

**FAILURES IN SOCIAL SYSTEMS: CONVERGING BIOLOGICAL,
BEHAVIORAL, AND ENGINEERING INSIGHTS**

THURSDAY, MARCH 7, 2024

Opening Remarks



Marcia McNutt is a geophysicist and president of the National Academy of Sciences. From 2013 to 2016, she served as editor-in-chief of the *Science* journals. Prior to joining *Science*, she was director of the U.S. Geological Survey (USGS) from 2009 to 2013. During her tenure, the USGS responded to a number of major disasters, including earthquakes in Haiti, Chile, and Japan, and the Deepwater Horizon oil spill. McNutt led a team of government scientists and engineers at BP headquarters in Houston who helped contain the oil and cap the well. She directed the flow rate technical group that estimated the rate of oil discharge during the spill's active phase. For her contributions, she was awarded the U.S. Coast Guard's Meritorious Service Medal.

Before joining the USGS, McNutt served as president and chief executive officer of the Monterey Bay Aquarium Research Institute (MBARI), in Moss Landing, California. During her time at MBARI, the institution became a leader in developing biological and chemical sensors for remote ocean deployment, installed the first deep-sea cabled observatory in U.S. waters, and advanced the integration of artificial intelligence into autonomous underwater vehicles for complex undersea missions.

From 2000 to 2002, McNutt served as president of the American Geophysical Union (AGU). She was chair of the Board of Governors for Joint Oceanographic Institutions, responsible for operating the International Ocean Drilling Program's vessel JOIDES Resolution and associated research programs.

McNutt began her academic career at the Massachusetts Institute of Technology (MIT), where she was the E.A. Griswold Professor of Geophysics and directed the Joint Program in Oceanography/Applied Ocean Science & Engineering, jointly offered by MIT and the Woods Hole Oceanographic Institution. Her research area is the dynamics of the upper mantle and lithosphere on geologic time scales, work that has taken her to distant continents and oceans for field observations. She is a veteran of more than a dozen deep-sea expeditions, on most of which she was chief or co-chief scientist.

McNutt received a B.A. in physics from Colorado College and her Ph.D. in Earth sciences at the Scripps Institution of Oceanography. She holds honorary doctoral degrees from the Colorado College, the University of Minnesota, Monmouth University, the Colorado School of Mines, University of Miami, Uppsala University, Michigan State University, Worcester Polytechnic Institute, George Washington University, Boston University, Texas A&M University, Indiana University Bloomington, and the National Academy of Sciences of Ukraine. McNutt is a member of the National Academy of Engineering, the American Philosophical Society and the American Academy of Arts and Sciences, a Foreign Member of the Royal Society, UK, the Russian

Academy of Sciences, and the Chinese Academy of Sciences, and a Foreign Fellow of the Indian National Science Academy. She is a fellow of AGU, the Geological Society of America, the American Association for the Advancement of Science, and the International Association of Geodesy. In 1988, she was awarded AGU's Macelwane Medal for research accomplishments by a young scientist, and she received the Maurice Ewing Medal in 2007 for her contributions to deep-sea exploration.



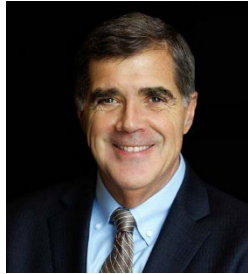
John L. Anderson is the president of the National Academy of Engineering since July 1, 2019. He was born in Wilmington, DE, and received his undergraduate degree from the University of Delaware in 1967 and a PhD degree from the University of Illinois at Urbana-Champaign in 1971, both in chemical engineering. He served as president of the Illinois Institute of Technology (IIT) and Distinguished Professor of Chemical Engineering from 2007 – 2015. Before that he was provost and executive vice president at Case Western Reserve University (2004–2007), following 28 years at Carnegie Mellon University including 8 years as dean of the College of Engineering and 11 years as head of the chemical engineering

department. He began his professional career as assistant professor of chemical engineering at Cornell University (1971-1976).

