Forum on Synthetic Biology

Committee

Vicki L. Chandler

Co-Chair

Vicki L. Chandler is the Chief Program Officer for the Gordon and Betty Moore Foundation's Science Program, investing in the development of new technologies, supporting top research scientists and bringing together new, often groundbreaking, scientific partnerships. The program’s portfolio—designed to advance scientific innovation and discovery—includes the Marine Microbiology Initiative, a plant science collaboration with the Howard Hughes Medical Institute, a new Data-Driven Discovery Initiative, a new Emergent Phenomena in Quantum Systems Initiative, and commitments to the California Institute of Technology and Thirty Meter Telescope.

Prior to coming to the Foundation, Dr. Chandler served as director of the BIO5 Institute at the University of Arizona, a prominent interdisciplinary research center that addresses leading edge research and translates that research to applications in medicine and agriculture. At UA, she was a Regents’ Professor in the departments of Plant Sciences and Molecular and Cellular Biology and held the Carl E. and Patricia Weiler Endowed Chair for Excellence in Agriculture and Life Sciences. Her pioneering research investigated the regulation of gene expression in plants and animals.

Dr. Chandler serves as president-elect for the Genetics Society of America, and has been honored with the Presidential Young Investigator Award, the National Science Foundation Faculty Award for Women Scientists and Engineers, the National Institutes of Health Director’s Pioneer Award, and was named a Searle Scholar. Dr. Chandler is a member of the National Academy of Sciences and a Fellow of the American Association for the Advancement of Science, and has served on national advisory boards and panels for the National Science Foundation, Department of Energy, National Institutes of Health, and Howard Hughes Medical Institute. She served on the National Science Foundation Biological Directorate Advisory Committee from 2001-2004, the National Research Council Committee on Defining and Advancing the Conceptual Basis of Biological Science and was elected to the governing council of the National Academy of Sciences in 2007. Dr. Chandler has chaired or co-chaired several national conferences, and has served in an editorial capacity for journals including Plant Physiology, Genetics, Science, and the Annual Review of Plant Biology. She is a member of the American Society for Biochemistry and Molecular Biology, the American Society of Plant Biologists, the Genetics Society of America, the International Society of Plant Molecular Biology, and the Rosalind Franklin Society. She has served on the Board of Directors of the Genetics Society and the International Society Plant Molecular Biology, and was President of the American Society of Plant Biologists.

Dr. Chandler has a Ph.D. in biochemistry from the University of California, San Francisco and a B. A . in biochemistry from the University of California, Berkeley.

Richard M. Murray

Co-Chair

Richard M. Murray is the Thomas E. and Doris Everhart Professor of Control and Dynamical Systems and Bioengineering at the California Institute of Technology. He received a B.S. degree in Electrical Engineering from California Institute of Technology in 1985 and the M.S. and Ph.D. degrees in Electrical Engineering and Computer Sciences from the University of California, Berkeley, in 1988 and 1991, respectively. Dr. Murray's research is in the application of feedback and control to networked systems, with applications in biology and autonomy. Current projects include novel control system architectures, biomolecular feedback systems and networked control systems.

