



SALTIEL LIFE SCIENCES SYMPOSIUM

BROADENING THE BIOSCIENCES: EXPLORING DIVERSE APPROACHES TO BIOLOGICAL AND BIOMEDICAL RESEARCH

SEPTEMBER 29 & 30, 2020

NINETEENTH ANNUAL LSI SYMPOSIUM

ZOOM WEBINAR

#LSIsymposium2020

SCHEDULE

TUESDAY, SEPTEMBER 29

2:00 P.M.

Welcome

Roger D. Cone, Ph.D.

Vice Provost and Director, Biosciences Initiative; Mary Sue Coleman Director, Life Sciences Institute; Professor of Molecular and Integrative Physiology, Medical School; Professor of Molecular, Cellular, and Developmental Biology, College of Literature, Science, and the Arts, University of Michigan

Marschall S. Runge, M.D., Ph.D.

Dean, Medical School, University of Michigan; Executive Vice President, Medical Affairs, CEO, Michigan Medicine

TALK SESSION 1: HUMAN ADAPTATION AND EVOLUTION

2:10 P.M.

Introduction of the Mary Sue and Kenneth Coleman Life Sciences Lecturer

Alan R. Saltiel, Ph.D.

Professor and Director, Institute for Diabetes and Metabolic Health, University of California San Diego School of Medicine; Director, Life Sciences Institute (2002–2015)

2:20 P.M.

Mary Sue and Kenneth Coleman Life Sciences Lecture— Genomic evolution and adaptation in Africa: Implications for health and disease

Sarah A. Tishkoff, Ph.D.

David and Lyn Silfen University Professor of Genetics and Biology; Director, Center for Global Genomics & Health Equity, Department of Genetics, Perelman School of Medicine, University of Pennsylvania

TALK SESSION 2: SOCIAL BIOMIMICRY

3:10 P.M.

Towards living robots: Using biology to make better machines

Barry A. Trimmer, Ph.D.

Henry Bromfield Pearson Professor of Natural Sciences; Director, Neuromechanics and Biomimetic Devices Laboratory, School of Arts and Sciences, Tufts University

4:05 P.M.

How the physics of slithering can teach multilegged robots to walk

Shai Revzen, Ph.D.

Associate Professor of Electrical Engineering and Computer Science, College of Engineering, University of Michigan

4:25 P.M.

What wasps can teach us about the evolution of animal minds

Elizabeth Tibbetts, Ph.D.

Professor of Ecology and Evolutionary Biology, College of Literature, Science, and the Arts, University of Michigan

5:20 P.M.

Closing remarks

Roger D. Cone, Ph.D.



SCHEDULE

WEDNESDAY, SEPTEMBER 30

9:00 A.M.

Welcome

Cheng-Yu Lee, Ph.D.

Robert H. Bartlett Collegiate Professor of the Life Sciences; Research Associate Professor, Life Sciences Institute; Associate Professor, Internal Medicine and Cell and Developmental Biology, Medical School, University of Michigan

TALK SESSION 3: BIOLOGICAL CONTROL OF DISEASE VECTORS

9:05 A.M.

Breaking up *Anopheles-Plasmodium* interactions for malaria control

Flaminia Catteruccia, Ph.D.

Professor, Immunology and Infectious Disease, T.H. Chan School of Public Health, Harvard University

10:00 A.M.

Cryopreservation of multicellular animals: Lessons from extreme insects

Nicholas Teets, Ph.D.

Assistant Professor of Entomology, College of Agriculture, Food and Environment, University of Kentucky

10:20 A.M.

Break

10:35 A.M.

Transgenic fungi for mosquito control

Raymond St. Leger, Ph.D.

Professor of Entomology, College of Agriculture & Natural Resources, University of Maryland

11:30 A.M.

Recombination versus mutation as the fuel for rapid evolution across the fungal tree of life

Timothy James, Ph.D.

Lewis E. Wehmeyer and Elaine Prince Wehmeyer Professor in the Taxonomy of Fungi, and Professor of Ecology and Evolutionary Biology, College of Literature, Science, and the Arts, University of Michigan

11:50 A.M.

