

Safeguarding the Bioeconomy: Finding Strategies for Understanding, Evaluating, and Protecting the Bioeconomy while Sustaining Innovation and Growth

Committee

Thomas M. Connelly, Jr.

Chair

Dr. Thomas M. Connelly, Jr. (NAE) is the Executive Director and CEO of the American Chemical Society. Dr. Connelly also currently serves as chair of the National Academies' Division on Earth and Life Studies. Dr. Connelly retired from DuPont in December 2014, where he was Executive Vice President, Chief Innovation Officer, and a member of the company's Office of the Chief Executive. At DuPont, he was responsible for Science & Technology and the geographic regions outside the United States, as well as Integrated Operations which includes Operations, Sourcing & Logistics and Engineering. At DuPont, Dr. Connelly led businesses and R&D organizations, while based in the US, Europe and Asia. Dr. Connelly graduated with highest honors from Princeton University with degrees in Chemical Engineering and Economics. As a Winston Churchill Scholar, he received his doctorate in chemical engineering from the University of Cambridge. He is a Director of Grasim Industries, an Indian listed company. He has served in advisory roles to the U.S. Government and the Republic of Singapore.

Steven M. Bellovin

Member

Dr. Steven M. Bellovin (NAE) is the Percy K. and Vidal L. W. Hudson Professor of Computer Science at Columbia University, member of the Cybersecurity and Privacy Center of the university's Data Science Institute, and an affiliate faculty member at Columbia Law School. He does research on security and privacy and on related public policy issues. He received a BA degree from Columbia University, and an MS and PhD in Computer Science from the University of North Carolina at Chapel Hill. Bellovin has served as Chief Technologist of the Federal Trade Commission and as the Technology Scholar at the Privacy and Civil Liberties Oversight Board. He is a member of the National Academy of Engineering and is serving on the Computer Science and Telecommunications Board of the National Academies of Sciences, Engineering, and Medicine. In the past, he has been a member of the Department of Homeland Security's Science and Technology Advisory Committee, and the Technical Guidelines Development Committee of the Election Assistance Commission.

Patrick M. Boyle

Member

Dr. Patrick M. Boyle is the Head of Codebase at Ginkgo Bioworks, a Boston-based synthetic biology company that makes and sells engineered organisms. Patrick is responsible for Ginkgo's Codebase, the company's complete portfolio of reusable biological assets. Codebase includes novel strains, enzymes, genetic parts, and diverse genetic repositories, including millions of engineered DNA sequences.

Codebase is being developed, maintained, and leveraged by Ginkgo's Organism Engineers via dozens of strain engineering projects. Prior to leading Codebase, Patrick founded the Design group at Ginkgo, which now produces hundreds of millions of base pairs of DNA designs each year to support Ginkgo's projects. Dr. Boyle received an S.B. in biology from the Massachusetts Institute of Technology in 2006. He then received his Ph.D. from Harvard Medical School in 2012, studying synthetic biology applications in bacteria, yeast, and plants.

Katherine Charlet

Member

Ms. Katherine Charlet is the inaugural director of Carnegie's Technology and International Affairs Program. She works primarily on the security and international implications of evolving technologies, with a focus on cybersecurity and cyber conflict, biotechnology, and artificial intelligence. Charlet most recently served as the acting deputy assistant secretary of defense for cyber policy, where she managed the development of the U.S. Department of Defense's cyber policy and strategy, the development of cyber capabilities, and the expansion of international cyber relationships. Charlet is the recipient of the Secretary of Defense Meritorious Civilian Service Award and has served in senior advisory roles on the Defense Science Board Task Forces on Cyber Deterrence, on Cyber as a Strategic Capability, and on the Presidential Commission on Enhancing National Cybersecurity. Prior to working on cyberspace issues, Charlet served as the director for strategic planning at the National Security Council, led teams at the U.S. Department of Defense working on Afghanistan strategy and policy, and conducted research on issues at the nexus of science and security at the Center for Strategic and International Studies.

Carol A. Corrado

Member

Dr. Carol A. Corrado is senior advisor and research director in economics at The Conference Board, where her primary focus is measuring intangible capital and analyzing innovation and economic growth. She also works with the Conference Board's China Center for Research on Economics and Business on measuring and analyzing industrial capacity utilization in China. Dr. Corrado has authored key papers on the macroeconomic analysis of intangible investment and capital, including the winner of the International Association of Research on Income and Wealth's 2010 Kendrick Prize ("Intangible Capital and U.S. Economic Growth"). Dr. Corrado joined the Conference Board in 2008. Prior to that, she was chief of the industrial output section at the Federal Reserve Board, where she managed a research program that studied the drivers of productivity and technical change and worked to improve the measurement of information and communications technology prices, and of industrial production and capacity utilization. She holds a Ph.D. in economics from the University of Pennsylvania and a B.S. in management science from Carnegie-Mellon University. In addition to her work for The Conference Board, Corrado is senior scholar at Georgetown University McDonough School's Center for Business and Public Policy, a member of the Technical Advisory Committee of Bureau of Labor Statistics, a member of the executive committee of the National Bureau of Economic Research's (NBER) Conference on Research on Income and Wealth, an organizer of a workshop on economic measurement at the NBER's annual Summer Institute and current chair-elect of the Business and Economics Section of the American Statistical Association.

