



**The Microbial  
Multiverse  
SYMPOSIUM**

The Microbial Multiverse Symposium  
September 14-16, 2023

Proceedings

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Dear colleagues and friends,

It is with great pleasure that we extend a warm welcome to the 2023 Microbial Multiverse Symposium hosted by the Microbial Systems Initiative. We are excited to have you join us for this celebration of our vibrant research community.

The Microbial Multiverse Symposium is a testament to the broad scope and diversity of microbial topics that are being studied at the University of Illinois. As you peruse the abstracts, you will encounter a mosaic of research topics, methodologies, and perspectives, highlighting the interdisciplinary nature of microbial systems research. The symposium's presentations and discussions will undoubtedly foster collaboration, inspire new ideas, and advance our understanding of the microbial world.

Too often research is conducted in isolated silos, much like the multiverse refers to the coexistence of numerous separate worlds. The Microbial Systems Initiative aims to dismantle these divisions by encouraging interconnectedness and collaboration. The Microbial Multiverse Symposium offers an ideal chance to gather, foster connections, and cultivate a supportive and innovative microbiology community. The relationships formed here will bridge gaps, paving the way for promising collaborations. Together, we can make UIUC feel more connected and accessible.

We would like to extend our sincere gratitude to all the participants, presenters, organizers, and sponsors who have made this event possible. Your dedication to the advancement of microbiology is truly commendable, and we look forward to the contributions and discussions that will enrich this symposium.

Warm regards,



Paola Mera and Chris Gaulke  
Microbial Multiverse Symposium Planning Chairs

## About the Microbial Systems Initiative

The Microbial Systems Initiative (MSI) is a research community founded in 2018 with the goal of strengthening our robust international profile in microbial sciences research and education. MSI has grown to a community of over 400 members representing over 60 campus units. We have built a collegial, collaborative community through efforts to connect across disciplinary boundaries, to recruit and retain the next generation of microbial sciences faculty, and to support high quality education and professional development experiences for trainees. With institutional recognition and support, MSI is poised to broaden the scope of our impact.



Cari Vanderpool  
Director



Shannon Sirk  
Associate Director



Sara Rassing  
Assistant Director



Maggie Berg  
Research Development Director

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The Microbial Multiverse Symposium is co-hosted by the Department of Microbiology, the Institute for Genomic Biology, the School of Molecular and Cellular Biology, the College of Veterinary Medicine, and the Personalized Nutrition Initiative and made possible by the Olga G. Nalbandov Lecture Fund.

**Thursday, September 14**

*Alice Campbell Alumni Center  
601 S. Lincoln Avenue, Urbana*

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6:00-8:00 p.m.	<b>Welcome</b> <i>Alice Campbell Alumni Center Ballroom</i> <b>Cari Vanderpool</b> , Director of the Microbial Systems Initiative <b>Gene Robinson</b> , Director of the Carl R. Woese Institute for Genomic Biology
	<b>Public Lecture</b> <i>Alice Campbell Alumni Center Ballroom</i> <b>Margaret McFall-Ngai</b> , Director and Senior Staff Scientist at Carnegie's Biosphere Sciences and Engineering Division
	<b>Reception</b> <i>Richmond Family Gallery</i>

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## Keynote

**The power of 'maiki' – How *Vibrio fischeri* shapes the biology of the Hawaiian bobtail squid *Euprymna scolopes*****Margaret McFall-Ngai**

Staff Scientist, Carnegie Institution for Science  
Faculty Associate, California Institute of Technology

Recent research has demonstrated that symbioses between animals and microbes [maiki – Hawaiian, the invisible force] are fundamental to the biology of most, if not all, animal species. The mutualistic association between the Hawaiian bobtail squid, *Euprymna scolopes*, and its luminous bacterium, *Vibrio fischeri*, is a powerful model to investigate signaling between the host and its microbial partner. In this system, symbiotic bacteria are acquired by horizontal transmission within hours of hatching. This presentation will focus on what we know about the mechanisms underlying the establishment and maintenance of the symbiotic state.