Dr. Anderson was elected to the NAE in 1992 for contributions to the understanding of colloidal hydro-dynamics and membrane transport phenomena. He was elected an NAE Councillor in 2015 and served on the Executive Compensation Committee and Temporary Nominating Committee on Member Diversity. He has also served on the Membership Policy Committee, Nominating Committee (chair), Chemical Engineering Section (chair, vice chair, section liaison, member), Chemical Engineering Peer Committee (chair), and Committee on Membership (immediate past chair, chair, vice chair, peer committee chair). His service also includes numerous National Academies activities, such as the Committee on Determining Basic Research Needs to Interrupt the Improvised Explosive Device Delivery Chain (chair); Committee on Review of Existing and Potential Standoff Explosives Detection Techniques (chair); Organizing Committee for the National Security and Homeland Defense Workshop (co-chair); Board on Chemical Sciences and Technology (co-chair); and Ford Foundation Minority Postdoctoral Review Panel on Physical Sciences, Mathematics, and Engineering.

In addition to his NAE membership, Dr. Anderson is a fellow of the American Academy of Arts and Sciences and the American Association for the Advancement of Science. He was appointed to the National Science Board in 2014 for a six-year term. He received the Acrivos Professional Progress Award from the American Institute of Chemical Engineers (AIChE) and an award from the Pittsburgh Section of AIChE for “Outstanding Professional Accomplishments in the Field of Academics,” and he is listed on the Alumni Wall of Fame at the University of Delaware. In 2012 he received the National Engineering Award from the American Association of Engineering Societies. He has held visiting professorships at the Massachusetts Institute of Technology (fellow of the John Simon Guggenheim Foundation), University of Melbourne (Australia), and Landbouwwuniversiteit Wageningen (the Netherlands). He has presented guest lectures at universities throughout the United States and is the author of numerous journal articles and book chapters. He has received honorary doctorates from Case Western Reserve University, Illinois Institute of Technology, Rensselaer Polytechnic Institute, and the University of Delaware. Dr. Anderson is married to Patricia Siemen Anderson. They have two children and five grandchildren.

What Does Failure Mean in Social Systems? Fostering a Collaborative View



Gregory H. Symmes is chief program officer for the National Academies. Previously he was the executive director of the Academies' Division on Earth and Life Studies, where he was responsible for the overall intellectual, strategic, managerial, and financial leadership of the division. Symmes joined the Academies in 1995 as a scientific reports officer for the Commission on Geosciences, Environment, and Resources, and served as the commission's assistant executive director and later as associate executive director.

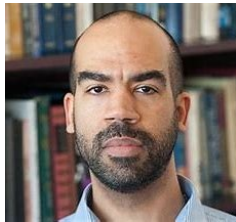
He was named the associate executive director of the Division on Earth and Life Studies when it was established in 2001 and rose to the position of deputy executive director in 2004. While holding these positions, he directed studies on a variety of science policy issues, including climate change science, mining on federal lands, radioactive waste management, and scientific peer review.

Symmes also directed the Roundtable on Science and Technology for Sustainability and served as a senior adviser for the 2010 InterAcademy Council Review of the Intergovernmental Panel on Climate Change. He received the Academies' Individual Award for Distinguished Service in 2002. Before joining the Academies, Symmes served as a research assistant professor and postdoctoral associate in the Department of Earth and Space Sciences at the State University of New York at Stony Brook. He graduated with a B.A. summa cum laude in geology from Amherst College and received his Ph.D. in geology from the Johns Hopkins University.