J. Bradley Dickerson

Member

Dr. J. Bradley Dickerson leads the Global Chemical and Biological Security (GCBS) group at Sandia National Laboratories (SNL) in Albuquerque, New Mexico. The GCBS group develops and applies systems-based solutions to reduce the risk of accidental release, or intentional misuse of dangerous biological and chemical materials globally. Dr. Dickerson has held numerous leadership positions within the United States government with responsibilities for chemical and biological security. Prior to joining SNL, he served as the Principal Scientific Officer in the Department of Justice's (DOJ) National Security Division. Specifically, he served as DoJ's principal science and technical advisor to the Committee on Foreign Investment in the United States. Prior to that Dr. Dickerson served as the Senior Biodefense Advisor in the Department of Homeland Security's (DHS) Office of Health Affairs, and as the Director of Chemical Security Policy in DHS's Office of Policy. At DHS he was responsible for the development and implementation of policies associated with biodefense, chemical defense, pandemic preparedness and infectious disease-related border issues. Dr. Dickerson completed a detail at the Centers for Disease Control and Prevention (CDC), where he led the policy and strategy component of the Office of Public Health Preparedness and Response, which comprises the CDC Division of Emergency Operations, Division of State and Local Readiness, Division of Select Agents and Toxins and the Division of the Strategic National Stockpile. He was awarded a Legis Congressional Fellowship from the Brookings Institute and the American Association for the Advancement of Science National Defense and Global Security Policy Fellowship. Dr. Dickerson holds a B.S. degree in Chemistry, an M.S. in Biomedical Engineering, and a Ph.D. in Biochemistry.

Diane DiEuliis

Member

Dr. Diane DiEuliis is a Senior Research Fellow at National Defense University (NDU). Her research areas focus on emerging biological technologies, biodefense, and preparedness for biothreats. Dr. DiEuliis also studies issues related to dual use research, disaster recovery research, and behavioral, cognitive, and social science as it relates to important aspects of deterrence and preparedness. Prior to joining NDU, Dr. DiEuliis was the Deputy Director for Policy in the Office of the Assistant Secretary for Preparedness and Response, U.S. Department of Health and Human Services. Dr. DiEuliis also previously served in the Office of Science and Technology Policy at the White House and was a program director at the National Institutes of Health. She has a broad knowledge about the policy implications of emerging technologies, as well as the intricacies that accompany instituting new policies to regulate such emerging technologies. Dr. DiEuliis received her Ph.D. in biological sciences from the University of Delaware.

Gerald L. Epstein

Member

Gerald Epstein joined National Defense University's Center for the Study of Weapons of Mass Destruction in July 2018 as a Distinguished Research Fellow. In that capacity he addresses challenges posed by nuclear, chemical, and biological weapons, particularly including the security implications of advanced life sciences, biotechnologies, and other emerging and converging technologies. Prior to arriving at National Defense University (NDU), he served as Assistant Director for Biosecurity and Emerging Technologies at the White House Office of Science and Technology Policy (OSTP), where he served on detail from his position as Deputy Assistant Secretary for Chemical, Biological, Radiological, and Nuclear Policy at the Department of Homeland Security. Before returning to government service in 2012, Dr. Epstein directed the Center for Science, Technology, and Security Policy at the American Association for the Advancement of Science (AAAS), which he joined in 2009. Prior positions include Senior Fellow for Science and Security at the Center for Strategic and International Studies (2003 – 2009) and Research Staff Member at the Institute for Defense Analyses (2001 – 2003). Dr. Epstein previously served in the White House from 1996 to 2001, ultimately in a joint appointment as Assistant Director of OSTP for National Security and Senior Director for Science and Technology on the National Security Council staff. From 1983 to 1989 and again from 1991 until its demise in 1995, he worked at the Congressional Office of Technology Assessment, where he directed a landmark study on the proliferation of weapons of mass destruction and worked on other international security and defense technology topics. From 1989 to 1991, he directed a project at Harvard University's Kennedy School of Government on the relationship between civil and military technologies, and he is a co-author of *Beyond Spinoff: Military and Commercial Technologies in a Changing World* (Harvard Business School Press, 1992). He also created and taught courses on arms control and nonproliferation at Princeton University, and on science, technology, and homeland security at Georgetown University. Dr. Epstein is a Fellow of the American Physical Society and the AAAS and is a member of the editorial boards for the journals *Health Security* and *Frontiers in Bioengineering and Biotechnology*. He has served on the Biological Threats Panel of the National Academies Committee on International Security and Arms Control as well as on the Committee on Science, Security, and Prosperity, which produced the report *Beyond Fortress America: National Security Controls on Science and Technology in a Globalized World* (Washington DC; National Academies Press, 2009). He currently serves as a board member on the Academies Board on Life Sciences. He received S.B. degrees in physics and in electrical engineering from MIT and a Ph.D. in physics from the University of California at Berkeley.

