NSF DISTINGUISHED LECTURE SERIES BIOECONOMY COORDINATING COMMITTEE 2021

CO-SPONSORED BY BIOLOGICAL SCIENCES DIRECTORATE | BIO
ENGINEERING DIRECTORATE | ENG

SOWING THE SEEDS OF CONVERGENT SYNTHETIC DESIGN

DATE
March 18

TIME
11 am - 1 pm

LOCATION
YouTube

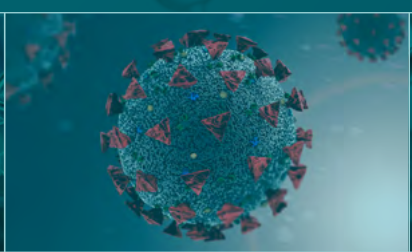
SPEAKERS


Dr. Lydia Contreras


Dr. Douglas Densmore


Dr. Julius Lucks


Dr. Jennifer Nemhauser


National Science Foundation
WHERE DISCOVERIES BEGIN

ABOUT THE SPEAKER

DR. JENNIFER NEMHAUSER

PROFESSOR
BIOLOGY

UNIVERSITY OF WASHINGTON

Dr. Jennifer Nemhauser is a Professor of Biology at the University of Washington and an HHMI Faculty Scholar. She has been studying plant hormones, signaling networks and development for a long time, and added synthetic biology to the mix after meeting her frequent collaborator, Prof. Eric Klavins (UW ECE) in 2007. Before coming to Seattle, Jennifer did her doctoral work on auxin and flower development at UC Berkeley with Dr. Pat Zambryski, followed by postdoctoral work on hormone interactions during seedling development at the Salk Institute with Dr. Joanne Chory. As part of her work as a scientist and a faculty member, Jennifer pursues every opportunity to disrupt structural inequities in academic science including systemic racism. One example is the DiversifyPlantSci database, which Jennifer co-founded as part of her service as an elected member of the North American Arabidopsis Steering Committee.

Please visit **http://depts.washington.edu/nemlab** for more information.

ABSTRACT

The recent *Plant Science Decadal Vision* argued that the reimagining of, and investment in, the potential of plants for a healthy and sustainable future should be a priority for global research efforts. Plant systems are the foundation of healthy ecosystems and environments, sentinels of climate change, and the primary producers of food, feed, fiber, energy, and shelter. In addition, plants have many other realized and prospective uses, including serving as programmable bioreactors for diverse specialized products. Arguably the most urgent humanitarian priority we face, alongside current and future pandemics, is solving the multi-level challenge of food security. Dr. Nemhauser will focus on two specific examples of how plant science research can serve this urgent need and bolster the U.S. bioeconomy: (1) synthetic biology applications for altering plant form and metabolism, and (2) new strategies for building the workforce and research culture needed to achieve these aims.

ABOUT THE SPEAKER

DR. LYDIA CONTRERAS

ASSOCIATE PROFESSOR

DEPARTMENT OF CHEMICAL ENGINEERING

JIM AND BARBARA MILLER ENDOWED FACULTY FELLOWSHIP IN CHEMICAL ENGINEERING

UNIVERSITY OF TEXAS

Dr. Lydia M. Contreras is an Associate Professor and Jim and Barbara Miller Faculty Fellow of Chemical Engineering at the University of Texas-Austin; she is also a member of the Institute of Cell and Molecular Biology. She teaches Introduction to Chemical Engineering Computing, Thermodynamics, Introduction to Chemical Engineering Analysis, and Fundamental and Applications of Cellular Regulation.

Dr. Contreras obtained a B.S.E. in Chemical Engineering from Princeton University in 2003, where she graduated Cum Laude. She completed her PhD in Chemical Engineering from Cornell University in 2008, focusing on engineering bacterial cells for improved production of therapeutic proteins. As a postdoctoral associate at the Wadsworth Center (New York State Department of Health), she focused on understanding mechanisms of infection in pathogenic bacteria. She began her career at the University of Texas-Austin in 2011, where she leads a research team focused on RNA biochemistry to study gene regulation mechanisms associated with stress-responses for applications in health and biotechnology. She has received several academic, teaching, and service awards including: an NSF CAREER, ACS BIOT Young Investigator Award, Biotechnology and Bioengineering Daniel I.C. Wang Award, Department of Thrust Reduction Agency (DTRA) Young Investigator, Airforce Office of Scientific Research Young Investigator, Health and Environmental Institute (HEI) Walter E. Rosenblith New Investigator, Norman Hackerman Advanced Research Program (NHARP) Early Career, Society of Hispanic Professional Engineers (SHPE) Young Investigator Award, and an Innovative Early-Career Frontiers of Engineering Educator. She lives in Austin, Tx and is a proud mom to toddler twins.

Please visit **https://sites.utexas.edu/contreraslab** for more information.

ABSTRACT

A key aspect of biotechnology is to be able to reprogram organisms to carry on robust processes that can improve our lives. The challenge is that organisms must maintain robustness in a variety of environmental conditions. Dr. Contreras will speak about the importance of transcriptional regulation in response to stress and how gene expression is altered to reprogram metabolism under a variety of conditions. She will focus on regulatory RNA networks and their complexity as well as methods to characterize and predict network interactions that are essential for efficient regulation. In addition to her scientific work, Dr. Contreras tackles the many challenges of equity in science exposure by spearheading the *Raising a Future Scientist* program which connects underrepresented students with resources required to enter the STEM fields.

