NATIONAL ACADEMIES Sciences Engineering Medicine

Developing Human Capital to Support U.S. Innovation Capacity

Government-University-Industry Research Roundtable

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Speaker Biographies

Sethuraman Panchanathan is a computer scientist and engineer and the 15th director of the U.S. National Science Foundation (NSF). Panchanathan was nominated to this position by the President of the United States in 2019 and subsequently unanimously confirmed by the U.S. Senate on June 18, 2020. NSF is an $8.8B independent federal agency and the only government agency charged with advancing all fields of scientific discovery, technological innovation and STEM education.

Panchanathan is a leader in science, engineering and education with more than three decades of experience. He has a distinguished career in both higher education and government, where he has designed and built knowledge enterprises, which advance research innovation, strategic partnerships, entrepreneurship, global development and economic growth.

Panchanathan previously served as the executive vice president of the Arizona State University (ASU) Knowledge Enterprise, where he was also chief research and innovation officer. He was also the founder and director of the Center for Cognitive Ubiquitous Computing at ASU. Under his leadership, ASU increased research performance fivefold, earning recognition as the fastest growing and most innovative research university in the United States.

Prior to joining NSF, Panchanathan served on the National Science Board as chair of the Committee on Strategy and as a member of the External Engagement and National Science and Engineering Policy committees. Additionally, he served on the National Advisory Council on Innovation and Entrepreneurship. He was chair of the Council on Research of the Association of Public and Land-grant Universities and co-chair of the Extreme Innovation Taskforce of the Global Federation of Competitiveness Councils. Arizona's Governor appointed Panchanathan as senior advisor for science and technology in 2018. He was the editor-in-chief of the IEEE Multimedia Magazine and editor/associate editor of several international journals.

Panchanathan's scientific contributions have advanced the areas of human-centered multimedia computing, haptic user interfaces, person-centered tools and ubiquitous computing technologies for enhancing the quality of life for individuals with different abilities; machine learning for multimedia applications; medical image processing; and media processor designs. He has published close to 500 articles in refereed journals and conference proceedings, and has mentored more than 150 graduate students, postdocs, research engineers and research scientists, many now occupy leading positions in academia and industry.

For his scientific contributions, Panchanathan has received numerous awards, including Distinguished Alumnus Awards and the Governor's Innovator of the Year for Academia Award for his development of information technology centric assistive and rehabilitative environments to assist individuals with visual impairments.

Panchanathan is a fellow of the National Academy of Inventors, where he also served as vice president for strategic initiatives. He is also a fellow of the American Association for the Advancement of Science, the Canadian Academy of Engineering, the Association for Computing Machinery, the Institute of Electrical and Electronics Engineers and the Society of Optical Engineering.

Panchanathan is married to Sarada "Soumya" Panchanathan, an academic pediatrician and informatician, who has taught medical students, pediatric residents and informatics fellows. They have two adult children, Amritha and Roshan.

Amy Burke is the Program Director for Science, Technology, and Innovation Analysis at the National Center for Science and Engineering Statistics of the National Science Foundation. Since joining NCSES as an analyst in 2015 she has authored or co-authored multiple analytical products including the Science and Engineering Indicators Summary Report and the STEM Labor report, as well as the Women, Minorities, and Persons with Disabilities in Science and Engineering reports, among others. She was a member of the NCSES Skilled Technical Workforce working group and served as a subject matter expert to the National Science Board's Skilled Technical Workforce Task Force. An economist by training, Amy has over 25 years of experience as analyst at both the state and federal levels. She received her doctorate in economics from the University of New Mexico.

Harry J. Holzer is the John LaFarge Jr. SJ Professor of Public Policy at Georgetown University's McCourt School of Public Policy, a Nonresident Senior Fellow at Brookings, and an Institute Fellow at the American Institute for Research in Washington, DC. He is a former Chief Economist for the U.S. Department of Labor and a former Professor of Economics at Michigan State University. He was a founding faculty director of the Georgetown Center on Poverty and Inequality. He is a research fellow at IZA (The Institute for Labor Economics). He is also an affiliate of the Institute for Research on Poverty at the University of Wisconsin-Madison, and of the Stanford Institute on Poverty and Inequality.

