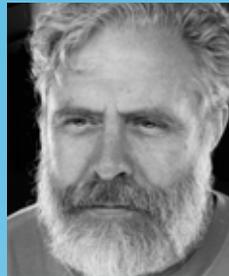


# PART III

## PANELISTS



**Drew Endy**  
Assistant Professor of  
Bioengineering at  
Stanford University



**George Church**  
Professor of Genetics  
at Harvard Medical School;  
Director of PersonalGenomes.org



**Laurie Zoloth**  
Professor of Medical Humanities,  
Bioethics, and Religious Studies  
at Northwestern University

## A VISION FOR 2033

### The long term promises, and social, ethical, and regulatory implications of synthetic biology

**Drew Endy**, who runs the world's first "fabless" genetic engineering lab at Stanford, also helped start the biological engineering major at MIT. His research team develops genetically encoded computers and redesigns genomes. He co-founded the BioBricks Foundation supporting free-to-use standards and technology for engineering biology. He co-organized the International Genetically Engineered Machine competition and the BIOFAB International Open Facility Advancing Biotechnology. Endy serves on the U.S. Committee on Science Technology and Law and the U.S. National Science Advisory Board for Biosecurity. He also served as an ad hoc member of the U.S. NIH Recombinant DNA Advisor Committee. *Esquire* named Endy one of the 75 most influential people of the 21st century.

**George Church** is a professor of genetics at Harvard Medical School. He directs PersonalGenomes.org, the world's only open-access information on human genomic, environmental and trait data. His Harvard Ph.D. included the first methods for direct genome sequencing, molecular multiplexing and barcoding, which led to the first commercial genome sequence — a pathogen called *Helicobacter pylori*. His innovations in genome sequencing and synthesis and cell/tissue engineering have led to 12 companies working in the fields of medical genomics, synthetic biology and new policies for privacy, biosafety and biosecurity. Church is director of the NIH's Center for Excellence in Genomic Science. He is a Franklin Laureate for Achievement in Science and has been elected to NAS and NAE.

**Laurie Zoloth** is McCormick professor at Northwestern University, where she was founding director of the Center for Bioethics, Science and Society and of the Brady Program in Ethics and Civic Life. She is currently on the National Recombinant DNA Advisory Board and will become President of the American Academy of Religion this year. Zoloth has a B.A., a BSN and two M.A. degrees, as well as a Ph.D. in social ethics from the Graduate Theological Union in Berkeley, Calif. Zoloth works on emerging issues in medical and research genetics, religion and science, and justice in health care delivery. She was also awarded an NIH grant to explore the ethical issues that arose after the mapping of the human genome. Zoloth has also been invited to testify on the issues of science, bioethics and religion to the National Bioethics Advisory Council and the U.S. Senate.

## MODERATOR



**Corey Powell**  
Editor-at-Large for  
DISCOVER Magazine

**Corey S. Powell** graduated from Harvard with a degree in history and science and performed an early stint as a research assistant at the NASA Goddard Space Flight Center, building and testing gamma ray telescopes. His journalism career has spanned *Physics Today*, *Scientific American*, and DISCOVER magazine, where he served for four years as editor-in-chief. His writing has been published in the *New York Times*, the *San Francisco Chronicle*, *Newsday* and the *Los Angeles Times*; his book "God in the Equation" explored the spiritual impulse in modern cosmology. Powell is a frequent commentator on Fox News and has appeared on CNN, MSNBC, ABC News, CBS News, Syfy, and NPR's Science Friday. He is now editor-at-large for DISCOVER, where he writes "Out There," a monthly column and blog about the edges of scientific exploration.

## PROGRAMMING LIFE THE REVOLUTIONARY POTENTIAL OF SYNTHETIC BIOLOGY

Just as today's engineers design integrated circuits based on the known physical properties of materials and use them to create electronic devices with amazing capabilities, tomorrow's synthetic biologists are poised to design and build biological systems that are custom-tailored to make a better world. Engineered life could lead to improved human health, a safer food supply, and a cleaner, more abundant supply of energy. Unlike many other areas of engineering, biology is incredibly non-linear. That poses a challenge: Unleashing its potential will require a broad and sustained effort, drawing on great minds from multiple disciplines. But the payoff could be huge, as synthetic biology is poised to make the kind of leaps in the 21st century that computer technology made in the 20th.

