SCHOOL OF MOLECULAR & CELLULAR BIOLOGY

2023 Graduate Research Retreat

8 a.m. - 5 p.m. | Monday, April 3, 2023 | I Hotel, Champaign

I am very grateful we have this opportunity today for graduate students, research scientists, and faculty across the school to connect with each other in person. My thanks to Waad Ayoub and the many graduate students who have organized this event. What I love about the people who make up the University of Illinois and School of MCB community is our collaborative, interdisciplinary spirit. I hope you feel a sense of pride and excitement as you share your research findings with one another, as you celebrate and learn about recent advancements, and reflect on challenges and new research questions waiting to be answered.

Here's to making new connections and collaborating on impactful discoveries!

Milan Bagchi
Deborah Paul Professor of Molecular & Cellular Biology
Director, School of Molecular & Cellular Biology

Program

8:00-8:45 a — **Check-in/Breakfast** Heritage Hall Lobby/Honors Room

8:45-9:00 a — **Welcoming Remarks by School Director** Heritage Hall

9:00-10:15 a — **Oral Presentations–Session I** Heritage Hall

Sonya Kumar Bharathkar – Biochemistry
Faculty Mentor: Beth Stadtmueller
Structure-Based Engineering of Secretory Immunoglobulin A Provides New Approaches for Targeting Mucosal Pathogens

Tongyu Liu – Microbiology
Faculty Mentor: Christopher Brooke
Variation in pdmH1N1 Influenza Neuraminidase Activities Governs the Evolutionary Trajectory of Hemagglutinin

Ingrid Possa Paranhos – MIP
Faculty Mentor: Patrick Sweeney
Medial-Basal Hypothalamic Deletion of MC3R Enhances Responsivity to Anorexic Stimuli

Yu Zhang – CDB
Faculty Mentor: Xin Li
Notch-Dependent Regulation of Netrin Pathway Controls Drosophila Transmedullary Neuron Axon Targeting and Optic Lobe Organization

Jilai Cui – Neuroscience
Faculty Mentor: Rhanor Gillette
Modeling Octopus Arm-Sucker Sensory-Motor Coordination

10:15-11:15a — **Poster Presentations–Session I** Heritage Hall Lobby

11:15a-12:15p — **Spotlight Faculty Talks** Heritage Hall

Pamela P. Martinez- Assistant Professor of Microbiology
Quantifying the Impact of SARS-CoV-2 Temporal Vaccination Trends and Disparities on Disease Control

Patrick R. Sweeney- Assistant Professor of Molecular & Integrative Physiology
Pregnancy and Lactation are Associated with Attenuated Satiety and Increased Meal Size in Mice

Joe Sanfilippo- Assistant Professor of Biochemistry
Shear Rate Sensitizes Bacterial Pathogens to H_2O_2 Stress

Kevin Van Bortle - Assistant Professor of Cell & Developmental Biology
Deconstructing the Cancer-Associated Pol III Transcriptome

Program

12:15-1:30p **Lunch** Honors Room

1:30-2:00p **Guest Speaker Presentation** Heritage Hall

Mark Cohen; Dean, Carle Illinois College of Medicine
What's on the Horizon for Medical Innovation at the Carle Illinois College of Medicine?

2:00-3:15p **Oral Presentations–Session II** Heritage Hall

Kritika Mehta – Biochemistry
Faculty Mentor: Kai Zhang
Neuronal Protein Arc utilizes the Multi-Vesicular Body Machinery for Capsid-Mediated Intercellular Communication

Molly Crowder – Microbiology
Faculty Mentor: Steven Blanke
Microbial-Mediated Genotoxicity Impairs Intestinal Epithelial Tissue Renewal

Jacob Beal – MIP
Faculty Mentor: Milan Bagchi
Extracellular Vesicles Secreted by Decidual Facilitate Cell-Cell Communication at the Maternal-Fetal Interface

Pradeep Kumar – CDB
Faculty Mentor: Andrew Belmont
Nucleolus and Centromere TSA-Seq Identifies Conserved and Non-Conserved Features between Different Cell Types

Andres Arango – Biophysics and Quantitative Biology
Faculty Mentor: Emad Tajkhorshid
Topological Learning Approach to Characterize Lipids