Building a moving wall: Maintaining cell wall polarity during tip growth

Cora MacAlister, Ph.D.

Assistant Professor of Molecular, Cellular, and Developmental Biology, College of Literature, Science, and the Arts, University of Michigan

12:10 P.M.

Closing remarks Roger D. Cone, Ph.D.

Special thanks to the Saltiel Life Sciences Symposium organizing committee:

Ken Cadigan, Ph.D., Chair and Professor of Molecular, Cellular and Developmental Biology, College of Literature, Science, and the Arts, University of Michigan

Cheng-Yu Lee, Ph.D., Robert H. Bartlett Collegiate Professor of the Life Sciences; Research Associate Professor, Life Sciences Institute; Associate Professor of Internal Medicine and Cell and Developmental Biology, Medical School, University of Michigan

Bing Ye, Ph.D., Burton L. Baker Collegiate Professor of the Life Sciences; Research Associate Professor, Life Sciences Institute; Associate Professor of Cell and Developmental Biology, Medical School, University of Michigan

SPEAKER BIOGRAPHIES



Flaminia Catteruccia, Ph.D.

Professor of Immunology and Infectious Disease, T.H. Chan School of Public Health, Harvard University

Flaminia Catteruccia earned a bachelor's degree in organic chemistry from the University of Rome La Sapienza, Italy, and a Ph.D. in molecular biology and genetics from Imperial College London in the United Kingdom, where she achieved the first genetic manipulation of *Anopheles*. Her research at the Harvard T.H. Chan School of Public Health focuses on the study of the molecular basis of reproductive biology in *Anopheles gambiae* mosquitoes, the major malaria vectors, and of the factors that shape the development of the malaria parasite in the mosquito vector.

Catteruccia has made unique and fundamental contributions to the field of mosquito research by developing transformative genetic tools and applying these tools to the study of mosquito mating behavior and reproductive biology. Her work has a strong field component in a number of African countries to confirm and expand the laboratory findings of her research group. Catteruccia has received the Faculty Scholar Award jointly sponsored by the Howard Hughes Medical Institute and the Bill & Melinda Gates Foundation and is a member of the Broad Institute.



Timothy James, Ph.D.

Lewis E. Wehmeyer and Elaine Prince Wehmeyer Professor in the Taxonomy of Fungi; Professor of Ecology and Evolutionary Biology, College of Literature, Science, and the Arts, University of Michigan

Before joining the faculty at the University of Michigan, Timothy James received a bachelor's degree in botany from the University of Georgia and a Ph.D. from Duke University. His practical experience includes more than 20 years of extensive work with living fungi, DNA sequencing data and bioinformatics.

James's research covers the areas of molecular mycology and evolutionary biology. His group investigates the evolutionary genetics of fungi, with a major emphasis on understanding the genomic consequences and mechanisms underpinning the evolution of mating systems in fungi across the tree of life. The majority of their work involves leveraging next-generation sequencing approaches to access genotypes of lab-evolved, wild-collected, or uncultured fungi and to infer evolutionary history through bioinformatic analyses.



Cora MacAlister, Ph.D.

Assistant Professor of Molecular, Cellular, and Developmental Biology, College of Literature, Science, and the Arts, University of Michigan

Cora MacAlister earned a bachelor's degree in plant biology and entomology from Michigan State University. She did her graduate work at Stanford University, where she earned a Ph.D. in biology and researched the developmental pathways of epidermal cell specification in plants. She completed a postdoctoral fellowship at the Cold Spring Harbor Laboratory, studying the genetic regulation of floral branch architecture in tomato, before joining the University of Michigan as an assistant professor.

Current work in MacAlister's lab focuses on understanding how plant cells grow, in particular how they maintain and remodel their cell walls during growth. The cell wall is critical to plant survival and plant genomes contain a large number of cell wall-related genes including many genes encoding cell wall-associated glycoproteins. However, the function of these glycoproteins and their role in the wall is poorly understood. The MacAlister lab has found that sexual reproduction in flowering plants is particularly sensitive to defects in glycoprotein production and is using the rapid and highly polarized growth of pollen tubes as an experimental system to explore the regulation of cell wall structure.