Holzer is an expert on the low-wage labor market, and has particularly studied the problems of minority workers in urban areas. He has authored or edited 12 books and several dozen journal articles, mostly on disadvantaged American workers and their employers, as well as on education and workforce issues and labor market policy. His books include *Making College Work: Pathways to Success for Disadvantaged Students* (2017, Brookings, with Sandy Baum), *Where are All the Good Jobs Going?* (2011, Russell Sage Foundation), *Reconnecting Disadvantaged Young Men* (2006, Urban Institute Press, with Peter Edelman and Paul Offner), *Moving Up or Moving On: Who Advances in the Low Wage Labor Market?* (2005, Russell Sage Foundation, with Fredrik Andersson and Julia Lane), and *What Employers Want: Job Prospects for Less-Educated Workers* (1996, Russell Sage Foundation).

His work has contributed to state and federal policies in a number of policy areas. His research on the difficulties faced by ex-offenders in the job market contributed to policies, which ultimately resulted in the First Step Act of 2018. He advised the Obama administration on the inclusion of employment and training initiatives in the American Recovery and Reconstruction Act of 2009 and on the vice president's "job-driven training" initiative in 2014. His research on minority employment difficulties and Affirmative Action has been cited in Supreme Court

opinions on Affirmative Action. Holzer's research on the costs to the U.S. economy of child poverty (in 2007) motivated other research on the topic, and was instrumental in getting the Biden administration to focus on reducing child poverty in their economic stimulus plan.

Holzer received his BA from Harvard in 1978 (graduating Summa Cum Laude) and his Ph.D. in Economics from Harvard in 1983. He has been the recipient of the Leslie Whittington Faculty of the Year Award at the McCourt School (known earlier as the Georgetown Public Policy Institute) in 2002 and the Hamilton Project Policy Innovation Prize in 2011 at the Brookings Institution.

Matt Sigelman is President of the Burning Glass Institute. He has dedicated his career to unlocking new avenues for mobility, opportunity, and equity through skills.

Sigelman and his team created the field of real-time labor market data, a breakthrough innovation that has transformed the way that policy makers, researchers, employers, education institutions, and workers understand, plan for, and connect with the world of work. By mining billions of job openings and career histories, Sigelman led Emsi Burning Glass to become a leading authority on the global market for talent, harnessing advanced AI and natural language processing to render data that provide unprecedented granularity on the changing landscape of opportunity for workers.

By tracking demand for tens of thousands of skills across over 30 countries, Sigelman's work has cracked the genetic code of an increasingly dynamic market, with deep insights that chart how work is being redefined and how to identify the skills that bridge the gap between people and opportunity. This intelligence is critical in protecting the workforce from obsolescence, and in highlighting routes to social mobility even amidst the threat of massive automation-driven displacement.

Before launching the Burning Glass Institute, Sigelman served as CEO of Emsi Burning Glass for nineteen years and continues to serve as the company's Chairman. Previously, Sigelman worked at McKinsey & Company and at Capital One. He is also Founder of the Main Line Classical Academy, an elementary school bringing the classical liberal arts curriculum and rigorous study in math and science to the kindergarten level on up and dedicated to the idea that children are never too young to learn great things.

Sigelman writes widely on the job market and is consulted frequently by public officials and the global media. He holds a BA from Princeton University and an MBA from Harvard.

Steve Welby is the Executive Director and Chief Operating Officer of the Institute of Electrical and Electronics Engineers (IEEE). IEEE is the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity. IEEE and its members inspire a global community to innovate for a better tomorrow with more than 423,000 members in over 160 countries, and through its highly cited publications, conferences, technology standards, and professional and educational activities. IEEE is the trusted "voice" for engineering, computing, and technology information around the globe.

Before joining IEEE in 2015, Welby was nominated by President Obama and confirmed by the U.S. Senate as the Assistant Secretary of Defense for Research and Engineering. In this role, he served as the chief technology officer for the U.S. Department of

Defense, leading one of the largest and most complex research, development, and engineering organizations in the world.

Welby has more than three decades of government and industrial experience in technology and product development, including senior leadership positions at the Defense Advanced Research Projects Agency (DARPA). His technical experience includes the development of leading-edge aeronautical and space systems, robotics, and machine learnings systems. He is a fellow of the IEEE.

Jeannine Kunz is the chief workforce development officer for the Society of Manufacturing Engineers (SME), including the leadership responsibility for Tooling U-SME, the learning and development arm of SME, a nonprofit dedicated to strengthening the manufacturing industry. There, she leads a team dedicated to the ongoing education and training of the workforce.

A recognized expert in the field of learning and development, Kunz is at the forefront of workforce management issues, providing forward-thinking learning and development solutions for companies, academia and individuals. She is deeply knowledgeable about the challenges facing the manufacturing workforce and provides guidance on best practices for designing, developing and implementing performance-based development strategies in today's advanced manufacturing environments. Her work directly addresses industry dynamics related to people's knowledge and skills in manufacturing.