**Friday, September 15***Beckman Institute**405 N Mathews Ave, Urbana*

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8:30-9:00 a.m.	<b>Breakfast and Registration</b> - <i>Beckman Room 1005</i>
9:00-9:15 a.m.	<b>Opening Remarks</b> - <i>Beckman Room 1025- Auditorium</i>
9:15-10:45 a.m.	<b>Session 1: Microbes and the Environment</b> <i>Beckman Room 1025- Auditorium</i> Chair: Katy Heath Presenters: Maggie Wagner, University of Kansas Shreya Arya, PhD student in O'Dwyer lab in the Department of Plant Biology Tony Yannarell, Natural Resources & Environmental Sciences Sierra Raglan, PhD student in Angela Kent's lab, Natural Resources & Environmental Sciences
10:45-11:00 a.m.	<b>Coffee Break</b> - <i>Beckman Room 1005</i>
11:00-12:30 p.m.	<b>Session 2: Microbe-microbe Interaction</b> <i>Beckman Room 1025- Auditorium</i> Chair: Asma Hatoum-Aslan Presenters: Dominique Limoli, University of Iowa Angad Mehta, Chemistry Ido Golding, Physics Christopher Brooke, Microbiology
12:30-1:30 p.m.	12:30-1:30 p.m. - <b>Lunch break</b> - <i>Beckman Room 1005</i>
1:30-3:00 p.m.	<b>Session 3: Microbes and Nutrition</b> <i>Beckman Room 1025- Auditorium</i> Session chair: Sharon Donovan Presenters: Suzanne Devkota, Cedars Sinai Sharon Donovan, Food Science & Human Nutrition Hannah Holscher, Food Science & Human Nutrition Jacob Allen, Kinesiology and Community Health
3:00-3:30 p.m.	<b>Coffee Break</b> - <i>Beckman Room 1005</i>
3:30-5:00 p.m.	<b>Session 4: Microbes and the Brain</b> <i>Beckman Room 1025- Auditorium</i> Chair: Adrienne Antonson Presenters: Helen Vuong, University of Minnesota Brett Loman, Animal Sciences Elisa Caetano-Silva, Postdoctoral student in Jacob Allen's Lab Adrienne Antonson, Animal Science
5:00-6:30 p.m.	<b>Poster Session and Refreshments</b> - <i>Beckman Center Atrium</i> Even number posters presented 5:00-5:45 p.m.; odd number posters presented 5:45-6:30 p.m.

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## Saturday, September 16

Beckman Institute

405 N Mathews Ave, Urbana

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9:00-9:30 a.m. **Coffee and Registration - Beckman Room 1005**

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9:30-11:00 a.m. **Session 5: Harnessing Microbial Activities**

Beckman Room 1025- Auditorium

Chair: Shannon Sirk

Presenters:

Erica Majumder, University of Wisconsin-Madison

Brenda Wilson, Microbiology

Asma Hatoum-Aslan, Microbiology

Na Wei, Civil & Environmental Engineering

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11:00-12:30 p.m. **Microbes in Society Panel Discussion**

Beckman Room 1025- Auditorium

Moderators: Pamela Martinez and Becky Smith

Presenters:

Monica Green, Author and Historian

Jodi Schneider, Informatics

Jacinda Dariotis, Family Resiliency Center

Pamela Martinez, Microbiology

Sang-Hwa Oh, Department of Advertising

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12:30-1:45 p.m. **Closing Remarks - Beckman Room 1025- Auditorium**

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## Poster Session

This session showcases the innovative research conducted by early career researchers at the University of Illinois. From environmental impacts, therapeutic applications and innovative approaches, the posters provide insight into the collaborative nature of microbial systems research. These 40 posters represent 17 departments/units across campus.

Poster Number	Presenter	Title
1	Saeed Ahmad	Microbial bead technology as a co-culture platform to study host-microbe interaction – androgenicity of urinary tract microbiomes on prostate cancer cells
2	Zainab Alzoubi	Chemotherapy-induced changes in gut microbial composition disrupt entero-hepatic bile acid metabolism.
3	Anubhav Basu	Raffinose family oligosaccharide utilization by <i>Bacteroides thetaiotaomicron</i>
4	Sierra Bedwell	Exploring the diversity of rhizobia in and out of mutualism
5	Sara Belchik	A veterinary gastrointestinal low-fat diet affects fecal characteristics, metabolites, bile acids, and microbiota concentrations of antibiotic-treated dogs
6	Mitchell Bryant	Microbial delivery of antibodies to combat porcine respiratory disease complex
7	Izan Chalen-Paredes	Evaluating fetal corticogenesis in germ-free mice in response to maternal IL-17a administration
8	Hunter Cobbley	Characterization of the evolutionary and ecological impact of rhizobiophages
9	Paola Corea	Heat transfer model for milk temperature for predicting quality of milk shared in different school lunch service and storage conditions
10	Luoyan Duan	Quantifying the impacts of zinc malnutrition on host-microbiota interactions
11	Allison Higgins	Crimson and Clover: Methylobacterium and clover fitness
12	Ezza Khan	The role of chromosome replication initiator in regulation of cell size
13	Morgan Letzkus	The role of the polar protein, TipN, in chromosome segregation in <i>Caulobacter crescentus</i>
14	Junya Li	The impact of non-pharmaceutical interventions on the transmission of human respiratory viruses in Chile
15	Adam Markowicz	Imaging biofilms and anti-microbial treatment effects with optical coherence tomography