SPEAKER BIOGRAPHIES



Shai Revzen, Ph.D.

Associate Professor of Electrical Engineering and Computer Science, College of Engineering, University of Michigan

Shai Revzen and his team at the Biologically Inspired Robotics and Dynamical Systems (BIRDS) Lab are working on discovering, modeling and reproducing the strategies animals use when interacting with physical objects. This work consists of collaboration with biomechanists to analyze experimental data, developing new mathematical tools for modeling and estimation of model parameters and construction of robots which employ the new principles.

Revzen received his Ph.D. in integrative biology from the University of California at Berkeley, and did his postdoctoral work in the GRASP Laboratory of the University of Pennsylvania. Prior to his academic work, Shai was chief architect R&D of the convergent systems division of Harmonic Lightwaves (HLIT) and a co-founder of Bio-Systems Analysis, a biomedical technology start-up.



Raymond St. Leger, Ph.D.

Professor of Entomology, College of Agriculture & Natural Resources, University of Maryland

Raymond St. Leger's dominating research interest has been directed toward understanding fungi that act as parasites of insects and using them as models for understanding how pathogens in general respond to changing environments, initiate host invasion, colonize tissues and counter host immune responses. His most controversial work has involved altering insect pathogens so that they carry genes encoding spider and scorpion toxins. The potential of these engineered pathogens to control insect borne diseases such as malaria has been successfully trialed in Burkina Faso. Other interests include pathogen and insect behavior (particularly the influence of sleep on disease resistance or tolerance), and evolution and mutualistic associations between microbes and plants that can be exploited to benefit agriculture.

St. Leger received his bachelor's degree from Exeter University before completing a master's degree at the University of London and a Ph.D. at the University of Bath in the United Kingdom. He has published more than 160 scientific papers and book chapters on fungal pathogens of plants, animals and insects, and received the AAAS Newcomb Cleveland Prize for the most impactful paper published in *Science*, 2019-2020.



Nicholas Teets, Ph.D.

Assistant Professor of Entomology, College of Agriculture, Food and Environment, University of Kentucky

Nicholas Teets is an insect physiologist and geneticist who specializes in the mechanisms that underlie adaptation to extreme environmental conditions. His current research includes NSF-funded projects on the genetic mechanisms of thermal plasticity in *Drosophila* and the physiology and genomics of extreme-adapted Antarctic insects. The Teets lab also investigates overwintering mechanisms in several economically important insect species and has USDA funding to identify genetic and environmental factors that may compromise genetically-based sterilization for insect control. In addition to the fundamental insights gained from this work, the Teets lab hopes to advance cryopreservation efforts in other animals through knowledge of extreme freeze tolerance in insects.

Outside of research, Teets is an instructor for an online introductory entomology course, an honors course on climate change and a molecular genetics course for the biotechnology program. Prior to joining the faculty in the Department of Entomology at the University of Kentucky, he completed his Ph.D. at Ohio State University and a postdoctoral fellowship at the University of Florida.

SPEAKER BIOGRAPHIES



Elizabeth Tibbetts, Ph.D.

Professor of Ecology and Evolutionary Biology, College of Literature, Science, and the Arts, University of Michigan

Elizabeth Tibbetts obtained her Ph.D. in neurobiology and behavior from Cornell University. Her postdoctoral work was at the Center for Insect Sciences at the University of Arizona. Following her postdoc, she joined the faculty of the University of Michigan as an assistant professor in the Department of Ecology and Evolutionary Biology. She was subsequently promoted to associate professor in 2012 and full professor in 2017.

Tibbetts' research program uses paper wasps to understand the evolution of animal cognition, communication and cooperation. Although paper wasps' brains are smaller than a grain of rice, they can perform seemingly complex behaviors like individual face recognition, transitive inference, social eavesdropping and concept learning. Her work adds to a growing body of evidence that the miniature nervous systems of insects do not limit sophisticated behaviors.



Sarah A. Tishkoff, Ph.D.

