



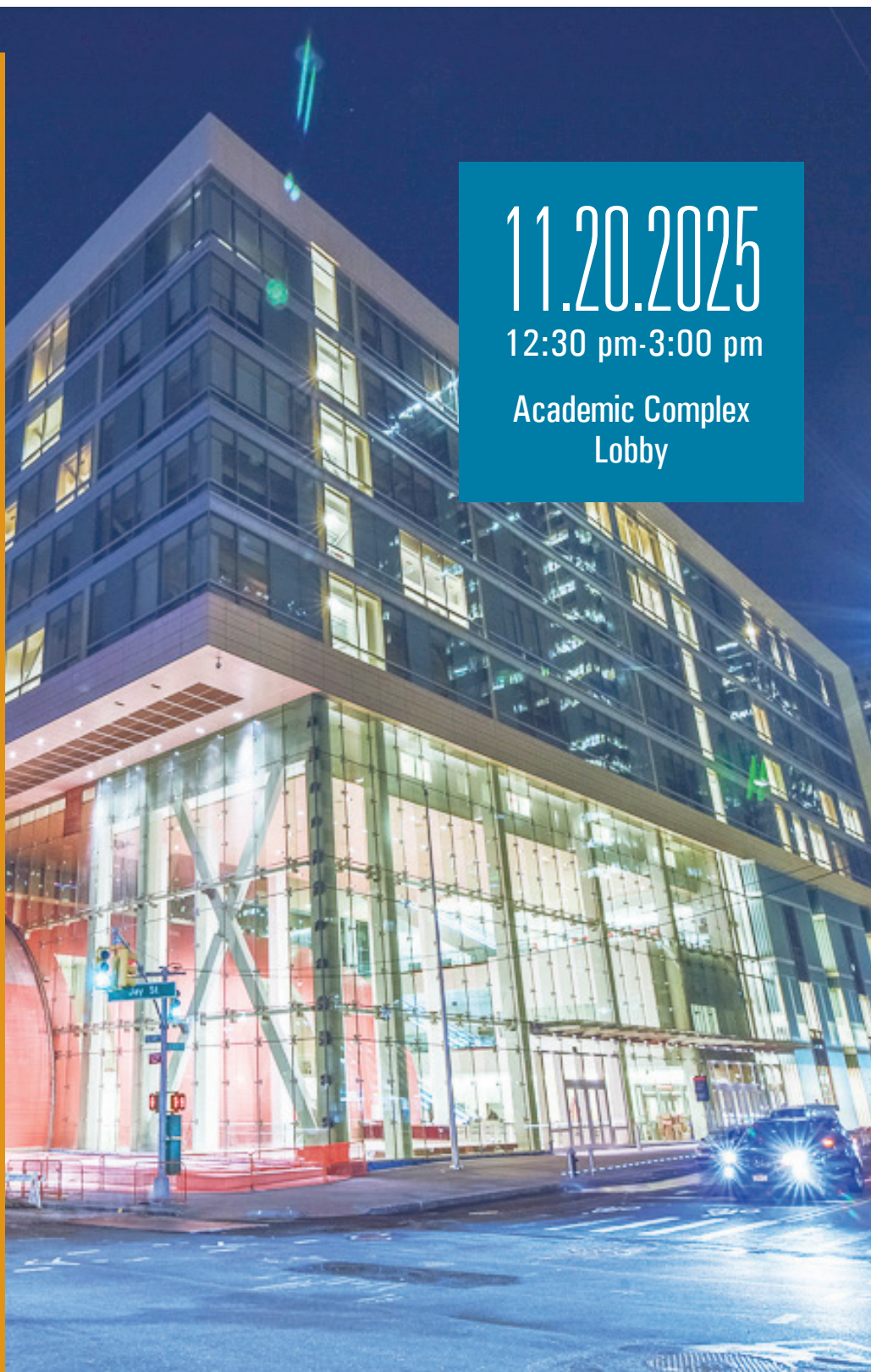
23rd
ANNUAL

POSTER SESSION

11.20.2025

12:30 pm-3:00 pm

Academic Complex
Lobby



A Showcase of City Tech Faculty and Students'
Research and Publications

ARCHITECTURE

**BIOLOGY
AND
HEALTH SCIENCES**

BUSINESS

CHEMISTRY

**COMMUNICATION
DESIGN**

**COMPUTER
ENGINEERING
AND INFORMATION
SYSTEMS
TECHNOLOGY**

**CONSTRUCTION
MANAGEMENT
AND
CIVIL ENGINEERING**

**ELECTRICAL AND
TELECOMMUNICATIONS
ENGINEERING
TECHNOLOGY**

INTERDISCIPLINARY

**LAW AND
PARALEGAL
STUDIES**

MATHEMATICS

PHYSICS

**RADIOLOGIC
TECHNOLOGY
AND MEDICAL
IMAGING**

SOCIAL SCIENCES

**STUDENT RESEARCH
UNDER FACULTY
MENTORSHIP**

23rd POSTER SESSION, 2025

12:30 pm–3:00 pm

WELCOME AND GREETINGS

1:00 pm–1:15 pm

Dr. Milton Santiago

Interim President

Dr. Pamela Brown

Provost

Dr. Reginald Blake

Associate Provost and Dean of Curriculum and Research

Dr. Justin Vazquez-Poritz

Dean of the School of Arts & Sciences

Dr. Hong Li

Interim Dean of the School of Technology & Design

Dr. Maureen Archer

Dean of the School of Professional Studies

AWARDING CEREMONY

1:15 pm–1:30 pm

ONE-MINUTE FACULTY POSTER PRESENTATION

1:30 pm–2:00 pm

2:30 pm–2:45 pm

Informal Q&A in the lobby

The program is organized by topics rather than by departments. Frequently the presentations are cross-disciplinary or difficult to assign to the discipline represented by the department with which the presenter is affiliated.

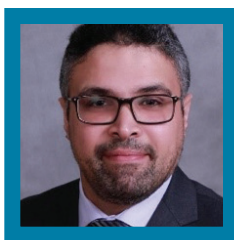
AWARDING CEREMONY

The organizing committee of the 22nd Annual Faculty and Student Research Poster Sessions has selected for special recognition the following awardees from among over 50 excellent posters. The names of presenters of the awarded posters are given in bold and identified with an asterisk*.

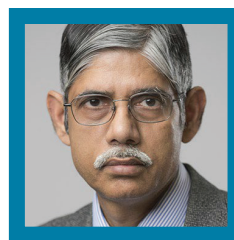
22nd POSTER SESSION AWARDEES, 2024



Vitaly Dorogan*, K. Cruz, M. Vardoshvili, P. Sotomayor, S. Rivera, and T. Gonzalez. Fabrication and Characterization of Monolayered Transition-Metal Dichalcogenides.



Ahmed Hassebo*, Mohamed Tealab. From a Traditional City to a Smart City: The Measurement of Cities' Readiness for Transition, Egypt as a Case Study.



Subhendra Sarkar*, Evans Lespinasse, Eric Lobel, Somdat Kissoon, and Daler Djuraev. Manipulating Harmful Compton Radiation in Composite Filters to Generate Variable X-ray Flux for Imaging Soft Biomaterials: Let Devil Do Some Good.

POSTER SESSION

ARCHITECTURE

- 1** Lia Dikigoropoulou and Michael Ray Malonjao, in LAWN 2025: Collaborative Futures for Ukraine's Urban-Nature Landscapes.

BIOLOGY AND HEALTH SCIENCES

- 2** Juan Rivera-Correa, Maria C. Velasco Pareja, Maria F. Yasnot-Acosta, Monica Delgado Hernández, Víctor Montenegro, and Alicia Rojas. Autoimmunity during Tropical Parasitic Diseases: Human Malaria and Canine Heartworm Disease.
- 3** Daniela Herrera de la Fuente and Margaret Rafferty. Dengue Fever: What Ambulatory Care Nurses Need to Know.
- 4** Aseela Hassan, and Margaret Rafferty. Lyme Disease: Implications for Nursing.
- 5** Tommy Li, Celeste Waddy, and Emerson Ea. Enhancing Psychiatric Nursing Education via Standardized Patients in Simulation.

- 6** Khrystyna Vyprynyuk and Isis Marsh. Documentation and Communication as Key Elements of Risk Management.

- 7** Khrystyna Vyprynyuk and Laura Andreesku. Infection Control Across Clinical and Laboratory Dental Settings: Protocols, Risks, and the Role of Emerging Technologies.

BUSINESS

- 8** Alyssa Dana Adomaitis, Diana Saiki, and Malik Lee. Employer Perceptions and Adoption of Policies Related to Diverse Gender Identities in the Fashion Workforce.

- 9** Nazanin Hedayat Munroe. Materiality and Meaning of Sufi Dervish Robes.

CHEMISTRY

- 10** Alberto Martinez, and Joshua Simmonds-Raphael. Antioxidant and anti-amyloidogenic properties of caffeic acid and resveratrol derivatives.

- 11** Vishwas Joshi. Ligand Design and Synthetic Strategies for Nanopatterning Bismuth Nanoparticles.

COMMUNICATION DESIGN

- 12** Noreen Y. Whyse, Shari Thurow, and Beverly Corwin. The Anatomy of a Question in Information Architecture and AI: Chatbots and Search.

COMPUTER ENGINEERING AND INFORMATION SYSTEM TECHNOLOGY

- 13** M. Tedeschi, S. Rizwan, C. Shringi, V. Devram Chandgir, S. Belich. An Advanced AI-Driven Database System.

- 14** Marcos Pinto. Breaking Down the Costs: Build a Small Language Model.

- 15** Xiangdong Li. Quantum-Enhanced Training of Large Language Models: A Hybrid Approach.

- 16** Stefano Pizzo, Cory Davis, Jonathan Lee, Aparicio Carranza. Python-Based Honeypot with Artificial Intelligence Driven System Analysis.

- 17** Jacob Perez, Christal Jean-Soveral, Yusuf Smaili, Chengcheng An, Aparicio Carranza. Safe Home Network Implementation.

- 18** Johnny Liu, Ayrton Lagos, Kevin Reino, Milton Murray, Aparicio Carranza. Reliability Evaluation of Hardware Security Modules and Trusted Platform Modules in Cybersecurity.

- 19** Jaheim Wilson, Raymond Kuang, Arvebyrle Cedron, Aparicio Carranza. How Code Builds Cybersecurity.

- 20** Chidi Agborennow, Jonathan Chan, Brandon Ramjeet, Raymond Spinelle, Aparicio Carranza. Methods to Stop Phishing Attacks with Artificial Intelligence.

- 21** Gregory Pimentel, Majida Naz, Nelie Louissant, Aparicio Carranza. Luring the Hacker: Python-Based Honeypot Services for Cyber Defense.

- 22** Clifton McFarlane, Jeremiah Hughes, Daniel Adekunasi, Aparicio Carranza. Cloud-Integrated IoT Devices with Python to Enhance Smart Home Security Systems (SHSS) Against Intrusions.

- 23** Cory Davis, Mohamed Kantako, Mohammed Imad, Aparicio Carranza. Python-Driven Exploitation and Defense of IoT Devices.

- 24** Marcelo Blas, Alexander Gordon, Micheal Chin, Chasman Miran, Aparicio Carranza. Enhancing Security Testing with Intrusion Detection Systems.