Under Kunz's direction, Tooling U-SME is an innovative pioneer in 21st-century learning, from online classes and virtual reality labs to traditional instructor-led training. Additionally, the organization has developed and implemented competency-based occupational apprenticeship programs, several of which have been endorsed by the Department of Labor and is a nationally recognized certifying body in manufacturing for over 50 years. Under Kunz's leadership, Tooling U-SME launched the first-ever aerospace engineering apprenticeship, and partnered with the Robert C. Byrd Institute, America Makes, the National Coalition of Advanced Technology Centers and AST2 to co-develop the first industry-vetted and U.S. Department of Labor approved framework for a new 3D-printing technician apprenticeship.

Kunz served on the executive committee of America Makes and is a board member for the National Coalition of Career Development, chair for the National Defense Industrial Association's Manufacturing Workforce Committee and sits on the Manufacturing USA's Advanced Robotics for Manufacturing's Education & Workforce Advisory Committee. She is also a founding member of the Skilled Trades Coalition, a consortium of over 20 leaders from associations that collaborate to improve awareness and perceptions of skilled trades. In 2020, Kunz joined the industry advisory committee for Clemson University's THINKER graduate program funded by the National Science Foundation, and in 2022, she was newly appointed as board member for the Manufacturing Technology Deployment Group. "Crain's Detroit Business" recognized Kunz's work when the publication selected her as one of its 2018 Notable Women in Manufacturing – in Michigan as well as one of its 2019 Notable Women in Education.

Edward L. Bolton is a retired United States Air Force Major General. Following his military career, he served as a senior executive at the Federal Aviation Administration. After his work in government, he became the as the Defense Systems Group senior vice president at the Aerospace Corporation until his retirement in March 2019. He currently works as a senior advisor to the Aerospace CEO. In this capacity, he helps shape and implement Diversity, Equity and Inclusion policies and programs at the Aerospace Corporation.

During his military career, Bolton served as commander of the 45th Space Wing and Eastern Test Range at Patrick Air Force Base, commander of the 30th Space Wing Operations Group at Vandenberg Air Force Base and commander of the 30th Spacelift Range Operations Squadron, also at Vandenberg Air Force Base. He completed assignments as the principal deputy to the chief operating office of the National Reconnaissance Office (NRO) and as director of Air Force space and cyber operations at the Pentagon. While in acquisition, he led the Satellite and Launch Systems and the Space Launch and Range Systems program offices at the Space and Missile Systems Center at Los Angeles Air Force Base. He was also on the White House Staff in two administrations as a director on the National Security Council. He retired from active duty after serving as the Deputy Assistant Secretary of the Air Force for Budget.

After his time in government, Bolton served as the Senior Vice President of the Defense Systems Group at the Aerospace Corporation, an independent, nonprofit organization focused on the nation's space program. Since September 2019, Bolton has served on the Board of Directors of the Virginia Commercial Space Flight Authority, and is a member of the Commercial Space Transportation Advisory Committee for the Department of Transportation. In addition, Bolton is a member of the Board of Directors of the Campagna Center, a not for profit community service organization located in Alexandria Virginia, where he currently resides.

Bolton has a BS in electrical engineering from the University of New Mexico, an MS in systems management from the University of Southern California, and an MS in national security strategy from the National War College. He completed a Senior Executive Fellowship at Harvard University as well as courses in executive program management and systems acquisition at the Defense System Management College at Fort Belvoir, Virginia.

Among Bolton's awards and honors are the Distinguished Service Medal, the Defense Superior Service Medal with oak leaf cluster and the Legion of Merit with oak leaf cluster. During his time as commander, the 45th Space Wing was awarded the General Robert Herres trophy for its selection as the top wing in Air Force Space Command. While at Los Angeles Air Base, his program office was selected as the Top Program Office in Space Acquisition by the Air Force Association. Bolton is also the recipient of both the NRO Leadership Award, and the NRO Gold Medal.

Kirsten Ellenbogen began her tenure as third President and CEO of Great Lakes Science Center in 2013 with a strategic initiative developed in collaboration with corporate leaders to change the community's narrative around advanced manufacturing for diverse middle-school youth and families. This work was recognized by the White House Office of Science and Technology Policy, who chose the Science Center as the unveiling site for the National Week of Making with Mythbuster's host Adam Savage in 2016. Most recently, she has launched Cleveland Connections: a new initiative integrating emerging technologies, to educate and empower youth in developing personal and community solutions.