3:15-4:15p **Poster Presentations–Session II** Heritage Hall Lobby

4:15-4:45p **Keynote Speaker Presentation** Heritage Hall

Stephen Boppart; Professor and Grainger Distinguished Chair in Engineering, Electrical and Computer Engineering and Bioengineering
Translating Optical Imaging Innovations to Impact Point-of-Care Diagnostics

4:45-5:00p **Closing Remarks/Awards** Heritage Hall

Meet
Our Guest & Keynote Speakers

Guest Speaker: Mark S. Cohen

What's on the Horizon for Medical Innovation at the Carle Illinois College of Medicine?

Mark Cohen is Dean of the Carle Illinois College of Medicine and Senior Vice President and Chief Academic Officer of Carle Health. He is also Professor of Surgery and Biomedical and Translational Sciences in the Carle Illinois College of Medicine and the Founder Professor of Bioengineering in the Grainger College of Engineering at UIUC. Dean Cohen is a practicing Surgical Oncologist treating patients with advanced endocrine malignancies as well as melanomas. He has run an NIH R01-funded translational oncology laboratory for the last 15 years working on developing novel therapeutics and diagnostics for the treatment and staging of advanced cancers as well as new programs in tissue engineering, AI and machine learning in health care decision-making, and use of extended reality technologies in teaching, skills development, and health-care delivery.

Keynote Speaker: Stephen A. Boppart

Translating Optical Imaging Innovations to Impact Point-of-Care Diagnostics

Stephen Boppart is a professor, physician-engineer, and serial entrepreneur. His Biophotonics Imaging Laboratory is focused on developing novel optical biomedical imaging technologies and translating these into clinical applications. He directs the GSK Center for Optical Molecular Imaging and a new NIH Center for Label-free Imaging and Multiscale Biophotonics. Professor Boppart has been a strong advocate for the integration of engineering, technology, and medicine to advance human health and our healthcare systems. He is leading the chancellor's charge to develop and implement a new cross-campus model for research and education in technology-inspired health innovation and is serving as the Interim Director for the Interdisciplinary Health Sciences Institute.

Meet
Our Spotlight Faculty Speakers

Pamela P. Martinez - MICROBIOLOGY
Pamela Martinez is Assistant Professor in the Department of Microbiology and in the Department of Statistics at UIUC. Previously, she was a postdoctoral fellow at the Center for Communicable Disease Dynamics at Harvard School of Public Health. She received her PhD in Ecology and Evolution from the University of Chicago and her master's degree in Ecology and Evolutionary Biology from the University of Michigan. Dr. Martinez's research focuses on the population dynamics of infectious diseases, particularly the impact of host heterogeneity, pathogen diversity, and social inequality on disease transmission.

Patrick R. Sweeney - MOLECULAR & INTEGRATIVE PHYSIOLOGY
Patrick Sweeney is Assistant Professor in the Department of Molecular & Integrative Physiology at UIUC. He obtained his undergraduate degree in psychology and biology at the University of Rochester. Following his undergraduate degree, Dr. Sweeney pursued a PhD in Neuroscience at SUNY Upstate Medical University, followed by a postdoctoral fellowship at the University of Michigan. His current research focuses on determining the neural circuitry regulating feeding, emotion, and reproductive behavior.

Joe Sanfilippo - BIOCHEMISTRY
Joe Sanfilippo is Assistant Professor in the Department of Biochemistry at UIUC. He received an undergraduate degree from the University of Wisconsin and a PhD from Indiana University. Before joining the University of Illinois, Dr. Sanfilippo was a postdoctoral researcher in the Department of Molecular Biology at Princeton University. His research is focused on using microfluidics to study bacterial stress responses in realistic environments.

Kevin Van Bortle - CELL & DEVELOPMENTAL BIOLOGY
Kevin Van Bortle is Assistant Professor in the Department of Cell & Developmental Biology at UIUC. He completed his graduate studies with Victor Corces at Emory University, exploring the role of CTCF and other architectural proteins in 3D chromosome organization. He then joined Mike Snyder's group at Stanford and continued using genomic approaches to investigate coordinate regulation and 3D organization of RNA polymerase II and RNA polymerase III transcription. Dr. Van Bortle's postdoctoral research in the Snyder group was supported by a Ruth L. Kirschstein NRSA (F32) award and his transition to the Department of Cell & Developmental Biology has been supported by an NIH Pathway to Independence Award (K99/R00) through the National Human Genome Research Institute.