Steven A. Benner

Member

Steven A. Benner is a distinguished fellow at the Foundation for Applied Molecular Evolution in Gainesville, Florida. He has BS and MS degrees in Molecular Biophysics and Biochemistry from Yale University and a PhD in Chemistry from Harvard University. The Benner group has initiated synthetic biology as a field. The Benner group was the first to synthesize a gene for an enzyme, and used organic synthesis to prepare the first artificial genetic systems. These systems have been used to direct the synthesis of artificial proteins having unnatural amino acids, in FDA-approved clinical assays for HIV, hepatitis B and hepatitis C that improves the medical care of over 400,000 patients annually, and to support the first artificial chemical system capable of Darwinian evolution. Benner's group invented dynamic combinatorial chemistry, combining ideas from molecular evolution, enzymology, analytical chemistry, and organic chemistry to generate a strategy to discover small molecule therapeutic leads. A German company, Alantos, is today using this technology to develop drug leads. The Benner group established paleomolecular biology, where researchers resurrect ancestral proteins from extinct organisms for study in the laboratory, The strategy allows scientists to connect chemistry to function in biology, which is defined by an organism's fitness in a complex and changing environment. The Benner group helped found evolutionary bioinformatics, in 1991, launched one of the first web-based bioinformatics servers with Gaston Gonnet, generated the first naturally organized protein sequence databases, and helped develop the MasterCatalog that generated ca. $4 million in sales. This work also supported the first exhaustive matching of a modern protein sequence database, the first convincing tools to predict structure in proteins from sequence data, strategies to detect distant homologs using structure prediction, and "post-genomic" tools to detect changing protein function. Steven Benner was a National Science Foundation Graduate Fellow, a Junior Fellow in the Harvard Society of Fellows, a Searle Scholar, 1984-86, a Sloan Foundation Fellow, 1984-86, a Townes R. Leigh Commemorative Professor, 1999. He received a Dreyfus Award for Young Faculty, 1982, an Anniversary Prize, Federation of European Biochemical Societies, 1993, a Nolan Summer Award, 1998, an Arun Gunthikonda Memorial Award, 1998, a B. R. Baker Award, 2001, and a Sigma Xi Senior Faculty Award 2005.

Jef D. Boeke

Member

Jef D. Boeke (NAS) is a professor in the New York University Langone School of Medicine, where he is the founding director of the Institute for Systems Genetics. Boeke is best known for elucidating how mobile yeast and human transposons, or “jumping genes,” move about the genome, and for his pioneering synthetic biology work. He previously served as the founding director of the High Throughput Biology Center (HiT Center), the first interdisciplinary center in the Johns Hopkins University School of Medicine's Institute for Basic Biomedical Sciences. Boeke has served as principal investigator of a National Cooperative Drug Discovery/Development Group, a National Institutes of Health Common Fund Protein Capture Initiative Center and a Common Fund Technology Center aimed at developing new technologies for dissecting networks and pathways of lysine modification. A major current activity in his lab is the design and construction of a synthetic yeast genome, aided by undergraduate students in the “build-a-genome” course and an international collaborative project funded by the National Science Foundation and agencies in the U.K. and China. He has also been active in technology transfer, serving as a founder of biotechnology company Avigen and CDI, Inc., and has executed various licensing deals. He has served as organizer and co-organizer of several international meetings on transposition and genome engineering.

Robert Carlson

Member

Rob Carlson is a Principal at Biodesic, an engineering, consulting, and design firm in Seattle. At the broadest level, Carlson is interested in the future role of biology as a human technology. He has worked to develop new biological technologies in both academic and commercial environments, focusing on molecular measurement and microfluidic systems. Dr. Carlson has also developed a number of new technical and economic metrics for measuring the progress of biological technologies. Carlson is the author of the book Biology is Technology: The Promise, Peril, and New Business of Engineering Life, published in 2010 by Harvard University Press; it received the PROSE award for the Best Science and Engineering Book of 2010 and was named to the Best Books of 2010 lists at both The Economist and Foreign Policy. He is a frequent international speaker and has served as an advisor to such diverse organizations as The Hastings Center, the PICNIC Design Festival, the UN, the OECD, the US Government, and companies ranging in size from startups to members of the Fortune 100. Carlson earned a doctorate in Physics from Princeton University in 1997.

From 2002 to 2007, Dr. Carlson was a Senior Scientist in the Electrical Engineering department at the University of Washington. From 2003 to 2008, he provided technology analysis and strategic consulting as a Senior Associate at Bio-Economic Research Associates (Bio-era), writing extensively on pandemic preparedness, synthetic vaccines, biofuels, and biological technologies, and presenting briefings on these subjects to executives and government officials around the world. From 1997 to 2002 he was a Research Fellow at The Molecular Sciences Institute in Berkeley, CA.

