



CBE Schoenborn Research Symposium

**October 17-18, 2024
NC State McKimmon Center**

**Judged Competitions of
Student Research**

**NC STATE
UNIVERSITY**

**Chemical and
Biomolecular Engineering**

CBE Schoenborn Research Symposium

Thursday, October 17, 2024

Poster Session I

2nd and 3rd Year Graduate Students and
Undergraduate Researchers

4:30 – 6:00 PM

Welcome Dinner

6:00 – 8:00 PM

Friday, October 18, 2024

Coffee Mixer

9:30 – 10:15 AM

Welcome

10:15 – 10:20 AM

Keynote Speaker:

Dr. Elaine Cohen Hubal, US EPA

10:20 – 11:20 AM

Three-Minute Thesis Competition Session I

11:20 – 12:00 PM

Lunch

Linde Exceptional TA Award

12:00 – 1:15 PM

Three-Minute Thesis Competition Session II

1:15 – 2:00 PM

Young Alumni Panel: Starting Your Career

2:00 – 3:15 PM

Poster Session II

4th and 5th Year Ph.D. Students and
Postdoctoral Researchers

3:15 – 4:45 PM

Closing and Winner Announcement

4:45 – 5:00 PM

Poster Session I

2nd and 3rd Year Graduate Students and Undergraduate Researchers

Biotechnology

Mohammad Shafayet Ali (B2)	Decoding the Intracellular Dynamics of Haptotactic Gradient Sensing and Response
John Cheadle (B1)	Elucidating Plant Root Colonization Factors Using Synthetic Biology Approaches
Kaleb Decker (B4)	RAFT Structures for Sgrna Delivery in <i>C. Elegans</i> for Gene Editing
Jose Escarce (B5)	Exploding Yeast
Qiaochu Li (B7)	Developing Engineering Tools to Understand P-Trap Colonization by <i>Enterobacter Ludwigii</i>
Crystal Magezi Ndamira (B6)	Polyimines for Delivery of DNA/RNA into Cells
Arianna Minzoni (B8)	Gene Therapy Adeno-Associated Viral Vectors Isolation and Enrichment
William Parker (B3)	Increasing the Secretory Capabilities of <i>Saccharomyces Boulardii</i> for Probiotic Applications
Aryan Razdan (B9)	Improving the Colonization Properties of <i>Saccharomyces Boulardii</i> via Mucus Glycan Metabolism

Catalysis and Kinetics

Micah Dickens (C&K 1)	Synthesizing Oxide Free Liquid Metal Nanoparticles
Casey Killmer (C&K 2)	Revealing Reaction Mechanism of Redox Activated CO ₂ Sorbents with In-Situ XRD and DFT
Tim Mallo (C&K 3)	Capturing Reactions of Polymer Pyrolysis in Solid Fuels
Negin Orouji (C&K 4)	Fast-Cat
Samuel Portillo (C&K 5)	Ni-Substituted Hexaaluminates for Cox Free Hydrogen and Carbon Nanotubes

Computational

Lejla Biberić (C1)	Generalizability of Machine Learning Derived Interatomic Potentials of Peptides and Isomers
Damilola Fasiku (C4)	Toward Distributed Derivative-Free Optimization
Corey Febo (C5)	Physics-Based Computational Design of Peptide Drugs for <i>Clostridioides Difficile</i>
Jiayi Huang (C6)	Limiting Laws for Charge Transport in Isotropic Melts and Solutions of Conjugated Polymers
Karthik Sinha (C8)	Sequence Specific Conformational Transitions of Polyampholytes in a Good Solvent
Arpan Tapdiya (C3)	Computational Design of Peptide Ligands as Biosensors for Early Detection of Ovarian Cancer
Haoyu Wang (C7)	Computationally Designing Peptide Sequences to Form Nanostructures
Cormak Weeks (C9)	Widefield Spatiotemporal Imaging of Nanoemulsions to Understand intermittent Flows
Moritz Woelk (C2)	Data-Driven State Observation through Kernel Canonical Correlation Method

