, as ATP, ADP, and AMP have distinct chemical shift values.[5] A kinetic study examining the efficiency in hydrolysis of the aforementioned catalysts can provide insight into the selectivity of these catalysts and help determine the mechanisms of phosphoanhydride bond hydrolysis.

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Utilizing Python Scripts and Generative AI as a Mechanism for Better Understanding of NIAID Biodefense Pathogens Data

Viruses populate our everyday lives and have been a continuous subject of research due to the impact they have on our world. The ability of a virus to keenly disrupt both our bodies and society can be plainly seen throughout history. Sometimes the amount of information published can be so extensive that concrete understanding of what you are looking at is near impossible. In this project, we aimed to answer the question of what kinds of data are being published in regard to the 48 viruses listed as part of the National Institute of Allergy and Infectious Diseases (NIAID)'s Biodefense Pathogens list and how accurately is a Large Language Model (LLM) in finding this information on its own. We accomplished this task through use of the programming software Python and GPT large language model to search the National Institute of Health's GenBank website for information pertaining to each virus in the list. Each virus analysis gave us an output which was then compared against the others in categories pertaining to number of publications, presence of a reference genome, identity of partial genome genes, and more. This information was then used as a reference to test the accuracy and precision of the same information generated from Large Language Models like GPT.

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Investigation of Non-radiative Møller Cross Sections in MERADGEN

The investigation of non-radiative Møller cross-sections in the MERADGEN simulation provides insights into the angular dependence of electron-electron scattering at varying energy levels and polarization states. In this project, we systematically varied energy levels in the simulation to measure cross-sections, then held energy constant while varying the scattering angle, and finally analyzed the effects of different polarization states while keeping energy levels constant and modifying the angle. Our results reveal that the Møller Born contribution for the non-radiative corrections in MERADGEN exhibits asymmetry around 90 degrees, with noticeable differences observed between 65 degrees and 115 degrees. To further quantify this discrepancy, we plotted the difference between these values as energy levels approached ultra-relativistic levels. This analysis enhances our understanding of MERADGEN's process of simulating electron-electron interactions in high-energy environments, contributing to the refinement of this model.

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Biology First-Generation Community Fellow – Cheat Sheet and exam score correlation.

During my time in the Stem Leadership Fellowship, I attended Dr. Nelson's Introduction to Organismal Biology lecture and aided students while they were doing assignments for the class. Additionally, I held weekly zoom meetings where students could join and ask any questions they had. Many questions revolved around having good study methods, and some students asked me how they should set up their cheat sheets for their coming exams. It led me to ask, is there such a thing as a "perfect" cheat sheet that should be used on exams? There have been other studies posted that discuss this question, and I wanted to see if the same reigned true for Temple University.

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Introductory Biology Lab Course Fellow

As a Peer Laboratory Assistant (PLA) for the Introductory Biology 1111 and 1112 labs, I provided hands-on support to both students and instructors. My role focused on teaching essential lab techniques, guiding students through procedures, and clarifying complex biological concepts to ease students' learning experience. I also held office hours to help students prepare for practical exams and participated in weekly meetings with fellow PLAs to discuss upcoming labs and address student concerns.

Throughout this experience, I improved my leadership, communication, and public speaking skills while deepening my knowledge of biological principles and laboratory methods. Engaging closely with faculty members such as Professors Garwood, Pote, and Mancer allowed me to build professional networks within the Biology Department, which opened doors to future research opportunities and helped shape my future career goals in the sciences.

This leadership role has taught me the importance of adaptability, collaboration, and individualized support in student success. Moving forward, I believe incorporating more in-person meetings within the STEM Leadership Fellows Program would help foster a stronger sense of community and encourage greater interaction between students, faculty, and peers.

Overall, participating in the SLF program has played a big role in my academic and professional development, and I am grateful for the support it provides to over 40 students annually.

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Assessing heavy metal contents in garden soils at local high schools

Children are among the most vulnerable members of society, making it essential to limit their exposure to known contaminants, such as heavy metals. Prolonged exposure to heavy metals in childhood can cause serious adverse health effects, and therefore, it is important to identify their possible exposure pathways and make efforts to reduce or eliminate such exposure to them. This study investigates gardening safety in soils at a local high school, with a specific focus on heavy metals, including lead, arsenic, nickel, and chromium, and determines if these soils are acceptable for garden activities. Soil samples were collected from various locations around the school's garden, dried, ground and used for a series of analysis. Results were then compared to Pennsylvania's Department of Environmental Protection Statewide Health Standards for residential areas to determine if the heavy metal content exceeds recommended limits. Given the potential health impacts of heavy metal exposure, this study seeks to provide valuable data to inform safety in gardening practices to the school, and ensure a healthy living environment for students and the community.

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Binding of DPAL Liposomes to Serum Albumin and Its Impact on Thrombogenesis

This project focused on investigating whether DPAL, a cationic liposome formulation, would interact negatively with albumin proteins, as it is being considered for treating thrombosis within the vasculature, where charge interactions could play a significant role. Specifically, we examined the binding interactions between DPAL (Zinc-dipicolylamine-cyanine-3[22,22]/1-palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine) and anionic globular proteins, bovine serum albumin (BSA) and human serum albumin (HSA). Serum albumin, synthesized in the liver by hepatocytes, plays a crucial role in modulating intravascular oncotic pressure and serves as a carrier for various compounds, including hydrophobic drugs. Given their importance in transporting molecules in the bloodstream, the interaction between DPAL liposomes (150–170 nm in size) and albumin proteins was analyzed to assess whether charge differences between the two would result in the formation of harmful aggregates. The results demonstrated that DPAL liposomes successfully bound to both BSA and HSA without causing any aggregate formation, indicating stability and biocompatibility. Additionally, previous studies have shown that DPAL liposomes reduced thrombogenesis in mouse models with minimal effects on bleeding, underscoring their potential for selective modulation of thrombin generation. These findings suggest that DPAL could offer a promising new approach to modulating harmful coagulation pathways, providing a targeted therapeutic strategy with potential for a wide range of clinical applications. It presents a safer alternative for managing thrombotic disorders and improving patient outcomes.

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Copilot-Quiz: Improving Critical Thinking through Responsible AI Use in the Classroom

Code suggestion tools utilizing Generative AI (Large Language Models), such as GitHub Copilot, have streamlined software development by offering real-time auto-suggestions for code. However, blind acceptance of these LLM-generated suggestions hinders students' critical thinking and potentially makes them over-reliant on these tools. As a result, instructors are concerned about programming assignments, with some believing that the use of LLM-powered tools hinders critical problem-solving skills, and others potentially viewing it as cheating. To address these concerns, instructors have used a variety of tools to monitor and restrict the use of LLM-generated suggestions. However, students have found these approaches too limiting, leading to further disengagement with coding. In our research, we created a tool called “Copilot-Quiz” that helps instructors build interactive quizzes where students can explore different variations of solving a single problem. By moving through suggestions one line of code at a time and allowing backtracking, students can improve their critical thinking in an environment more closely emulating how a programmer might utilize LLM-generated suggestions in their own coding. In this study, we will conduct user experiments in classroom settings utilizing our quiz software, comparing it with baseline tools. Results from our pilot study indicate that using variation theory with negative expertise in the “Copilot-Quiz” creates more opportunities to explore different solutions. Therefore, it engages participants more deeply in the critical thinking process than baseline tools.