*Posters continued*

Poster Number	Presenter	Title
16	Breanna Metras	In vitro fermentation characteristics of dietary fibers using fecal inoculum from dogs consuming commercial or traditional kefir
17	Guillermo Monroy	Development of Cold microplasma point of care system to treat otitis media – advancements in a preclinical small animal model
18	Lydia Okyere	Zebrafish: An emerging model of the interplay between vertebrates, gut microbiota, and bile acids
19	Ashley Otero	Influenza A virus during pregnancy disrupts the downstream maternal intestinal immune and microbial landscape in a dose- and time-dependent manner
20	Sumashini Pagaldevatti	Figs, fungi and forests: The role of seed-fungal interactions in shaping the coexistence of closely related tree species in a tropical forest ecosystem
21	Stephanie Puentes	To let go or not to let go: how ParA can impact the release of the chromosomal anchoring in <i>Caulobacter crescentus</i>
22	Megan Ringling	<i>Helicobacter pylori</i> vacA's binding region and its potential as a clinical gastric disease risk marker
23	Joel Rivera Cardona	Characterization of strain differences in ISG antagonism during influenza A virus infection through single-cell level analyses
24	Alexander Shuppara	Flow patterns bacterial growth by modulating spatial H <sub>2</sub> O <sub>2</sub> gradients
25	Janet Sorrells	Label-free optical metabolic imaging of bacteria and biofilms with high spatiotemporal resolution using multiphoton autofluorescence microscopy
26	Laura Suttentfield	CRISPR-Cas mediated drivers of <i>Pseudomonas aeruginosa</i> lysogen diversity
27	Mark Tarabey	In vivo production and delivery of biotherapeutics against respiratory pathogens
28	Ivan Valishev	Psychological stress depletes microbiota-derived aryl-metabolites in parallel to heightened host IDO1 activity
29	Adriana Velasquez	Optimizing bioactive metabolites in a whole food matrix (yogurt) by the addition of LABs and metabolic co-factors
30	David Vereau Gorbitz	Patterns of plasmid inheritance and diversity within core and variable elements of <i>Rhizobium leguminosarum</i> genomes

*Posters continued*

Poster Number	Presenter	Title
31	Zihan Wang	The ecological consequences of microbial metabolic strategies in fluctuating environments
32	Jeremiah Wanyama	Novel insights into the biogeography and functional potential of the zebrafish microbiome
33	Sofia Wilson	Effects of dietary fiber and biotic supplementation on fecal characteristics, metabolites, and microbiota of healthy adult dogs
34	Amanda Wong	<i>Nannizziopsis guarroi</i> infection trial in six adult bearded dragons ( <i>Pogona vitticeps</i> )
35	Jiaying Wu	Aggregative soil sampling using boot covers compared to soil grabs from commercial romaine fields shows similar indicator organism and microbial community recovery
36	Zifan Xie	Harnessing Endogenous Type II-A CRISPR System to Do Genome Editing in <i>Lactocaseibacillus rhamnosus</i> GG
37	Lufan Yang	A neonatal piglet model reveals interactions between nasal microbiota and influenza A virus pathogenesis
38	Yu-Hsuan Yeh	Engineering protein secretion of <i>Bacteroides</i> species
39	Fu Yu	Sparse identification of bacterial transcriptional regulation
40	Changyi Zhang	Novel insight into the infection mechanisms of archaeal viruses



## Session 1: Microbes and the Environment

*Friday, September 15, 9:15 – 10:45 a.m*

*Beckman Institute Room 1025 – Auditorium*

Chair: Katy Heath

### **PRESENTERS:**

Adaptation of plants and microbial neighbors to shared abiotic stress

Maggie Wagner, Department of Ecology and Evolutionary Biology, University of Kansas

Sparsity of higher-order interactions enables learning and prediction for microbiome

Shreya Arya, PhD student in O'Dwyer lab in the Department of Plant Biology, University of Illinois

Causal microbes: what microbial ecologists can learn from causal graphs

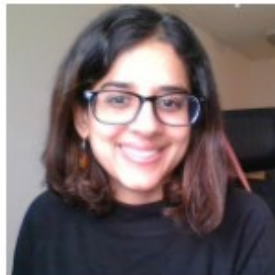
Tony Yannarell, Natural Resources & Environmental Sciences, University of Illinois