ABOUT THE SPEAKER

DR. JULIUS LUCKS

ASSOCIATE PROFESSOR
CHEMICAL AND BIOLOGICAL ENGINEERING

ASSOCIATE CHAIR
CHEMICAL AND BIOLOGICAL ENGINEERING

NORTHWESTERN UNIVERSITY

Julius B. Lucks is Associate Professor of Chemical and Biological Engineering at Northwestern University. Research in the Lucks group seeks to uncover the molecular principles that enable biological systems to sense and adapt to changing environments, and to understand how we can use these principles to engineer synthetic biological systems that benefit humankind. His group recently pioneered new approaches to creating low-cost cell-free synthetic biology diagnostics to solve challenges in global water quality monitoring. He is also the PI of the first NSF NRT graduate training program in synthetic biology. For his research, Professor Lucks has been recognized with a number of awards including a DARPA Young Faculty Award, an Alfred P. Sloan Foundation Research Fellowship, an ONR Young Investigator Award, an NIH New Innovator Award, an NSF CAREER award, the ACS Synthetic Biology Young Investigator Award, a Camille-Dreyfus Teacher Scholar Award, and most recently was a finalist for the Blavatnik Awards for Young Scientists. He is a founding member of the Engineering Biology Research Consortium and co-founded the Cold Spring Harbor Synthetic Biology Summer Course. He is also a co-founder of Stemloop, Inc., which aims to use cell free biosensing technology to empower people to make meaningful community health decisions.

Please visit http://luckslab.org for more information.

ABSTRACT

This talk begins with a fundamental question in biology: How do cells sense and respond to changing environments? In this talk, Dr. Julius Lucks will describe how a scientific quest to answer this question has led to fundamental investigations of RNA folding, discoveries from which have led to the creation of new synthetic biology technologies for low-cost, rapid, and deployable diagnostic platforms that benefit humankind. Along the way he will discuss how this line of research is spinning out new technologies to tackle emergent challenges of the COVID-19 crisis, new entrepreneurship avenues to deliver these technologies from the lab to the world and is contributing to a new paradigm in synthetic biology graduate education – all sponsored in some way by the National Science Foundation.

ABOUT THE SPEAKER

DR. DOUGLAS DENSMORE

ASSOCIATE PROFESSOR

ELECTRICAL & COMPUTER ENGINEERING

KERN FACULTY FELLOW

HARIRI INSTITUTE FOR COMPUTING AND COMPUTATIONAL SCIENCE AND ENGINEERING FACULTY FELLOW

BOSTON UNIVERSITY

Douglas Densmore is a Kern Faculty Fellow, a Hariri Institute for Computing and Computational Science and Engineering Faculty Fellow, and Associate Professor in the Department of Electrical and Computer Engineering at Boston University. His research focuses on the development of tools for the specification, design, assembly, and test of synthetic biological systems. His approaches draw upon his experience with embedded system-level design and electronic design automation (EDA). Extracting concepts and methodologies from these fields, he aims to raise the level of abstraction in synthetic biology by employing standardized biological part-based designs which leverage domain-specific languages, constraint-based genetic circuit composition, visual editing environments, microfluidics, and automated DNA assembly. This leads to a new research area he calls “Hardware, Software, Wetware Co-design.”

Please visit **https://www.cidarlab.org/ddensmore** for more information.

ABSTRACT

Modern engineering efforts leverage software and automation regularly to design, build, and test new systems. This is true in the design of semiconductors, the automobile industry, and industrial construction projects. Synthetic biology clearly can benefit from such approaches but there are some challenges that make it particularly unique when applying computer aided design techniques. This talk will describe how National Science Foundation-supported efforts have helped to develop a wide variety of bio-design automation software, principles, and workflows. These include the design of biological genetic circuits, hybrid biological electronic microfluidic systems, and design approaches to automate the physical assembly of biological systems. Also addressed are the various needs, opportunities, and challenges in biomanufacturing and bio-readiness and effective ways to commercialize bio-design automation tools. In addition to his scientific research, Dr. Densmore will present the “STEM Pathways Program” and the International Workshop on Bio-Design Automation (IWBDA), which are dedicated to fostering the next generation of synthetic biologists.

UPCOMING
LECTURES | 2021

NSF Bioeconomy Coordinating Committee Distinguished Lecture Series

NSF invests in fundamental research to support biotechnology and advance the U.S. bioeconomy across all fields of science and engineering. Presented by NSF's Bioeconomy Coordinating Committee and NSF Directorates, this distinguished lecture series will bring in individual speakers and panels representing the science and technology funded by a Directorate every month. Speakers will present on research and broader impacts in areas associated with biotechnology and the bioeconomy that are of interest broadly across the foundation.

All sessions will be conducted virtually.

THURSDAY, SEPTEMBER 9, 2021

11:00 a.m. – 1:00 p.m.

PANEL PRESENTATION:

TOM MUIR, PHD
Princeton University

BEN GARCIA, PHD
Washington University School of Medicine

LISSA ANDERSON, PHD
National High Magnetic Field Laboratory

PING MA, PHD
University of Georgia

CO-SPONSORED BY THE BIOECONOMY COORDINATING COMMITTEE, BIO, AND MPS

For more information, refer to the NSF Bioeconomy Distinguished Lecture Series website or contact **Jared Dashoff at jdashoff@nsf.gov**.

WEBSITE
www.nsf.gov

TELEPHONE
TEL: (703) 292-5111
FIRS: (800) 877-8339
TDD: (800) 281-8749

ADDRESS
2415 Eisenhower Avenue
Alexandria, Virginia 22314, USA

National Science Foundation
WHERE DISCOVERIES BEGIN