- 25** Kevin Balbuena Montes, Stefano Guerrero, Ousmane Diop, Aparicio Carranza. Authentication and Encryption in the Cloud: A Dual Approach to Cybersecurity.

CONSTRUCTION MANAGEMENT AND CIVIL ENGINEERING

- 26** Samaneh Gholitabar, Owen Murphy. Planning a Health Impact Assessment Framework for Major Events in New York City.

ELECTRICAL AND TELECOMMUNICATIONS ENGINEERING TECHNOLOGY

- 27** Oscar Situ, Viviana Vladutescu, Mikhail Polyanskiy, William Li, Vikas Teotia, Marcus Babzien, Dismas Choge, Li Geng, Lufeng Leng, Giovanni Ossola, Mark Palmer, Tianyi Zhao, Tahsinur Rahman, Brandon Palencia, Joseph Rukaj, Jorge Chavez, Mithila Islam. Particle Accelerators at the Confluence of Magnets, Electron Beams, and Lasers.

- 28** Ahmed Hassebo. Smart Cities and Surveillance Technology: Balancing Innovation, Security, and Privacy in Urban Environments.

- 29** Viviana Vladutescu, Mikhail Polyanskiy, Dismas Choge, Marcus Babzien, Tahsinur Rahman, Tianyi Zhao, William Li, Igor Pogorelski. LIDT of Ultrafast High Power Lasers Components.

INTERDISCIPLINARY

- 30** Vitaliy Dorogan, Alex Davis, Khaoula Dehhou, and Ivana Radivojevic Jovanovic. Photoluminescence of Novel Hybrid Quantum-Dot/Indium Selenide Nanostructures for Optoelectronics.

- 31** Mithila Islam, Viviana Vladutescu, Mikhail Polyanskiy, William Li, Vikas Teotia, Marcus Babzien, Dismas Choge, Mark Palmer, Tianyi Zhao, Brandon Palencia, Joseph Rukaj, Tahsinur Rahman, Jorge Chavez, Oscar Situ, Li Geng, Lufeng Leng, Giovanni Ossola. Beam Manipulation via Superconducting Magnets for Ultrafast Electron Diffraction and Electron Beam-Ultrafast High Power Laser Interaction experiments.

- 32** Jorge Chavez, Viviana Vladutescu, Mikhail Polyanskiy, William Li, Vikas Teotia, Marcus Babzien, Dismas Choge, Mark Palmer, Tianyi Zhao, Brandon Palencia, Joseph Rukaj, Tahsinur Rahman, Mithila Islam, Oscar Situ, Li Geng, Lufeng Leng, Giovanni Ossola. Integrated Magnet, Electron Beam, and Ultrafast Laser Studies for Accelerator Applications.

- 33** Tianyi Zhao, Viviana Vladutescu, Mikhail Polyanskiy, William Li, Vikas Teotia, Marcus Babzien, Dismas Choge, Mark Palmer, Tahsinur Rahman, Joseph Rukaj, Brandon Palencia, Jorge Chavez, Mithila Islam, Oscar Situ, Li Geng, Lufeng Leng, Giovanni Ossola. Comprehensive Design and Testing of Particle Accelerator Technology.

- 34** Brandon Palencia, V. Vladutescu, M. Polyanskiy, W. Li, V. Teotia, M. Babzien, D. Choge, M. Palmer, J. Chavez, M. Islam, J. Rukaj,

T. Rahman, T. Zhao, O. Situ, L. Geng, L. Leng, G. Ossola. An Integrated Study of Particle Accelerator Technologies: Magnet Fabrication, Electron Beam Dynamics, and Lasers Optics.

- 35** Tahsinur Rahman, Viviana Vladutescu, Mikhail Polyanskiy, William Li, Dismas Choge, Marcus Babzien, Vikas Teotia, Mark Palmer, Tianyi Zhao, Joseph Rukaj, Jorge Chavez, Mithila Islam, Oscar Situ, Brandon Palencia, Li Geng, Lufeng Leng, Giovanni Ossola. Studying Laser Damage Limits in High-Power Lasers and Accelerator Equipment.

LAW AND PARALEGAL STUDIES

- 36** Marissa J. Moran. Challenges Posed when Using Emerging Technologies in Law Practice.

MATHEMATICS

- 37** David M. Bradley and Johann Thiel. Polynomials that encode depth and node information for the binary trees created by QuickSort.

- 38** Hans Schoutens. Categories versus Model theory.

PHYSICS

- 39** Roman Ya. Kezerashvili. Can we observe the Yukawa correction to Newton's law of gravity using a solar sail?

- 40** Joseph Rukaj. Magnetic Spectrometry of Electron Beams for Ultrafast Electron Diffraction Applications.

- 41** Nafis Arafat, Oleg L. Berman, Godfrey Gumbs, and Peter B. Littlewood. Theory of Two-Component Superfluidity of Microcavity Polaritons.

- 42** Jeremiah Harrington, Oleg L. Berman, and Klaus G. Ziegler. Entanglement Entropy of a Monitored Quantum Walk of Cavity Photons Coupled to Qubits.

- 43** Gabriel P. Martins, Oleg L. Berman, Godfrey Gumbs, and Gabriele Grosso. Long-living Superfluidity of Dark Excitons in a Strip of Strained Transition Metal Dichalcogenide Double Layer.

- 44** Charlotte Olsen, Charlotte Welker, and Ena Chia. Finding the Earliest Quenching in Star-Forming Galaxies through Spatially Resolved Star Formation Histories.

- 45** A. Spiridonova, R. Ya. Kezerashvili, and K. Ziegler. Electric Field Tunable Magnetoexcitons in Xenon/hBN/TMDC, Xenon/hBN/BP, and Xenon/hBN/TMTC Heterostructures.

- 46** Klaus G. Ziegler, and Roman Ya. Kezerashvili. Controlling Quantum States with Macroscopic Currents.

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47 Subhendra Sarkar, Achlyn Genao, Jennifer Balbuena, Kathleen Thangaraj, Jaskaran Singh, Al Emran, Zeenia Ahmed, and Hailah Nagi. Developing a Workable Theory for MRI of Porous Materials from Experiments.

48 Subhendra Sarkar, Zoya Vinokur, Natalya Tomskikh, Jasper Chang, Kathleen Thangaraj, Daler Djuraev, and Ali Algemsh. Scatter, Scatter Everywhere: How to Focus X rays for Communicating Within Nanostructures.

49 Subhendra Sarkar, Evans Lespinasse, Kathleen Thangaraj, and Taro Suzuki. Mapping Trace Quantities of Iron in Biological Matrix: Standardization and Validation of MRI Maps with X-ray Maps.

SOCIAL SCIENCES

50 Amanda Lee Almond. The Transtheoretical Model of Behavior Change to Promote Anti-Racist Behaviors in Medical Settings.

51 Lisa Pope Fischer. Gender and Memory in Hungary: From the Siege of Budapest to the Present Day.

STUDENT RESEARCH UNDER FACULTY MENTORSHIP

ARCHITECTURE

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Kenneth Conzelmann.

52 Adama Bah, Girabell Bergollo, Noelia Lazo, Willeiris Guzman, and Kenneth Conzelmann. The Hunting Cabin: A Search for Regenerative Architecture.

53 Kevin Hernandez, and Kenneth Conzelmann. A Hunting Cabin: The Question of Regenerative Architecture Retrofit.

54 Andrew Aucanzhala, Javier Espinal, Kevin Hernandez, and Kenneth Conzelmann. The Off-Grid Solar Shed: From Schematics to Design Development and Construction Documents.

55 Andrew Aucanzhala, Kevin Hernandez, and Kenneth Conzelmann. The Solar Shed: Off the Grid, from off the Shelf.

56 Osaruyi Amadasun, Andrew Aucanzhala, Sara Fares, and Kevin Hernandez, Christopher Lopez, Kenneth Conzelmann. Mountain, City, Sea: Three Contexts for Building, Dwelling, Thinking.

57 Andrew Aucanzhala, Kevin Hernandez, and Kenneth Conzelmann. Urban Tech: A Deep(er) Energy Retrofit.

58 Isimamwen Imarhiagbe, Calvin Walters Jr., Cheriya Wilmot, and Kenneth Conzelmann. Country Tech: The Adaptive Reuse of a Former Theatre in the Catskill Mountains.

59 Felix Alvarado, Dahrel Cadore, Rokhaya Ndiaye, and Kenneth Conzelmann. Country Tech: The Re-Birthing of a Windswept Dairy Barn in The Catskill Mountains – Part 3.

60 Felix Alvarado, Dahrel Cadore, Rokhaya Ndiaye, and Kenneth Conzelmann. Country Tech: The Re-Birthing of a Windswept Dairy Barn in The Catskill Mountains - Part 2.

61 Dahrel Cadore, Rokhaya Ndiaye, Felix Alvarado, and Kenneth Conzelmann. Country Tech: The Rebirthing of a Windswept Dairy Barn in The Catskill Mountains - Part 1.

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Faculty mentors:
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62 Lucy Lin, Eva Rubano. Photoluminescence Response of Tungsten Diselenide.

63 Tonatiuh Fitzgerald, Sean Sinclair, Photoluminescence of Two-Dimensional Chalcogenides.

RADIOLOGIC TECHNOLOGY AND MEDICAL IMAGING

Faculty mentor:
Subhendra Sarkar

64 Ali Algemsh, Jaskaran Singh, Al Emran, Feldy Liriano, Hailah Nagi, Daler Djuraev, Natalya Tomskikh, Hanna Baghdadi, Jennifer Balbuena, Zeenia Ahmed, Taro Suzuki, Halima Alazeb. Distinguishing Quantum Mottle from Information-Bearing Fluctuations (“Quantum Communication”) in X-ray Imaging.

ONE-MINUTE FACULTY POSTER PRESENTATION

- 1** Lia Dikigoropoulou and Michael Ray Malonjao, in LAWN 2025: Collaborative Futures for Ukraine's Urban-Nature Landscapes.
- 2** Aseela Hassan, and Margaret Rafferty. Lyme Disease: Implications for Nursing.
- 3** Khrystyna Vyprynyuk and Isis Marsh. Documentation and Communication as Key Elements of Risk Management.
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- 12** David M. Bradley and Johann Thiel. Polynomials that Encode Depth and Node Information for the Binary Trees Created by QuickSort.

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ARCHITECTURE

1.

inLAWN 2025: Collaborative Futures for Ukraine's Urban-Nature Landscapes

Lia Dikigoropoulou and Michael Ray Malonjao/
Department of Architecture, NYC College of Technology, CUNY

The 7th International Landscape and Architecture Workshop (inLAWN) brought together students and faculty from seven universities across six countries to explore sustainable landscape strategies for the Holoiiiv region of Kyiv, Ukraine. Focusing on the theme of Green Recovery, the workshop addressed the role of landscape and urban design in post-conflict regeneration, biodiversity conservation, and public well-being. Teams developed proposals across three themes—Urban Connections, Exploring Landscape, and Educational Design—working collaboratively in Evinghausen, Germany. The workshop demonstrated how international and interdisciplinary dialogue can lead to innovative, culturally grounded strategies for ecological and social resilience. This poster presents the workshop methodology and outcomes.

BIOLOGY AND HEALTH SCIENCES

2.