Poster Session 1

Henry Chen MICROBIOLOGY
The Relationship between Campylobacter Jejuni Cytolethal Distending Toxin (CDT) Holotoxin and Toxin Cellular Activity: Revisiting CDT Structure-Function Relationships

Nic Handy MICROBIOLOGY
Insertion-trigger Residues Modulate Cargo Delivery by Cytotoxic Necrotizing Factor Toxins

Nicole Godellas MOLECULAR & INTEGRATIVE PHYSIOLOGY
Probing Function in Ligand-Gated Ion Channels without Measuring Ion Transport

Saika Hossain MICROBIOLOGY
The Broad-Spectrum Metallophore Staphylopine Sensitizes Staphylococcus Sureus to Copper Poisoning during Infection

Steven Hobbs MOLECULAR & INTEGRATIVE PHYSIOLOGY
Elucidating the Role of the IQGAP1-YAP Axis in ECM Stiffness-Mediated Hepatocellular Carcinoma Progression

Anjana Asokakumar MOLECULAR & INTEGRATIVE PHYSIOLOGY
Elucidating the Role of Constitutive Androstane Receptors in Maintaining the Hepatocyte Ploidy

Daniel Joo MICROBIOLOGY
The Role of N-terminus in Regulating ParB's Specific Binding in Caulobacter Crescentus

Emma Bridgeman MOLECULAR & INTEGRATIVE PHYSIOLOGY
The Role of ApoE4 and Hyperphosphorylated Tau in Seizure Susceptibility in Alzheimer's Disease

Gisela Cymes MOLECULAR & INTEGRATIVE PHYSIOLOGY
Capping of the Orthosteric-Site Loop C Is Required for Ligand Binding but Not for Binding–gating Coupling in Cys-Loop Receptors

Gregory Tracy MOLECULAR & INTEGRATIVE PHYSIOLOGY
A Novel Role for Kv7/KCNQ Potassium Channels in Synaptic Excitability

Hyojeong Hwang COMPARATIVE BIOSCENCES
Phase Transition of Maternal RNAs During Vertebrate Oocyte-to-Embryo Transition

Jessie Chen COMPARATIVE BIOSCENCES
RNAs Undergo a Phase Transition from Soluble to Insoluble upon Oocyte Maturation

Kerem Catalbas MOLECULAR & INTEGRATIVE PHYSIOLOGY
Lactational Hyperphagia is Associated with Attenuated Gut-Brain Satiety Signaling

Meng Ma COMPARATIVE BIOSCENCES
Remodeling of the Endoplasmic Reticulum (ER) during Oocytes Maturation

Motaher Hossain MICROBIOLOGY
Tandem Mobilization of Anti-phage Defenses Alongside Staphylococcal SCCmec Cassettes

Riley McFarlane MICROBIOLOGY
Investigating How the Staphylococcus Aureus Superoxide Dismutases Are Regulated in Response to Manganese Starvation and Oxidative Stress

Rou Ramezanifard MICROBIOLOGY
The Role of TamAB in Salmonella Pathogenesis

Shweta Shree BIOCHEMISTRY
Nanodisc Based System for Investigating KRas4b Trafficking

Snigdha Mathure CELL & DEVELOPMENTAL BIOLOGY
Elucidating the Role of Btk29A During Early Regeneration in Drosophila

Tianle Chen BIOPHYSICS & QUANTITATIVE BIOLOGY
Post-translational Modifications Optimize the Ability of SARS-CoV-2 Spike for Effective Interaction with Host Cell Receptors

Vanessa Jones MICROBIOLOGY
Exploring Anti-Phage Defenses in Integrative Conjugative Elements Encoded by Staphylococci

Yutong "Gloria" Hou MICROBIOLOGY
Understanding InvR-mediated Post-transcriptional Regulation of SPI-1 Transcriptional Activator HilA and Discovering Potential sRNA Regulators of SPI-1 in S. Typhimurium