Poster Session I

2nd and 3rd Year Graduate Students and Undergraduate Researchers

Materials

Elaheh A. T. Moghadam (M16)	The Glass Transition and TTT Diagram in Indomethacin/Sucrose Benzoate Co-Amorphous Systems
Yara Abu Dahab (M17)	Single-Step Synthesis of Polymer Structures Using iCVD in Nematic Liquid Crystals
toprak Eraslan (M1)	Novel Morphologies of Magnetic Silicone Microparticles for 3D Printing of Porous Elastomers
Katherine Ernst (M2)	Influence of Viscoelastic Properties on Hollow Fiber Formation in Melt Spinning
Syed Ahmed Jaseem (M5)	Energy Harvesting Using Liquid Metal Particles
Pragyan Jha (M3)	Photo-Induced Bandgap Engineering of Metal Halide Perovskite Quantum Dots in Flow
Byeunggon Kim (M9)	Development of Food Packaging Films Based on Sustainable Biopolymer Components
Junbin Li (M8)	AI-Assisted Synthesis Study of Double Perovskite Nanoplatelets via Self-Driving Fluidic Platform
Darshana Malusare (M10)	Aerosol-Assisted Particle Deposition for Solvent-Free Synthesis of MOF-Polymer Composites
Sahel Mohammadkhah (M7)	Rheological Behavior and Interactions of Whey Protein Isolate with Polysaccharides
Nikolai Mukhin (M13)	Sonic-Flow: A Self-Driving Lab for Synthesis Space Mapping of Metal Halide Perovskites
Anicah Smith O'Brien (M18)	Exploring The Role of Surface Coatings on Polymer Biodegradation
Oluwatobi Ojuade (M4)	The Role of Surface Free Energy Modification for Elastomeric Interfacial Friction Control
Syedamin Razavi (M15)	Perovskite Oxides as New Family of Tunable CO ₂ Sorbents
Tuyen Truong (M11)	Fibrous Porous Composite Interlayer for Lithium-Sulfur Batteries
Logan Williams (M6)	The Crystallization and Rigid Fraction of PLLA
Kushal Yadav (M12)	Enhancing the Performance of Triboelectric Nanogenerator Using Porous Elastomers
Mohammadreza Zare (M14)	Reversible Molecular Capture and Release with Liquid Metals

Undergraduate Researchers

Jillian McNaught (UG4)	Functional Polyvinylidene Difluoride (PVDF) Separators for Next-Generation Lithium-Sulfur Batteries
Sreemanth Meka (UG3)	Development of Co-Amorphous Pharmaceuticals Using Additives of Human Body Compounds
Linda Pomiranceva (UG3)	Development of Co-Amorphous Pharmaceuticals Using Additives of Human Body Compounds
Hrishikesh Ram (UG1)	Modeling the Pyrolysis of Perfluorinated Carboxylic and Sulfonic Acids
Adeline L. Witherspoon (UG2)	Impacts of Denaturation Conditions on the Rheological Properties of Whey Protein

Exposure Science Principles: Enabling Healthy Places and Spaces



Elaine A. Cohen Hubal

US EPA, Center for Public Health
and Environmental Assessment

Chemical pollutants continue to be released in large quantities, are ubiquitous in humans and the environment, and have the potential to cause severe ecosystem and human health impacts. Even low-level and prevalent environmental exposures may contribute substantially to the burden of common complex disease. Understanding the relationships between environmental exposures and health outcomes requires consideration of interconnected physical, chemical, biological, and social systems. Exposure science is the study of our contact, by ingesting, breathing, or touching, with environmental agents and stressors. Sparsity of exposure information has been consistently identified by health scientists and policy makers as a barrier to addressing our most pressing public health challenges. In this presentation, six principles of exposure science that are fundamental to developing information and tools to address challenges in environmental health will be advanced. Current research to identify important sources and pathways for exposure to per- and polyfluoroalkyl substances (PFAS) will be highlighted as an example.

Elaine Cohen Hubal is an expert in the field of environmental health with broad scientific background in environmental engineering, human exposure, and chemical safety evaluation. Her primary research interest is in understanding complex systems at the nexus of the built environment, natural environment, and human health with an emphasis on impacts to vulnerable populations and life stages. Dr. Cohen Hubal currently works as a Senior Science Advisor in USEPA's Center for Public Health and Environmental Assessment. In this capacity, she leads the EPA Office of Research and Development research efforts to advance understanding of human exposure to Per- and polyfluoroalkyl substances (PFAS). She also serves as Editor-in-Chief for the Journal of Exposure Science and Environmental Epidemiology. Previously, Dr. Cohen Hubal served as Deputy National Program Director for EPA's Chemical Safety for Sustainability research program. She also served as Interim Director of the Computational Exposure Division and as Acting Director of the Integrated Systems Toxicology Division. Dr. Cohen Hubal obtained her bachelor's degree from MIT and her Ph.D. from NC State.