Autoimmunity During Tropical Parasitic Diseases: Human Malaria and Canine Heartworm Diseases

Juan Rivera-Correa^{1,2}, Maria C. Velasco Pareja³, Maria F. Yasnot-Acosta³, Monica Delgado Hernández⁴, Víctor Montenegro⁴, Alicia Rojas⁵

¹ Biological Sciences Department, NYC College of Technology, CUNY

² CUNY Graduate Center

³ GIMBIC, Universidad de Córdoba, Montería, Córdoba, Colombia

⁴ Laboratorio de Parasitología, Escuela de Medicina Veterinaria, Universidad Nacional, Heredia, Costa Rica

⁵ Laboratorio de Helmintología, Faculty of Microbiology, Universidad de Costa Rica, San José, Costa Rica

Many infection-induced pathologies are due to inadequate immune responses, particularly autoimmune responses against the host's cells and tissues. Several infections lead to the production of autoantibodies that mediate pathologies such as anemia during malaria (one of the top global infectious killers). My previous studies characterized and correlated the presence of autoantibodies with malaria anemia in both mice and various cohorts of

malaria patients around the world. The mechanism by which autoantibodies are produced and the roles they play during malaria and other tropical parasitic infections are not well understood. My research program focuses on understanding the role of autoimmunity during infections such as human malaria, trypanosomiasis, canine dirofilariasis, and other infections. The findings of these studies could elucidate novel mechanisms involving the influence of infections in human and veterinary immune responses that could be applied to other important global infections and vaccinations with implications as biomarkers of disease.

3.

Dengue Fever: What Ambulatory Care Nurses Need to Know

Daniela Herrera de la Fuente and Margaret Rafferty/
Nursing Department, NYC College of Technology, CUNY

Cases of both travel related and locally acquired dengue fever surged in the United States in 2024. Nurses need to be prepared to care for increasing number of patients diagnosed with this vector-borne disease. Climate change is making conditions more favorable for the Aedes mosquitoes and the spread of the dengue virus that they carry. Warmer temperatures can increase mosquito development, increase biting rates, and make faster the time the virus needs to develop inside the mosquito. By higher rates of irregular rainfall, this creates incubated habitats and standing water in cities, making mosquito populations breed faster. The focus of this poster is the nursing care for patients with dengue fever highlighting preventive health teaching using available climate resilience toolkits.

4.

Lyme Disease: Implications for Nursing

Aseela Hassan and Margaret Rafferty/
Nursing Department, NYC College of Technology, CUNY

Lyme disease is the most common tick-borne illness in the United States. Its rising prevalence is linked to climate change. Warmer temperatures, shorter winters, and changing rainfall patterns allow ticks to survive longer, reproduce more, and expand into new regions. As exposure increases, the greatest risks fall on older adults, men, and people active outdoors during summer months, when cases peak. Without early recognition and treatment, Lyme disease can progress to serious long-term complications, including fatigue, joint pain, and neurological problems. Nurses are essential in addressing this growing challenge through prevention education, early detection, patient care, and advocacy for climate informed public health interventions. This poster will focus on treatment best practices including available climate resilience toolkits.

5.

Enhancing Psychiatric Nursing Education via Standardized Patients in Simulation

Tommy Li, Celeste Waddy, Emerson Ea/
Nursing Department, NYC College of Technology, CUNY

This pilot evaluated the effectiveness of standardized patients (SPs) in enhancing psychiatric interviewing skills among undergraduate nursing students at City Tech. In collaboration with the NYSIM Center, students

participated in a simulation featuring an SP portraying a decompensating patient with bipolar disorder and a history of suicide attempt. The scenario required comprehensive assessment of mood, psychosis, coping, substance use, suicide risk, and social supports. Following the simulation, 52 students completed the Simulation Effectiveness Tool-Modified (SET-M), which measures pre-briefing, learning, confidence, and debriefing. Results indicated strong student agreement that the simulation fostered preparation, learning, and self-assurance in conducting psychiatric assessments. Qualitative feedback highlighted the realism of the SP interaction, increased confidence, and appreciation for the paired interview structure. Several students recommended expanding simulation opportunities earlier in the semester. These findings suggest that integrating SPs into psychiatric nursing education strengthens communication skills and supports clinical preparedness.

6. Documentation and Communication as Key Elements of Risk Management

Khrystyna Vyprynyuk¹ and Isis Marsh²

¹NYC College of Technology, CUNY

²Hostos Community College, CUNY

There are multiple components of the overall healthcare risk management set of actions. They include clinical and administrative measures to identify, evaluate, and reduce the risk of injury to the healthcare staff and visitors, as well as the risk of loss to the organization. An increase in incidence of patient aggressive behavior highlights an emergent need for further research, increased awareness, and risk mitigation. The goals of this project included articulating a policy framework aimed at improving quality, fostering accountability, and identifying characteristics and factors to encourage continuous improvement in the quality of care.

7. Infection Control Across Clinical and Laboratory Dental Settings: Protocols, Risks, and the Role of Emerging Technologies

Khrystyna Vyprynyuk¹ and Laura Andreesku²

¹Department of Dental Hygiene, NYC College of Technology, CUNY

²Department of Restorative Dentistry, NYC College of Technology, CUNY

This research explores infection prevention strategies and disease transmission pathways in dental settings, emphasizing the critical connection between clinical practice and dental laboratories. It highlights the risks of cross-contamination, disinfection and sterilization challenges, and the growing role of technology in enhancing infection control.

8. Employer Perceptions and Adoption of Policies Related to Diverse Gender Identities in the Fashion Workforce

Alyssa Dana Adomaitis¹, Diana Saiki², and Malik Lee¹

¹NYC College of Technology, CUNY

²Ball State University

Policies that help guide employee behavior regarding diversity, including diverse genders, are important in creating a safe and productive work environment. Recent trends in the U.S. suggest companies are embracing such policies. Limited research has explored the adoption and the perceptions of employers of workplace policies related to gender diversity. Therefore, the purpose of this paper is to explore perceptions and the adoption of gender diversity policies among U.S. employers with management responsibilities in fashion companies. A qualitative method was employed by surveying 25 employers in the fashion industry, purposely sought out because they worked in an innovative industry (fashion) and lived in a large urban city (NYC). The results suggest that employers are empathetic towards individuals with diverse gender identities. However, policy adoption is limited and not specifically targeted at gender diversity. Further research can examine this barrier to adopting gender-specific policies in the workplace. In addition, the results can be utilized to develop strategies to educate employers and employees on methods to understand and adopt gender specific workplace policies.

9. Materiality and Meaning of Sufi Dervish Robes

Nazanin Hedayat Munroe/

Business Department / Business & Technology of Fashion,
NYC College of Technology, CUNY

From the earliest practice of mystical Islam (tasawwuf) dating to the ninth century CE, adherents to this alternate path of worship wore woollen robes, causing them to be known as Sufi (from the Arabic suf, wool). The earliest robes were called moraqq'a (lit. patchwork), signalling devotion to asceticism by donning a well-worn and patched robe, its wearer known as a "dervish." As Sufism was institutionalized in the medieval period, this outer garment was transformed into many types, developing the general name of khirqa (pl. khirqa) indicating affiliation for any member of a Sufi order. As lay membership grew, the Sufi robe became an outward symbol causing much disturbance within the devotees, who felt these "simulators" were adopting the outward elements of Sufism but not its essence. Why did the moraqq'a change over time, and how does it compare with other types of Sufi garments? How did earthly and celestial associations of material culture impact on the meaning and materials of this symbolic garment? Though few early examples survive, types of Sufi robes will be examined in primary sources, Persian and Orientalist painted depictions, and extant materials from the modern period that preserve and transform the traditional garment in Sufi circles active today.



L: Iranian Dervish Robe [Derwischmantel] (B180) Yazd, Iran. 19th c. patchwork (*moraqqa'a*), various materials. Ethnological Museums, Humboldt Forum, Berlin.
R: Vasily Vereshchagin. "Dervishes in Festive Outfits." Tashkent, 1869-70.

Nazanin Hedayat Munroe is Director of Textiles and Associate Professor in Business & Technology of Fashion at City Tech College, and Director of Interdisciplinary Programming for the Academy of Humanities and Sciences at CUNY Graduate Center. With a Ph.D. in Art History from University of Bern, Switzerland and M.F.A. from Cranbrook Academy of Art, Hedayat Munroe worked with the Islamic Art and Education Departments at The Metropolitan Museum as a researcher and artist educator from 2011 to 2016, has exhibited her work in museums across the country, and is an NEA-grant recipient. She is author of several publications, including *Sufi Lovers*, *Safavid Silks and Early Modern Identity* (AUP 2023), winner of the R.L. Shep Award for outstanding book in global textile studies by the Textile Society of America, and *Skilled Immigrants in the Textile and Fashion Industries* (Bloomsbury 2024), currently short-listed for Book of the Year by the Association of Dress Historians.

CHEMISTRY

10. Antioxidant and Anti-amyloidogenic Properties of Caffeic Acid and Resveratrol Derivatives

Alberto Martinez, and Joshua Simmonds-Raphael/
Department of Chemistry, NYC College of Technology, CUNY

Alzheimer's disease (AD) is the most common form of dementia that affects more than 6 million Americans and more than 40 million people around the world. The incidence is expected to rapidly increase due to aging population and the lack of any effective treatment. Polyphenols and phenolic acids have shown to possess anti-AD properties. Caffeic acid is an abundant phenolic acid widely distributed in plant tissues that occur in foods such as fruits, spices, vegetables, wine, olive oil, and coffee. Its antitumor, anti-inflammatory, and anti-AD properties have been described. Resveratrol, a natural polyphenol, reached Phase II clinical trials in patients with AD. In this work we report the antioxidant and anti-amyloidogenic properties of three caffeic acid derivatives, AM67, AM68 and AM70, and a resveratrol analog, AM60. Results reveal that all

compounds have a comparable or better antioxidant ability than that of controls. In addition, the new compounds behave comparably or better than parent compounds in inhibiting A β fibril and total aggregation. In conclusion, these compounds represent a promising strategy in the development of new anti-AD agents.

11. Ligand Design and Synthetic Strategies for Nanopatterning Bismuth Nanoparticles.

Vishwas Joshi^{1,2}

¹ NYC College of Technology, CUNY

² Anvesha Labs, Inc., New York

Metal nanoparticles (NPs, 10-1000 nm in dia.) and their nano-assemblies (NAs) have found applications in biomedical applications, including imaging, diagnosis, and therapy.

We designed ligand coatings with sulfur core to stabilize the bismuth NPs (BiNPs) and end functional groups that can be synthetically manipulated to produce either BiNPs or BiNP assemblies (BiNAs).

The average diameter of ligand stabilized BiNPs was 5.2 nm, while BiNAs were 30 to 65 nm long in which BiNPs (2.5 ± 0.57 nm dia.) are held at $1.77 \text{ nm} \pm 0.34 \text{ nm}$ (Bi-to-Bi distance) and $5.21 \pm 0.59 \text{ nm}$ away from each other with ligand layer between them.

We are evaluating them as X-ray contrast agents and for BiNP enhanced radiation therapy.