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Introductory Biology Lab Course Fellow

As an Introductory Biology Lab Course Fellow, I provide hands-on support to students in laboratory settings, helping them develop practical skills and a deeper understanding of scientific methodologies. In this role, I guide students through laboratory procedures while ensuring adherence to safety protocols. One of the most important aspects of my position is serving as a bridge between students and the instructor—reducing the stress of asking questions and making learning more accessible in a large classroom setting. By offering one-on-one assistance, I help students gain confidence in experimental techniques, fostering greater engagement with scientific inquiry. This experience not only enhances students' learning but also strengthens my leadership and mentoring abilities, preparing me for future roles in scientific education and research.

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Humoral immunogenicity assay to detect human anti-CAR antibodies (HACA) in Tandem CAR-T cell therapy patients using flow cytometry

T Cells which have been engineered to express Chimeric Antigen Receptors (CARs) have shown to be highly effective against blood cancers (leukemias, lymphomas) and have great potential for treating solid tumors as well. However, clinicals trials testing CAR-T cells against solid tumors (epithelial ovarian carcinomas, glioblastoma) suffer from poor CAR-T cell persistence. Considering that the CAR construct is a foreign molecule within the host, it is likely to be immunogenic. The development of Human Anti-CAR Antibodies (HACA) can greatly impair the effectiveness of CAR-T therapy as well as the viabilities of the CAR-T cells. Early detection of HACA is necessary for physicians to administer immunosuppressive drugs in order to see the best outcome within CAR-T patients.

An assay to detect HACA within patients' sera using flow cytometry has been developed. By using immortal human T-lymphocyte cell lines (Sup-T1) expressing the same CAR construct administered to the patient, the presence of HACA against the particular construct can be quantified. Both pre- and post-CAR infusion sera is taken from the patient and are incubated with these cells along with a negative control cell line (CAR19). After incubation the cells are stained with a fluorophore conjugated, monoclonal anti-human IgG antibody. HACA that is present in the sera will bind to the CAR, then the anti-human IgG antibody will bind to the HACA. The fluorophore will allow for detection on a flow cytometer. Here, the presence of HACA can be quantified.

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The Feedstack Approach: Organizing Feedback without losing the conversation

Design feedback is essential for learning, but designers often struggle with feedback that's either too constraining or too open-ended. The Feedback methods today lack a healthy mix of natural and structured conversation, making it quite difficult for designers to take action on the feedback received. It fails to find the balance of free flowing conversation along with clear organization. We created a novel solution for this with Feedstack, an Al-augmented critique system that highlights your conversations into visual design principles like balance, contrast, typography, color. This helps designers view feedback clearly in its original discussion while also seeing it in an organized way. We plan to study how non-expert designers use Feedstack compared to regular feedback methods. This research will show how combining natural conversations with organized feedback helps designers better understand and use critique, leading to better design feedback tools.

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Journey of the Algorithm: Math Guide

As part of the STEM Leadership Fellowship (SLF), my project focused on enhancing the academic experience of incoming students through a foundational algebra course. In my role as a Teaching Assistant and Tutor for the course Journey of the Algorithm, I helped students develop problem-solving skills and a deeper understanding of how math courses are structured at Temple University. I engaged with students in both lecture hall and classroom settings, providing support to ensure they developed the skills necessary to succeed in more advanced math courses. Additionally, as a Captain, I was tasked with tracking student progress and maintaining detailed records of student engagement. This leadership responsibility helped me develop my organizational, communication, and leadership skills. Moving forward, I aim to explore how the learning environment impacts student success, particularly through the comparison of lecture halls versus classrooms, considering factors like teaching styles, class timing, and cost-effectiveness. By researching these factors, I hope to provide insights that can optimize learning environments at Temple University and improve student outcomes. This experience has significantly enhanced my teaching and leadership abilities and deepened my understanding of how different educational settings can influence student success.

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Factors Associated With Prehospital Delay in Patients with Acute Ischemic Stroke

Strokes are a widely recognized medical emergency, yet symptom recognition continues to pose a significant challenge for the general population. The prevalence of stroke during 2017-2020 was 3.3%[1] Despite the advancements in reperfusion therapy, the majority of patients are ineligible for this treatment due to the sensitive time window in which it must be delivered. To migrate the effects of acute ischemic strokes (AIS), early hospital presentation is critical. Through qualitative interviews, this study aims to identify and understand the factors contributing to prehospital delays in patients experiencing AIS. By exploring the reasons behind the delays, this study uncovers valuable insights. Enhancing public education on stroke symptom recognition could profoundly improve treatment outcomes for individuals who may experience a stroke. Elucidating modifiable factors will help guide program synthesis to reduce pre-hospital delays.

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Enhancing First-Year Student Success through Peer Leadership: Insights from the First Year Experience Conference

This poster presentation highlights key insights gained from the First Year Experience, a conference hosted by the University of South Carolina, held this year in New Orleans, Louisiana. As Peer Leader Captains representing the College of Science and Technology, we explored innovative strategies to enhance the First-Year Seminar (FYS), Transfer Seminar, and Peer Leader programs with the ultimate goal of improving student engagement and retention.

Common themes emerged from our findings, including the importance of structured self-reflection for Peer Leaders, the need for targeted training on boundary-setting and classroom challenges, and the integration of research-based projects to enhance the Peer Leader program. Notably, we identified the potential benefits of standardized self-assessment tools, such as "midpoint tickets," to encourage continuous Peer Leader improvement. Additionally, various universities emphasized equipping Peer Leaders with boundary-setting techniques and strategies to navigate difficult classroom situations, which could be incorporated into the Peer Leader Development Seminar. Further insights reinforced the value of Peer Leader Captains engaging in research-based projects to assess and enhance elements of FYS. Finally, the integration of workshops focusing on study techniques, stress management, and growth mindset development was identified as a crucial method to better prepare students for academic success.

By implementing these insights, we aim to strengthen our Peer Leader and First-Year Seminar programs, ultimately fostering a more engaging and supportive environment for first-year students at Temple University.

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Extensive eQTM Analysis Reveals Methylation-Gene Expression Non-Canonical Causality is Prevalent in Ovary

DNA methylation (DNAm) is a chemical reaction that occurs when methyl groups are added to the DNA molecule, mostly cytosine in CpG dinucleotides. DNAm regulates gene expression, and its pattern varies from organ to organ. Non-mutational epigenetic reprogramming is one of the hallmarks of cancer. The relationship between DNAm and genetic expression can be analyzed using an expression quantitative trait methylation (eQTM) map. The goal of this research is to develop a reliable and fast eQTM algorithm and analyze the correlation between methylation at CpG sites in flanking regions and gene expression of various organs to determine the presence of a non-canonical positive correlation. This eQTM algorithm utilizes a mixed linear model to analyze DNAm alongside age and, if applicable, sex covariate data. Our study discovered the ovary among nine organs have the most non-canonical positive causality between methylation level and gene expression. Analysis of the ovary data using an 18-state chromatin model additionally discovered that the repressive polycomb region had the largest positive-to-negative correlation ratio followed by the bivalant enhancer region. t-SNE and PCA models further reinforce these findings, as the ovary is distant from the lung, muscle skeletal, and colon transverse, which had notably different results in the chromatin state analysis. As such, our study will elucidate the biological mechanisms underlying non-canonical correlations between methylation and gene expression across nine organs.

