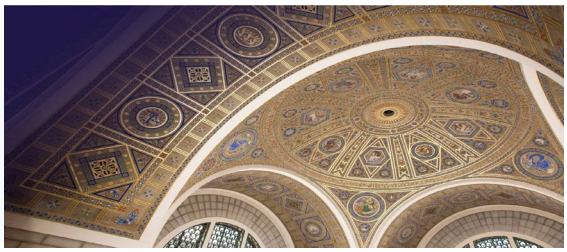
NATIONAL ACADEMIES Sciences Engineering Medicine

Board on Environmental Studies and Toxicology | Board on Life Sciences

Paving the Way for Continental Scale Biology: Connecting Research Across Scales (*A Webinar Series)*

Public Agenda for April 24-25, 2023



MEETING GOAL AND OBJECTIVES

This is one of three public information gathering sessions that will explore how biological research at multiple scales can inform the development of a continental scale biology. This will include identifying and discussing practices that have been used successfully to translate knowledge from small-scale biological research to regional- and continental-scale, challenges that prevent uptake of these practices and specific research questions that could serve as pilots for implementing research projects that integrate one or more successful practices. Speakers will highlight frontier research efforts demonstrating continental-scale biology. This event will provide a platform for creative collaboration among experts from multiple fields, organizations, and sectors.

MONDAY, APRIL 24, 2023

1:30-1:35 pm EST — **Welcome**

Clifford Duke, National Academies – Board on Environmental Studies and Toxicology

1:35-1:45 pm — **Opening Remarks**

Jianguo (Jack) Liu, Michigan State University (Chair)

1:45-2:30 pm — **Keynote Speaker**

Forecasting Global Change Impacts on Biodiversity

Janet Franklin, San Diego State University

2:30-3:55 pm — **Panel: Biology at Multiple Scales from Researchers' Perspectives**

Moderator: N. Louise Glass, University of California, Berkeley

Goals:

- Learn about research happening at different scales of biology from researchers in the field
- Explore ways that small-scale biological research informs larger-scale efforts, and vice versa
- Examine how specific knowledge, approaches, and tools can be translated across multiple scales of biology

Panelists:

David Schimel, National Aeronautics and Space Administration
Emiley Eloe-Fadrosh, Lawrence Berkeley National Laboratory
Sydne Record, University of Maine
Marten Winter, German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig/Univ Leipzig
Noah Fierer, University of Colorado, Boulder
Thomas Elmqvist, Stockholm University

3:55-4:00 pm **Key Takeaways from Day 1**

Jianguo (Jack) Liu, Michigan State University (Chair)

END OF FIRST DAY

TUESDAY, APRIL 25, 2023

1:00-1:05 pm **Welcome**

EST Jianguo (Jack) Liu, Michigan State University (Chair)

1:05-1:50 pm **Keynote Speaker**

Ecosystems and the Biosphere as Complex Adaptive Systems: Scaling, Collective Phenomena and Governance

Simon Levin, Princeton University

1:50-3:20 pm **Panel – Biology at Multiple Scales from Program Managers' Perspectives**

Moderator: Stephanie Hampton, Carnegie Institution for Science

Goals:

- Learn about research happening at different scales of biology from program managers for different funding agencies
- Understand the current state of research at multiple scales
- Explore opportunities to connect research at multiple scales

Panelists:

Anika Dzierlenga, National Institutes of Health
Katharina Dittmar, National Science Foundation
Woody Turner, National Aeronautics and Space Administration
Todd Anderson, Department of Energy
Scott Hagerthey, Environmental Protection Agency
Michael Wilson, U.S. Department of Agriculture

3:20-3:30 pm **Key Takeaways from Day 2**

Jianguo (Jack) Liu, Michigan State University (Chair)