COMMUNICATION DESIGN

12. The Anatomy of a Question in Information Architecture and AI: Chatbots and Search

Noreen Y. Whysel¹, Shari Thurow², and Beverly Corwin²

¹ Department of Communication Design, NYC College of Technology, CUNY

² The Information Architecture Gateway

Artificial Intelligence (AI, or particularly GenAI) has problems with search. GenAI is not yet equipped to handle questions and answers, and it struggles with metaphor, which is what language is based on. We are treating artificial intelligence as if it were a human, but AIs do not have access to many nuances of meaning. We still need humans for that. In order for GenAI to do search well, it requires better search integrity, IA integrity and an understanding of the search context, including the physical and cognitive abilities of the human performing the search. We are not there yet. AI is not new, but GenAI interfaces are changing how we search. AI can be augmented with other technologies like Retrieval Augmented Generation and filtered locally. For what it still can't do, it requires human expertise to generate a useful answer.

13. An Advanced AI-Driven Database System

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Contemporary database systems, while effective, often face challenges with complexity and usability, particularly for non-technical users unfamiliar with query languages like SQL. This paper introduces a new AI-driven database system designed to improve data management through natural language processing (NLP)-based interfaces, automatic query generation, and support for semi-structured formats like YAML, JSON, and API documentation. By integrating Large Language Models (LLMs) and advanced machine learning algorithms, the system automates essential tasks such as data modeling, schema creation, query understanding, and performance optimization. The goal is to minimize the need for technical skills, reduce human error, and enhance database performance. The AI database system uses generative schema inference and format selection to continuously improve its operation across relational, NoSQL, graph, and vector databases. Reinforcement learning mechanisms are explored for ongoing system adaptation. This approach aims to revolutionize database usability and performance by combining cutting-edge AI technologies, offering a user-friendly, self-optimizing solution.

14. Breaking Down the Costs: Build a Small Language Model (SLM)

Marcos Pinto/Department of Computer Systems Technology,
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Current AI models use Large Language Model (LLM) which requires huge amount of electricity and computer power (GPU/CPU). It has become a way to minimize the costs and customize the results the use of a scaled-down version: a Small Language Model (SLM). SLMs are lightweight and focused models that can enable domain-specific, language-based applications like chatbots more efficiently.

15. Quantum-Enhanced Training of Large Language Models: A Hybrid Approach

Xiangdong Li/Department of Computer Systems Technology,
NYC College of Technology, CUNY

The training of large language models (LLMs) presents significant computational challenges, particularly regarding efficient convergence. This paper presents a hybrid quantum-classical framework designed to address the

significant computational challenges associated with training LLMs. By integrating quantum computing principles superposition, entanglement, and tunneling with classical deep learning methods, we propose an approach to accelerate convergence, enhance optimization efficiency, and improve model generalization.

Quantum feature mapping is employed to project classical data into high-dimensional Hilbert spaces, facilitating more expressive data representations. Quantum-assisted optimization algorithms, such as Quantum Approximate Optimization Algorithm and Variational Quantum Eigensolver, efficiently navigate non-convex loss landscapes, mitigating issues of local minima encountered by classical methods. Quantum-accelerated matrix operations, like the Harrow-Hassidim-Lloyd algorithm and Quantum Fourier Transform, offer computational speed-ups essential for LLMs training. Our theoretical framework and conceptual analyses demonstrate the feasibility and potential advantages of hybrid quantum-classical methodologies. This work lays a foundation for future research, aiming toward practical implementations as quantum hardware continues to mature.

16. Python-Based Honeypot with Artificial Intelligence Driven System Analysis

Stefano Pizzo, Cory Davis, Jonathan Lee, and Aparicio Carranza/
Computer Engineering Technology, NYC College of Technology, CUNY

We have developed and implemented a Python-Based honeypot system to monitor and analyze malicious activity in a controlled environment. A honeypot lures attacks to study threats, while Artificial Intelligence (AI) analyzes data to detect, classify, and predict attacks. Acting as a decoy system, it captured actions such as network scanning, brute-force login attempts, command execution, and malware delivery. The honeypot operated on a virtual machine, combining networking and logging capabilities to observe the attacker's behavior. Simulated attacks were used to evaluate their performance. The findings highlighted both the potential and the challenges of using honeypots to gain insights into attack methods and to strengthen proactive cybersecurity defenses.

17. Safe Home Network Implementation

Jacob Perez, Christal Jean-Soveral, Yusuf Smaili, Chengcheng An,
and Aparicio Carranza/
Computer Engineering Technology, NYC College of Technology, CUNY

We have implemented methods for enhancing cybersecurity in small-scale environments, such as securing router settings, configurations of basic firewall rules, addressing network vulnerabilities and threats, and the implementation of wireless encryption standards to protect connected devices. Our main focus has been on software-based configurations to provide protection without relying on the cost of third-party services. We demonstrate how the available methods help prevent common vulnerabilities, protect user data, and create a safer online environment for all users. We thoroughly explain the accessibility and cost-efficient security practices that allows anyone to enhance the protection of their home networks against everyday threats.

18.

Reliability Evaluation of Hardware Security Modules and Trusted Platform Modules in Cybersecurity

Johnny Liu, Ayrton Lagos, Kevin Reino, Milton Murray, and Aparicio Carranza/
Computer Engineering Technology, NYC College of Technology, CUNY

Nowadays, the security of a system can be software-based or hardware-based. We focus our attention on hardware-based security as hardware plays an important role in protecting sensitive data and encryption keys from attacks. We evaluate the reliability of Hardware Security Modules (HSMs) and Trusted Platform Modules (TPMs) to help us improve cybersecurity. HSMs, such as Thales Luna, Entrust nShield, and YubiHSM 2, are used by companies to secure important keys for banking, websites, and cloud services. TPMs are built into most modern computers and support AES, RSA, ECC, and SHA-256 to protect data and check system integrity. We demonstrate SoftHSM with OpenSSL for key protection and TPM-based disk encryption and secure boot to show how they work in real life. We report their benefits, challenges, and why hardware-based security is becoming more important.

19.

How Code Builds Cybersecurity

Jaheim Wilson, Raymond Kuang, Arvebryle Cedron, and Aparicio Carranza/
Computer Engineering Technology, NYC College of Technology, CUNY

We investigate the role of programming languages in cybersecurity, focusing on how Python, Go, and Bash can be leveraged. Making use of these programming languages our analysis covers three main areas: data protection, tools development for threat detection, and understanding their application in server vulnerability analysis to highlight security weaknesses. We also report the performance evaluation of each of these programming languages in terms of their execution speed and recommend their integration in a cybersecurity system solution.

20.

Methods to Stop Phishing Attacks with Artificial Intelligence

Chidi Agborennow, Jonathan Chan, Brandon Ramjeet, Raymond Spinelle, and Aparicio Carranza/
Computer Engineering Technology, NYC College of Technology, CUNY

Nowadays, Phishing Attacks have become very common and are one of the most common threats to cybersecurity. To countermeasure these attacks we have made use Artificial Intelligence (AI) to detect malicious links and block them automatically. Our Artificial Intelligence methods learn from a dataset obtained from PhishTank which contains thousands of malicious links that served to train our system on. The prototype concept has been developed using the Python Programming Language along with the AI on Python as well and the concepts of performance was tested and debugged for some abnormalities.

21.

Luring the Hacker: Python-Based Honeypot Services for Cyber Defense

Gregory Pimentel, Majida Naz, Nelie Louissant, and Aparicio Carranza/
Computer Engineering Technology, NYC College of Technology, CUNY

In most security fields there has always been a type of bait or trap – they are called honeypots.

The honeypots are usually critical parts of gathering information and are used as strong pieces of evidence in court cases by authorities. A honey service is the cybersecurity equivalent of a honeypot, mainly used to gather critical sensitive personal information. Whenever possible, assess hackers attack patterns, exploits, and other related information. We have developed and implemented in Python a secure back-end Application Programming Interface (API) and database, honeypot agents that mimic vulnerable systems, and a data analysis and visualization dashboard.

22.

Cloud-Integrated IoT Devices with Python to Enhance Smart Home Security Systems Against Intrusions

Clifton McFarlane, Jeremiah Hughes, Daniel Adekunasi, and Aparicio Carranza/
Computer Engineering Technology, NYC College of Technology, CUNY

As Smart homes become increasingly common, they also face increased risks of cyber and physical intrusions due to poorly secured Internet of Things (IoT) devices. We have developed and implemented a simplified Smart Home Security System (SHSS) with three components: A Python-programmed IoT motion sensor that generates activity events, A Cloud-connected back-end that ingests data applying Rule-Based anomaly detection, and stores events securely, and a lightweight Web Interface that display alerts and device status. Our prototype implementation emphasizes secure communication, encrypted storage, and resilience.

23.

Python-Driven Exploitation and Defense of IoT Devices

Cory Davis, Mohamed Kantako, Mohammed Imad, and Aparicio Carranza/
Computer Engineering Technology, NYC College of Technology, CUNY

The Internet of Things (IoT) has become a bigger part of everyday life, but many devices are built with little attention to security. Our effort is focused on the vulnerability analysis of IoT devices, how prone they are to attacks and whether simple defenses can make them safer. Using a Raspberry Pi and sensors, a prototype system has been built to act as an IoT device. A program written in Python has been used to carry out attacks such as packet sniffing, brute force login attempts, and replaying captured commands to expose weaknesses. After identifying the vulnerabilities, defensive measures such as encryption, authentication, and monitoring were added using Python-Based tools. Our emphasis has been on the threats posed by insecure IoT hardware while also showcasing the effectiveness of Python in developing and securing connected systems.

24.

Enhancing Security Testing with Intrusion Detection Systems

Marcelo Blas, Alexander Gordon, Micheal Chin, Chasman Miran, and Aparicio Carranza/
Computer Engineering Technology, NYC College of Technology, CUNY

As cyber threats become more sophisticated, businesses must implement robust security measures to safeguard their assets. We examine the deployment of three Intrusion Detection Systems (IDS): signature-based, anomaly-based, and hybrid IDS. Signature-based IDS detect known attack patterns, while anomaly-based IDS identify deviations from normal behavior, and hybrid IDS combine both approaches for enhanced detection. By integrating these IDS into our security framework, we improve real-time threat monitoring, unauthorized access detection, and incident response. This implementation strengthens overall cybersecurity resilience, allowing organizations to proactively prevent, detect, and mitigate security breaches.

25.

Authentication and Encryption in the Cloud: Dual Approach to Cybersecurity

Kevin Balbuena Montes, Stefano Guerrero, Ousmane Diop, and Aparicio Carranza/
Computer Engineering Technology, NYC College of Technology, CUNY

Cloud computing has revolutionized data management and storage by leveraging powerful centralized resources, enabling end-user devices to rely less on their own computational capabilities. However, this shift introduces challenges such as latency, reliability, privacy, and control. While distributed micro-data centers address latency and reliability, reliance on centralized entities raises risks like unauthorized access, data breaches, and surveillance. We explore a dual approach to cybersecurity in the cloud, emphasizing authentication mechanisms and encryption techniques as key tools for ensuring data protection. Multi-Factor Authentication (MFA) and bio-metric systems are examined for securing user access, while Symmetric and Asymmetric Encryption algorithms are analyzed for safeguarding data at rest and in transit. By addressing these challenges, the study shows the importance of trust in cloud services and focus on the need for robust security frameworks.

CONSTRUCTION MANAGEMENT AND CIVIL ENGINEERING

26.