Dr. Kavita Berger is the Board Director of the Board on Life Science of the National Academies of Sciences, Engineering, and Medicine. She is a life scientist with extensive experience in biological science and security policy. Throughout her career, she has worked on problems at the intersection of health, science, national security, and policy. Prior to joining the National Academies, Dr. Berger was a principal scientist at Gryphon Scientific. There, she led numerous projects involving biotechnology landscape analyses, biosecurity and biodefense policy, risk and benefits of life science research and technologies, and international bioengagement. Recently, she led system-based analyses of the entire U.S. biosecurity and biodefense policy landscape and of dual use capabilities of scientists. She also has led a comparative analysis of genome editing technologies, examination of biosecurity considerations associated with high-consequence pathogens and enabling biotechnologies, and development of scenario-based training exercises on laboratory biosecurity and biosafety concepts in the Middle East and North Africa. Dr. Berger was responsible for several biosecurity and biodefense initiatives at the American Association for the Advancement of Science (AAAS). At AAAS, she developed activities that engaged Washington-DC-based science policy and security experts on topics ranging from health security to biological weapons. These efforts provided opportunities for scientists to bring their knowledge and experience to current security policy dialogues and for the security policy community to better understand the broader implications of science and technology. Dr. Berger's interest in looking between the lines of policy and practice led her to initiate two significant activities at AAAS, both of which have influenced her work at Gryphon Scientific. One activity was to promote dialogue between the Federal Bureau of Investigation and university officials to enhance their familiarity with each other, find common ground, and promote

trust-building. For the FBI, she led a project involving evaluation of national and transnational security implications of big data in the life sciences. The second activity was to engage scientists across the Middle East, North Africa, and South Asia to work together to prevent biosecurity threats. Dr. Berger has served on two National Research Council committees related to cooperative biological engagement, as deputy chair of the nongovernmental Global Health Security Agenda Consortium, and as a subject matter expert for various government and nongovernmental organizations. Dr. Berger has a Ph.D. in genetics and molecular biology from Emory University.



Dr. Emanuel Robinson is the Director of the Board on Human-Systems Integration at the National Academies of Sciences, Engineering, and Medicine. Dr. Robinson's work spans human factors, industrial/organizational and cognitive psychology, and program evaluation. He has worked with a range of federal, state, private, and philanthropic organizations to successfully execute projects in decision-making strategies, transportation, technology design and human factors, organizational change and leadership, behavioral economics, and safety. Dr. Robinson has published in these areas and is regularly invited to speak at conferences and professional meetings. He has served as a reviewer for journals in human factors and behavioral economics, including previously serving as a Consulting Editor for the *Journal of Experimental Psychology: Applied*. Prior to joining the Academies, he led the Center for Human Performance and Safety at a leading science research non-profit and was a Senior Study Director for Transportation Systems Management and Operations at a top behavioral research firm. Dr. Robinson received a B.S. from the University of New Orleans in Psychology, and an M.S. and Ph.D. in Experimental Psychology from the Georgia Institute of Technology.



Guru Madhavan is the Norman R. Augustine Senior Scholar and senior director of programs of the National Academy of Engineering, where he is also founding director of the Forum on Complex Unifiable Systems (FOCUS) program. He has served as a technical advisor to the U.S. Department of Health and Human Services and the European Union Malaria Fund. Earlier in the medical device industry, he has contributed to the research and development of surgical catheters for cardiac ablation and neuromuscular stimulators for improving blood circulation.

A systems engineer by background, he received his M.S. and Ph.D. in biomedical engineering and an M.B.A. from the State University of New York that awarded him the Edward Weisband Distinguished Alumni Award for Public Service or Contribution to Public Affairs. His recent awards include: ASME Henry Laurence Gantt Medal for business leadership, AAMI Laufman-Greatbatch Award for contributions to health technology, IEEE Norbert Wiener Award for Social and Professional Responsibility, IEEE Alfred Goldsmith Award for Outstanding Achievement in Engineering Communication, and IEEE-USA Award for Distinguished Literary Contributions Furthering Public Understanding and the Advancement of the Engineering Profession and the George F. McClure Citation of Honor for engineering leadership.

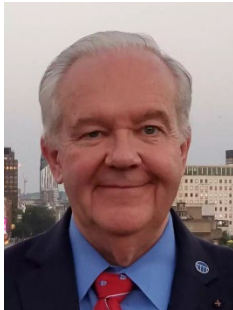
He is an elected fellow of the Institution of Engineering and Technology (UK), the American Association for the Advancement of Science, the American Institute of Medical and Biological Engineering, and the American Society of Mechanical Engineers. He was a former vice president

of IEEE-USA and a founding member of the Global Young Academy. His books include the nonfiction “Applied Minds: How Engineers Think” (W.W. Norton) that has been translated into many languages.