Steven L. Evans

Member

Dr. Steven L. Evans is currently a research scientist at Dow AgroSciences. Dr. Evans has 30 years experience in Discovery R&D, biotechnology regulatory and commercialization of crop traits and biological and biochemical pesticides. For the past ten years he has worked to advance the field of synthetic biology in public-private partnerships. He served in industrial leadership on the NSF Engineering Research Center (SynBERC) and is currently on the executive leadership team of the successor non-profit Engineering Biology Research Consortium (EBRC) in Emeryville, California. He co-chairs the BIO Synthetic Biology working group and is involved in technology and policy implications of advanced technologies applied to agriculture, including environmental release, biosafety and biosecurity, and the UN-CBD assessment of synthetic biology. As part of Dow AgroSciences, Dr. Evans has been involved in development of several plant traits leading to the Herculex™ product line, in capability development in bioanalytical sciences, and in enabling the EXZACT™ Zinc Finger technology. Dr. Evans served on the 2016 NAS Preparing for Future Products of Biotechnology committee.

George B. Frisvold

Member

Dr. George B. Frisvold is currently professor and extension specialist in the Department of Agriculture and Resource Economics at the University of Arizona. Dr. Frisvold has been a visiting scholar at the National Institute of Rural Development in Hyderabad, India, a lecturer at The Johns Hopkins University, and Chief of the Resource and Environmental Policy Branch of USDA's Economic Research Service as well. His research interests include domestic and international environmental policy, as well as the causes and consequences of technological change in agriculture. In 1995-96, Dr. Frisvold served on the Senior staff of the President's Council of Economic Advisers with responsibility for agricultural, natural resource, and international trade issues. He is a past co-editor of the Journal of Agricultural and Resource Economics. Dr. Frisvold earned his B.S. in political economy of natural resources in 1983 and his Ph.D. in agricultural and resources economics in 1989, both from the University of California, Berkeley. He has not served on a National Academies activity yet.

Jeffrey L. Furman

Member

Dr. Jeffrey L. Furman is an associate professor of strategy and innovation at Boston University and a faculty research fellow at the National Bureau of Economic Research (NBER). Dr. Furman's research addresses issues at the intersection of strategy, international business, and innovation. His recent projects examine the strategic management of science-based firms, the impact of institutions on cumulative innovation, and science and innovation policy. Dr. Furman is an active member of the Academy of Management (AOM) and has served as reviewer, presenter, discussant, and session chair at AOM annual meetings and has served as a member of the Business Policy and Strategy Division Executive Committee. In addition to his contributions to the AOM, he co-organizes the National Bureau of Economic Research's weekly Productivity Seminar. Dr. Furman received his Ph.D. in 2001 from MIT – Sloan School of Management.

Linda Kahl

Member

Dr. Linda Kahl is presently Senior Counsel and Director of Ownership, Sharing and Innovation for the BioBricks Foundation (BBF). Dr. Kahl works with academic research institutions, industry leaders, government agencies, funding organizations and other stakeholders to ensure that the engineering of biology is conducted in an open and ethical manner. In addition to her work on the infrastructure supporting biotechnology in the public interest, Dr. Kahl led development of the BBF's legal tools, including the OpenMTA and Public Domain Chronicle. Dr. Kahl has been appointed as a Policy Fellow at the University of Cambridge Centre for Science and Policy, a Visiting Research Fellow at Stanford University, and a member of the Committee on Intellectual Property and Ownership Issues for Synthetic Biology for the National Academies, Policy and Global Affairs Division. She currently serves on the Human Practices Committee for the International Genetically Engineered Machine (iGEM) competition and on the Advisory Board for Artists United. Dr. Kahl received her B.S. in Biology from the University of California, Los Angeles, and her M.S. and Ph.D. in Cell Biology and Biochemistry from Princeton University. She received her J.D., magna cum laude, from Santa Clara University School of Law, earning the High Tech Law Certificate with an emphasis in intellectual property law. Dr. Kahl is a licensed patent attorney, with bar admission to practice law in California and before the United States Patent Office (USPTO).