Planning a Health Impact Assessment Framework for Major Events in New York City

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Department of Construction Management and Civil Engineering,
NYC College of Technology, CUNY

This research, conducted with the New York City Department of Health and Mental Hygiene (DOHMH), focuses on enhancing preparedness and response to major planned and unplanned events that may affect public health. Events such as large-scale gatherings like the upcoming FIFA World Cup, transportation disruptions, and political movements pose complex challenges before, during, and after they occur. To support proactive decision-making, this project aims to plan for the implementation of a Health Impact Assessment (HIA) framework that identifies potential health impacts, establishes monitoring metrics for at-risk populations, and recommends strategies for risk mitigation and equitable response. The work involves developing a comprehensive HIA methodology, identifying key data sources, consulting with agency experts, and applying the framework to two emergency scenarios. The final deliverable will provide actionable recommendations that integrate health equity principles into emergency preparedness and response, New York City College of Technology, CUNY

ELECTRICAL AND TELECOMMUNICATIONS ENGINEERING TECHNOLOGY

27.

Particle Accelerators at the Confluence of Magnets, Electron Beams, and Lasers

Oscar Situ¹, Viviana Vladutescu¹, Mikhail Polyanskiy², William Li², Vikas Teotia³, Marcus Babzien², Dismas Choge², Li Geng¹, Lufeng Leng¹, Giovanni Ossola¹, Mark Palmer², Tianyi Zhao¹, Tahsinur Rahman¹, Brandon Palencia¹, Joseph Rukaj¹, Jorge Chavez¹, Mithila Islam¹

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We are part of a team of collaborators from across the globe working with synchronous and asynchronous technologies to collaboratively explore and develop 'Peeragogy', a collection of practical techniques for collaborative learning and collaborative work. Use cases for these techniques include

peer learning and research co-production. Alongside our shared informal learning in the Peeragogy Project, several of us are employed as instructors in formal education settings. Here, we explore the interface between these two worlds. This paper shows how a graduate class was instructed to use Beautiful Soup for a final project in a web assisted course. We started with step-by-step installation instructions for both Windows and Unix systems, and quickly moved into practical applications. The focus was on retrieving data from major educational and economic websites, such as those of the World Bank. We used standard teaching methods to explain the tools and assignments. Students then worked together in groups, teaching each other in a more peeragogical manner. The results of these student collaborations will be described. In addition, we reflect briefly on other examples at the interface between peeragogy and formal teaching. Our conclusions point to the need for more work on refining techniques that can support peeragogy within traditional educational settings.

28. Smart Cities and Surveillance Technology: Balancing Innovation, Security, and Privacy in Urban Environments

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The integration of surveillance technology into smart cities is transforming urban living, enhancing security, traffic management, and emergency response systems. This research examines the role of artificial intelligence, facial recognition, IoT-connected sensors, and predictive analytics in modern surveillance infrastructures. While these technologies improve efficiency and public safety, they also raise ethical concerns regarding privacy, data security, and government oversight. The study explores how urban planners, policymakers, and technologists can design surveillance frameworks that align with democratic values, ensuring transparency and accountability. Additionally, the research investigates citizen perceptions, legal implications, and potential solutions to mitigate privacy risks while optimizing security measures. By analyzing global case studies, the study aims to provide insights into designing responsible surveillance systems that support smart city initiatives while preserving individual freedoms.

29. LIDT of Ultrafast High Power Lasers Components

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Optical technology is pushed to the upper limits of damage with the advent of ultrafast high-power (UFHP) lasers. UFHP are at the forefront of particle accelerators, being used in interaction with electron beams to produce high-gradient electron acceleration, generation of compact radiation sources like inverse Compton scattering and free electron lasers. The UFHP laser levels, repetition rates, and operating environmental conditions lower the damage threshold of the optical components of femtosecond lasers uttering them useless. In this regard, the present study provides the threshold levels for various optical components used in 800 nm and 9.2 um

femtosecond lasers. The components tested and analyzed are the main medium for the optical parametric amplification used at the input stage of the LWIR UFHP laser system at BNL Post-experiment analysis using laser scanning electron microscopy revealed detailed damage structure, providing insights into the material behavior under high-intensity laser exposure.

INTERDISCIPLINARY

30. Photoluminescence of Novel Hybrid Quantum-Dot / Indium Selenide Nanostructures for Optoelectronics

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Hybrid nanostructures combining zero-dimensional (0D) colloidal quantum dots (QDs) and two-dimensional (2D) transition metal dichalcogenides (TMDs) have become a key research focus because of their potential in optoelectronics and sensing technology. These structures leverage the strengths of both components: QDs provide excellent light absorption and emission with a tunable band gap, while 2D TMDs offer high carrier mobilities and strong charge transport properties. The main advantage is the improved light absorption and photodetection efficiency, thanks to efficient charge and nonradiative energy transfer mechanisms at the interface. This project presents a novel hybrid system integrating colloidal PbS QDs with 2D layers of Indium Selenide (InSe), a combination not previously explored. InSe is notable among TMDs because it transitions from a direct to an indirect band gap when reduced from two to one monolayer thickness, making its band gap broadly tunable. Additionally, InSe features high electron mobility, which boosts its potential for high-performance electronic devices. We begin by fabricating these hybrid structures using commercially available PbS QDs of different sizes combined with exfoliated p- and n-type InSe flakes. Next, we analyze their optical properties with steady-state micro-photoluminescence (PL) spectroscopy, examining how QD size and InSe type influence PL intensity and spectral position at room temperature. Finally, we investigate the underlying energy transfer and exciton dynamics within this hybrid nanostructure. The development of this new hybrid material system is expected to provide valuable insights into carrier and energy transfer processes in 0D-2D systems and holds great promise for applications in optoelectronic devices such as light-emitting diodes and photodetectors.

31.

Beam Manipulation via Superconducting Magnets for Ultrafast Electron Diffraction and Electron Beam-Ultrafast High Power Laser Interaction Experiments

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Particle accelerators drive advances in medicine, technology, and fundamental science. This study explores three core components of accelerator systems from superconducting magnets (SCM) to ultra-fast electron diffraction (UED), and to ultra-fast high-power (UFHP) lasers. At the Superconducting Magnet Division (SMD), dipole and quadrupole window magnets were designed using SIMULIA OPERA and RAT-GUI, with a canted-cosine theta (CCT) quadrupole coil directly wound using Nb-Ti wire and tested for field quality. These magnets align electron beams in the UED beamline, where General Particle Tracer (GPT) simulations modeled beam dynamics, including beam emittance and space charge effects, which are confirmed through solenoid and quadrupole scans. At the Accelerator Test Facility (ATF), 3DOptix software was used to design and optimize mirror geometries, beam paths, and focal spots. By combining superconducting magnet, ultrafast electron diffraction beam diagnostics, and laser and optical alignment, this work lays the foundation for accelerator science performance.

32.

Integrated Magnet, Electron Beam, and Ultrafast Laser Studies for Accelerator Applications

Jorge Chavez¹, Viviana Vladutescu¹, Mikhail Polyanskiy², William Li², Vikas Teotia², Marcus Babzien², Dismas Choge², Mark Palmer², Tianyi Zhao¹, Brandon Palencia¹, Joseph Rukaj¹, Tahsinur Rahman¹, Mithila Islam¹, Oscar Situ¹, Li Geng¹, Lufeng Leng¹, Giovanni Ossola¹

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This study provides an integrated overview of key accelerator technologies explored at Brookhaven National Laboratory: superconducting magnets, ultrafast electron diffraction, and ultrafast high-power lasers. At the Superconducting Magnets Division, dipole and quadrupole magnets were designed using Simulia OPERA and Rat-GUI, with simulations validated through 3D-printed coil testing. These magnets were later applied in the Ultrafast Electron Diffraction facility, where General Particle Tracer (GPT) simulations and real experiments with solenoids, dipoles, and quadrupoles revealed consistent particle beam behavior. At the Accelerator Test Facility, ultrafast lasers were used to generate and manipulate electron pulses. Laser setups were simulated in 3DOptix, then assembled and tested using instruments like oscilloscopes and beam profilers. Across all modules, experimental results closely aligned with simulations, confirming model accuracy.

33.

Comprehensive Design and Testing of Particle Accelerator Technology

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The Accelerator Science and Technology field integrates advanced magnet design, electron beam physics, and precision laser-optics systems to enable high-resolution experimental studies. At the Ultrafast Electron Diffraction (UED) facility at Brookhaven National Laboratory (BNL), femtosecond laser pulses generate electron bunches that are RF-accelerated and magnetically focused onto crystalline samples, producing diffraction patterns that capture atomic motion in real time. To enhance electron beam control in the accelerator, we designed and fabricated a superconducting quadrupole magnet using Nb-Ti conductor, chosen for its ductility, ease of cabling, and low mechanical strain during winding. This design, modeled with SIMULIA Opera and the RAT GUI, optimizes coil geometry to improve beam focusing and energy resolution. In addition, high-power ultrafast lasers are central to emerging accelerator schemes such as laser-wakefield acceleration (LWFA), where tightly focused, high-intensity pulses drive plasma waves capable of producing GeV-level electron beams over centimeter-scale distances. These same laser systems, when coupled with advanced optics, also enable precise beam shaping, timing synchronization, and pump-probe studies in a variety of ultrafast science applications, from condensed matter physics to high-field plasma research.

34.

An Integrated Study of Particle Accelerator Technologies: Magnet Fabrication, Electron Beam Dynamics, and Lasers Optics

Brandon Palencia¹, V. Vladutescu¹, M. Polyanskiy², W. Li², V. Teotia², M. Babzien², D. Choge², M. Palmer², J. Chavez¹, M. Islam¹, J. Rukaj¹, T. Rahman¹, T. Zhao¹, O. Situ¹, L. Geng¹, L. Leng¹, G. Ossola¹

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The research presented here focused on the core areas of particle accelerators. The superconducting magnet research, carried out in collaboration with the Superconducting Magnets Division at BNL, involved designing a Canted Cosine Theta magnet. The magnet was designed on RAT GUI and fabricated with direct wind technology. Additionally, OPERA, a finite-element analysis software, was utilized to simulate dipole and quadrupole magnets. The successful simulation and validation of these magnets provided insight into how advanced magnet technology is used to guide and focus charged particles within accelerator beamlines. Building upon this foundation, electron beam research involved measurements and simulations conducted at the Ultrafast Electron Diffraction facility at BNL. Techniques such as emittance measurements and spectrometry were essential for producing beams suitable for UED experiments. Results from General Particle Tracer simulations matched the measurements obtained from the e-beam, confirming the accuracy of both the modeling and the diagnostic methods.

35.