MEETING ADJOURNS

SPEAKER BIOS

SIMON A. LEVIN, PRINCETON UNIVERSITY

Simon A. Levin is the James S. McDonnell Distinguished University Professor in Ecology and Evolutionary Biology at Princeton University. He received his B.A. from Johns Hopkins University and his Ph.D. in Mathematics from the University of Maryland. Levin is a Fellow of the American Academy of Arts and Sciences and the American Association for the Advancement of Science; a Member of the National Academy of Sciences and the American Philosophical Society; and a Foreign Member of the Istituto Veneto and the Istituto Lombardo. He is a University Fellow of Resources for the Future; a Fellow of the Beijer Institute of Ecological Economics, the Society for Industrial and Applied Mathematics, the Society for Mathematical Biology, the American Mathematical Association; a Distinguished Fellow of the Luohan Academy; and a Fellow of the Academia Europaea. He is a former President of the Ecological Society of America and the Society for Mathematical Biology, Chair of the Council of IIASA, Chair of the Board of the Beijer Institute, and Chair of the Science Board of the Santa Fe Institute. His awards include: the Kyoto Prize in Basic Sciences, Heineken Prize for Environmental Sciences, Margalef Prize for Ecology, Tyler Prize for Environmental Achievement, U.S. National Medal of Science, and the BBVA Foundation Frontiers of Knowledge Award in Ecology and Conservation Biology.

JANET FRANKLIN, SAN DIEGO STATE UNIVERSITY

Janet Franklin is the Endowed Campanile Foundation Professor in the Department of Geography, San Diego State University. She was previously a Distinguished Professor in the Department of Botany, University of California at Riverside (2017-2022), a Regent's Professor in the School of Geographical Sciences and Urban Planning, as well as a Distinguished Sustainability Scientist at Arizona State University where she was appointed in 2009. From 1988-2009 she was on the faculties of Geography and Biology at San Diego State University. She received her Ph.D. in Geography from the University of California – Santa Barbara in 1988. Her research expertise is in Landscape Ecology, Global Change Biology, Conservation Biogeography, and Geospatial Science. Franklin's scholarship seeks to understand the patterns and dynamics of terrestrial (land) plant communities at the landscape scale. Her work addresses the impacts of human-caused landscape change on the environment and biological diversity. She is a Member of the National Academy of Sciences, USA, and a Fellow of the American Association for the Advancement of Science, the American Academy of Arts and Sciences, and the Ecological Society of America.

ANIKA DZIERLENGA, NATIONAL INSTITUTES OF HEALTH

Anika Dzierlenga is a Program Officer in the National Institute of Environmental Health Sciences (NIEHS) of the NIH. She manages a broad portfolio of grants that explore the relationship among chemical exposure, host microbiome, and human health outcomes. In addition, she oversees the NIEHS-NSF co-funded Oceans & Human Health Program, which supports research on ocean and Great Lakes exposures, climate change, and public health by leveraging interdisciplinary collaborations and community partnerships. Prior to assuming her role as Program Officer, Dr. Dzierlenga trained as an IRTA postdoctoral fellow at the National Toxicology Program. She received her B.S. in Biochemistry at Trinity University in San Antonio, and her Ph.D. in Pharmacology & Toxicology at the University of Arizona (2016).

WOODY TURNER, NASA

Woody Turner is the Program Scientist for Biological Diversity and co-Program Manager for Ecological Conservation in the NASA Headquarters Earth Science Division. As program scientist, he oversees the agency's basic research efforts to use satellite-derived information to understand the relationships of biodiversity to climate, landscape/seascape change, and ecosystem function. The NASA Ecological Conservation Program is an applications activity seeking to bring together satellite observations, in-situ data, and ecological models to support decision making for conservation biology. Born in Nashville, TN, Woody graduated from the University of North Carolina, Chapel Hill in 1982 and earned master's degrees in public affairs from Princeton University in 1987 and in conservation biology from the University of Maryland in 2001.

TODD ANDERSON, DEPARTMENT OF ENERGY

Dr. Anderson serves as the Director of the Biological Systems Science Division within DOE's Office of Biological and Environmental Research (BER). The division manages basic science programs addressing the fundamental biology of plants and microbes of relevance to DOE's bioenergy and environmental missions. The current portfolio includes the Genomic Science Program, the DOE Bioenergy Research Centers, the DOE Joint Genome Institute, the DOE Systems Biology Knowledgebase, the National Microbiome Data Collaborative and, capabilities at the DOE Synchrotron Light and Neutron sources for Structural Biology. Dr. Anderson has been with DOE-BER for the past nineteen years managing a variety of basic science programs within the Office and has served as a division director for the past eleven years. Dr. Anderson holds a bachelor's degree in chemistry from the University of Virginia, a master's degree in environmental engineering from the Johns Hopkins University and a Ph.D. in environmental engineering from the University of Massachusetts. His publication record spans various topics in environmental microbial ecology including anaerobic hydrocarbon degradation, dissimilatory metal reduction and radionuclide immobilization.