R. A. Charo

Member

R. Alta Charo is the Warren P. Knowles Professor of Law and Bioethics at the University of Wisconsin at Madison, where she is on the faculty of the Law School and the Department of Medical History and Bioethics at the medical school. She also serves on the faculty of the UW Masters in Biotechnology Studies program and lectures in the MPH program of the Dept. of Population Health Sciences.

Charo (B.A. biology, Harvard 1979; J.D. Columbia, 1982) is an elected member (2004) of the World Technology Network and (2005) the Wisconsin Academy of Sciences, Arts and Letters. And in 2006 she was elected to membership in the National Academy of Medicine. Professor Charo served on President Obama's transition team, where she was a member of the HHS review team, focusing her attention particularly on transition issues related to NIH, FDA, bioethics, stem cell policy, and women's reproductive health. She was on leave 2009-2011 to serve as a senior policy advisor on emerging technology issues in the Office of the Commissioner at the US Food & Drug Administration.

Charo has also served on several expert advisory boards of organizations with an interest in stem cell research, including CuresNow, the Juvenile Diabetes Research Foundation, the International Society for Stem Cell Research and WiCell, as well as on the advisory board to the Wisconsin Stem Cell Research Program. From 2005-2009 she was a member of the ethics standards working group of the California Institute for Regenerative Medicine. Also in 2005, she helped to draft the National Academies' Guidelines for Embryonic Stem Cell Research, and in 2006 she was appointed to co-chair the National Academies' Human Embryonic Stem Cell Research Advisory Committee.

Charo's advisory committee service for the federal government includes the 1994 NIH Human Embryo Research Panel, and (1996-2001) President Clinton's National Bioethics Advisory Commission where she participated in drafting its reports on "Cloning Human Beings"(1997); "Research Involving Persons with Mental Disorders that May Affect Decisionmaking Capacity"(1998); "Research Involving Human Biological Materials: Ethical Issues and Policy Guidance"(1999); "Ethical Issues in Human Stem Cell Research"(1999); "Ethical and Policy Issues in International Research: Clinical Trials in Developing Countries" (2001); and "Ethical and Policy Issues in Research Involving Human Participants" (2001).

Laura K. Donohue

Member

Laura K. Donohue is a Professor of Law at Georgetown Law and Director of Georgetown's Center on National Security and the Law. She writes on the history of national security and counterterrorist law in the United States and United Kingdom. Her most recent book, The Cost of Counterterrorism: Power, Politics, and Liberty (Cambridge University Press, April 2008) analyzes the impact of American and British counterterrorist law on life, liberty, property, privacy, and free speech. She is currently writing on drones, the War Powers Resolution, and emerging technologies. Her articles focus on biometric identification; state secrets; surveillance, data collection, and analysis; extended detention and interrogation; antiterrorist finance and material support; biological weapons; scientific speech; and the history of quarantine law.

Professor Donohue has held fellowships at Stanford Law School's Center for Constitutional Law, Stanford University's Center for International Security and Cooperation, and Harvard University's John F. Kennedy School of Government, where she was a Fellow in the International Security Program as well as the Executive Session for Domestic Preparedness. In 2001 the Carnegie Corporation named her to its Scholars Program, funding the project, Security and Freedom in the Face of Terrorism. She took up the award at Stanford, where she taught in the Departments of History and Political Science and directed a project for the United States Departments of Justice and State and, later, Homeland Security, on mass-casualty terrorist incidents. In 2008–09 she clerked for Judge John T. Noonan, Ninth Circuit Court of Appeals.

Professor Donohue is a Life Member of the Council on Foreign Relations, an Advisory Board Member of the ABA Standing Committee on Law and National Security, and an Advisory Board Member of the Electronic Privacy Information Center (EPIC). She obtained her AB in Philosophy (with Honors) from Dartmouth College, her MA in Peace Studies (with Distinction) from the University of Ulster, Northern Ireland, her JD (with Distinction) from Stanford Law School, and her PhD in History from the University of Cambridge, England.