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Potential of MICU3 as a Therapeutic Target for Alzheimer's Disease

Alzheimer's Disease (AD) is a neurodegenerative disease that affects millions of Americans, characterized by cognitive decline, loss of memory and motor function, and neuronal death. The primary hypothesized mechanism underlying AD is accumulation of amyloid beta (Aß) plaques in the brain; however, targeting Aß aggregation/accumulation has been unsuccessful as a therapeutic target. Mitochondrial calcium ($_{m}Ca^{2+}$) is an essential regulator of cellular metabolism, signaling, and bioenergetics. Our lab has found that $_{m}Ca^{2+}$ overload promotes AD pathology, including excessive production of reactive oxygen species, metabolic derangement, and cell death. Expression of MICU3, a gating protein on the mitochondrial calcium uniporter, is significantly downregulated in neurons in AD in both patient and animal models. This data suggests that restoring normal regulation of $_{m}Ca^{2+}$ uptake through rescued MICU3 expression could be a viable treatment strategy for AD, which has limited effective treatments. Therefore, we induced viral overexpression of MICU3 in Neuro-2a (N2a) cells, and observed a higher rate of calcium uptake. Further, using CRISPR-Cas9, a $MICU3^{-/-}$ line was generated in N2a cells, and these cells demonstrated a decreased rate of calcium uptake, aligning with the known protein function. Inducing calcium stress on $MICU3^{-/-}$ cells led to increased membrane rupture and cell death, recapitulating features of AD. Finally, rescue of MICU3 in N2a cells resulted in increased cell viability, indicating potential as an AD treatment.

Temple University
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Session 3 Abstracts

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Peer Laboratory Assistant

I have been a PLA for about two years. Each semester I have added on to my skills of being a Peer Laboratory Assistant, while becoming more confident and comfortable with the material. I have been able to connect with students in the lab, to better assist them through lab procedures and guide their understanding of the material. As a Peer Laboratory Assistant, I provide demonstrations of relevant dissections, brief descriptions of lab materials, and one on one guidance through assignments. I assist students in finding specimens under microscopes, properly identifying organs and structures within organisms, and proper technique in completing assignments. I foster an inclusive and judge-free environment to support students and cater to their academic needs. As a Peer Laboratory Assistant, I am able to gain insight on the effectiveness of material being taught, to better understand and communicate with my supervisor what may need to be refined and what works great for students. The biology department does a great job at catering to students' needs, which is why being a Peer Laboratory Assistant can help amplify students' voices when needed.

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STELLAR Engagement Fellow

During my time as an SLF Captain, my goal was to implement and maintain STELLAR within CST to enhance student engagement. STELLAR, a program within the Suitable platform, allows students to track and showcase their co-curricular activities while increasing involvement in campus organizations. A major part of my contributions involved outreach and engagement, where I introduced STELLAR to student organizations and faculty through various communication methods. I uploaded and approved event listings, attended club meetings to promote STELLAR, and secured advertising in the Honors & CST Bulletins to increase visibility for the program. Additionally, I contributed to promotional material development by creating and managing a tracking list of clubs, designing promotional content, and documenting processes related to Suitable for future STEM fellows. Beyond implementation, I learned many different professional development skills, such as creating a strategy for outreach and thought of prizes and initiatives for the Interclub Competition to boost participation. Through advertising and leadership-focused problem-solving, I learned many different applicable skills that will help me succeed in the workplace. Currently, STELLAR hopes to expand its impact by onboarding more student organizations onto the platform and increasing the number of diverse club events. By broadening its reach, STELLAR continues to enhance student engagement and create a more connected campus community within CST.

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A Photolyase Cavity Mutant That is pH-Sensitive

DNA damage caused by ultraviolet (UV) radiation poses a significant threat to genomic stability and requires prompt repair mechanisms. One of the most common UV-induced lesions is the cyclobutane pyrimidine dimer (CPD), which distorts the DNA helix and, if not repaired, can lead to mutations. DNA photolyase, a flavoprotein enzyme, utilizes visible light to repair CPDs through a light-driven mechanism. The enzyme's catalytic action is facilitated by flavin adenine dinucleotide (FAD), a cofactor that plays a key role in the electron transfer process that breaks the CPD bonds, restoring normal DNA structure. Despite extensive studies on the enzyme's overall function, the effects of specific mutations on its efficiency have not been fully explored. This study focuses on the R344H mutation, where the amino acid arginine at position 344 is replaced by histidine. This substitution may alter the protein's electrostatic interactions, potentially impacting FAD binding or catalytic efficiency. Using site-directed mutagenesis, the R344H mutation is introduced into the photolyase gene, expressed in Escherichia coli BL21 cells, and purified for detailed kinetic analysis. The primary objective is to assess how this mutation affects photolyase's ability to repair DNA damage and to understand the structural role of adenine in the enzyme's function. The findings of this research could inform the development of engineered photolyase variants with enhanced DNA repair capabilities, providing insights that are valuable for biotechnology and therapeutic applications, particularly in treating genetic disorders and cancers linked to DNA repair defects.

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Genetic Determinants of Streptococcus pyogenes and Enterococcus faecalis Virulence

Streptococcus pyogenes (Group A Streptococcus, GAS). GAS infections range from mild illnesses to severe invasive diseases, with considerable genetic diversity influencing pathogenicity and host interactions, particularly among highly virulent clonal *emm* types. Our research investigates the increasing incidence of invasive GAS (iGAS) infections in the Kensington area of Philadelphia since 2019, particularly among people who inject drugs (PWID) and individuals experiencing housing insecurity. This scoping review aims to explore the association between *emm* type, known GAS virulence factors, and infections in PWID populations. To identify relevant studies, our review team collaborated with a librarian to develop comprehensive search strategies, adhering to the PRISMA-ScR guidelines for search reporting. Searches were conducted across PubMed (NLM), Embase (Elsevier), Web of Science Core Collection (Clarivate Analytics), Cochrane Central (Wiley; clinical trials only), and CINAHL (EbscoHost), along with grey literature sources such as ProQuest Dissertations & Theses Global, ClinicalTrials.gov, TRIP Pro, and Europe PMC. The librarian designed and translated search strategies, peer-reviewed via PRESS. The search yielded 1,187 results, with 118 papers manually selected. Rayyan AI will screen abstracts, identify relevant studies, and extract key data.

Enterococcus faecalis is a versatile bacterium essential to microbiomes but also causes infections like urinary tract infections and endocarditis. Its virulence is influenced by strain variations and gene acquisition. Pheromone-responsive plasmids (PRPs) are found in 60-80% of virulent *E. faecalis*, with pCF10 linked to larger endocarditis vegetations. We recently discovered that pCF10 remodels biofilms and increases antibiotic resistance. PRPs are constantly rearranging. This project aims to develop a genetic screen to identify genes involved in rigid biofilm using 33 dental isolates containing PRPs using a PCR-based screen for essential genes *orf1&2, pcfZ1&2,* and *uvaf1&2*. This screen will be applied to *E. faecalis* isolates from TUHS patients to investigate associations with severe disease outcomes.