Roots of Change: understanding the influence of bioenergy sorghum breeding on the root metabolome and microbiome

Sierra Raglin, PhD student in Angela Kent's lab, Natural Resources & Environmental Sciences, University of Illinois



Maggie Wagner



Shreya Arya



Tony Yannarell



Sierra Raglin

## Session 2: Microbe-microbe Interaction

*Friday, September 15, 11:00 – 12:30 p.m.*

*Beckman Institute Room 1025 – Auditorium*

Chair: Asma Hatoum-Aslan

The symbiotic and antagonistic relationships that microorganisms share with each other play vital roles in microbial survival and evolutionary trajectory. Investigating these intricate interactions is essential not only for understanding microbial population dynamics, but also for discerning their influence on a myriad of environmental and biological processes, including ecosystem dynamics and human health and disease. Speakers in this session will delve into the complex interactions between diverse microorganisms and highlight their far-reaching impacts, ranging from the emergence of disease to the development of new biotechnologies.

### PRESENTERS:

War and Peace: Polymicrobial interactions in cystic fibrosis airway disease

Dominique Limoli, Department of Microbiology and Immunology, University of Iowa

Engineering microbial “cell within cell” systems to study evolution

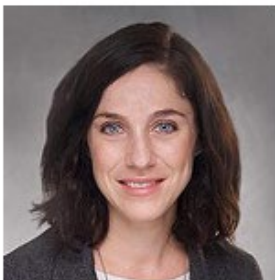
Angad Mehta, Department of Chemistry, University of Illinois

Co-infecting phages impede each other’s entry into the cell

Ido Golding, Department of Physics, University of Illinois

Collective dynamics within influenza virus populations

Christopher Brooke, School of Molecular & Cellular Biology, University of Illinois



Dominique Limoli



Angad Mehta



Ido Golding



Christopher Brooke

## Session 3: Microbes and Nutrition

*Friday, September 15, 1:30 – 3:00 p.m.*

*Beckman Room 1025 – Auditorium*

Chair: Sharon Donovan

Diet and nutrition have a substantial influence on human health and wellbeing. The gut microbiome also plays a fundamental role in human health and diet is one of the most effective modulators of gut microbiota composition and metabolic function. This session will highlight: (1) how diet affects microbial colonization and host-microbe interactions in early life, and (2) how diet and fermented foods interact with the microbiome to influence metabolic and immune outcomes.

### PRESENTERS:

Compensatory actions of the gut microbiome during times of chronic nutritional stress  
Suzanne Devkota, Cedars-Sinai Division of Gastroenterology

Factors influencing establishment of the microbiota in the first 1000 days of life –  
Implications for child outcomes  
Sharon Donovan, Department of Food Science and Human Nutrition, University of Illinois

Diet, the gut microbiota, and metabolic health  
Hannah Holscher, Department of Food Science and Human Nutrition, University of Illinois

Optimizing bioactive microbial metabolites in fermented food to support human  
immune function  
Jacob Allen, Department of Kinesiology & Community Health, University of Illinois



Suzanne Devkota



Sharon Donovan



Hannah Holscher



Jacob Allen

## Session 4: Microbes and the Brain

*Friday, September 15, 3:30 – 5:00 p.m.*

*Beckman Room 1025 – Auditorium*

Chair: Adrienne Antonson

It has become increasingly apparent that endogenous microbes contribute to host brain development and function throughout the lifespan. Similarly, cues from the central nervous system influence microbial physiology at the cellular and community level. This bidirectional communication between the microbiome and the central nervous system is regulated through various neuronal, endocrine, chemical, and immune signaling pathways, each of which can be disrupted by exogenous stimuli. This session will highlight: (1) how microbes regulate early brain development during health and disease, and (2) how psychological stress can disrupt intestinal physiology and microbial homeostasis.