Drew Endy

Member

Drew Endy runs the world's first "fabless" genetic engineering lab in the new bioengineering program at Stanford University and previously helped start the biological engineering major at the Massachusetts Institute of Technology. His Stanford research team develops genetically encoded computers and redesigns genomes. Dr. Endy co-founded the BioBricks Foundation as a public-benefit charity supporting free-to-use standards and technology that enable the engineering of biology. He co-organized the International Genetically Engineered Machines (iGEM) competition and the BIOFAB International Open Facility Advancing Biotechnology (BIOFAB). He serves on the National Academy of Sciences' Committee on Science Technology and Law and is a new voting member of the U.S. National Science Advisory Board for Biosecurity. Dr. Endy chaired the 2003 Synthetic Biology study as a member of DARPA ISAT, served as an ad hoc member of the U.S. NIH Recombinant DNA Advisor Committee, and co-authored the 2007 "Synthetic Genomics: Options for Governance" report with colleagues from the Center for Strategic & International Studies and the J. Craig Venter Institute. Esquire named Endy one of the 75 most influential people of the 21st century. He lives in Menlo Park, CA with his wife and Stanford Bioengineering colleague Prof. Christina Smolke.

Richard A. Johnson

Member

Richard A. Johnson is engaged with shaping the policy, legal, ethical, investment, research funding, biosecurity, and governance issues related to synthetic biology. Johnson is a member of the Board on Life Sciences at the National Academy of Sciences and recently Co-chaired the comprehensive Board review of the National Academies' science, technology and economic policy programs. He serves as a Director of the BioBricks Foundation, and is the Chairman of the OECD/BIAC Biotechnology Committee and Vice-Chairman of the Technology and Innovation Committee. Johnson is also the Chairman of the Brown Advisory Council on Biology and Medicine, a member of the MIT Corporation Visiting Committee, the Brown Institute on Brain Science, the European Union's IT Futures of Medicine initiative, and several other research university boards and task forces. He participates in a number of synthetic biology policy and legal task forces, the Human Genome Organization's Genomics and Society Committee, and the U.S. State Department's international S&T joint consultative meetings.

Johnson is the CEO and founder of Global Helix LLC, an analytical consulting and government strategy firm. It provides analysis and advice about: (1) enabling basic research for markets, societal challenges, and new forms of innovation (public and private); (2) connecting innovation and entrepreneurship, the globalization of R&D and science policy, new knowledge networks and value chains, university-industry collaborations, Big Data, knowledge-based capital, and social impact investing; (3) assessing the globalization of research, new forms of innovation and organizational models, and the changing role of universities and academic medical centers in delivering societal returns on research; and (4) promoting the intersection of STEM policies, new business models, and innovation to address pressing global "grand challenges."

After 30 years, Johnson retired as Senior Partner in Arnold & Porter LLP, where he represented many of the leading research universities, foundations, and high growth companies about: (1) enabling basic research, innovation and collaborative mechanisms; (2) creating a number of path-breaking university-industry collaborations, pre-competitive consortia, and public-private partnerships; (3) translating research into new markets and solutions to meet emerging societal challenges; and (4) assessing the globalization of research, competitiveness, and new sources of economic growth.

Johnson is also very active with the intersection of S&T, entrepreneurship and economic development in emerging markets and in base-of-pyramid countries. He is an Executive Fellow of the Center for Science, Technology and Society at Santa Clara University, which is a global leader in promoting entrepreneurship in base-of-pyramid countries and indigenous regions. Johnson also participates in various international initiatives related to emerging technologies, knowledge networks, S&T capacity building, public benefit infrastructure and public-private partnerships, and entrepreneurship.

In addition to receiving his Juris Doctor degree from the Yale Law School where he was Editor of the Yale Law Journal, he received his M.S. from the Massachusetts Institute of Technology where he was a National Science Foundation National Fellow and his undergraduate degree with Highest Honors from Brown University

Claire Marris

Member

Claire Marris is Senior Research Fellow in the Department of Social Science, Health, and Medicine at King's College London. She conducts social science research on biosciences and biotechnology and for the last four years her work has focused on synthetic biology. Her current research takes place within the EPSRC-funded Centre for Synthetic Biology and Innovation (CSynBI), where she plays a key role in the implementation of responsible research and innovation. She wrote a report for the Royal Society in 2011 about the transnational governance of synthetic biology, was in 2012 a member of the coordination group that produced the UK Synthetic Biology Roadmap, convened by the UK Department for Business, Innovation and Skills, and is a member of the expert group Observatoire de la Biologie de Synthèse convened by the French Ministry for Higher Education and Research.