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STEM Leadership Fellow: Assisting in a classroom

As a STEM Leadership Fellow at Temple University, I actively contribute to the College of Science and Technology by supporting STEM education, mentoring students, and assisting in the development of hands-on learning activities. My role aligns with the university's broader mission of fostering academic excellence and student engagement within STEM fields. By leading academic reviews in collaboration with Professor Gist, I facilitate high-quality engagement in the classroom, helping students build confidence in STEM subjects and promoting teamwork among diverse student groups. This experience has allowed me to support the development of future STEM professionals by encouraging collaboration, confidence-building, and academic success.

In addition to my mentorship and teaching assistance, my position provides valuable professional development that will be crucial in my future career. The leadership, communication, and critical thinking skills I have cultivated will directly translate to dental school, where clear communication of complex procedures and diagnoses is essential. Moreover, my ability to connect with individuals from diverse backgrounds and my problem-solving skills will enhance my clinical practice in healthcare settings.

Looking ahead, there are several opportunities to further enhance the program. These include increasing hands-on research and clinical opportunities for fellows, fostering greater faculty collaboration to enrich learning experiences, and organizing networking events to connect fellows with STEM alumni and professionals in healthcare. These strategies will help develop a more dynamic and interconnected community of learners, preparing fellows for successful careers in STEM and healthcare.

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STEM Leadership Fellow

Being a STEM Leadership Fellow, I tutored computer science and math students to make sure they understand the concepts and improve their problem-solving skills. Through tutoring and coaching them, I observed areas of difficulty and adjusted my teaching method to keep it simple and understandable. A part of my responsibility was providing feedback on incorrect answers on test questions brought by students, explaining their mistakes and helping them regain points. I also tried my best to prepare students for upcoming exams as they came to me for help. Additionally, I supported the professor in the classroom by responding to questions raised by the students and explaining contents they seemed confused about in lectures and assignments. This helped me acquire good communication skills and gain more confidence in leadership within an academic setting.

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PLA Captain

As a senior graduating this May, serving as an SLF Captain under the Peer Laboratory Assistant (PLA) Captain position for two years has been an unforgettable experience. I had the opportunity to work alongside many wonderful people, including Dr. Jay Lunden. One of my primary responsibilities was to facilitate communication between other PLAs and Dr. Lunden, ensuring that all laboratories ran smoothly and identifying areas for improvement. I also had the privilege of helping to provide new opportunities to PLAs, allowing them to grow and maximize their experience.

Fostering a positive and inclusive environment that empowered students in laboratory settings was at the forefront of my work. This experience has allowed me to strengthen my leadership skills and develop a deeper understanding of working with a team. I am grateful for the opportunity I was given and am hopeful that the program will continue to thrive.

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Enhancing First-Year Student Success through Peer Leadership: Insights from the First Year Experience Conference

This poster presentation highlights key insights gained from the First Year Experience, a conference hosted by the University of South Carolina, held this year in New Orleans, Louisiana. As Peer Leader Captains representing the College of Science and Technology, we explored innovative strategies to enhance the First-Year Seminar (FYS), Transfer Seminar, and Peer Leader programs with the ultimate goal of improving student engagement and retention.

Common themes emerged from our findings, including the importance of structured self-reflection for Peer Leaders, the need for targeted training on boundary-setting and classroom challenges, and the integration of research-based projects to enhance the Peer Leader program. Notably, we identified the potential benefits of standardized self-assessment tools, such as "midpoint tickets," to encourage continuous Peer Leader improvement. Additionally, various universities emphasized equipping Peer Leaders with boundary-setting techniques and strategies to navigate difficult classroom situations, which could be incorporated into the Peer Leader Development Seminar. Further insights reinforced the value of Peer Leader Captains engaging in research-based projects to assess and enhance elements of FYS. Finally, the integration of workshops focusing on study techniques, stress management, and growth mindset development was identified as a crucial method to better prepare students for academic success.

By implementing these insights, we aim to strengthen our Peer Leader and First-Year Seminar programs, ultimately fostering a more engaging and supportive environment for first-year students at Temple University.

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Siphamia in a Temperature-Dependent World

This research aims to explore how temperature influences the symbiotic relationship between *Siphamia* fish and *Photobacterium Mandapamensis*. *Photobacterium Mandapamensis* is a bioluminescent bacterium housed within the fish's specialized light organ, located in *Siphamia*'s gastrointestinal tract. We currently have *P. Mandapamensis* isolates from both tropical and temperate species of *Siphamia*. The goal is to see how bacteria that are the of same species, but isolated from different hosts, differ in terms of their growth rates. To do this, we observed growth rates over a 24-hour period and compared the average growth rates of each species. Since *Siphamia* species inhabit both temperate and tropical regions, comparing symbiotic dynamics across these environments can provide valuable insight into how these bacterial strains have adapted to different temperatures and host fish.

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Beyond Q&A: Computing Students' Envisioned Designs for Educational Chatbots in Course Discussion Forums

Online discussion forums have long been a valuable resource for students seeking academic support and peer collaboration, especially in computing courses. However, these platforms have introduced new challenges, such as low engagement and student reluctance to participate due to feelings of anxiety and a lack of confidence in their responses. With the advent of generative AI (genAI) tools like ChatGPT, students have shifted away from these traditional forums to turn to genAI-driven tools for assistance. This study aims to explore how genAI-powered social chatbots can enhance educational discussion forums to better meet student needs. Through conducting participatory design workshops, students imagined genAI-powered discussion forums that go beyond conventional Q&A chatbots, enhancing problem-solving and facilitating collaborative learning. Preliminary findings suggest that integrating genAI agents into discussion forums can create a more inclusive learning environment, foster meaningful peer interactions, and improve learning through strengthening reflective learning and metacognition.

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Journey of the Algorithm Fellow

The Journey of the Algorithm course provides an important mathematics foundation for Business students and assists non-STEM majors in developing mathematical reasoning skills for analytic thinking. I understood that it is difficult for students to understand complicated mathematical concepts, so I attempted to translate these concepts into business contexts to better relate to students. I believed students needed to see the importance of math, so students understood the relevancy of math in business-related contexts.

My duties included developing illustrative examples, constructing teaching practice problems, and over 100 hours of tutoring to reinforce course objectives. I also worked with Dr. Varnum to develop procedures to increase student engagement and incentivize student attendance in tutoring sessions. Additionally, I was able to complete tutoring at a different level via Zoom and craft engagement rich digital content to assist students understanding of mathematical concepts in an online format. In addition to positively contributing to students' learning, I was also able to grow as a professional by developing communication and leadership skills through providing a bridge for students and instructors. To improve the SLF for the future, I recommend additional collaboration among SLFs, structuring SLFs to share knowledge through workshops, and inclusion of feedback from direct supervisors regarding performance to develop the professional practice of teaching.

This experience has strengthened the importance of implementing mathematical principles in actual business situations and pointed out the need for adaptive teaching styles around math to make it more approachable for non-STEM students.