She leads an innovative and committed team at the Science Center that has used the best scientific research to develop safe operating models, allowing them to continue to serve families and schools during the public health and economic crises that have magnified

persistent racial inequities in our community. The Science Center has been honored for this work and named a 2021 National Medal for Museum and Library Service finalist, recognizing their pioneering approaches and deep community partnerships during this difficult year.

Ellenbogan's research focus has included measuring the community impact of science centers and studies at the intersection of rhetoric, science communication, and informal science education. She was appointed to Section X of the British Association for the Advancement of Science and to the National Academy of Sciences' committee that produced Learning Science in Informal Environments. Ellenbogen's energetic leadership on field-advancing initiatives such as the Center for Informal Learning and Schools and the Nanoscale Informal Science Education Network, has included serving as co-principal investigator of the Center for Advancement of Informal Science Education. She was elected President of the Visitor Studies Association in 2007. In 2010, she was awarded a Noyce Fellowship focused on using museum resources to help policy makers use scientific evidence to inform decision-making. She is honored to have received the recognition as the 2015 Community Inspiration Award at STEMCON, 2017 Crain's Women of Note Award, 2019 Crain's Notable Women in STEM, 2019 Cleveland Magazine Women Living STEM, and the 2021 Cleveland 500 Leaders, Doers, Visionaries, & Idea Generators Who Shape the City.

In 2018, Ellenbogen was appointed to the National Academies of Sciences, Engineering, and Medicine Standing Committee on Advancing Science Communication Research and Practice, which she co-chairs. She is also chair of the Downtown Cleveland Alliance Visioning Committee, and Secretary of the board and co-chair of the conference planning committee of the Association of Science and Technology Centers, serving more than 600 science centers in 48 countries.

Ellenbogen is passionate about Cleveland and has been honored to lead the Science Center in playing important roles that help put the city in the spotlight for the 2016 Republican National Convention and the 2021 National Football League Draft. She served on the Cleveland Mayor's Sustainable City Committee, the Planning and Urban Design Committee of the Group Plan Commission, and is a proud alumni of the 2014 class of Leadership Cleveland. Currently she serves on the boards of the Cleveland Water Alliance, the Rock and Roll Hall of Fame and Museum, and Cleveland's MC2STEM High School. She received her Ph.D. in Science Education from Vanderbilt University and her BA from the University of Chicago. She lives in Shaker Heights with her husband, a Cleveland Metropolitan School District teacher, and their two children.

V. Celeste Carter received her Ph.D. in Microbiology from the Pennsylvania State University School of Medicine. She completed postdoctoral studies at the University of California at Berkeley. She joined the Division of Biological and Health Sciences at Foothill College to develop and head both Biotechnology and Bioinformatics Programs. She served as a Program Director twice in the Division of Undergraduate Education (DUE) at the National Science Foundation (NSF).

Carter accepted a permanent program director position in DUE in 2009. She is the Lead Program Director for the Advanced Technological Education (ATE) Program in DUE. Carter also works on other programs in DUE and serves on federal interagency working groups.

Talitha Washington is the inaugural director of the Atlanta University Center Consortium (AUCC) Data Science Initiative. This new initiative seeks to provide data-driven solutions to current and emerging societal problems, especially as it pertains to the African American community. Poised to bring new diverse perspectives to data science, Washington is a professor of Mathematics at Clark Atlanta University and is an affiliate faculty member at Morehouse College, Morehouse School of Medicine, and Spelman College.

Washington is a former program director at the National Science Foundation (NSF) in the Convergence Accelerator. Previously, as a program director in the Division of Undergraduate Education, she was instrumental in building and establishing NSF's first Hispanic-Serving Institutions Program which funded $40,000,000 in awards in FY19. Her research interests include the applications of differential equations to problems in biology and engineering, as well as the development of nonstandard finite difference schemes to numerically solve dynamical systems.

She was elected to honor societies Phi Beta Kappa and Sigma Xi, and mathematics honor societies Kappa Mu Epsilon and Pi Mu Epsilon. She is the recipient of the 2019 BEYA STEM Innovator Award, MAA's 2018 Leitzel Lecturer, an ASI Fellow, and featured by NSF as a Woman History Maker. In 2019, she received the distinguished Outstanding Faculty Award from Howard University. In 2020, she received the NSF Director's Award for Superior Accomplishment.