Studying Laser Damage Limits in High-Power Lasers and Accelerator Equipment

Tahsinur Rahman¹, Viviana Vladutescu¹, Mikhail Polyanskiy², William Li², Dismas Choge², Marcus Babzien², Vikas Teotia², Mark Palmer², Tianyi Zhao¹, Joseph Rukaj¹, Jorge Chavez¹, Mithila Islam¹, Oscar Situ¹, Brandon Palencia¹, Li Geng¹, Lufeng Leng¹, Giovanni Ossola¹

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In this study, we examine the particle accelerator setup and the impact that the different system components have on the overall performance of the accelerator. Some of the main elements of particle accelerators ultrafast high power lasers (UFHP), which are used for Laser Wakefield Acceleration, a future method for the acceleration of particles at lower distances. The development of UFHP lasers pushed the optical technologies to their limits, particularly in terms of managing material damage thresholds under extreme field conditions. In this regard, the present study provides the threshold levels for various optical components used in 800nm femtosecond lasers. The components tested, analyzed, and discussed here are fused silica wedges, beta barium borate crystals and Ti:Sapphire crystal. The Beta-Barium Borate crystals, is of particular interest as it is the main gain medium for the Optical Parametric Amplifier used at the input stage of the Long Wave-Infrared UFHP laser system at Brookhaven National Laboratory. Post-experiment analysis using optical and electron microscopy revealed detailed damage structure, providing insights into the material behavior under high-intensity laser exposure.

LAW, AND PARALEGAL STUDIES

36.

Challenges Posed When Using Emerging Technologies in Law Practice

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Legal practitioners and pro se litigants are exploring the use and innovative capabilities of emerging technologies, such as Generative Artificial Intelligence, to conduct legal research, create Victim Impact Statements, and present oral arguments. Courts must then navigate the resulting ethical, legal, and security challenges that may arise due to such use or misuse, and consider appropriate sanctions.

Noting the integrity of the legal system, in one of the first reported decisions regarding *AI Hallucinations*, District Judge, the Honorable P. Kevin Castel, Southern District of New York, stated, "An attempt to persuade a court or oppose an adversary by relying on fake opinions is an abuse of the adversary system."ⁱ Similarly, a Federal District Court

in the Southern District of Florida noted, "There is no room in our court system for the submission of fake, hallucinated case citations, facts, or law."ⁱⁱ The court further referenced it's, "inherent authority to sanction the misuse of AI when it affects the Court's docket, case disposition, and ruling."ⁱⁱⁱ

During a sentencing hearing, an Arizona state court judge permitted the use of an AI-Generated Victim Impact Statement of the deceased victim. In another matter, a pro se litigant attempted to use an AI Avatar of himself to argue his case before the NYS Supreme Court Appellate Division's First Judicial Department, New York City College of Technology, CUNY

ⁱ Mata v. Avianca, Inc. (S.D.N.Y. 2023) 678 F.Supp.3d 443, 461, see also Park v. Kim (2d Cir. 2024) 91 F.4th 610, 615 [quoting Mata].

ⁱⁱ Versant Funding LLC v. Teras Breakbulk Ocean Navigation Enterprises, LLC (S.D. Fla., May 20, 2025, No. 17-cv-81140) 2025 WL 1440351, at 7.

ⁱⁱⁱ Versant Funding LLC, 2025 WL 1440351, at 3.

ⁱ Harston, A. (2025, May 9). When the dead speak: AI and the future of victim impact statements. When the Dead Speak: AI and the Future of Victim Impact Statements. <https://dontlooksecurity.substack.com/p/when-the-dead-speak-ai-and-the-future>

ⁱ Neumeister, L. (2025a, April 6). An ai avatar tried to argue a case before a New York Court. the judges weren't having it. AP News. <https://apnews.com/article/artificial-intelligence-ai-courts-nyc-5c97c3a3f3757d9ab3c2e5840127f765>

MATHEMATICS

37.

Polynomials that Encode Depth and Node Information for the Binary Trees Created by QuickSort.

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We obtain a generating series whose coefficients are polynomials that, for a given positive integer n , encode the depth at which the various list entries appear as labeled nodes in the binary trees obtained by QuickSorting permutations of the list consisting of one copy of each of the first n non-negative integers. Extracting the appropriate coefficients yields information in the form of "node distribution polynomials" that encode the distribution of list entries that appear at different depths, and "depth distribution polynomials" that encode the distribution of depths at which a given list entry appears. These yield formulas for the number of times a given list entry appears at a given depth, the total number of list entries that appear at a given depth, and consequently the average number of list entries that appear at a given depth taken over all $n!$ permutations.

38.

Categories versus Model-Theory

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In mathematics, both category-theory and model-theory are viewed as foundational theories for the rest of mathematics. But the former concentrates on the interaction between mathematical structures while the latter investigates its details. However, I postulate that when combined, the model-theory of categories is sufficient to encompass all of category-theory and all of model-theory.

PHYSICS

39.

Can We Observe the Yukawa Correction to Newton's Law of Gravity Using a Solar Sail?

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Since Isaac Newton formulated the law of universal gravitation in 1687, physicists have proposed several modifications, including the Yukawa correction. In this work, we examine the combined effects of the Yukawa correction and solar radiation pressure (SRP) on the motion of a solar sail.

We investigate how the Yukawa correction impacts the trajectories of bound and escape solar sails. Deflections of these trajectories are compared with results from classical Newtonian gravity.

To test the hypothesis, we propose using a circular and a highly elongated elliptical orbit with a perihelion of 0.1 AU and an aphelion of about 50 AU. The spacecraft would reach this orbit using SRP along with Earth and Jupiter gravity assists. We compute the perihelion and aphelion shifts of solar sail orbits considering both the Yukawa correction to Newtonian gravity and SRP. Deviations from Newtonian trajectories are analyzed, allowing estimation of the Yukawa potential range parameter λ for cases where $\lambda > r$ and $\lambda < r$, with r being the Sun–sail distance. Careful analysis of solar sail ephemerides can provide a method for probing and testing Newton's law of gravity.

40.

Magnetic Spectrometry of Electron Beams for Ultrafast Electron Diffraction Applications

Joseph Rukaj/

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Electron beams are essential in applications ranging from particle accelerators and electron microscopes to medical treatments, where precise energy control is critical. This study employed a spectrometer that uses magnetic deflection to measure electron beam energy spread. To model spectrometer performance, General Particle Tracer (GPT) simulations were conducted, tracking beam deflections in magnetic fields. The deflected beams strike a scintillator, producing light captured by a CCD camera. Depending on the energy bandwidth, the electron bunch footprint appears as a point or a vertical or horizontal smear. Conventional and superconducting magnets were modeled using Simulia OPERA and Rat-GUI. A superconducting Canted-Cosine Theta (CCT) magnet was designed and fabricated, enabling high currents with minimal losses. This magnet will be integrated into the Ultrafast Electron Diffraction (UED) facility at Brookhaven National Laboratory to measure electron beam energy. A key component of UED is the 266 nm laser pulse that generates electrons at the photoinjector, highlighting the importance of lasers in next-generation accelerators such as Laser Wake Field Acceleration (LWFA) and Particle Acceleration by Stimulated Emission of Radiation (PASER). This project challenged students to bridge theory with practice, providing a foundation for transitioning from academic training to a professional research environment.

41.

Theory of Two-Component Superfluidity of Microcavity Polaritons

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We present a microscopic theory of superfluidity with the unusual occurrence of co-existing Bose–Einstein condensates of upper and lower polaritons in a microcavity [1]. Incorporating interbranch scattering in a modified Hamiltonian, we derive the collective excitation spectrum and show that both the sound velocity and the critical temperature of superfluidity are enhanced compared to a single-component polariton condensate. To describe the population balance between the two polariton branches, we introduce a condensate population–split parameter α . Changing α interpolates between one-component condensate limits and genuine coexistence of two condensates, providing a systematic way to track how superfluid properties evolve. Our analysis reveals how detuning, Rabi splitting, and polariton density tune these enhancements in GaAs/AlGaAs quantum wells and in transition-metal dichalcogenide monolayers. We demonstrate that the sound velocity and critical temperature T_c depend nontrivially on α , offering a phase-diagram-like view of the onset of two-component condensation.

[1] A. N. Arafat, O. L. Berman, G. Gumbs, and P. B. Littlewood, Theory of two-component superfluidity of microcavity polaritons, arXiv:2505.18491[cond-mat.quant-gas] (2025).

42.

Entanglement Entropy of a Monitored Quantum Walk of Cavity Photons Coupled to Qubits

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We discuss an approach to monitor the entanglement of cavity photons, which is based on a measurement protocol. To this end we consider a photonic cavity with either a single qubit (Jaynes-Cummings model) or two qubits inside. The entanglement of the cavity photons is caused by their interaction with these qubits and controlled by repeated projective measurements. We study the photon entanglement by calculating the Rényi entanglement entropy.

43.

Long-living Superfluidity of Dark Excitons in a Strip of Strained Transition Metal Dichalcogenide Double Layer

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⁴ ASRC, CUNY

We investigate the emergence of long-living superfluidity of dipolar dark excitons in a one-dimensional (1D) strip of strained double-layer transition metal dichalcogenide (TMDC) heterostructures [1]. Applying arc-shaped strain to MoS₂ layers separated by hexagonal boron nitride (h-BN) induces a momentum-space mismatch between the conduction and valence band extrema, leading to the formation of dark excitons—excitons that cannot recombine via photon emission alone. This results in significantly extended exciton lifetimes.

We treat excitons in this system as a quasi-1D weakly interacting Bose gas and obtain their binding energies, effective masses, and collective excitation spectra. We show that these excitons form a superfluid phase characterized by a sound-like dispersion, with the critical temperature increasing with both exciton concentration and interlayer separation. Notably, two counterpropagating superfluid flows appear at the strip's edges due to a doubly degenerate ground state.

[1] G. P. Martins, O. L. Berman, G. Gumbs, and G. Grosso, Long-living superfluidity of dark excitons in a strip of strained transition metal dichalcogenide double layer, *Phys. Rev. B* 112, 075429 (2025).

44.

Finding the Earliest Quenching in Star-Forming Galaxies through Spatially Resolved Star Formation Histories

Charlotte Olsen, Charlotte Welker, Ena Chia/
Physics Department, NYC College of Technology, CUNY

Star formation is an important physical observable that traces the complex processes involved in galaxy evolution. The inflows and outflows of gas that drive star formation and quenching as well as the timescales upon which they act are still not well understood. We use nine star-forming galaxies from the UVCANDELS survey where a total of 10 HST bands

including UV follow up in F275W allow for us to reconstruct the star formation histories (SFHs) of multiple regions across each galaxy. The spatial information from regions within the galaxies along with temporal information of stellar mass and star formation rate over time as obtained from the SFHs of regions within the galaxies. We reproduce scaling relations and radial profiles of regions within each galaxy at the time of observation and 1 Gyr lookback time noting possible trends in the evolution. By comparing the change in star formation over time we can begin to infer the timing and location of bursts of star formation and begin to see early signs of star formation shut off before the galaxy is quenched.

45.

Electric Field Tunable Magnetoexcitons in Xenes/hBN/TMDC, Xenes/hBN/BP, and Xenes/hBN/TMTC Heterostructures

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² The Graduate School and University Center, CUNY

³ Universität Augsburg, Germany

We propose novel van der Waals (vdW) heterostructures composed of Xenes, transition metal dichalcogenides (TMDCs), phosphorene, and transition metal trichalcogenides (TMTCs) separated by insulating hexagonal boron nitride (hBN) layers. The behavior of Rydberg indirect excitons is theoretically investigated in Xenes/hBN/TMDC, Xenes/hBN/BP, and Xenes/hBN/TMTC heterostructures with perpendicular to the system parallel electric and magnetic fields providing a comprehensive framework for controlling excitonic phenomena in low-dimensional materials. The results demonstrate that binding energy, the diamagnetic energy contributions, and coefficients can be controlled by the electric field strength and by dielectric screening from hBN layers.