Block I: Thinking Beyond Root Causes



Steve Frank is the Donald Bren Professor of Biological Sciences at UC Irvine. His theoretical studies include the control of trait expression and the breakdown of those controls in disease. His broader interests in natural selection have led to books on microbial metabolism, cancer, infectious diseases, and general principles of conflict and cooperation.



Dr. Roger McCarthy is an independent Mechanical Engineering consultant, an Officer and Treasurer of the National Academy of Engineering (NAE), and a Director on the Board of The National Academies Corporation (TNAC). He also serves as a Director on the Board of Shui on Land (SOL), Ltd., which is publicly traded (stock code 0272) on the Hong Kong Exchange. Dr. McCarthy was formerly employed by Exponent, Inc., (NASDAQ symbol “EXPO”), headquartered in Menlo Park, California. Dr. McCarthy joined Exponent, then Failure Analysis Associates, Inc., (FaAA) in 1978, and retired in 2008 where, during his 30+-year tenure, he was variously CEO, Chairman and Chairman Emeritus. In 1992, then-President Bush appointed Dr. McCarthy to a two-year term on the President’s Commission on the National Medal of Science. He was Commencement Speaker for the University Of Michigan College Of Engineering Graduation in April 2008. Dr. McCarthy has investigated some of the major disasters of the current age, most recently in the NAE investigation: Deepwater Horizon Explosion, Fire, and Oil Spill in the Gulf of Mexico for Secretary of the Interior Salazar. He has appeared on The History Channel, Myth Busters, Discovery, Modern Marvels, and the National Geographic Channel. Dr. McCarthy holds a PhD from the Massachusetts Institute of Technology (MIT) in Mechanical Engineering.” He is currently the chair of the NAE committee investigating the collapse of the Aricebo telescope for the NSF.



Dr. Marie-Elisabeth Paté-Cornell is the Burt and Deedee McMurtry Professor in the School of Engineering, and a Professor and Founding Chair of the Department of Management Science and Engineering at Stanford University (2000-2011). Previously, she was the Professor and Chair of the Stanford Department of Industrial Engineering and Engineering Management and an Assistant Professor of Civil Engineering at MIT. Her specialty is engineering risk analysis with application to complex systems (seismic risk, space systems, medical procedures and devices, offshore oil platforms, cyber security, etc.). Her earlier research has focused on the optimization of warning systems and the explicit inclusion of human and organizational factors in the analysis of systems’ failure risks. Her more recent work is on the use of game theory in risk analysis with applications that have included counterterrorism and cyber security.

She is a member of the National Academy of Engineering where she chairs the section of Interdisciplinary Engineering and Special Fields, of the French Académie des Technologies, and of the NASA Advisory Council. She is co-chair of the committee of the National Academies (NASEM) on risk analysis methods for nuclear war and nuclear terrorism. She is a Fellow (and past president) of the Society for Risk Analysis and of the Institute for Operations Research and Management Science. She is the author of more than one hundred publications, with several best paper awards, and the co-editor of a book on Perspectives on Complex Global Problems (2016). She was a member of the Board of Advisors of the Naval Postgraduate School, which she chaired from 2004 to 2006, and of the Navy War College. Dr. Paté-Cornell was also a member of the President's (Foreign) Intelligence Advisory Board (2001-2008), of the board of the Aerospace Corporation (2004-2013) of Draper Laboratory (2009-2016), and of InQtel (2006-2017). She was awarded the Frank Ramsey Medal of the Decision Analysis Society, the 2021 IEEE Ramo medal in Systems Engineering and Science, and the 2022 PICMET Award for Leadership in Technology Management. She is a Fellow (and past president) of the Society for Risk Analysis and of the Institute for Management Science and Operations Research, and a Distinguished Visiting Scientist of the NASA Jet Propulsion Laboratory. She is the author of more than one hundred publications, for which she got several best paper awards, and the co-editor of a book on Perspectives on Complex Global Problems (2016). She holds a BS in Mathematics and Physics, Marseille (France), an Engineering degree (Applied Math/CS) from the Institut Polytechnique de Grenoble (France), an MS in Operations Research and a PhD in Engineering-Economic Systems, both from Stanford University.