MARTEN WINTER, LEIPZIP UNIVERSITY

Dr. Marten Winter is a renowned senior researcher with over a decade of experience leading sDiv (www.idiv.de/sdiv), the synthesis centre for biodiversity research at iDiv, the German Centre for Integrative Biodiversity Research (Halle-Jena-Leipzig). His research interests include macroecology and biological invasions, with a focus on macroecology of biological invasions (www.glonaf.org), developing policy-relevant indicators (www.idiv.de/stwist), and improving interoperability and data enrichment for large-scale analyses. Dr. Winter's extensive knowledge of biodiversity research has enabled him to provide valuable support and guidance to numerous initiatives and projects as part of advisory boards, such as those at BioDivERsa (https://www.biodiversa.eu/), AquaSync (https://www.aquasync.dk/);, FinBio (https://finbio.org/), and Future Earth (https://futureearth.org/networks/global-research-networks/natural-assets/). He is also a core and founding member of the International Synthesis Consortium (https://synthesis-consortium.org/).

DAVID SCHIMEL, NASA

David Schimel is a Senior Research Scientist at NASA's Jet Propulsion Laboratory. He was formerly Chief Science Officer, Principal Investigator, and CEO for the National Ecological Observatory Network (NEON). Schimel was a founding director at the Max Planck Institute for Biogeochemistry from 1995 to 2002. Schimel was a convening lead author, reviewing the carbon cycle, of the 1995 Intergovernmental Panel on Climate Change report, which led to the IPCC receiving the Nobel Peace Prize in. He earned his PhD from Colorado State University and was a National Research Council Postdoctoral Fellow at NASA's Ames Research Center. His work focuses on the global carbon cycle, and the role of ecosystems, as well as on global biodiversity. His is currently Mission Scientist for NASA's Surface Biology and Geology mission. He has authored over 200 papers on biogeochemistry and the global carbon cycle and several books.

SCOT HAGERTHEY, EPA

Scot E. Hagerthey, Ph.D., is currently the Interim National Director of EPA's Sustainable and Healthy Communities Research Program in the Office of Research and Development. In this role, he leads the development of research to help communities make better decisions to sustain a healthy society and environment. From 2019-2002 he has served as a Senior Science Advisor in EPA's Center for Public Health and Environmental Assessment and from 2015-2019 as a Deputy Division Director in EPA's National Center for Environmental Assessment. His career at EPA began in 2011 and spanned the areas of ecological assessment, water quality, sustainability, community empowerment, strategic planning, and program implementation. He relies on a systems approach to provide the science to support environmental decision making. His has applied this approach to the study of freshwater ecosystems, European mudflats, Everglades restoration, and communities. He holds B.S. in Biology from East Carolina University and a Ph.D. in Biology from Michigan Technological University.

EMILEY ELOE-FADROSH, LAWRENCE BERKELEY NATIONAL LABORATORY

Emiley Eloe-Fadrosh is a Staff Scientist at Berkeley Lab where she heads the Metagenome Program at the Department of Energy's (DOE) Joint Genome Institute and also leads the DOE's multi-lab National Microbiome Data Collaborative. Her research focuses on leveraging genome-resolved metagenomic approaches to identify and characterize genomic information from uncultivated microbes and viruses. She serves on the Board of the Genomic Standards Consortium and is on the Steering Committee for the International Metagenomics and Microbiome Standards Alliance.