46.

Controlling Quantum States with Macroscopic Currents

Klaus G. Ziegler^{1,2} and Roman Ya. Kezerashvili^{2,3}

¹ Universität Augsburg, Germany

² NYC College of Technology, CUNY

³ The Graduate School and University Center, CUNY

The Josephson effect in superconductors is accompanied by the creation of quantum states. These states couple to the macroscopic superconducting order parameter, leading to the Bogoliubov de Gennes equation as an effective description of these states. Since the properties of the order parameter can be controlled by external fields, this intimate connection of classical and quantum effects offers a direct access to the quantum states, allowing us to manipulate the latter through a number different means. Here we discuss how chiral quantum states, characterized by a topological invariant, are created in superconducting double layers and controlled by loop currents. The “analytic bulk-edge connection” is employed to determine the edge modes on a torus [1] and for a circular geometry [2].

[1] K. Ziegler, A. Sinner and Yu. E. Lozovik, Anomalous Josephson effect of s-wave pairing states in chiral double layers, *Phys. Rev. Lett.* 128, 157001 (2022).

[2] K. Ziegler and R. Ya. Kezerashvili, Edge modes in chiral electron double layers, *Phys. Rev. B* 111, L140507 (2025).

47.

Developing a Workable Theory for MRI of Porous Materials from Experiments

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MRI of porous media has been both rewarding and challenging. There are applications in geoscience and petrochemical engineering for porous composite structures but application to biological porous media has been quite ignored. As biomedical imaging struggles with understanding the behavior of heterogeneous tissues, for example, complex hippocampus or undifferentiated tumor architectures, we feel we can build ad hoc models that explain MR images of porous composites from experiments where either bulk or surface behaviors of porous materials dominate, but not both. The basis of our experiments are MR active probes that populate either bulk or surfaces and thus distinctly demonstrate bulk or surface MR characteristics.

48.

Scatter, Scatter Everywhere: How to Focus X rays for Communicating Within Nanostructures

Subhendra Sarkar^{1,2}, Zoya Vinokur¹, Natalya Tomskikh¹, Jasper Chang¹, Kathleen Thangaraj², Daler Djuraev³, and Ali Algemsh⁴

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Scattered x-ray radiation has been a challenge and a nuisance to keep out of patient's body and quality imaging x-ray technology. Recently there are enthusiasm and efforts to deliberately use scattered radiation to bring out information from nano structures. However, there is no comprehensive theory underlying the secondary generation of x-ray scattered radiation. We are developing plausible theoretical models based on experiments that manifest patterns of secondary emissions in biological and industrial materials. Our goal is to make use of the weak and broad energy content of such radiation to image previously transparent, thin composites as well as light weight trace metals from transition element groups in periodic table that have very interesting electronic properties.

49.

Mapping Trace Quantities of Iron in Biological Matrix: Standardization and Validation of MRI maps with X-ray Maps.

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³ Department of Chemistry, NYC College of Technology, CUNY

Various studies on brain iron have suggested some links between brain volumes and iron content. There also exist studies that show gender, race, age and region dependent variation of brain iron.

While these studies have merits, they also add confusion and inconsistency. We hypothesize that magnetic screening to count iron is wrong since the count can change depending on orientation or shape or proximity of the iron particle. Hence we propose to use molecular or nano probes that can indirectly map iron distribution using photon flux and avoid magnetic measurements.

50.

The Transtheoretical Model of Behavior Change to Promote Anti-Racist Behaviors in Medical Settings

Amanda Lee Almond/
Social Science Department, NYC College of Technology, CUNY

This paper proposes the application of the transtheoretical model, a stage-matched process for effecting change, to better encourage anti-racist behaviors and methods among health care professionals in medical settings. Despite widespread organizational implementation of diversity, equity and inclusion (DEI) initiatives, which are aimed at reducing racial health and healthcare inequities across the United States, the absence of a theoretical framework for change has made it all but impossible to standardize meaningful anti-racist practices – a point of particular concern as President Donald Trump's administration rolls back DEI efforts and requirements alike. Translational and clinical sciences aim for a gold standard of diversity, equity and inclusion amidst the dual threats of recent policy changes and ongoing complications born of capitalism, but the lack of a clinical and evaluative model for implementation – and lasting change – persists. Diversity science must account for, and solve for, individual differences in readiness to engage in anti-racist behaviors among medical professionals. The transtheoretical model of behavior change is an analytical framework for clinical applications that can facilitate change – even transformation – among individuals working in medical organizations.

Accepted for Publication in Springer Nature's journal, "Current Psychology"

51.

Gender and Memory in Hungary: From the Siege of Budapest to the Present Day

Lisa Pope Fischer/

Social Science Department, NYC College of Technology, CUNY

This cultural anthropology book, published by Bloomsbury Academic, uses life history interviews with elderly Hungarian women to explore key historical moments: World War II, the Rákosi era, the Kádár era, post-communism, and goulash populism. Each chapter centers on a single life story, supplemented by others to show how their experiences overlap, forming a chorus of shared histories and highlighting the complexities of unofficial narratives. In April 2022, Hungary's far-right populist Fidesz party secured a fourth consecutive term and retained a two-thirds majority in Parliament. While some celebrate strict immigration policies and a Christian society, others fear an all-powerful leader who can control the media, change the constitution, and incite racism. By emphasizing my informants' voices, I aim to demonstrate how the past influences current society and, using an anthropological approach, provide insights into goulash populist movements.

STUDENT RESEARCH UNDER FACULTY MENTORSHIP

ARCHITECTURE

52.

The Hunting Cabin: A Search for Regenerative Architecture

Student Researchers:

Adama Bah, Girabell Bergollo, Noelia Lazo, Willeiris Guzman
CSTEP Summer 2025 / Department of Architecture / City Tech / CUNY

Faculty Mentor: Prof. Kenneth Conzelmann, Architect

Design Consultants: Prof. Patricia Semmler, Chris Leung, CPHC, LEED

Regenerative Architecture (R.A.) is a design philosophy that aims to regenerate the environment and reconnect people with nature. Unlike conventional sustainability, which minimizes harm, R.A. fosters architectural design as living organisms that support ecosystems and communities. Key concepts include enhancing human/nature relationships, creating positive environmental impacts, and optimizing building lifecycles. To explore R.A., we developed a design program for two small wood-based camping cabins in the Catskill Mountains of New York. These cabins will utilize local material such as raw-cut lumber, bluestone, field stones, straw, wool, straw and beeswax—sourced on site or within

a 10-mile radius. The “cliff cabin” is perched on a steep bank along a stone creek, while the “tree cabin” is set in the woods on a natural knoll. Both cabins are off-grid and will share a solar-powered community shed for cooking and cleaning. They encourage interactions with nature through activities like forest bathing, stargazing, and gardening, fostering a deeper connection to the environment.

53.

A Hunting Cabin: The Question of Regenerative Architecture Retrofit

Student Researcher: Kevin Hernandez

CIRE Summer 2025 / Department of Architecture / City Tech / CUNY

Faculty Mentor: Prof. Kenneth Conzelmann, Architect

Design Consultant: Chris Leung, CPHC, LEED

Climate disruption, a.k.a. climate change, primarily results from pollution caused by human activities since the Industrial Revolution, impacting animals, plants, and ecosystems. In response, sustainable design emerged to mitigate environmental harm from buildings. However, it proved insufficient, leading to Regenerative Architecture philosophy aimed at restoring and actually enhancing the environment. This research project evaluates a 1960 hunting cabin in New York's Catskill Mountains for retrofitting with regenerative principles or maintaining its current state. Additionally, a new two-story addition will be designed with full regenerative concepts. The cabin will also be part of a larger vision for a camping community featuring student-built cabins and a solar-powered common area for meetings, cleaning and cooking. Implementing regenerative practices can help lessen climate change effects, promoting sustainability for communities and ecosystems. This study is part of CIRE's three-phase research program conducted from fall 2024 to summer 2025, involving collaboration among students from other research programs.

54.

The Off-Grid Solar Shed: From Schematics to Design Development and Construction Documents

Student Researchers: Andrew Aucanzhala, Javier Espinal, Kevin Hernandez
CIRE ESP Spring 2025 / Department of Architecture / City Tech / CUNY

Faculty Mentor: Prof. Kenneth Conzelmann, Architect

This research advances the Solar Shed project, a case study of an energy self-sufficient off-grid structure built atop a repurposed concrete pool. The project will utilize passive solar principles and renewable energy sources (wind, solar, geothermal, and hydro), incorporating technologies like turbines, photovoltaic panels, and battery storage to demonstrate the potential of a locally powered world. In the previous semester, we focused on Schematic Design, exploring initial concepts and establishing project foundations. In this semester, we will concentrate on Design Development, refining aspects such as spatial layout, sections, elevations, materials, and systems. Building on prior knowledge from online resources, we will also consult numerous books for further inspiration. The final stage involves preparing technical and construction documentation for construction permits. Completing this process will bring our proposal closer to reality, ensuring it meets aesthetic and functional principles while promoting a sustainable lifestyle integrated with the environment.

55.

The Solar Shed: Off the Grid, from off the Shelf

Student Researchers: Andrew Aucanzhala, Kevin Hernandez
CIRE and ESP Fall 2024

Faculty Mentor: Prof. Kenneth Conzelmann, Architect

Today's off-grid structures are, in a sense, a return to pre-industrial practices i.e., living off the land, locally. Yet contemporary off-grid methods are fully informed by techniques, inventions, and breakthroughs brought about by thousands of years of human curiosity, creativity, and discovery, and their insatiable search for knowledge, advancement, and improved standards of living. This research project will trace the timeline featuring pivotal human technological breakthroughs from the times of prehistoric cave dwellings to the beginning of agricultural settlements, to ancient civilizations, to the Renaissance, the industrial revolutions, and the communication, information space age. Using the Solar Shed as a real-world case study, we will explore and learn from the multitude of natural resources (e.g., wind, solar, hydro, etc.) and man-made innovations (e.g., turbines, photo-voltaic panels, generators, etc.) to propose a solution and opportunity to consider what it can mean to be truly off-grid, living off the land, locally.

56.

Mountain, City, Sea: Three Contexts for Building, Dwelling, Thinking

Student Researchers: Osaruyi Amadasun, Andrew Aucanzhala, Sara Fares,
Kevin Hernandez, Christopher Lopez
CSTEP Summer 2024

Faculty Mentor: Prof. Kenneth Conzelmann, Architect

Inspired by Martin Heidegger (1889-1976), a German philosopher, our research views building as beyond shelter, it is a means of engaging in cultural discourse. While generic glass box buildings dominate global cities due to the International Style movement, many regions still retain local construction traditions. This project explores site-specific design within the philosophical framework of how and why we build, dwell, and think. We focus on three distinct locations: the Mountain (rural/woodlands), the City (urban/built), and the Sea (suburban/tropical). Each site involves designing or modifying a dwelling: the Cliff House for off-grid living in mountainous terrain, the City House as a progressive addition to an historic rowhouse, and the Sea House addressing coastal severe weather. Using GIS and climate data, we analyzed each site, including topography and historical building standards. Each project presents unique challenges and opportunities to explore the interplay between context, design, and architecture's response to its environment.