She and her late husband, Dr. Allin Cornell had two children, Philip Cornell (born 1981) and Ariane Cornell (1984). She is married to Admiral James O. Ellis Jr. (US Navy, Ret.).



Leslie A. DeChurch is an expert in teamwork and leadership in organizations. She is Chair and Professor of Communication Studies (School of Communication) and holds courtesy appointments in Management & Organizations (Kellogg School of Management) and the Department of Psychology (Weinberg College of Arts & Sciences) at Northwestern University. Her research examines the leadership and teamwork that make extraordinary successes possible, from the Italian Renaissance to space exploration to human-AI partnerships.

Prof. DeChurch leads the [ATLAS lab: Advancing Teams, Leaders, and Systems](#), where her research program on teamwork and leadership has been continuously funded by agencies including the National Science Foundation (NSF), National Aeronautical and Space Agency (NASA), and Army Research Office (ARO). Her work has appeared in top outlets including the Proceedings of the National Academy of Sciences (PNAS), Journal of Applied Psychology (JAP), Academy of Management Review (AMR), Academy of Management Journal (AMJ), and Journal of Management (JoM). She served on the National Research Council Committee on The Context of Military Environments, and has contributed to several National Academies Committees on teamwork issues ranging from measurement to innovation.

Professor DeChurch holds a PhD in Organizational Psychology and is a fellow of the American Psychological Association (APA), Association for Psychological Science (APS), and the Society of Industrial & Organizational Psychology (SIOP). She is Past-President and Chairperson of the Board of INGRoup, the Interdisciplinary Network for Group Research.

Block II: Organizational Approaches to Failure Management



Dr. Cynthia Null is the NASA Technical Fellow for Human Factors with the NASA Engineering and Safety Center since 2003. She began her career at NASA Ames in 1991 as a branch chief in the Human Factors Research Division. In 1996, she edited the Space Human Factor Requirements Definition for the Advance Human Support Technology Program. In 1997, while a program manager in the Aeronautics Enterprise, Dr. Null was part of the lead team designing the Aviation Safety Program. She was the acting Chief of the Human Factors Research Division from Spring of 1998 until she returned to research in late 1999. Her career began with an academic appointment at the College of William and Mary, where she was on the faculty for 18 years before joining NASA. She was the managing editor of the journal *Psychometrika* for 20 years. In her role as NASA Technical Fellow for Human Factors, Dr. Null has been a tireless champion of the positive value of human performance across NASA's missions. She has also been instrumental in enabling, funding, and shaping ideas about human contributions to mission safety and success across the Agency.



Dr. Jon Holbrook is a cognitive scientist in the Crew Systems and Aviation Operations Branch at NASA's Langley Research Center. Dr. Holbrook explores the cognitive aspects of skilled human performance in complex environments, and the development of safe, high-performing human and multi-agent teams and organizations. Dr. Holbrook's research has included: mental representation of false memories, weather-related decision making by Alaska bush pilots; prospective memory performance by commercial airline pilots; workstation design and decision support for air traffic control tower personnel; organizational resilience in NASA's International Space Station program; and human contributions to safety in commercial aviation. Dr. Holbrook serves as Human Factors Discipline Deputy for the NASA Engineering and Safety Center. He received his Ph.D. in Cognitive Science from Vanderbilt University.



Jim Bagian joined University of Michigan's Industrial & Operations Engineering after serving as the Chief Patient Safety Officer and the founding director of the National Center for Patient Safety at the VA Hospital system. He is an engineer, a medical doctor and an astronaut. He is a member of the National Academy of Engineering, National Academy of Medicine, the Department of Defense Health Board/Trauma and Injury Subcommittee, and the NASA Aerospace Safety Advisory Board. Jim is the founding director of the Center for Healthcare Engineering and Patient Safety.