David and Lyn Silfen University Professor of Genetics and Biology; Director, Center for Global Genomics & Health Equity, Department of Genetics, Perelman School of Medicine, University of Pennsylvania

Sarah Tishkoff studies genomic and phenotypic variation in ethnically diverse Africans. Her research combines field work, laboratory research and computational methods to examine African population history and how genetic variation can affect a wide range of traits — for example, why humans have different susceptibility to disease, how they metabolize drugs and how they adapt through evolution.

Tishkoff earned her Ph.D. in genetics from Yale University and completed postdoctoral fellowships at Pennsylvania State University and the South African Institute of Medical Research, University of the Witwatersand. She is a member of the National Academy of Sciences and a recipient of an NIH Pioneer Award, a David and Lucile Packard Career Award, a Burroughs/Wellcome Fund Career Award, an ASHG Curt Stern award, and a Penn Integrates Knowledge (PIK) endowed chair. She also is a member of the Board of Global Health at the National Academy of Sciences and serves on the editorial boards at *PLOS Genetics, Genome Research, G3 (Genes, Genomes, and Genetics)* and *Cell.*



Barry A. Trimmer, Ph.D.

Henry Bromfield Pearson Professor of Natural Sciences; Director, Neuromechanics and Biomimetic Devices Laboratory, School of Arts and Sciences, Tufts University

Barry Trimmer's research focuses on the neuromechanics of locomotion, the science of how animals control their movements. In addition to his work on living systems, Trimmer is Director of the Tufts Neuromechanics and Biomimetic Devices Laboratory, which specializes in the application of found biological principles to the design and fabrication of soft robots, and is also editor in chief of the journal *Soft Robotics*.

Trimmer's lab designs and builds a variety of soft robots that are used to test hypotheses about locomotion and to explore new types of control systems. His interests in living systems and robots converge in his recent research that seeks to "grow" robotic devices using a combination of biosynthetic materials, cellular modulation, and tissue engineering. These biosynthetic robots will be versatile, safe, biocompatible and biodegradable.

ABOUT THE LIFE SCIENCES INSTITUTE

The Life Sciences Institute is a hub for collaborative bioscience discovery at the University of Michigan. Our faculty, who hold joint appointments in schools and colleges across the campus, work to advance the understanding of fundamental biology in important areas of human health and disease. In addition to faculty labs, the LSI houses a world-class cryo-electron microscopy facility, a high-throughput screening center with extensive chemical libraries, a unique library of natural products and a comprehensive protein production and X-ray crystallography facility. The LSI is also the administrative home for the U-M Program in Chemical Biology, Michigan Drug Discovery and the Michigan Life Sciences Fellows program.

ABOUT THE ANNUAL SYMPOSIUM

In 2002, while construction of the institute was still underway, the LSI held its first symposium. The event continues to represent the LSI's most important values: excellence in science, investment in high-impact research and especially the synergy that happens when top scientists from a range of fields meet and share their work around a common theme.

In 2016, the annual LSI symposium was named the Saltiel Life Sciences Symposium thanks to an endowment made possible by the generous support of the LSI's faculty, Leadership Council, Scientific Advisory Board and friends. The name recognizes the leadership and scientific contributions made by former LSI Director Alan R. Saltiel during his 13-year tenure.

PAST SYMPOSIA

- 2019 Protein Engineering & Biological Design
- 2018 The Power of One: Frontiers in Single Cell Biology
- 2017 Game Changers: Technologies that Are Rewriting the Future of the Life Sciences
- 2016 Chemical Biology: Rise of the Cellular Machine
- 2015 Defense Mechanisms in Life: From Bacteria to the Human Body
- 2014 Victors for Discovery: Biomedicine at Michigan
- 2013 Exploring Epigenetics and RNA
- 2012 Development and Diseases of the Nervous System

- 2011 Autophagy
- 2010 Macromolecular Complexes in Cell Biology
- 2009 Evolutionary Biology
- 2008 Focus on Chemical Biology
- 2007 Frontiers in Stem Cell Biology
- 2006 Molecular Insights into Metabolic Disease
- 2005 Cancer Insights: Molecules to Medicine
- 2004 Exploring the Complexity of Life
- 2003 Genetic Insights into Biology and Disease
- 2002 Structural Biology of Cell Signaling

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