Isaac S. Kohane

Member

Dr. Isaac S. Kohane (NAM) is currently chair of the Department of Biomedical Informatics at Harvard University. Over the last 30 years, Dr. Kohane's research agenda has been driven by the vision of what biomedical researchers could do to find new cures, provide new diagnoses and deliver the best care available if data could be converted more rapidly to knowledge, and knowledge to practice. Dr. Kohane has designed and led multiple internationally adopted efforts to "instrument" the healthcare enterprise for discovery and to enable innovative decision-making tools to be applied to the point of care. He has worked on recharacterizing and reclassifying diseases such as autism, rheumatoid arthritis and cancers. In many of these studies, the developmental trajectories of thousands of genes have been a powerful tool in unraveling complex diseases.

Kelvin H. Lee

Member

Dr. Kelvin H. Lee is the Gore Professor of Chemical and Biomolecular Engineering at the University of Delaware. Dr. Lee previously served as Director of the Delaware Biotechnology Institute. He received a B.S. in chemical engineering from Princeton and both his M.S. and Ph.D. in chemical engineering from Caltech. His research lab is focused on the development of next generation tools for protein expression profiling and the use of existing tools applied to specific problems in biomolecular engineering and medicine. Dr. Lee's lab explores issues such as productivity and product quality of biopharmaceuticals, building in vitro models of the blood-brain barrier to facilitate drug development, improving the diagnosis and treatment of Alzheimer's disease, developing new methods to make next generation biofuels, and understanding microbial communities in the environment.

Mary E. Maxon

Member

Dr. Mary E. Maxon is the Associate Laboratory Director for Biosciences at Berkeley National Lab. Dr. Maxon oversees Berkeley Laboratory's Biological Systems and Engineering, Environmental Genomics and Systems Biology, and Molecular Biophysics and Integrated Bioimaging Divisions and the DOE Joint Genome Institute. She earned her B.S. in biology and chemistry from the State University of New York, Albany, and her Ph.D. in molecular cell biology from the University of California, Berkeley. Dr. Maxon has worked in the private sector, both in the biotechnology and pharmaceutical industry, as well as the public sector, highlighted by her tenure as the Assistant Director for Biological Research at the White House Office of Science and Technology Policy (OSTP) in the Executive Office of the President, where she developed the National Bioeconomy Blueprint.

Maureen McCann

Member

Dr. Maureen McCann is the Director of Purdue University's Energy Center. She is also Director of the Center for Direct Catalytic Conversion of Biomass to Biofuels (C3Bio), an Energy Frontier Research Center funded by the US Department of Energy's Office of Science, and Director of Purdue's NEPTUNE Center for Power and Energy, funded by the Office of Naval Research. At the national level, she has served on the USDA-DOE Biomass Research and Development Technical Advisory Committee and the DOE Office of Science, Council for Chemical and Biochemical Sciences. In 2018, Dr. McCann is participating in the US Department of Energy's Oppenheimer Science and Energy Leadership Program to provide future leaders with an overview of the Department of Energy and the National Laboratory system. Dr. McCann obtained her undergraduate degree in 1987 in Natural Sciences from the University of Cambridge, U.K., and a Ph.D. in 1990 in Botany from the University of East Anglia, UK. The goal of her research is to understand how the molecular machinery of the plant cell wall contributes to cell growth and specialization, and thus to the final stature and form of plants. Also, within C3Bio, Dr. McCann's lab explores synthetic biology and genetic engineering approaches to optimize cell wall and biomass structure for chemical conversion processes.

Piers D. Millett

Member

Dr. Piers D. Millett is Director of Safety and Security at iGEM and co-chairs iGEM's Safety Committee. Dr. Millett is a certified biorisk management professional, with a specialization in biosecurity. Until June 2014, Dr. Millett was Deputy Head of the Implementation Support Unit for the Biological Weapons Convention, a treaty for which he worked for over a decade. Trained originally as a microbiologist, Dr. Millett is a chartered biologist and works closely with the citizen science movement, synthetic biologists, the biotechnology industry as well as governments. His efforts have seen him collaborate with a range of intergovernmental organizations spanning health (human and animal), humanitarian law, disarmament, security, border control, law enforcement, and weapons of mass destruction – both inside and out of the United Nations system. Dr. Millett also co-founded a consultancy firm that works with government, industry and academia to ensure the safe, secure and sustainable exploitation of biology as a manufacturing technology. He also holds fellowships with the Future of Humanity Institute at the University of Oxford, and the Woodrow Wilson Center for International Scholars in Washington D.C., where he researches pandemic and deliberate disease and the implications of biotechnology. He also consults for the World Health Organization, supporting their R&D efforts.