William B. Rouse, PhD, is Research Professor in the McCourt School of Public Policy at Georgetown University, as well as Professor Emeritus and former Chair of the School of Industrial and Systems Engineering at the Georgia Institute of Technology. He has served on the faculties of Tufts University, University of Illinois, Delft University of Technology, Georgia Tech, Stevens Institute of Technology, and Georgetown. He was founder and CEO of two software companies, Search Technology, Inc. and Enterprise Support Systems, Inc.

His research focuses on understanding and managing complex public-private systems such as healthcare delivery, higher education, transportation, and national security, with emphasis on mathematical and computational modeling of these systems for the purpose of policy design and analysis. His recent books include *From Human-Centered Design to Human-Centered Society* (Routledge, 2024), *Beyond Quick Fixes* (Oxford, 2023), *Bigger Pictures for Innovation* (Routledge, 2023), *Transforming Public-Private Ecosystems* (Oxford, 2022), *Failure Management* (Oxford, 2021), and *Computing Possible Futures* (Oxford, 2019).

Among many advisory roles, he has served as Chair of the Committee on Human Factors (now Board on Human Systems Integration) of the National Academies, a member of the advisory committee for the Division of Behavioral and Social Sciences and Education of the National Academies, a member of the U.S. Air Force Scientific Advisory Board, and a member of the DoD Senior Advisory Group on Modeling and Simulation. He has been designated a lifetime National Associate of the National Research Council and National Academies.

Rouse is an elected member of the National Academy of Engineering and has been elected a fellow of four professional societies -- Institute of Electrical and Electronics Engineers (IEEE), the International Council on Systems Engineering (INCOSE), the Institute for Operations Research and Management Science (INFORMS), and the Human Factors and Ergonomics Society (HFES). He received his B.S. from the University of Rhode Island, and his S.M. and Ph.D. from the Massachusetts Institute of Technology.

Block III: Engaging with Risks and Vulnerabilities: A Case Study of the Bioeconomy



Sarah Richardson is a computational and molecular biologist, specializing in germ wrangling. Sarah Richardson earned a BS in Biology at the University of Maryland College Park; with the support of a prestigious [DOE Computational Science Graduate Fellowship](#) she earned a PhD in Human Genetics and [Molecular Biology](#) from the Johns Hopkins University School of Medicine. As a [Distinguished Postdoctoral Fellow](#) of Genomics at the Lawrence Berkeley National Laboratory she worked on massive scale synthetic biology projects and the integration of computational genomics with experimental genomics. In 2015 she was also one of five promising young female scientists to receive a postdoctoral fellowship award from [L'Oréal USA](#); she proposed to study CRISPR systems and the domestication of non-model bacteria. In 2015, she was named a [SynBio LEAP Fellow](#) based on her “leadership potential and vision for shaping a future in biotechnology.” In 2020 she was awarded the Association for Women in Science’s [Next Generation Award](#) for leadership and vision.



Christopher Austin is the CEO-Partner at Flagship Pioneering in Cambridge, MA, and founding CEO of Vesalius Therapeutics, a company focused on precision drug development for common diseases. Prior to joining Flagship Pioneering, he led the National Center for Advancing Translational Sciences (NCATS) at the NIH, where he spearheaded efforts to accelerate therapeutic development for all diseases. With a background in both medicine and genetics, Chris has a deep understanding of translational science and drug discovery. He holds degrees from Princeton and Harvard Medical School, with clinical training at Massachusetts General Hospital.



Georgia Lagoudas is a science policy expert, bioengineer, and passionate citizen interested in tackling important problems, especially at the intersection of biotechnology and sustainability. Dr. Lagoudas was most recently at the White House Office of Science and Technology Policy, where she was responsible for leading implementation of the Bioeconomy Executive Order that the President signed in September 2022.