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Investigating the Role of Seed Banks and Seed Rain in Post-Disturbance Forest Regeneration

Natural disturbances play a crucial role in shaping forest ecosystems by altering species composition, habitat structure, and ecological interactions. Large, infrequent disturbances, in particular, may cause extensive structural damage to forests, which may increase habitat heterogeneity and create microhabitats that alter ecological processes such as plant recruitment. The early stages of forest reorganization following such disturbances provide a unique opportunity to study ecological succession, and provide a window into later recovery. On September 1, 2021, an EF-2 tornado struck a mature temperate forest stand on Temple University's Ambler Campus. The site was intentionally left to recover naturally, creating a valuable opportunity to examine how forests regenerate and how forest communities and the ecological interactions within them are reestablished. To clarify regeneration dynamics following disturbance, this study will investigate how seed dispersal and soil seed banks contribute to plant recruitment in a disturbed (Temple Forest Observatory) and an undisturbed (Robbins Park, directly adjacent to Ambler Campus) forest. By collecting soil core samples, monitoring seed dispersal, and recording seedling and sapling growth across both sites, this study will identify processes by which disturbances may influence future species composition. Given that climate change is increasing the frequency and intensity of tornadoes and other large disturbances in areas like the northeastern United States where they once were rare, there is an increasing need to understand these ecological processes for biodiversity conservation and forest management.

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SLF Captain: STEM Challenge & FunScienceTools

Through my role as a SLF Captain for the STEM Challenge & FunScienceTools initiative, I explored emerging STEM technologies, contributed to BiologyWorkshop.org, held office hours for STEM Challenge courses, and provided in-class demonstrations using LabQuest tools. Additionally, I helped find 3D-printable educational kits to support STEM integration in school curriculum. This experience enhanced my public speaking skills, technical expertise in 3D printing, and ability to communicate complex scientific concepts effectively.

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Predation Traces on Mollusk Shells: Digital Image-Based Metrics

Predation traces on mollusk shells offer a wealth of information about predator-prey interaction. Damage on gastropod (*Lunatia* sp.) and bivalve (*Mereanaria mercenaria and Spisula solidissima*) shells from North Carolina, Massachusetts, and New Jersey were examined to quantify their patterns. Most openings were due to predation (sponges: *Entobia* isp; gastropods: *Oichnus* isp., and birds: *Belichnus* isp.),with anomalous damage hypothesized to be from transport by physical processes (abrasion), given the location of the damage and the peeling around the perimeter of the opening were considerably different than other specimens. Image color-intensity analysis was used for rapid assessment of the damage (location, perimeter, diameter, and extent of openings) in order to differentiate between the predation strategies, which ultimately helped to distinguish between feeding traces of different tracemakers. This study has possible paleo-ichnological and paleoecological implications.

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Enhancing First-Year Student Success through Peer Leadership: Insights from the First-Year Experience Conference

This poster presentation highlights key insights gained from the First-Year Experience, a conference hosted by the University of South Carolina, held this year in New Orleans, Louisiana. As Peer Leader Captains representing the College of Science and Technology, we explored innovative strategies to enhance the First-Year Seminar (FYS), Transfer Seminar, and Peer Leader programs with the ultimate goal of improving student engagement and retention.

Common themes emerged from our findings, including the importance of structured self-reflection for Peer Leaders, the need for targeted training on boundary-setting and classroom challenges, and the integration of research-based projects to enhance the Peer Leader program. Notably, we identified the potential benefits of standardized self-assessment tools, such as "midpoint tickets," to encourage continuous Peer Leader improvement. Additionally, various universities emphasized equipping Peer Leaders with boundary-setting techniques and strategies to navigate difficult classroom situations, which could be incorporated into the Peer Leader Development Seminar. Further insights reinforced the value of Peer Leader Captains engaging in research-based projects to assess and enhance elements of FYS. Finally, the integration of workshops focusing on study techniques, stress management, and growth mindset development was identified as a crucial method to better prepare students for academic success.

By implementing these insights, we aim to strengthen our Peer Leader and First-Year Seminar programs, ultimately fostering a more engaging and supportive environment for first-year students at Temple University.

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The Implementation of Additional Neuronal Synapse Models into the Simulation Tool Neuro-VISOR

Neuro-VISOR is a virtual reality modeling tool that simulates inter-neuronal dynamics for groups of neurons using the Hodgkin Huxley model. Two synaptic models have been implemented in the latest public release of Neuro-VISOR, those being the excitatory glutamatergic NMDA receptor and the inhibitory GABA receptor. Although these two receptor types are among the most common among the synaptic connections within the brain, the implementation of additional synaptic receptors will be a major step towards the goal of using Neuro-VISOR as a method of simulating the behavior of functional pathways. As such, a major focus of development this semester is to reconstruct the program to allow for the implementation of additional synaptic receptors, as well as begin the implementation of receptors such as the excitatory AMPA receptors and metabotropic dopaminergic receptors.

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Fostering Belonging in Computing Research Labs Through Spontaneous Online Social Networks

Joining an academic lab or club can be intimidating, especially for new members who struggle with imposter syndrome and fitting into established groups. This study explores whether a Slack channel with an integrated photo bot can help new members feel more welcome and improve their sense of belonging. The bot will send daily prompts designed to encourage self-expression, such as sharing a picture of their surroundings or personal items. The study will examine different factors like prompt timing (morning, afternoon, or evening), prompt type (personal vs. impersonal, choice-based vs. default), and whether participant tagging influences engagement and self-disclosure. The research will take place at the Temple University HCI Lab and will use both qualitative and quantitative methods, including pre- and post-surveys as well as Zoom interviews. By tracking how participants interact over time, the study aims to see if spontaneous social interactions in online spaces can help new members feel more connected and reduce feelings of imposter syndrome. The results will offer valuable insights into how low-cost digital tools like Slack and automated photo bots can be used in research labs and student organizations to create a more inclusive and welcoming environment.

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The Half-Life Extension of Anticoagulants

Thrombosis is a fatal, yet very common health problem, contributing to approximately 25% of global deaths. Thrombin plays a crucial role in the thrombosis cascade of events. Bivalirudin directly inhibits thrombin by binding to the catalytic site and the anion-binding secondary binding site of thrombin within the thrombi and circulation. However, bivalirudin ends up getting removed out of the body too soon through the excretory system. Earlier studies have shown promising results of the conjugation of bivalirudin in terms of preventing thrombosis. In this project, we aim to extend the half-life of anticoagulants in the body by conjugating bivalirudin to polyethylene glycol 20K (PEG-20K). PEG-20K was covalently conjugated to bivalirudin and then characterized by high performance liquid chromatography to determine the best reaction ratio. The optimal ratio of bivalirudin to conjugate was then tested in vitro using both a thrombin activity assay and a clotting assay. We discovered the optimal PEG-20K to bivalirudin ratio was five to one. In the thrombin activity assays, the half-maximal inhibitory concentration (IC50) of the conjugate is less than the IC50 of bivalirudin. However, in the clot formation assay, the IC50 of the conjugate was more than the IC50 of bivalirudin. These results indicate a support for PEG-20K linked bivalirudin as an effective anticoagulant. The conjugation of shorter chains of polyethylene glycol to bivalirudin is currently being studied. Future studies should investigate the safety of polyethylene glycol-conjugated bivalirudin and the pharmacokinetics of such conjugated anti-coaugulant in mice.