SYDNE RECORD, UNIVERSITY OF MAINE

Dr. Sydne Record is the Associate Professor of Landscape Conservation in the Department of Wildlife, Fisheries, and Conservation Biology at the University of Maine. Her research program seeks to understand what drives the distribution and abundance of life on Earth across space and time. Within the context of this key question, research in her group focuses on two main themes: 1) understanding what processes (i.e., demographic, species interactions) result in the distribution of species and 2) determining drivers of genetic, trait, and species diversity across large landscapes (and oceans). More specifically, her research program focuses on linking ecological theory and site-scale empirical data with collation of large data sets on regional and global ecological patterns using quantitative methods. Record's research also models an increasingly collaborative, network-based style of research for ecology. Given that much of her research spans continental spatial and long temporal scales, she leverages national and international collaborations with colleagues and federally funded networks (e.g., the Long Term Ecological Research Network [LTER], the Smithsonian ForestGEO network, and the National Ecological Observatory Network [NEON]) to access infrastructure to make the work that she does possible.

KATHARINA DITTMAR, NATIONAL SCIENCE FOUNDATION

Katharina Dittmar is the program director of the division of environmental biology at the National Science Foundation. The division programs include: Ecology and Evolution of Infectious Diseases, Predictive Intelligence for Pandemic Prevention, Incorporating Human Behavior in Epidemiological Models, Biodiversity on a Changing Planet, Partnership to Advance Conservation Science and Practice, Systematics and Biodiversity Sciences, Population and Community Ecology. Dittmar's professional experience and interests include the fields of evolution and ecology, systematics, bioinformatics, vector borne pathogens and diseases, parasitology, and veterinary medicine. From 2007 to 2018 she was on the faculty of the biological sciences department at the University of Buffalo. She was also the director of the graduate program in Ecology, Evolution, and Behavior from 2013 to 2016 at the University of Buffalo. Dittmar conducted postdoctoral research at Brigham Young University/University of Wyoming. She received a DVM and conducted graduate research at the University of Leipzig in Germany.

MICHAEL WILSON, U.S. DEPARTMENT OF AGRICULTURE

Michael Wilson serves as the Rocky Mountain Research Station's Forest Inventory and Analysis (FIA) Program Manager based in Riverdale, UT; he is responsible for implementation of the Program across the eight Interior West States and NFS Regions 1-4. Prior to coming to FIA, Michael conducted his undergraduate and graduate work at the Northern Arizona University School of Forestry, conducted State-wide forest resource inventories across the Interior West, and worked in several National Forests across Arizona and New Mexico in local resource inventory and monitoring efforts. He has served in several Station and national FIA leadership details, and he currently serves on the National FIA Management Team, providing leadership for a variety of NFS-FIA partnerships. FIA is a critical cross-Deputy area program, building strong partnerships with States and other federal agencies by providing up-to-date broad-scale resource inventory and monitoring information and knowledge across all land ownerships. At home Michael enjoys gardening, and his passions are hiking and archery elk hunting across the West.

NOAH FIERER, UNIVERSITY OF COLORADO BOULDER

Noah Fierer is a Professor in the Department of Ecology and Evolutionary Biology, the Director of the Center for Microbial Exploration, and a Fellow of the Cooperative Institute for Research in Environmental Sciences at the University of Colorado Boulder. He is a microbial ecologist and his research program focuses on microbes living in a range of environments, including those bacteria, fungi, and protists living inside our homes, in soil, on plants, and in the atmosphere. His group uses a range of approaches, including DNA sequencing and high-throughput cultivation, to explore the diversity and structure of microbial communities, identify the fundamental controls on microbial processes, and examine the mechanisms by which microorganisms influence the health of ecosystems, plants, and animals (including humans). For more information, see: http://fiererlab.org/

THOMAS ELMQVIST, STOCKHOLM UNIVERSITY

Thomas Elmqvist, PhD, is a professor in Natural Resource Management at Stockholm Resilience Centre, Stockholm University. His research is focused on urbanization, urban ecosystem services, land use change, natural disturbances and components of resilience including the role of social institutions. He has led and coordinated several major international interdisciplinary research projects, such as the UN-initiated global project “Cities and Biodiversity Outlook” and the Future Earth Project “Urban Planet” He currently serves as Editor in chief for the Nature Research journal “npj Urban Sustainability” and as associated editor for the journals Sustainability Science, Current Opinion in Environmental Sustainability. He has published over 100 papers, 30 books and book chapters and received the Biodiversa prize 2018 for “Excellence in science and impact” and the Ecological Society of America prize for best paper in “Sustainability Science” in 2019 and 2023.