Washington completed her undergraduate studies in mathematics at Spelman College and studied abroad at the Universidad Autónoma de Guadalajara, Mexico. She earned her master's and doctoral degrees in mathematics from the University of Connecticut. She was a VIGRE Research Associate in the Department of Mathematics at Duke University. She held assistant professorships at The College of New Rochelle and the University of Evansville, an associate professorship at Howard University, and most recently, a full professorship at Clark Atlanta University.

Washington is an in-demand speaker who enjoys sharing her expertise on applied mathematics as well as STEM diversity to a wide range of audiences. Her work on Dr. Elbert Frank Cox, the first Black in the world to earn a PhD in mathematics, has been shared on radio and television stations, as well as in the Notices of the American Mathematical Society.

Lance Collins is the inaugural vice president and executive director of the Virginia Tech Innovation Campus, which was announced by the university as part of the state's successful effort to attract Amazon's HQ2 to Northern Virginia. In this role, he provides strategic direction for the Innovation Campus (see the campus Strategic Plan), helping to build a campus that will impart a lasting influence on the region's tech ecosystem.

Collins joined Virginia Tech in August 2020 from Cornell University where he served as the Joseph Silbert Dean of Engineering for 10 years. He was also part of the leadership team that successfully bid to partner with New York City to build Cornell Tech, which opened its Roosevelt Island campus in 2017. As the engineering dean at Cornell, Collins led one of the largest capital campaigns in the college's history. He also accelerated efforts to diversify the college's faculty and student body: During his tenure, the proportion of underrepresented minority students increased from 8 to 19 percent and the undergraduate female

enrollment from 33 to 50 percent. Collins was elected as a member of the National Academy of Engineering in February 2021, in recognition of his leadership in engineering, and contributions to the diversity of the profession.

Prior to Cornell, Collins spent 11 years as an assistant professor, associate professor, and professor of chemical engineering at Penn State University. Collins earned a bachelor's degree in 1981 at Princeton University and a master's degree and a Ph.D. in 1987 at the University of Pennsylvania, all in chemical engineering.

Collins serves as a member of the President's Cabinet at Virginia Tech, regularly reports to the University Board of Visitors, and maintains a faculty appointment in the Virginia Tech Department of Mechanical Engineering. Collins collaborates with a wide "matrix" of Virginia Tech administrators in the planning and execution of the Innovation Campus that includes the senior leadership of the College of Engineering.

Eric Smith blends technical, legal, and policy expertise with collaborative design to build inclusive innovation ecosystems in which entrepreneurs thrive and companies grow. As Director of the Office of Innovation and Entrepreneurship (OIE) at the U.S. Economic Development Administration (EDA), he manages OIE's grant portfolio—$250+million across 275+grants and four programs—and manages the National Advisory Council on Innovation and Entrepreneurship (NACIE),which advises the Commerce Secretary on accelerating innovation and catalyzing technology entrepreneurship.

A former computer scientist and lawyer, Smith began his career as in-house counsel in fintech before joining the U.S. Patent and Trademark Office, focusing on technologies that power the Internet of Things and wireless infrastructure. He joined OIE, helping build and evolve its programs through their first years with dedicated appropriations and designing operations and synthesizing policy for NACIE. Before returning to EDA, Smith led digital transformation as the Chief Customer Officer of NASA's Small Business Innovation Research and Small Business Technology Transition (SBIR/STTR) Programs. Smith's team of technologists and designers ran the software with which NASA manages $200 million in annual small business-led R&D.

Born and (mostly) raised and educated in Indiana and a member of the New York bar, he earned a J.D. from the Indiana University Maurer School of Law and a B.S. in computer science and mathematics, along with a technical translation certificate in German, from the Rose-Hulman Institute of Technology; he's now dedicated to his adopted home of DC. Outside of work, you'll find him on long bike rides, amid overly-complicated cooking projects (ask about Big Noodle Club!), or traveling—and ideally combining all three.

Christophe Combemale is an independent research consultant with a focus on the workforce, supply chain and production process implications of technology change and adoption. He holds a Ph.D. in Engineering and Public Policy from Carnegie Mellon University with a research background in labor economics and systems engineering.

Among other roles, he serves as a Fellow at the Allegheny County Department of Human Services, where his principal projects with the department include integrating thousands of DHS clients into workforce training programs in advanced manufacturing, as well as designing and deploying a rate-setting methodology and incentive structures for $530

million in annual behavioral health reimbursements by DHS. In addition, Combemale serves as an expert contributor on labor and technology issues for an NSF-funded pilot program seeking to develop a National Network for Critical Technology Assessment.