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Understanding Drivers of Nutrient Distributions Along the Antarctic Margin

Despite occupying a small geographic area, water properties along and near the Antarctic margin play an important role in the global climate system. Nutrient distributions and exchange between the Antarctic continental shelf and open-ocean impact ocean ecosystems and air-sea CO_2 fluxes. Shelf nutrients are influenced by regional circulation (particularly the Antarctic Slope Current and Antarctic Coastal Current), sea ice coverage, upwelling and the delivery of offshore nutrients, ocean mixing, and biological processes. The Antarctic margin can be broken up into distinct "shelf types" based on regional dynamics governing the physical properties in the region and connections between the waters on and off-shore of the shelf. Here we examine the mean-state and variability of nutrient content along the Antarctic margin utilizing a solution of the Biogeochemical Southern Ocean State Estimate (B-SOSE), a numerical simulation constrained by available Southern Ocean observations. We utilize monthly output of biogeochemical tracers from an iteration of B-SOSE at 1/6th- degree horizontal resolution from 2013 through 2023. Our analysis quantifies shelf iron, nitrate, and chlorophyll content and variability on monthly, seasonal, and inter-annual timescales to build a mechanistic understanding of drivers of changes in nutrient content along the shelf. Our results shed light on the physical and biogeochemical processes setting the mean-state and driving variability in nutrient budgets in five distinct shelf sectors. Advances in our understanding of the dynamics governing Antarctic margin nutrient distributions are required to create a better understanding of global ocean biogeochemical processes and for predicting changes as the climate continues to warm.

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Investigating Factors Influencing High School Girls' Enrollment in STEM Courses in Philadelphia, PA and vicinity

Despite increasing efforts to bridge the gender gap in STEM, female representation remains disproportionately low in many technical fields. This research investigates the factors influencing high school girls' enrollment in advanced mathematics courses across Philadelphia area school districts. By collecting and analyzing survey data from students, teachers, and administrators, this study examines the impact of societal perceptions, institutional support, and personal motivation on young women's decisions to pursue STEM-related coursework. The findings aim to highlight key barriers and opportunities that can inform policies and interventions to encourage more female students to engage in STEM pathways, ultimately contributing to greater gender equity in the field.

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Measurement of cannabinoid pathway genes in the rat prefrontal cortex in response to pharmacological manipulation of the serotonin 2A receptor

The purpose of the study is to the effect of stimulation or antagonism of the serotonin 2A receptor (5HT2AR) on gene expression in the prefrontal cortex of the rat brain. 5HT2AR is essential for learning and cognition. It is targeted by several hallucinogens, including psilocybin, and medications for psychiatric disorders. The receptor is associated with multiple psychiatric disorders and drug addiction. Psilocybin acts as an agonist to the serotonin 2A receptor, whereas ketanserin is an antagonist at the receptor. In a prior study, the Daws lab treated rats with psilocybin or ketanserin then measured gene expression in the prefrontal cortex using unbiased RNA sequencing. The prefrontal cortex is a brain region important for psychiatric disorders. One pathway regulated by sequencing was related to cannabinoid neurotransmission and biogenesis. Cannabinoids are important for synaptic plasticity and neurotransmission. We performed validation of the sequencing study by using qPCR to measure three cannabinoid-related genes- mgll, crn1, and faah, in the prefrontal cortex of rats treated with psilocybin or ketanserin. We observed significant regulation of mgll in the prefrontal cortex following ketanserin treatment but no regulation with psilocybin. Our results demonstrate that antagonism of 5HT2AR may impact cannabinoid signaling in the prefrontal cortex.

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STEM Leadership Fellow: Coach & Classroom Assistant

Jennifer Vaughn is a classroom assistant and a coach for the course titled Journey of the Algorithm. During the class, she helps answer student questions and assists the professor. Once a week, she also hosts a 6-hour coaching session where students come in for homework help, quiz or test review, or for partial credit opportunities. Her goal is to help students understand key mathematical topics to improve their problem-solving skills and help them succeed in their future courses at Temple University.

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SARS-CoV-2 Spike Protein and Cocaine Effects on Blood Brain Barrier Permeability in the Rat

Substance use disorders can worsen COVID-19 symptoms. Particularly, the misuse of cocaine can increase the blood brain barrier's (BBB) permeability. This allows toxins and harmful substances from the bloodstream to enter the brain potentially leading to neuroinflammation, which is implicit in neurological disease. It has also been seen that SARS-CoV-2 spike protein can also increase BBB permeability *in vitro*. Thus, we hypothesize that the combination of cocaine and a spike protein will exacerbate BBB permeability in a rat model. To test this, animals were injected with cocaine (i.p.. 20 mg/kg x 3 injections) and/or spike protein (i.v., 50-1000 ng/kg) together with sodium fluorescein IV. One hour later, brains were obtained and sodium fluorescein content in the brain was used to determine changes in BBB permeability. We found that cocaine increased BBB permeability in the olfactory bulb, while high doses of spike protein decreased sodium fluorescein in the hippocampus. However, in the absence of blood we saw that spike protein increased BBB permeability in the olfactory bulb, prefrontal cortex, and hippocampus. The combined effects of cocaine and spike protein are currently under investigation. This work will help shed light on how cocaine and spike protein together affect BBB permeability.

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STEM Leadership Fellow

This represents my experience as a course assistant in a data science class, where I played a key role in supporting students' learning through teaching Python, pandas, and data visualization and analysis techniques in Jupyter Notebooks. My responsibilities included assisting students during office hours, leading "Tips and Tricks" sessions to help students navigate lab exercises and collaborating with the course coordinator and fellow assistants to enhance course delivery. Through this role, I developed critical leadership, communication, and teamwork skills by explaining complex technical concepts, contributing to course improvement discussions, and providing personalized support to students. Additionally, I gained valuable insights into educational development, such as the importance of hands-on learning and peer collaboration. Tailoring the experience in a way to not only help students complete the assignments but learn and internalize the information was a valuable experience. This experience has significantly contributed to my professional growth, equipping me with the tools needed for future roles in dealing with teamwork, education, and leadership.

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Session 4 Abstracts

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Streamlining Peripheral Awareness and Accountability: Strategic Organizational Methods for HCI Lab Efficiency

Running a large, undergraduate-focused research lab presents unique challenges in coordination, progress tracking, and sustaining engagement among members. As lab membership grows, so do the demands for effective organization and tools to foster peripheral awareness, enabling students to stay informed on lab-wide activities and deadlines. The project explores the development and implementation of a Canvas-based digital workspace to centralize resources, streamline communication, and support lab members in tracking both individual and collective research progress. The platform aims to facilitate better awareness, accountability, and cohesion across a diverse lab team. Through a series of evaluations, we will investigate this platform's impact on student engagement, collaboration, and self-management skills.

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Maximizing Student Engagement in Supplemental Review Sessions

My STEM Leadership role was to provide weekly review sessions to students in Pre-Calculus (MATH-1022) in Fall '24 and College Algebra (MATH-1021) in Fall '23, Spring '24, and Spring '25. Last year, my focus was exploring what elements of review sessions students found the most beneficial to their learning. This year, I explored how attendance in review sessions could be maximized.

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Does Greening Philadelphia's Vacant Lots Result in Lower Arthropod Diversity?

In urban areas, greenspaces can be incredibly important refuges for biodiversity, therefore, it is necessary to understand how management of urban greenspaces impacts biodiversity. Vacant lots are often an overlooked type of urban greenspace that may hold value for biodiversity, especially arthropods. In Philadelphia, which has over 40,000 vacant lots, approximately 12,000 of these vacant lots have been "greened" through a partnership between the city of Philadelphia and the Pennsylvania Horticultural Society (PHS). Lot greening provides neighborhoods with small outdoor spaces in an otherwise crowded city. However, this "greening" involves removing and mowing all overgrown shrubs, trees, and plants and replacing them with grass lawns and a few trees. There has not been research performed on this greening process and what effect it has on arthropod biodiversity. The goal of this study is to understand how arthropod biodiversity of Philadelphia's vacant lots varies across greened versus ungreened lots.