Three-Minute Thesis Competition Session I

4th and 5th Year Ph.D. Students

Jinge Xu

Advisor: Prof. Milad Abolhasani

RAINBOW: Robotic And AI-Assisted Nanocrystal Bandgap Optimization Workflow

Jiangfeng Xu

Advisors: Prof. Kiril Efimenko, Prof. Jan Genzer

Functional Hydrogels for Selective Phosphate Removal from Water and Release On Demand

Ghanesh Kesav Venkatesa Prabhu

Advisor: Prof. Harvinder Gill

Microneedles: A Child-Friendly Approach to Treating Food Allergies

Sina Sadeghi

Advisor: Prof. Milad Abolhasani

Engineering a Sustainable Future with Self-Driving Laboratories

Zachary Park

Advisors: Prof. Peter Fedkiw, Prof. Michael Dickey

Liquid Metal as a Bandage for Next-Generation Li-Ion Batteries

Jake McKibbin

Advisor: Prof. Erik Santiso

Modeling Nucleation of Molecular Crystals from Solution

Hannah R. M. Margavio

Advisor: Prof. Greg Parsons

What Makes a Chip?

Tianyu Li

Advisor: Nathan Crook

Engineering Vibrio Natriegens to Degrade and Assimilate Polyethylene Terephthalate (PET)

Gautami R. Kelkar

Advisor: Prof. Albert Keung

A Human Paternal UBE3A Reporter Stem Cell Line for Angelman Syndrome Therapeutic Development

Three-Minute Thesis Competition Session II

4th and 5th Year Ph.D. Students

Sina Jamalzadegan

Advisor: Prof. Qingshan Wei

Stretchable Plant Sensor Using Liquid Metals

Haeleen Hong

Advisor: Prof. Orlin Velev

Strategies for Capturing Microplastics by Using Active Supraparticles

Mohamad Javad (MJ) Haghigat Manesh

Advisor: Prof. Robert Kelly

Follow the Yellow(Brick)Stone Road: The Eccentric Story of Thermoacidophiles and Critical Metals

Kin Gomez

Advisor: Prof. Adriana San Miguel

Understanding Neurodegeneration Fundamentals by Using the C. Elegans Model

Fernando Delgado Licona

Advisor: Prof. Milad Abolhasani

Dynamic Experiments for Accelerated Materials Research

Cyrus Cao

Advisor: Prof. Orlin Velev

Unraveling Viral Defense: How Surfactants Deactivate Non-Enveloped Viruses

Michael Bergman

Advisor: Prof. Carol Hall

Computational Discovery of Plastic-Binding Peptides for Microplastic Remediation

Abhirup Basu

Advisor: Prof. Orlin Velev

Dynamics and Propulsion of Magnetic Microbots in Viscoelastic Fluids

Mesbah Ahmad

Advisor: Prof. Orlin Velev

Chitosan-Based Stretchable, Transparent, and Biodegradable Substrates for Wearable Soft Electronics

Mai Abdelmigeed

Advisor: Prof. Greg Parsons

Mechanically Robust Benign Synthesized Mesoporous UiO-66-NH₂ Composites for Advanced Filtration and Organophosphonates Catalytic Degradation

Young Alumni Panel: Starting Your Career



Ryan Dudek

Ryan works as a Program Manager at the U.S. Department of State, Bureau of Energy Resources. As a diplomat, Ryan oversees U.S. technical assistance programs to help foreign governments effectively govern their energy and natural resource sectors and create the legal and regulatory frameworks to foster private investment in energy projects. During his Ph.D. studies in CBE at NC State (2015-2020), Ryan researched catalyst and reactor design for the valorization of natural gas in the lab of Prof. Fanxing Li. Ryan developed his interest in policy and governance while at NC State, serving in senior roles in the university Graduate Student Association and founding a student organization, Science Policy Pack. He earned his B.S. in ChE from the University of Delaware, not far from his home town of Ridley Park, PA.



Amber M. Hubbard

Amber is an R&D Associate Staff Member in the Sustainable Manufacturing Technologies Group at Oak Ridge National Laboratory. She graduated from Auburn University with a B.S. in Chemical Engineering in 2014 and attended North Carolina State University for her graduate studies where she defended her Ph.D. in 2019. Amber was a National Science Foundation Graduate Research Fellow during her time at NC State with a research focus on stimuli-responsive polymers. She completed a postdoc at the Air Force Research Laboratory in 2022, where she was a National Research Council Postdoctoral Fellow with a research focus on vitrimer composites. Her current research focuses on natural fiber polymer composites, polymer processing, and inherently recyclable materials for industrial applications.



Dilara Sen

Dilara is a Senior Scientist at Tune Therapeutics, where she is developing novel epigenetic therapies for common and rare diseases. Before starting at Tune, she studied at Bogazici University in Istanbul for her undergraduate degree; in 2021 she earned her Ph.D. in Chemical Engineering in Albert Keung's lab at NC State. Dilara was drawn to a small biotech by her passion for basic scientific research and desire to develop innovative therapeutic solutions that improve human lives.