Dr. Lagoudas entered policy as an AAAS Congressional Science and Engineering Policy Fellow, working in the Senate on climate and biotechnology policy. During her fellowship, she wrote three bills, one of which eventually became law in the CHIPS and Science Act of 2022 ("Bioeconomy Research & Development Act"). Dr. Lagoudas has expertise in international biosafety and biosecurity policy, having spent time in the Department of State Bureau of International Security and Nonproliferation. Prior to coming to DC, Dr. Lagoudas worked at the Innovation Center of DSM, a multinational company that creates products in nutrition, health, and materials. She led biotech projects at the intersection of microbiome, animal agriculture, and sustainability, doing large-scale sequencing and data analysis to create products to improve animal gut health and reduce the use of antibiotics for growth promotion in animals.

Dr. Lagoudas completed her Ph.D. at MIT and the Broad Institute. She built microfluidic technologies to analyze microbial genomes at extremely high-throughput and used DNA sequencing to study antimicrobial resistance. Dr. Lagoudas coached and mentored dozens of students, and served as a Communication Fellow at MIT. She enjoys the mountains, cycling, trail running, and serving as a NOLS Instructor.

Synthesis: Advancing the Integration of Biological, Behavioral and Engineering Insights



Dr. George Poste is the Del E. Webb Professor of Health Innovation and Chief Scientist at The Complex Adaptive Systems Initiative (CASI) at Arizona State University (ASU) (<http://www.casi.asu.edu>). This program integrates research in genomics, synthetic biology and high-performance computing to study the altered regulation of molecular networks in human diseases to develop new diagnostic tests for precision medicine and the remote monitoring of health status using miniaturized body sensors and mobile devices. He assumed this post in 2009. From 2003 to 2009 he directed and built The Biodesign Institute at ASU (<https://biodesign.asu.edu/>).

He has published more than 400 research papers and edited 14 books on pharmaceutical technologies, cancer and infectious diseases.

He is a Fellow of the U.K. Royal Society, the Royal College of Pathologists, the U.K. Academy of Medicine and The American Institute for Medical and Biological Engineering (AIMBE), the Council for Foreign Relations and the US Academy of Medicine Forum on Global Health. He served as a member of the Defense Science Board of the U.S. Department of Defense and currently serves on advisory committees for several U.S. government agencies in defense, intelligence, national security and healthcare and is an Ex-Officio Member of the Bipartisan Commission on Biodefense. His areas of expertise in biosecurity focus on zoonotic emerging infectious diseases, dual-use research in biotechnology and synthetic biology and new diagnostic systems for global biosurveillance.

Looking to the Future: Guiding Scientific Investments and Policy Measures



Sudip S. Parikh, Ph.D., became the 19th Chief Executive Officer of the American Association for the Advancement of Science (AAAS) and Executive Publisher of the Science family of journals in January 2020. Parikh has spent two decades at the nexus of science, policy, and business.

Immediately prior to joining AAAS, Parikh was senior vice president and managing director at DIA Global, a neutral, multidisciplinary organization for healthcare product development. At DIA, Parikh led strategy in the Americas and oversaw DIA programs that catalyzed progress globally toward novel regulatory frameworks for advanced therapies.

Prior to DIA, Parikh was a vice president at Battelle, a multibillion-dollar research and development organization, where he led two business units with over 500 scientific, technical, and computing experts performing basic and applied research, developing medicines and healthcare devices, developing agricultural products, and creating advanced analytics and artificial intelligence applications to improve human health.

From 2001 to 2009, Parikh served as science advisor to the Republican leadership of the U.S. Senate Appropriations Committee, where he was responsible for negotiating budgets for the National Institutes of Health (NIH), Centers for Disease Control and Prevention, Agency for Healthcare Research and Quality, Biomedical Advanced Research and Development Authority, and other scientific and health agencies. As a key legislative liaison to the research and development ecosystem, Parikh was on the frontlines of many science policy issues debated during that time, including embryonic stem cell research, cloning, disease surveillance, bioterrorism, cyber security, and doubling the NIH budget.

An active member of the scientific advocacy community, Parikh serves as a board member and officer for several impactful organizations, including Research!America (which he has chaired since 2023), Friends of Cancer Research, and ACT for NIH. He also serves as co-chair of the Science and Technology Action Committee, Science CEO Group, and the Coalition for Trust in Health and Science. He is also a member of the Board of Life Sciences of the U.S. National Academies of Science, Engineering, and Medicine.