In 2019 and 2022, we sampled arthropods from 25 vacant lots in Philadelphia. The arthropods were identified to order and the Hemipteran order was further identified to family. We explored the effects of lot greening, sampling year and surrounding impervious surface on the abundance, richness and composition of arthropod orders and Hemipteran families.

In conclusion, we found that lot greening did lead to a reduction in arthropod diversity, however, inter-annual fluctuations in arthropod communities confounded these patterns. Future work should focus on understanding the habitat features in vacant lots that support arthropod diversity and contribute to their conservation.

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Assessing the Use of Generative AI to Support Automated Just-in-Time Programming for Visual Scene Displays

Individuals with communication disorders, such as those on the autism spectrum, often rely on augmentative and alternative communication (AAC) devices to express themselves. One common AAC tool is the Visual Scene Display (VSD), which presents communication options within images to aid interaction. Though VSDs are useful, the current model requires manual setup, which can be time-consuming and labor-intensive for communication partners. This study investigates the feasibility of using generative AI to automate the creation of communication options for VSDs. We asked 17 pre-service speech-language pathology (SLP) students to create VSDs to evaluate the effectiveness of AI-generated VSDs with novice users. Participants were instructed to create 68 VSDs total using both an existing software Snap Scene and our prototype. Snap Scene VSD creation is entirely manual, whereas our prototype leverages generative AI to generate VSDs and enables users to edit and finalize the VSDs in order to utilize their specific knowledge about potential clients. Through a mixed-methods analysis, we found that users have increased confidence when creating VSDs with the prototype as a result of its ability to assist with generating communication options. Findings indicate that the communication options generated by GPT-4V were contextually relevant and effective in their ability to assist users in creating VSDs. Additionally, users were faster in creating VSDs when using our prototype. Our analysis is ongoing, however, our prototype shows promise in lowering the barriers to using VSDs in more contexts by novice users.

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Time Series And Its Applications In A Medical Setting

Time series analysis examines sequences of data points collected over time, enabling pattern recognition and forecasting. While widely used in finance for stock market predictions, its application in healthcare remains underexplored.

This poster will highlight the potential of time series analysis in medical settings by presenting real-world examples. It will introduce key concepts such as the ARIMA model and Granger causality, demonstrating their relevance in healthcare. Additionally, examples will illustrate the practical utility of time series methods in improving medical decision-making and patient outcomes.

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Peer Laboratory Assistant

As a STEM leadership fellow, my role as a Peer Laboratory Assistant (PLA) for BIOL 1112 involves supporting students in the lab and promoting an interactive learning environment. This involves answering students' questions, providing guidance, facilitating participation, and demonstrating techniques for students during their lab. By acting as a bridge between the instructor and students, I help students gain confidence asking questions and receiving help.

This experience has enabled me to develop my personal and professional skills by learning how to better communicate with students and faculty, and how to adapt to different situations and learning styles. I was able to learn how to clearly describe complex biological ideas and techniques to those with different and diverse backgrounds and learning styles. Importantly, this role gave me a new appreciation for mentorship, learning, and collaboration, and skills that will carry on to my future career.

This presentation will delve into my experience as a Peer Laboratory Assistant and the influence it has had on my professional development, and the significance of this program in CST. As a SLF, I have gotten a new perspective on teaching and learning and developed skills that I can use in my future career as a healthcare professional.

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Data Science STEM Leadership Fellow

As a STEM Leadership Fellow and Course Assistant for Elements of Data Science for the Physical and Life Sciences, I played a key role in supporting students across various STEM disciplines at Temple University. This course, modeled after Berkeley's Data 8, introduces foundational data science concepts, programming in Python, and statistical analysis. My responsibilities included attending weekly lectures, assisting with Jupyter Notebook labs, and hosting office hours to provide one-on-one support. Through active engagement, I helped students navigate complex topics and build confidence in their analytical skills. None of this would have been possible without the guidance and support of Dr. Jonathan Smith, whose dedication to student success made this experience truly meaningful.

This opportunity was a full-circle moment for me, as I transitioned from a student who once struggled with uncertainty to a mentor helping my peers succeed. It strengthened my communication, time management, and leadership skills, while also deepening my understanding of data science. Teaching others not only reinforced my own knowledge but also taught me patience, adaptability, and the importance of meeting students where they are.

Looking towards the future, I believe the STEM Leadership Fellow Program could be even more impactful by fostering stronger connections among students. Opportunities for peer mentorship, regular check-ins, and informal gatherings would help build a supportive community where students can share experiences, exchange advice, and encourage one another. Creating a space for open conversations and shared learning would make the program even more enriching for future participants.

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Journey of the Algorithm Fellow/STEM Challenge Fellow, STEM Leadership Fellow Captain

Placed as a Journey of the Algorithm Fellow/STEM Challenge Fellow, my role as a STEM Leadership Fellow Captain position for SCTC 1021: Journey of the Algorithm focused on providing academic support to students and professors by targeting student engagement and effective exposure in addition to mentoring other STEM Leadership Fellows. Utilizing both in-person and online means, I helped students navigate coursework by hosting tutoring and review sessions in addition to assisting all lectures. This experience has strengthened my communication and leadership skills which translate directly into diverse applications. 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.

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Phosphate Bond Hydrolysis: Effects of pH and Lewis Acidity

Chemical warfare agents (CWA) pose great threats to human civilization, demanding efficient materials to detoxify those chemicals. Zirconium-based metal-organic frameworks (MOFs), porous materials with organic linkers that connect metal-oxide nodes formed by metal salt hydrolysis, have shown catalytic activity in the detoxification of CWAs, where the high Lewis acidity is assumed to be the driving force [1]. To test this hypothesis, we compare the reactivity of metal salt, a MOF precursor, of different oxidation states by using the hydrolysis reaction of dimethyl nitrophenyl phosphate (DMNP), a chemical warfare agent simulant. UV-Vis spectroscopy was used to monitor the DMNP hydrolysis process under basic and acidic conditions, where catalysts with different oxidation states were used, such as Ce (III) and Ce (IV). Our results show that higher oxidation states of metal centers show better catalytic activity toward phosphate bond hydrolysis in basic conditions. Our findings provide insight into the impact of Lewis acidity and pH on CWA detoxification and offer guidance to improve the catalytic ability of existing materials.