Her research is in the area of social scientific study of bioscience, with a particular focus on the nature, role and translational possibilities of advanced biosciences and biotechnology, in particular genetic modification and synthetic biology. She is interested in the ways in which a field of bioscience, such as synthetic biology, comes to be defined and problematized in different scientific, regulatory, political and public arenas, through for example risk regulation, R&D policy, public engagement activities, and organized opposition by social groups. Marris' most influential research has focused on understandings of risk and uncertainty among publics, scientists, and risk regulators; and critical assessments of methods for public participation in the governance of emerging biotechnologies.

Darlene J. Solomon

Member

Darlene J.S. Solomon is Senior Vice President and Chief Technology Officer for Agilent Technologies. Her responsibilities include developing the company's long-term technology strategy and overseeing the alignment of Agilent’s objectives with its centralized research-and-development activities.

Solomon brings extensive experience in R&D and management to her current leadership role at Agilent. She joined Hewlett-Packard Laboratories in 1984 as a member of the technical staff, subsequently holding a variety of research and management positions there, including R&D manager for the Chemical and Biological Systems Department. She joined Agilent Technologies when the company was formed in 1999 with a dual role as director of the Life Sciences Technologies Laboratory within Agilent Laboratories, and as senior director, research and development/technology for Agilent's Life Sciences and Chemical Analysis business. Prior to being named to her current post, Solomon was vice president and director of Agilent Laboratories.

Solomon received her bachelor's degree in chemistry from Stanford University, a doctorate in bioinorganic chemistry from the Massachusetts Institute of Technology, and completed Stanford University’s Executive Development Program. With numerous patents and publications to her name, Solomon was inducted into the Women in Technology International's Hall of Fame in 2001, received the YWCA Tribute to Women and Industry Award in 2004, and named to Diversity Journal’s Women Worth Watching in 2007 and Corporate Board Member’s 50 Top Women in Technology in 2008.

Solomon serves on multiple academic and government advisory and review boards, including the National Academies’ Board on Chemical Sciences and Technology, Visiting Committee for Advanced Technology for the National Institutes of Standards and Technology, Stanford University Interdisciplinary Biosciences Advisory Council, UC Berkeley’s College of Chemistry, Bay Area Science and Innovation Consortium (BASIC) and A-STAR Board for Singapore Economic Development (2004-10).

Linda Chrisey

Ex Officio Member

Linda A. Chrisey has been a program officer at the Office of Naval Research (ONR) since 1998, where she is currently the lead for ONR's Team Bio as well as manager for research programs spanning several areas, including Synthetic Biology, Microbial Energy Harvesting, Marine Biofouling, and Gut Microbiology. Prior to joining ONR, Dr. Chrisey worked at the Naval Research Laboratory (NRL), as a research chemist. Her research activities included the development of a research program utilizing DNA as a biomaterial, and other applications of DNA in biosensors. She has published >25 peer-reviewed papers which have been cited over 1250 times.

Dr. Chrisey received a B.S. from SUNY Binghamton (Biochemistry, 1983), a PhD from the University of Virginia (Bio-Organic Chemistry, 1988), and then completed a postdoctoral fellowship at the NIH. She then joined a start-up biotech company, SYNTHECELL Corp., where she served as a Senior Scientist for Antisense DNA Research Development.

Dr. Chrisey currently serves as the DOD representative to the US-EC Task Force on Biotechnology, and also represented the Navy to the DOD Strategic Environmental Research and Development/Environmental Security Technology Certification Programs from 2000-2010.

