



# Unseen Partners: Manipulating Microbial Communities that Support Life on Earth

Michigan Meeting • Spring 2016

Updated May 13, 2016

Microbes are everywhere. We battle the few that cause disease, yet rely on many of them to maintain a habitable planet and our own health. Unintentionally, we have altered many of these important microbial communities through climate change, oil spills, and changes in living conditions and diet. Now that we have the tools to document changes in microbial communities, is it time to push beyond observing and begin manipulating microbial biomes to improve human and environmental health?

This conference brings together scientists who appreciate the many aspects of microbial life to address the conceptual, technical and ethical dimensions associated with manipulating microbiomes. This meeting aims to facilitate the exchange of information and ideas through a variety of formats and to catalyze the creation of new strategies for identifying if, when, and how scientists might choose to manipulate microbial communities. In addition to more conventional presentations and poster sessions, we are hosting a panel discussion and debate, featuring thought leaders in the field. Additionally, we welcome the public to join us for two evening sessions focused on contemporary issues associated with manipulating human and environmental microbiomes. We will end with a participant-driven 'unconference' to address gaps, make connections and identify future directions for microbiome research that demand the most immediate attention.

***All presentations will be held in the 4<sup>th</sup> floor amphitheater of the Rackham Building.***

## May 16<sup>th</sup> - Day 1 Schedule

- 8:00 AM Registration and Breakfast (Assembly Hall, Rackham 4<sup>th</sup> floor)
- 9:00 AM **Thomas Schmidt, Ph.D.**, University of Michigan  
**Welcome, Introductions, and Plans**
- 9:20 AM **Mark Schlissel, Ph.D.**, University of Michigan President  
**Opening Remarks**
- 9:45 AM ***Local and Global Microbiomes***  
Convener: **Thomas Schmidt, Ph.D.**

Without microbes, there would be no life on Earth. Recent technological advances have provided windows into the world of microbes and the complex communities in which they live. As a result, we are expanding our appreciation of the impact of microbes on local and global elemental cycles and human health. In this opening session, international experts will provide a contemporary view of three communities of microbes. Dr. Derek Lovley will explain how microbes in a diversity of environments make electrical connections with other cells and with minerals, Dr. Kathrine McMahon will provide insights into the microbes that form the base of the food chain in the fresh water environments, and Dr. Patrick Schloss will offer perspective on the importance of human microbiome to development and health.

**Derek Lovley, Ph.D.**, University of Massachusetts  
**The Electromicrobiome: Ecology, Evolution, and Application**

- 10:45 AM Coffee Break (Assembly Hall, Rackham 4<sup>th</sup> Floor)



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- 11:15 AM **Katherine McMahon, Ph.D.**, University of Wisconsin  
*Diving deep into freshwater lake community genomes to infer traits and track populations*
- 12:15 PM Lunch (Assembly Hall, Rackham 4<sup>th</sup> Floor)
- 1:30 PM **Patrick Schloss, Ph.D.**, University of Michigan  
*What Deliverables Can We Expect From the Human Microbiome?*  
Introduction by: **Evan Snitkin, Ph.D.**
- 2:30 PM *Ramifications for Managing Microbiomes – a panel discussion*  
Convener: **Kevin Theis, Ph.D.**

Biologists and philosophers of biology are increasingly focused on the ecological and evolutionary complexities of host-microbiota organization and interaction. The fidelity of microbiota transmission and assembly and the scope and regulation of host-microbiota interactions are both active areas of research. As part of this effort, scientists are developing the framework and vocabulary to discuss the host in light of its microbiome. Definitions of the organism, the individual, and units and levels of selection are all being debated, and the development of foundational concepts such as extended phenotype, niche construction, and the hologenomic concept of evolution is underway. Through a series of short presentations, interspersed with panel-audience discussions, we will inquire how progress in the area of host-microbiota evolutionary ecology could potentially translate to enhancing host health and function.

**Panel:**

**Lisa Lloyd, Ph.D., Indiana University, Bloomington**  
*In what ways are holobionts units of selection?*

**Jan Sapp, Ph.D., York University**  
*Resolving ecology's central enigma*

**Kevin Theis, Ph.D., Wayne State University**  
*Medicine through a hologenomic lens*

**Ulrich Mueller, Ph.D., University of Texas, Austin**  
*Artificial selection on beneficial microbiomes to improve plant and animal health*

- 4:00 PM Poster Session, Lightning talks, and Reception  
(Assembly Hall and West Conference Room, 4<sup>th</sup> Floor Rackham)



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7:00 PM **Evening Session – Open to Public** (Amphitheater, Rackham 4<sup>th</sup> Floor)

## ***Invisible Influence: Microbiomes in the World***

Moderator: **Nick Wigginton, Ph.D.**, Senior editor for *Science* magazine

Microbial communities inhabit and impact virtually every environment on Earth, including our own bodies. Today, scientists and engineers are exploring ways to actively alter these communities to improve our quality of life, from increasing agricultural yields to controlling chronic diseases. In this session, award-winning science writer Ed Yong and renowned scientist Jack Gilbert will discuss how microbes affect the lives of humans, animals, and plants, and how we might manipulate them to improve human and environmental health.