Hyun Park BIOPHYSICS & QUANTITATIVE BIOLOGY
Machine Learning Guided Sampling of Protein Transition Pathways

Alice Troitskaia BIOPHYSICS &D QUANTITATIVE BIOLOGY
Probing the Damage-Sensing Mechanism(s) of a DNA Repair Helicase

Moeen Meigooni BIOPHYSICS & QUANTITATIVE BIOLOGY
Computational Modeling of Single-Molecule Peptide Conductance Measurements

Yiquan Wang BIOCHEMISTRY
A large-scale Systematic survey Reveals Recurring Molecular Features of Public Antibody Responses to SARS-CoV-2

Chun Kit Chan BIOCHEMISTRY
Disordered Regions of Respiratory Supercomplexes Offer New Pathways for Substrate Channeling in Crowded Membranes

Dajin Cho MOLECULAR & INTEGRATIVE PHYSIOLOGY
Identification of a Melanocortin Pathway Linking Energy Homeostasis with Anxiety-Related Behavior

Nikita Modi BIOCHEMISTRY
Brd4 Regulates Metabolic Reprogramming of Macrophages upon H. pylori Infection

Megan Ringling MICROBIOLOGY
The Role of Sphingomyelin for Helicobacter Pylori Protein Exotoxin Vacuolating Cytotoxin A (VacA) Binding Region Allelic Variants

Mireille Farjo MICROBIOLOGY
Within-Host Evolutionary Dynamics and Tissue Compartmentalization During Acute SARS-CoV-2 Infection

Ezza Khan MICROBIOLOGY
Cell Size Regulation in Bacteria-Connection Between Nutrients and Chromosome Replication

Elizabeth Thayer MICROBIOLOGY
Cellular Heterogeneity in Pre-infection Gene Expression Patterns Influences Influenza A Virus Infection Susceptibility and IFN Induction

Andrew Lutsky BIOPHYSICS & QUANTITATIVE BIOLOGY
Brownian Diffusion of Charged Species in Relation to Protein Crowding Effects

Anisha Bhole MOLECULAR & INTEGRATIVE PHYSIOLOGY
Nanoparticle Drug Delivery and Seizure Susceptibility in Mice

Archit Bajaj MOLECULAR & INTEGRATIVE PHYSIOLOGY
TC-2153 Targets STEP Alone to Reduce Seizure Intensity in Male and Female Mice

Caroline Vermilya MICROBIOLOGY
Regulation of Phosphate Homeostasis in Staphylococcus Aureus Differs from Established Models

Divyanshi CELL & DEVELOPMENTAL BIOLOGY
Assembly of the Germplasm Aggregate

Elizabeth Rowland MICROBIOLOGY
Spatial-Temporal Mapping of Influenza A and Innate Immune Signaling in Whole Tissue Reveals Heterogenous Distribution of Virus Spread and Host Response

Fatih Cakar MICROBIOLOGY
GRIL-seq Eeveals Novel Small RNAs Regulating SPI1 T3SS in Salmonella Typhimurium via hilD mRNA 3'UTR

Fredy Kurniawan CELL & DEVELOPMENTAL BIOLOGY
BEND3 Safeguards Pluripotency by Repressing Differentiation-Associated Genes

Gloria Lau BIOPHYSICS & QUANTITATIVE BIOLOGY
Identification of Different AMPAR Populations in Neurons with DNA-PAINT

Jinrui Grace Lyu NEUROSCIENCE
Cognitive Impairment and Reduced Dendritic Spine Density after Chronic Chemogenetic Inhibition of Somatostatin-Positive Interneurons in the Dentate Hilus

Haichao Wang MOLECULAR & INTEGRATIVE PHYSIOLOGY
Analyzing Auditory Circuit Disruption and Perceptual in Genetically Distinct Rat Models of Autism

Jessica Palalay BIOCHEMISTRY
Type IV Pili and Shear Force Coordinate Surface Departure of Pseudomonas Aeruginosa

Jiayue Yang MICROBIOLOGY
CRISPR-Mediated Dynamics in Natural and Simulated Sulfolobus Populations

Md Fulbabu Sk BECKMAN INSTITUTE
Exploration of Conformational Dynamics of Phosphorylated Active and Inactive Janus Kinase 2 Using Gaussian Accelerated Molecular Dynamics Simulations