Barbara Gerratana

Ex Officio Member

Barbara Gerratana, PhD, is a program director in the Division of Pharmacology, Physiology, and Biological Chemistry at the National Institute of General Medical Sciences (NIGMS). She manages research grants on enzyme catalysis and regulation. Before coming to NIGMS, Gerratana served as an associate professor with tenure in the department of chemistry and biochemistry at the University of Maryland, College Park. She earned a B.S. in chemistry from the Università degli Studi di Pavia in Pavia, Italy, and a PhD in biochemistry from the University of Wisconsin-Madison. Gerratana conducted postdoctoral research at Johns Hopkins University.

Marc Salit

Ex Officio Member

Marc Salit leads a group at the National Institute of Standards and Technology (NIST) dedicated to technology development and measurement infrastructure (standards, reference data, predictive models) for massively multiplexed genome-scale measurement methods. This "Multiplexed Biomolecular Science" group is a multidisciplinary team growing out of work to address microarray measurement science issues, and a long-running effort in technology and measurement science in microfluidics.

Dr. Salit has worked extensively in measurement science in chemistry and physics, with emphasis on precision measurements, lab automation, algorithm development, measurement uncertainty, traceability, and standards development. His research is now focused on bringing experience from the chemical metrology community to the emerging biometrology community.

Jessica M. Tucker

Ex Officio Member

Jessica M. Tucker is a Chemical Engineer at the U.S. Department of Health and Human Services (HHS) in the Office of the Assistant Secretary for Preparedness and Response. Previously, she worked in the same office as a Senior Policy Analyst/Contractor with STG International and an American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellow. Her projects at HHS address policy issues related to synthetic biology, biosafety, and biosecurity, and she has also worked on pandemic influenza preparedness and response. She supported efforts to issue a funding opportunity for research related to public health recovery after Hurricane Sandy. Dr. Tucker is currently on a temporary assignment at the National Institute of Biomedical Imaging and Bioengineering, within the National Institutes of Health, to serve as the Program Director for the drug and gene delivery systems and devices portfolio.

Prior to her time at HHS, Dr. Tucker was a Visiting Assistant Professor at Stony Brook University within the Department of Technology and Society, where she conducted engineering education research and lectured within the Department of Chemical and Molecular Engineering. She also completed a postdoctoral fellowship, which was supported by the Center for the Advancement of Scholarship in Engineering Education within the National Academy of Engineering, at Stony Brook University. Dr Tucker worked for two years in research and development in the pharmaceutical industry in a biopharmaceuticals division. She holds a B.S.E. in Chemical Engineering from Princeton University and a PhD in Chemical Engineering from Carnegie Mellon University.

Edward H. You

Ex Officio Member

You works in the FBI's Weapons of Mass Destruction Directorate, Biological Countermeasures Unit. He is responsible for creating programs and activities to coordinate and improve FBI and interagency efforts to identify, assess, and respond to potential intentional biological threats or incidents. These efforts include expanding FBI outreach to the Biological Sciences community to address biosecurity. Before being promoted to the Weapons of Mass Destruction Directorate, Mr. You was a member of the FBI Los Angeles Field Office Joint Terrorism Task Force and served on the FBI Hazardous Materials Response Team.

Mr. You has also been directly involved in policy-making efforts with a focus on biosecurity. He holds ex officio positions on the NIH National Science Advisory Board for Biosecurity and the Synthetic Biology and Engineering Research Center Scientific Advisory Board. He is also an active Working Group member of the National Security Council Interagency Policy Committee on Countering Biological Threats; is the FBI representative on the Executive Order 13546 Select Agent Program Federal Experts Security Advisory Panel; and presented, on behalf of the FBI, to the Presidential Commission for the Study of Bioethical Issues regarding biosecurity and synthetic biology.

Prior to joining the FBI, Mr. You worked for six years in graduate research focusing on retrovirology and human gene therapy at the University of Southern California, Keck School of Medicine. He subsequently worked for three years at the biotechnology firm AMGEN Inc. in oncology research.

Anne-Marie C. Mazza

Staff Officer