**Ed Yong**, Science writer for The Atlantic and author of the forthcoming book “I Contain Multitudes”

**Jack Gilbert, B.Sc., Ph.D.**, Professor of Surgery at University of Chicago, Director of the Microbiome Center at Argonne National Laboratory

## May 17<sup>th</sup> - Day 2 Schedule

8:00 AM ***Integrated Training in Microbial Systems Breakfast***  
**\*open to ITiMS community** (Assembly Hall, Rackham 4<sup>th</sup> Floor)

9:30 AM **Mick Follows, Ph.D.**, Massachusetts Institute of Technology  
**Can We Understand the Functional Biogeography of Marine Plankton in Terms of Competition?**

10:30 AM ***Debating Life's Family Tree***  
Conveners: **Thomas M. Schmidt and Matthew Chapman, Ph.D.**

An expanded ‘Tree of Life’ was recently published, enlarging the evolutionary framework that represents the most important organizing principle in biology. Phylogenetic relationships are essential for understanding the history of life and they guide our explorations of the microbial world, including the “dark matter” of microbial genomes, relationships between the structure and function of microbial communities and the microbial species concept. In this session, National Academy members Norman R. Pace and W. Ford Doolittle will present contrasting interpretations of the tree of life, the concept of prokaryotes, and the suggestion that eukaryotes arose from archaea. They will also address how contrasting interpretations of the tree of life influence sequence-based analyses of complex microbial communities.

Speakers: **Norman Pace, Ph.D.**, University of Colorado

**W. Ford Doolittle, Ph.D.**, Dalhousie University

Noon Lunch (Assembly Hall, Rackham 4<sup>th</sup> Floor)

1:30 PM ***The Urban Microbiome***  
Convener: **Lutgarde Raskin, Ph.D.**



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Humans and microbial communities are intimately linked via air, water, soil, and food. Human activities now shape environmental microbiomes in dramatic ways and on large scales, with consequences for human and environmental health that we are just beginning to understand. In this session, University of Michigan professors Nancy Love and Greg Dick will present their research on water distribution systems. Specifically, they will discuss how humans are perturbing microbial communities in aquatic environments, and in turn, impacting ecosystem services such as drinking water and fisheries.

1:30 PM      **Gregory Dick, Ph.D.**, University of Michigan  
**Unintended Manipulation of Microbial Communities in Lake Erie**

2:30 PM      Break

2:45 PM      **Nancy Love, Ph.D.**, University of Michigan  
**Microbiome at the Tap: From Ann Arbor to Addis Ababa**

3:45 PM      Poster Presentations

4:30 PM      Reception (Slurping Turtle, open to registrants)

7:00 PM      ***Evening Session – Open to the Public***  
(Amphitheater, Rackham 4<sup>th</sup> Floor)

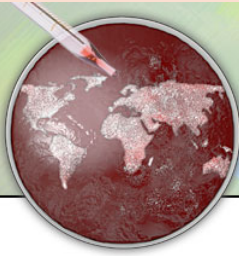
## ***Ethical and Scientific Considerations of Fecal Transplants***

Moderator: **Emilia Askari, MS, Ph.D.**, University of Michigan

Fecal microbiota transplantation (FMT) is increasingly being considered as a therapeutic for a range of human diseases. While a high success rate has been observed for treating *Clostridium difficile* infections, the evidence for FMT to successfully treat other conditions, including autism and inflammatory bowel disease, is less obvious and presents important ethical considerations. In this session, Drs. Vincent Young and Pilar Ossorio will summarize the current understanding of FMT, including the ethical and legal implications for the potential widespread use of fecal transplants.

Speakers:    **Pilar Ossorio, J.D., Ph.D.**, University of Wisconsin Law School

**Vincent Young, M.D., Ph.D.**, University of Michigan



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## May 18<sup>th</sup> - Day 3 Schedule

- 8:30 AM Breakfast (Assembly Hall, Rackham 4<sup>th</sup> Floor)
- 9:00 AM ***The Unconference***(Assembly Hall, Rackham 4<sup>th</sup> Floor)  
**Melissa Duhaime, Ph.D.**, convener  
**Nina Lin, Ph.D.**, convener  
**Patrick Schloss, Ph.D.** convener

Throughout the first two days of presentations and discussions, attendees are asked to suggest ideas, question, technical needs and knowledge gaps. As the suggestions are collected on poster boards, they will be organized into themes that will form the basis of the schedule for Wednesday morning's 'unconference'.