SynBERC, the leading synthetic biology research organization, and DISCOVER magazine, the leading general-interest science magazine, have teamed up to explore the vast possibilities of this new type of biological engineering.

[www.SynBERC.org](http://www.SynBERC.org)

[www.DiscoverMagazine.com](http://www.DiscoverMagazine.com)

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SynBERC & DISCOVER Magazine present:

# PROGRAMMING LIFE THE REVOLUTIONARY POTENTIAL OF SYNTHETIC BIOLOGY

**Monday, March 25, 2013, 1:00-2:30 P.M.**  
BY INVITATION ONLY • RECEPTION TO FOLLOW  
Stanley Hall Auditorium, University of California at Berkeley

**synberc**  
Building the Future with Biology

**DISCOVER**  
MAGAZINE

# AGENDA

Welcoming Remarks:  
Jay Keasling

Keynote Address:  
Juan Enriquez

All Panel Discussions Moderated by:  
Corey Powell, Editor-at-Large, DISCOVER Magazine

## PART I. CATALYZING BIOLOGICAL ENGINEERING

### Creating tools, building an industry, training a workforce

Panelists: Douglas Densmore, Christina D. Smolke, Christopher Voigt

## PART II. FROM LAB TO LIVING ROOM

### State of the art, near term prospects, and the role of the private sector

Panelists: Jay Keasling, Steve Evans, Virginia Ursin

## PART III. A VISION FOR 2033

### The long term promises, and social, ethical, and regulatory implications of synthetic biology

Panelists: Drew Endy, George Church, Laurie Zoloth

#### KEYNOTE SPEAKER



**Juan Enriquez**  
Co-Founder, Synthetic Genomics

**Juan Enriquez** is one of the world's leading authorities on the economic and political impacts of life sciences. He is a managing director in Excel Venture Management, which invests in companies that apply transformative life science technologies to solve problems in health care and beyond. He was the founding director of Harvard Business School's Life Sciences Project, and he founded Biotechnology, a research and investment firm, where he remains chairman and CEO. He also co-founded Synthetic Genomics, which focuses on developing and commercializing genomic-driven solutions to address the challenges of global energy, medicine, clean water and food. At Harvard, Enriquez won a McKinsey Prize and published the best-selling book *As the Future Catches You*, an analysis of the impact of genomics on business and society. He also co-authored an e-book

with Steve Gullans, *Homo Evolutis: A Short Tour of our New Species*, which describes a world where humans increasingly shape their environment, themselves and other species. Enriquez serves on the Public Interfaces Steering Committee of the Division of Earth & Life Sciences of the National Academy of Sciences, the Genetics Advisory Council of Harvard Medical School, the Chairman's International Council of the America's Society, and the Visiting Committee of Harvard's David Rockefeller Center. He earned a B.A. and an MBA from Harvard, with honors.

# PART I

## CATALYZING BIOLOGICAL ENGINEERING

### Creating tools, building an industry, training a workforce

#### PANELISTS



**Douglas Densmore**  
Assistant Professor of Electrical and Computer Engineering at Boston University

**Douglas Densmore** received his Ph.D. in electrical engineering from the University of California, Berkeley. He worked as a postdoctoral research fellow at SynBERC and the Joint BioEnergy Institute. Densmore's research centers on extracting design techniques from electronic design automation and applying them to the design of synthetic biological systems. The Clotho unified tool set — a two-time winner of the "best software tool" at the International Genetically Engineered Machines Competition — captures many of these research concepts. He received the National Science Foundation's CAREER Award and the ECE Award for Excellence in Teaching at BU, and he is currently a junior faculty fellow in the Hariri Institute for Computing and Computational Science and Engineering at BU.