Morgan Letzkus MICROBIOLOGY
Using mCherry as a Tool to Determine TipN's Function

Quang Nguyen MOLECULAR & INTEGRATIVE PHYSIOLOGY
Circadian Regulation of Permeability and Tight-Junction Proteins of the Blood-Brain Interface

Robbie Ingram NEUROSCIENCE
Hypothalamic AVPV Kisspeptin Neuron Hyperactivity in a Mouse Model of Temporal Lobe Epilepsy

Shruti Bendre MOLECULAR & INTEGRATIVE PHYSIOLOGY
Role of Cholesterol Efflux Pump ABCA1 in Macrophages and Subsequent Modulation of the Tumor Microenvironment

Sierra Bedwell MICROBIOLOGY
Exploring Plasmid Stability in a Nested Legume-Rhizobium Mutualism Undergoing Nitrogen Deposition

Temirlan Shilikbay CELL & DEVELOPMENTAL BIOLOGY
Increased Fear Memory and Abnormal Dendritic Arborization in RNA Helicase Mov10 Brain Knockout Mouse

Tongyu Zhang MICROBIOLOGY
Brain Microglia is a Major HIV Reservoir and Virus Can Potentially Disseminate in CNS Through Vasculatures

Yupeng Li BIOPHYSICS & QUANTITATIVE BIOLOGY
Revealing Nucleotide-induced Domain Movements of GTP-Bound Rbg1 with Long-Timescale Molecular Dynamics Simulations

Ali Rasouli BIOPHYSICS & QUANTITATIVE BIOLOGY
Residues Involved in Proton-Coupled Transport of Antimalarial Drugs by PfCRT

Matt Sinclair BIOCHEMISTRY
Molecular Mechanisms of Functional Impairment for Active Site Mutations in Glucose-6-phosphatase Catalytic Subunit 1 Linked to Glycogen Storage Disease Type 1a

Anasuya Das Gupta MOLECULAR & INTEGRATIVE PHYSIOLOGY
The Cholesterol Metabolite, 27-Hydroxycholesterol, Enhances the Secretion of Cancer Promoting Extracellular Vesicles by Impairing Lysosomal Integrity

Teak Jung Oh BIOCHEMISTRY
Elucidation of Necroptosis Pathway Using Optogenetics

Wenhao Ouyang BIOCHEMISTRY
Probing the Biophysical Constraints of SARS-CoV-2 Spike N-terminal Domain Using Deep Mutational Scanning

Allison Boss-Kennedy CELL & DEVELOPMENTAL BIOLOGY
Muscle Cell-Derived Ccl8 Is a Negative Regulator of Skeletal Muscle Regeneration

Kaylee Kuzelka BIOCHEMISTRY
A Fully Biocatalytic Platform for the Asymmetric Alkylation of α-Keto Acids by Mining and Engineering of S-Adenosylmethionine-Dependent Methyltransferases

Qianqiao Liu BIOCHEMISTRY
Structural Basis for Evasion of IgA Immunity by Streptococcus Pyogenes Revealed in the Complex of Arp4 with Human IgA

Ami Seeger MICROBIOLOGY
Host Cellular Sensing and Response to Helicobacter Pylori Vacuolating Cytotoxin A

Remya Rajan MOLECULAR & INTEGRATIVE PHYSIOLOGY
Effect of Epilepsy on Potassium Currents in Gonadotropin-Releasing Hormone Neurons

Eric Shinn BIOPHYSICS & QUANTITATIVE BIOLOGY
Inducing Concentration Gradients Across the Membrane in Molecular Dynamics Simulations to Investigate Membrane Permeability

MCB Annual Graduate Research Retreat Committee Members (2023)

Waad Ayoub, Biophysics and Quantitative Biology

Saika Hossain, Microbiology

Rayeed Ihsan, Biochemistry

Tony Liu, Microbiology

Kritika Mehta, Biochemistry

Jessica Palalay, Biochemistry

Shashank Shastry, Biophysics and Quantitative Biology

Eric Shinn, Biophysics and Quantitative Biology

Amber Wang, Molecular and Integrative Physiology