### PRESENTERS:

Towards understanding the role of the microbiota in fetal development

Helen Vuong, Department of Pediatrics, University of Minnesota

Implications of diet and stress on microbiota-host neurotransmission

Brett Loman, Department of Animal Sciences, University of Illinois

Stress hormone signaling modify epithelial layer physiology

Elisa Caetano-Silva, post doc in Allen Lab, Department of Kinesiology, University of Illinois

Exogenous and endogenous microbes influence prenatal brain development through immune signaling

Adrienne Antonson, Department of Animal Sciences, University of Illinois



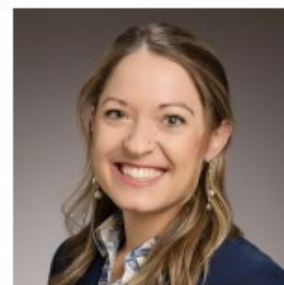
Helen Vuong



Brett Loman



Elisa Caetano-Silva



Adrienne Antonson

## Session 5: Harnessing Microbial Activities

*Saturday, September 16, 9:30 – 11:00 a.m.*

*Beckman Room 1025 – Auditorium*

Chair: Shannon Sirk

Recent years have seen a growing appreciation and understanding of the fundamental and powerful roles that microbes play in countless processes across human, animal, and environmental health. Researchers studying these microscopic organisms have uncovered countless insights into their behavior, metabolism, and community interactions, establishing the foundations to move beyond discovery, toward application. Speakers in this session will share the diverse approaches they have taken to exploit and expand this substantial body of microbial knowledge, and describe the innovative ways in which they aim to harness microbial activities to address unmet needs in human health and environmental sustainability.

### PRESENTERS:

Mechanisms of microbe-contaminant interactions and their applications in environmental health

Erica Majumder, Department of Bacteriology, University of Wisconsin-Madison

Harnessing bacterial toxin diversity: Learning from modularity, domain swapping, and evolutionary fine-tuning

Brenda Wilson, School of Molecular & Cellular Biology, University of Illinois

Harnessing bacterial viruses to combat antibiotic-resistant pathogens

Asma Hatoum-Aslan, School of Molecular & Cellular Biology, University of Illinois

Engineering microbes for environmental sustainability

Na Wei, Civil & Environmental Engineering, University of Illinois



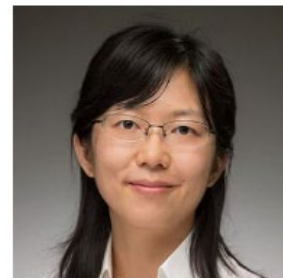
Erica Majumder



Brenda Wilson



Asma Hatoum-Aslan



Na Wei

## Microbes in Society Panel Discussion

*Saturday, September 16, 11:00 – 12:30 p.m.*

*Beckman Institute Room 1025 – Auditorium*

Moderator: Becky Smith

This panel will discuss the intersection of microbial and social sciences, featuring speakers from a wide range of health-related research areas outside microbiology. Discussion will highlight how work across these disciplines can push the boundaries of what is possible.

### PANEL:

Monica Green, Author and Historian

Jodi Schneider, School of Information Science

Jacinda Dariotis, Human Development and Family Studies, Family Resiliency Center

Pamela Martinez, School of Molecular & Cellular Biology

Sang-Hwa Oh, Department of Advertising



Monica Green



Jodi Schneider



Jacinda Dariotis



Pamela Martinez



Sang-Hwa Oh



## Panel Keynote:

**When Microbes Become Visible: Plague, SARS-CoV-2, and the History of Human-Animal-Microbe Connections****Monica Green**

A long-standing problem in the field of history of medicine has been the challenge of reconstructing disease histories in the pre-microscopic age. Before the advent of modern bacteriology (and later, virology), infectious diseases could be known only by reports of their symptoms, usually just in human patients. Even readily visible diseases might not be systematically reported. And records of historical zoonotic transmissions hardly exist at all.

As the world has learned from the rapid reconstruction of the origins of the COVID-19 pandemic, genetics (which can track the pathogen itself) is now a powerful tool for inferring human-animal connections that underlie a number of major infectious diseases. That power is also being used to reconstruct the history of historical pandemics. For historians, this presents the opportunity to return to historical records and reconstruct a microbial world that would have been invisible to past populations. Although most work must remain at the level of inference, by mapping evidence drawn from a variety of disciplinary approaches, it is becoming increasingly possible to perceive human-animal-microbial connections of which we were previously unaware. This talk will take recent results from the history of the Black Death (whose origins are being pushed back nearly a century and a half) and show how expanded chronologies and geographies of pandemics also show us ways to think more broadly about humans' roles in microbial proliferation.

**Monica H. Green** is a historian of medicine specializing in the history of the premodern period and the comparative history of global health. Trained in the History of Science at Princeton University, she has taught and held fellowships at leading institutions such as Duke University, the Institute for Advanced Study, and All Souls College. Both her research and her teaching have been honored by top prizes, and she was recently recognized by having a prize named in her honor by the Medieval Academy of America. She is currently completing *The Black Death: A Global History*, which melds new insights from genetics with a reinterrogation of the documentary record of the world's most devastating pandemic. She can be followed on Twitter at @monicaMedHist.