Parikh is an elected member of the American Academy of Arts and Sciences and the Council on Foreign Relations. He has also received multiple public service awards, including recognition from

the Society for Women's Health Research, the American Association of Immunologists, the National AIDS Alliance, the Coalition for Health Services Research, and the Juvenile Diabetes Research Foundation.

Early in his career, Parikh was a Presidential Management Intern at the NIH. He was awarded a National Science Foundation Graduate Research Fellowship while earning his Ph.D. in macromolecular structure and chemistry at the Scripps Research Institute in La Jolla, Calif. There, he used structural biology and biochemistry techniques to probe the mechanisms of DNA repair enzymes. The son of Indian immigrants who worked in the textile and furniture manufacturing plants of North Carolina, Parikh completed undergraduate studies at the University of North Carolina at Chapel Hill, first as a journalism major before switching into materials science. As a parent of three energetic children, he prioritizes volunteering as a mentor for their Science Olympiad teams.

Looking to the Future: Guiding Scientific Collaborations



Randolph Nesse is a physician and co-founder of the field of evolutionary medicine. After a 40 year career at the University of Michigan medical school he moved to Arizona State University to found its Center for Evolution and Medicine. His current mission is to help psychiatry find its missing scientific foundation in evolutionary biology.

Block IV: Reflections and Next Steps



Jay Labov currently serves as a Senior Advisor to the National Academies of Engineering's Program Office. An organismal biologist by training, Dr. Labov devoted most of his career to the improvement of STEM education in the United States at the K-12, undergraduate, and graduate levels. He spent more than 23 years as a staff member of the National Academies of Sciences, Engineering, and Medicine, retiring in 2018 as a Senior Advisor for Education and Communication, Director of the National Academies Teacher Advisory Council, and overseeing the education portfolio of the Board on Life Sciences. He directed or contributed significantly to more than 30 studies and other activities that led to National Academies reports. Prior to his employment at the National Academies, Dr. Labov was a tenured member of the Department of Biology at Colby College for 18 years.

Concluding Remarks



Alton D. Romig, Jr. is the executive officer of the National Academy of Engineering. Under Congressional charter, the Academy provides advice to the federal government, when requested, on matters of engineering and technology. As executive officer, Dr. Romig is the chief operating officer responsible for the program, financial, and membership operations of the Academy, reporting to the NAE president.

He was previously vice president and general manager of Lockheed Martin Aeronautics Company Advanced Development Programs, better known as the Skunk Works®. He spent the majority of his career at Sandia National Laboratories, operated by the Lockheed Martin Corporation, having joined Sandia as a member of the technical staff in 1979 and moved through a succession of R&D management positions leading to his appointment as executive vice president in 2005. He served as deputy laboratories director and chief operating officer until 2010, when he transferred to the Skunk Works.

Dr. Romig serves or has served on a number of Advisory Committees including those at Univ of Washington, MIT, Ohio State, Purdue, Georgia Tech, the Colorado School of Mines and Sandia National Laboratories. He is also visiting Associate of Applied Physics and Materials Science at Cal Tech. Dr. Romig is a member of the Board of Directors of Football Research, Inc., a non-profit entity created and supported by the National Football League to review engineering technology to improve the safety of the sport. From 2003 to 2008, he served on the Board of AWE, Aldermaston, UK and chaired the Program committee.

Dr. Romig is a Fellow TMS, IEEE, AIAA and AAAS. He is also a Fellow and Honorary Member of ASM International. Dr. Romig was elected to the National Academy of Engineering in 2003 and the Council of Foreign Relations in 2008. He was awarded the ASM Silver Medal for Materials Research in 1988, and he received the IEEE-USA George F. McClure Citation of Honor in 2023. Dr. Romig graduated from Lehigh University in 1975 with a BS in Materials Science and Engineering. He received his MS and PhD in Materials Science and Engineering from Lehigh University in 1977 and 1979, respectively.