Justin Vento

Justin graduated with a Bachelor's degree in chemical engineering from Manhattan College. He worked for two years as a process engineer before starting the PhD program at NCSU, where he worked in the labs of Dr. Chase Beisel and Dr. Nathan Crook. While at NCSU, he was part of the MBTP fellowship program, which enabled him to perform a summer internship in Denmark. He defended his thesis in December 2021, then worked at Ginkgo Bioworks in Boston MA as a scientist / senior scientist. He accepted a role as an Assistant Teaching Professor at Villanova in Fall 2023, where he enjoys teaching fundamental chemical engineering courses, as well as new biotechnology electives.

Poster Session II

4th and 5th Year Ph.D. Students and Postdoctoral Researchers

Biotechnology

Cyrus Cao (B2)	Unraveling Viral Defense: How Surfactants Deactivate Non-Enveloped Viruses
Kin Gomez (B3)	Findings in Neurodegeneration Using Worm Brains
MJ Haghghat Manesh (B5)	Follow the Yellow(Brick)Stone Road: The Eccentric Story of Thermoacidophiles and Critical Metals
Gaurav Joshi (B4)	Design and Evaluation of a Novel Universal Flu Nanovaccine
Gautami R. Kelkar (B7)	Developing a Paternal UBE3A Reporter Model for Angelman Syndrome Therapeutic Development
Tianyu Li (B1)	Engineering Vibrio Natriegens for Degrading and Assimilating Poly(Ethylene Terephthalate)
Hrishikesh Mane (B9)	Inter-Relation Between Neuronal Activity and The Redox State in C. Elegans
Sobhana A. Sripada (B6)	De-Risking Biomanufacturing through Host Cell Protein (HCP) Removal Using Peptides as Ligands
Ghanesh K. Venkatesa Prabhu (B8)	Manipulating Skin Immunity – From Microneedle Immunotherapy to Allergy Model Development

Catalysis and Kinetics

Mai Abdelmigeed (C&K 1)	Robust Mesoporous Uio-66-NH ₂ /Nanofibrous Aerogel 3D Matrix Composites for Advanced Filtration
Aaron Frye (C&K 2)	Chemical Looping Oxidative Dehydrogenation of Alkyl Benzenes with Multifunctional Redox Catalysts

Computational

Michael Bergman (C1)	Computational Discovery of Microplastic-Binding Peptides
Sina Jamalzadegan (C2)	Shape and Size-Dependent Surface Plasmonic Resonances of Liquid Metal Alloy (EGaIn) Nanoparticles
Nisarg Joshi (C3)	Systematic Development of Machine Learning Interatomic Potentials for Mapi3 Perovskites
Jake McKibbin (C4)	Modeling Nucleation of Molecular Crystals from Solution

Materials

Mesbah Ahmad (M1)	Chitosan-Based Stretchable, Transparent, and Biodegradable Substrates for Soft Electronics
Abhirup Basu (M3)	Dynamics and Propulsion of Magnetic Microbots in Viscoelastic Fluids
Fernando Delgado Licona (M2)	Data Intensification in Flow for Accelerated Synthesis Space Mapping of Inorganic Nanomaterials
Haeleen Hong (M5)	Strategies for Capturing Microplastics by Using Active Supraparticles and Hierarchical Meshes
Sooyoung Kim (M6)	The Interface between a Gas Impermeable Wall and Gallium Liquid Metal
Jeong Yong (David) Kim (M8)	A Soft Energy Harvester Using Liquid Metal-Core Hydrogel Fibers
Hannah R. M. Margavio (M4)	Integrated Thin Film Deposition and Etching for Microelectronic Device Fabrication
Zachary Park (M10)	Liquid Metal as a "Self-Healing" Agent for Phosphorus in Li-Ion Batteries
Lucille Rivera (M13)	Development of MFD for Characterization of Microfiber Formation and Release in Water
Sina Sadeghi (M7)	Accelerated Optimization and Manufacturing of Eco-Friendly Perovskite Nanocrystals
Bret Tantomio (M9)	Spatial Heterogeneity of Polymer Blends
Jinge Xu (M11)	Smart Manufacturing of Perovskite Quantum Dots by a Multi-Robotic Platform
Jiangfeng Xu (M12)	Functional Hydrogels for Selective Phosphate Removal from Water and Release on Demand

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A Special Thanks To

The CBE Department and McKimmon Center Staff

Our External and Internal Judges

The CBE Centennial Committee