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Proteomic Profiling of Cancer-Associated Fibroblasts in Pancreatic Ductal Adenocarcinoma to Identify Exploitable Protein-Protein Interactions for Therapeutics

Pancreatic ductal adenocarcinoma (PDAC) currently has a 13% 5-year survival rate post-diagnosis, largely due to late-stage diagnoses and a lack of effective therapeutics. A significant driver of poor outcomes is desmoplasia (D-ECM), a dense extracellular matrix (ECM) constructed by cancer-associated fibroblasts (CAFs) that dominates the tumor microenvironment (TME). CAFs can be classified as either tumor-suppressing (TS) or tumor-promoting (TP) and differ from naïve fibroblasts through their activated phenotype that arises through pathways such as TGF-β signaling, leading to the overexpression of integrin, a family of heterodimeric proteins that mediate cell-ECM interaction. Previous studies have shown that TS and TP CAFs are distinguishable by their D-ECM alignment and localization of integrin. While all CAFs contain active (open) and inactive (closed) conformations of $\alpha_5\beta_1$-integrin, TS CAFs show a higher saturation of active integrin on the cell surface and TP CAFs show a greater abundance of inactive integrin in the cytoplasm, suggesting that the relative abundance of $\alpha_5\beta_1$-integrin conformations is crucial in determining CAF function and consequently, predicting tumor progression. Elucidating the protein-protein interactions involved in TS and TP CAFs is critical in identifying novel therapeutic targets for PDAC; shotgun proteomics analyses allow for mapping of these interactions, which may lead to targeted treatments capable of modifying the TME and inhibiting disease progression. By profiling proteomic differences between TS and TP CAFs, we aim to reveal protein interactions that could be exploited for therapeutic intervention, leading to the discovery of novel drug targets and biomarkers and ultimately improved outcomes for PDAC patients.

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AI Agents

AI agents are transforming human-computer interaction by autonomously processing queries and delivering precise, thoughtful responses. Unlike typical LLMs like ChatGPT and DeepSeek, which generate single-step answers, our AI agent uses multi-step reasoning frameworks (ReAct, CoT, ToT) to explore different solution paths before making a decision. This allows it to consider multiple perspectives, resulting in more accurate and reliable outcomes.

What makes our AI agent stand out is its modular design. It uses agent-chaining, where multiple specialized agents collaborate to handle complex, multi-step tasks. This enables it to break down large problems into smaller, manageable steps, making it highly effective for detailed operations. While LLMs can process specific data when prompted, they typically respond in a linear fashion. In contrast, our AI agent applies structured reasoning, making it better suited for solving intricate, real-world challenges that require multiple stages of decision-making.

Additionally, the agent's flexibility allows it to be tailored for domain-specific applications, offering more precise and actionable insights. Its ability to coordinate multiple agents also makes it highly adaptable, enhancing its effectiveness in areas like business automation, data analysis, and problem-solving.

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Quantum Stresses in the Hydrogen Atom

Studies of the non-trivial structure of the proton have a long history; so far, three Nobel Prizes have been awarded to this field. A key focus in this area is the stress tensor, which contains information about pressure and shear forces inside the proton. Recently, it has been recognized that related studies for the hydrogen atom could provide valuable new insights into this fascinating field. In this work, we have therefore addressed two specific topics. First, we have scrutinized recently published results on the stress tensor of the hydrogen atom in the ground state ψ_{100}. To this end, we have recalculated various form factors (FFs) which parameterize the stress tensor. Second, we have extended the calculations in three ways: computing the FFs for the first excited state ψ_{200}, conducting exploratory studies for excited states with arbitrary n, and studying the impact of the size of the hydrogen atom (which can be tuned via changing specific parameters) on the FFs. We present our results and comment on their potential implications.

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Assessing the Role of Diversity in LLM Explanations for Enhancing Student Understanding

Large Language Models have the capability to generate explanations that are better than those generated by peers, which can be highly beneficial in a computer science classroom. While explanations generated by LLMs are better than those generated by peers, it is unlikely that they are better than gold-standard explanations generated by instructors. We take inspiration from computational creativity research which suggests that quantity can sometimes be more valuable than quality. For instance, multiple diverse design inspiration has been demonstrated as an effective method for optimizing creative output. Applying this same concept to explanation generation, we determine whether it is beneficial to get inspiration from multiple diverse explanations in order to create one high-quality explanation for programming exercises. In addition, we discuss the implications of utilizing the power of LLMs for explanation generation. Knowing that LLMs can produce substantial amounts of data, generating multiple diverse explanations could be well within its capabilities. As a result, diversity can be attained by incorporating information from multiple heterogeneous explanations.

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The Knowledge Gap of Online Safety Between Generations in Computer Science Education

As digital technologies continue to rapidly evolve, online privacy and security has become an increasingly prevalent concern. While some take proactive measures to protect their personal data, many remain unaware of the risks that exist with the failure to implement effective security practices. Due to the constantly changing nature of technology, different age groups may have varying perceptions and knowledge of how to keep themselves safe online. This study aims to explore the perspectives of students and professors regarding cybersecurity and privacy concerns, highlighting the differences in their understanding and awareness. Through surveying and interviewing students and professors within computing education, we aim to compare their viewpoints to identify gaps in knowledge, address potential misconceptions, and provide insights for improving cybersecurity education and best practices in academic settings. The findings from this study will support the development of focused educational strategies that will better inform and prepare students and professors with the knowledge needed to securely navigate an increasingly digital world.

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Developing a Community and Supportive Practices for Underrepresented Students

For the 2024-2025 school year, the main goal for the Persistence Initiative was to learn how to best support CST first-year students that come from historically marginalized backgrounds. Since this is the second year of the program, we felt it was important to reflect on our progress from the past and decide what changes need to be made to ensure the program's growth. Last year, our biggest struggle was garnering student engagement; Therefore, in the fall we began hosting monthly events. These events allowed us to connect with first year students, better understand their needs, and create a cohort. Some events we hosted include an Arts & Crafts Night and First- Semester Q&A Session. Student participation increased and we enhanced our knowledge of what current first-year concerns are.

As we transitioned into the second semester, we met some challenges with operating the program, due to shifts in educational policy. In response, the program has been renamed from the Underrepresented Initiative to the Persistence Initiative. The recent implementations made to the initiative caused a slight delay in our growth, but we have been able to maintain its expansion by organizing a cohort. This cohort is assembled of 30 students that we work closely with to support their academic needs as they transition into CST and Temple. We hope the addition of this cohort will improve student readiness in their first year and foster a positive environment for growth.

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Composition and Structure of Biofilms on Monuments

Biofilms are microorganism communities, made of things such as bacteria, fungi, or algae that are stuck to a surface. The project Dr. Grattepanche's lab is working on is the investigation of biofilms.

A sample was scraped off the Merchant's Exchange Building, which is in the process of being sonicated from the rock and viewed under a microscope, to investigate the different types of microorganisms that were present on the building. This process started with using vibration baths, from 5-15 minutes, but after creating samples and viewing them under microscopes, it was seen that the biofilms were still present on the rock. Therefore, the intensity of the vibrations was increased, to the point that a probe was used to sonicate the rocks instead. All samples made were filtered and put onto slides, a rockslide and a liquid slide, so that both parts could be viewed under a microscope to check for biofilm presence.

While the biofilm hasn't been fully separated from the rock as of this abstract being written, substantial progress is being made, as with every sample taken and every test run, less and less biofilm is showing up on the rocks, and more is shown on the liquids.

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Autism & Active Learning

Prior research in computing education often centers neurotypical students. Leaving neurodiverse people out of computing education research means only neurotypical people will be designing and developing curricula and educational technologies. This lack of representation may harm neurodiverse students. This begs the question: what are the opportunities and challenges for neurodiverse computing students? To better understand what research has been conducted in this field, we are conducting a systematic literature review focused on neurodivergent students and computing education. A systematic review of the literature, following PRISMA reporting guidelines, will synthesize current studies on neurodivergence in computing education and highlight gaps and where there are opportunities for further research.