**Christina D. Smolke**  
Associate Professor of Bioengineering at Stanford University

**Christina D. Smolke's** research focuses on developing modular genetic platforms for programming information processing and control functions in living systems. She has pioneered the design and application of RNA molecules that process and transmit user-specified input signals to targeted protein outputs, thereby linking molecular computation to gene expression. These technologies are leading to transformative advances in how we interact with and program biology and are being applied to address key challenges in scalable biosynthesis platforms, cellular therapeutics and targeted molecular therapies. She has been honored with the NIH Director's Pioneer Award, NSF CAREER Award, Beckman Young Investigator Award, Sloan Research Fellowship, WTN Award in Biotechnology, TR35 Award and Neekeyfar Lecturer.



**Christopher Voigt**  
Associate Professor of Biological Engineering at the Massachusetts Institute of Technology

**Christopher Voigt** is co-director of the Synthetic Biology Center, co-founder of the MIT-Broad Foundry, and editor-in-chief of ACS Synthetic Biology. He has a BSE in chemical engineering from the University of Michigan and a Ph.D. in biochemistry/biophysics from the California Institute of Technology. He did postdoctoral work at the University of California, Berkeley and was a member of the faculty in the Department of Pharmaceutical Chemistry at the University of California, San Francisco. He serves on science advisory boards, including Amyris Biotechnologies and Stony Brook University, and he has consulted for Bayer CropScience and Dow Ag, among others. He has been honored as a Sloan fellow, Pew scholar, Packard fellow, MIT TR35, NSF CAREER Award and Vaughan lecturer.

# PART II

## FROM LAB TO LIVING ROOM

### State of the art, near term prospects, and the role of the private sector

#### PANELISTS



**Jay Keasling**  
Director of SynBERC; CEO of the Joint BioEnergy Institute; Professor of Biochemical Engineering at the University of California, Berkeley

**Jay Keasling**, who was named DISCOVER Magazine's 2006 *Scientist of the Year*, received his bachelor's degrees in chemistry and biology from the University of Nebraska, earned his Ph.D. in chemical engineering from the University of Michigan, and did postdoctoral work in biochemistry at Stanford University. In 1992, Keasling became an assistant professor at the University of California, Berkeley, where he is currently the Hubbard Howe, Jr., Distinguished Professor of Biochemical Engineering. In addition to his work at the Synthetic Biology Engineering Research Center, Keasling is the Chief Executive Officer of the Joint BioEnergy Institute and Associate Laboratory Director of Bioscience at Lawrence Berkeley National Laboratory. Keasling's research focuses on engineering microorganisms to produce useful chemicals.



**Steve Evans**  
Fellow at Dow AgroSciences

**Steve Evans** received B.A. and B.S. degrees and a Ph.D. in microbial physiology from the University of Mississippi. He was an NIH postdoctoral fellow at the University of California, Berkeley, and subsequently with the U.S.D.A. in Peoria, IL. At the U.S.D.A., Evans blended high-resolution chemical analysis with enzymology to research agricultural applications of biotechnology. In 1988 he joined Mycogen Corp., now Dow AgroSciences, where he has been involved in the development of several traits from the Mycogen pipeline. Now a Dow Fellow, Evans continues to identify and acquire differentiating biotechnology capabilities. Evans is chairman of the Industrial Advisory Board of the SynBERC synthetic biology consortium and co-chair of the BIO Organization IES synthetic biology subteam.



**Virginia Ursin**  
Technology Prospecting Lead and Science Fellow at Monsanto

**Virginia Ursin** received her bachelor's degree in plant and soil sciences from the University of Massachusetts and her master's degree from the University of California, Davis Department of Vegetable Crops. She received her Ph.D. in genetics from UC-Davis. She has held a postdoctoral appointment as a research geneticist at the U.S. Department of Agriculture's Plant Gene Expression Center in Albany, Calif., and conducted research for Calgene, a California-based biotechnology company. Ursin joined Monsanto as a research scientist in 1991. Since then, she has led several research programs and authored numerous scientific papers. She also holds several patents. Ursin is currently a member of the Monsanto Technology Prospecting Team and is a Monsanto science fellow.