57.

Urban Tech: A Deep(er) Energy Retrofit

Student Researchers: Andrew Aucanzhala, Kevin Hernandez
ESP Spring 2024

Faculty Mentor: Prof. Kenneth Conzelmann, Architect

Building upon the ESP Research from Fall 2023, this research delves deeper into the impact of buildings on greenhouse gas emissions. According to the Federal EPA, U.S. buildings produce about 40% of all greenhouse gases, including CO₂ from fossil fuel combustion and methane from livestock and landfills. In New York City, buildings account for roughly two-thirds of these emissions. To

combat this, NYC's Local Law 97 aims for carbon neutrality by 2050, targeting the elimination of fossil fuels in building operations. Most NYC buildings are energy inefficient, particularly those built post-WW2, like our case study, a 17-story residential structure built in 1962. Our research will develop a master plan for significant upgrades to meet and exceed current energy efficiency standards. We will further explore technologies such as thin-film photovoltaic systems and ground-source heating. Ultimately, we aim to create a template for retrofitting similar buildings, contributing to a fully electric city future.

58.

Country Tech: The Adaptive Reuse of a Former Theatre in the Catskill Mountains

Student Researchers: Isimamwen Imariagbe, Calvin Walters Jr.,
Cheriyah Wilmot NOMAS
CSTEP Summer 2023 / Department of Architectural Technology, City Tech / CUNY

Faculty Mentor: Prof. Kenneth Conzelmann, Architect

This research focuses on the adaptive reuse of an early 20th-century social hall theatre in Shandaken town in the Catskills, which has served various purposes, including a former furniture manufacturing turned theater, social hall, and artist studios. The project involves upcycling existing structures for contemporary functions. The proposal aims to restore it as a social hall and performance space with year-round events such as art exhibits, conferences, and a place to foster the City Tech community. We conducted a site analysis covering environmental conditions, history, and circulation, alongside on-site surveys with sketches and photography. The proposal retains the building's configuration while overhauling the shell for improved energy efficiency. The dropped ceiling will be removed to reveal grand timber trusses, creating a vaulted ceiling. Additionally, simple wood frame cabins will serve as a forest retreat, complemented by solar panels, geothermal wells, and a communal outdoor garden to anchor the historic Square.

59.

Country Tech: The Re-Birthing of a Windswept Dairy Barn in The Catskill Mountains – Part 3

Student Researchers: Felix Alvarado, Dahrel Cadore, Rokhaya Ndiaye
ESP Spring 2023 / Department of Architectural Technology, City Tech / CUNY

Faculty Mentor: Prof. Kenneth Conzelmann, Architect

This is the final phase of a yearlong research project on a ca. 1911 dairy barn in the Catskill Mountains. The first phase showcased the barn's history and demise, featuring a Skywalk as a visionary design feature. The second phase aimed to preserve the barn's remains as a living memorial alongside a new Environmental Study Center. This current phase introduces the Communal House, designed using passive house principles and sustainable practices. This off-grid retreat will foster connections with nature and people. The barn, located on a 20-acre parcel purchased by its owners in 2020, faced challenges when a windstorm destabilized it in 2022. Our team engaged with the landscape through documentation and advanced digital methods to create innovative design concepts. The proposal preserves the barn ruins and integrates renewable energy strategies. The team envisions an interactive learning experience for visitors while serving as a gathering place for family and friends.

60.

Country Tech: The Re-Birthing of a Windswept Dairy Barn in The Catskill Mountains - Part 2

Student Researchers: Felix Alvarado, Dahrel Cadore, Rokhaya Ndiaye
ESP Fall 2022 / Department of Architectural Technology, City Tech / CUNY

Faculty Mentor: Prof. Kenneth Conzelmann, Architect

This project represents the birth, abandonment, destruction, and rebirth of a ca. 1911 dairy barn in the Catskill Mountains. Purchased in 2020, the owners began restoring it until its obliteration by a windstorm in 2022. The goal is to repurpose the barn's remains into a New Environmental Study Center managed by City Tech students and faculty and to educate and inspire the community. The center will incorporate renewable energy strategies and sustainable agricultural practices while preserving the barn's ruins as a historical site. The team documented the barn's condition and identified the life cycle as part of the CSTEP research program conducted in June 2022. Proposed elements include an elevator for visitors to enjoy views and an earthen tunnel for a unique experience, natural heating and cooling, solar panels, and wind turbines. The Emerging Scholars Program continues to explore and refine these ideas, aiming to transform the site into an inspiring educational hub for CUNY.

61.

Country Tech: The Rebirthing of a Windswept Dairy Barn in The Catskill Mountains - Part 1

Student Researchers: Dahrel Cadore, Rokhaya Ndiaye, Felix Alvarado
CSTEP June 2022 / Department of Architectural Technology, City Tech / CUNY

Faculty Mentor: Prof. Kenneth Conzelmann, Architect

This project is the first phase on the journey of a ca. 1911 dairy barn in the Catskill Mountains, located on a 0-acre parcel acquired by its current owners in 2020. The owners began restoring the barn for future use, but a windstorm in late winter 2022 used it to tilt dangerously and become unoccupiable. The goal is to repurpose the barn's remains into an environmental study center to educate and inspire the community through advanced agricultural practices and renewable energy strategies. By examining the barn's lifecycle and causes of collapse, we aim to address future challenges. This off-grid center will preserve the barn's ruins as a historical site. Our team documented the location using traditional methods and advanced 3D modeling technologies to explore design iterations. We look forward to continuing our research in the next phase, uncovering more discoveries and innovative designs!

PHYSICS

62.

Photoluminescence Response of Tungsten Diselenide

Student Researchers:

Lucy Lin and Eva Rubano

Physics Department, NYC College of Technology, CUNY

Faculty Mentors: Prof. Vitaliy Dorogan, Prof. Lufeng Leng, and Prof. German Kolmakov

The optical properties of the 2D material, tungsten diselenide (WSe₂), was studied using photoluminescence. Studying the photoluminescence response of 2D materials will help with the research of transmission of information through quantum networks. 2D materials are extremely thin, usually one or two atoms thick. To prepare the sample, WSe₂ is exfoliated into monolayers using polydimethylsiloxane, which is placed onto a glass slide. Using a transfer stage, the monolayer is moved from the glass slide onto a silicon substrate. Then, spectra was taken of the sample at different intensities of light. From the data collected from spectra, the max peak, area under the curve, and full width at half maximum (FWHM) was calculated. The results showed that WSe₂ consistently exhibited a PL peak at around 750 nm, with a FWHM of about 20 across all spectra.

63.

Testing Photoluminescence of Two-Dimensional Chalcogenides

Student Researchers:

Tonatiuh Fitzgerald and Sean Sinclair

Physics Department, NYC College of Technology, CUNY

Faculty Mentors: Prof. Vitaliy Dorogan, Prof. Lufeng Leng, and Prof. German Kolmakov

This research investigates the Photoluminescent properties of 2D materials. Photoluminescence occurs when a molecule absorbs a photon, exciting an electron to create an exciton, then radiates a photon as the electron returns to a lower energy state.

To create 2D materials from WSe₂ (Tungsten Diselenide) and InSe (Indium Selenide), exfoliation is used: samples are applied to sticky PDMS (Polydimethylsiloxane), then the strip is opened and closed repeatedly to create mono/bi/multi layers. WSe₂ provides the highest photoluminescence as a monolayer with some bilayer emission, while InSe shows a direct correlation between the number of layers and the photoluminescence signal.

Potentially photoluminescent flakes are transferred to glass slides for observation. The transfer stage is preheated to 40°C, the sample is aligned and angled so the desired flake contacts the silicon substrate, then heated to 70°C. After confirming successful transfer, samples undergo photoluminescence testing on a spectrometer setup, emitting peaks at 750 nm for WSe₂ and 1000 nm for InSe.

64. Distinguishing Quantum Mottle from Information-Bearing Fluctuations ("Quantum Communication") in X-ray Imaging

Faculty mentor: Prof. Subhendra Sarkar

Ali Algemsh ¹, Jaskaran Singh ¹, Al Emran ¹, Feldy Liriano ¹, Hailah Nagi ²,
Daler Djuraev ³, Natalya Tomskikh ², Hanna Baghdadi ², Jennifer Balbuena ²,
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¹ Department of Chemistry, NYC College of Technology, CUNY

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³ Department of Biology, NYC College of Technology, CUNY

Conventional imaging practice interprets all image "noise" as negative relative to diagnostic quality. For example, X-Ray quantum mottle Poisson fluctuations arising from the statistical nature of photon detection are presumed to predominate at low dose. However, not all informationally noisy pixels arise from a quantum nature: in ultrasound, considerable grain occurs from digitization/quantization and system electronics far more than photon detection statistics. Thus, we pose whether fluctuations at low doses purely constitute unpatterned quantum mottle or whether a percentage carries reproducible, material-based information. We present a two-tiered distinction for operational potential (i) for a random, exposure-dependent increase/decrease in patterned mottle versus (ii) for an information-bearing aspect of "quantum communication" stemming from substantial, systematic compositions where composition and electron shells imprint spatial/temporal correlations from scattering/secondary photon excitation, which determines what is/what isn't detected once observed. To validate this challenge, we will image photon-starved images of phantoms with lanthanide-cation nanoparticles and simultaneously control phantoms of salts dominated by large anions and matched controls. Expected data include photon-transfer/Fano statistics to assess Poisson behavior, noise-power spectra and spatial autocorrelation to demonstrate random structure and frame-to-frame cross-correlation against phase-randomized controls to highlight reproducibly detectable information. Regions with more lanthanide occurrence (high-Z, characteristic shells) will be compared against the large-anion preparations with the same entrance dose to determine the extent at which fluctuations beyond mottle occur and whether features can be drawn from scatter. Our goal is to clarify the extent to which "noise" can harbor informative signals within the field of x-ray imaging for ultra-low-dose improvements and nanoparticle-enabled contrasts without assuming a positive finding.

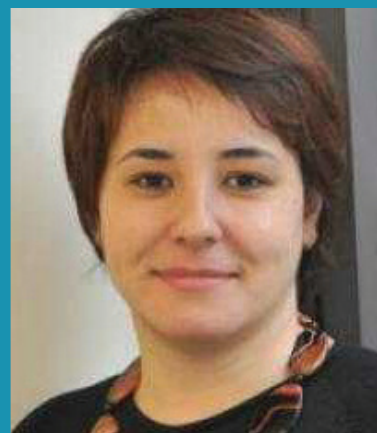
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Roman Kezerashvili
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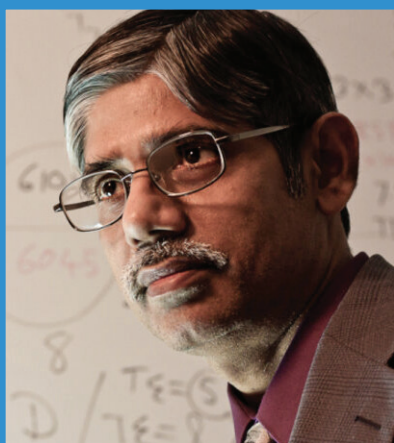
Calvin Grace



Alberto Martinez



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Subhendra Sarkar



Viviana Vladutescu



Mai Zahran

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