Public Meeting of the

President's Council of Advisors on Science and Technology (PCAST)

May 22, 2024

Meeting Minutes

MEETING PARTICIPANTS

PCAST MEMBERS

1. Frances Arnold, Co-Chair
2. Arati Prabhakar, Co-Chair
3. Maria T. Zuber, Co-Chair
4. Dan E. Arvizu
5. Dennis Assanis
6. John Banovetz
7. Frances Colón
8. Lisa A. Cooper
9. John O. Dabiri
10. William Dally
11. Sue Desmond-Hellmann
12. Inez Fung
13. Andrea Goldsmith
14. Laura H. Greene
15. Paula Hammond
16. Eric Horvitz
17. Joe Kiani
18. Jon Levin
19. Steve Pacala
20. Saul Perlmutter
21. William Press
22. Jennifer Richeson
23. Vicki Sato
24. Lisa Su
25. Kathryn Sullivan
26. Terence Tao
27. Phil Venables
28. Catherine Woteki

PCAST STAFF

1. Lara Campbell, Executive Director
2. Reba Bandyopadhyay, Deputy Executive Director
3. Bich-Thuy (Twee) Sim, Assistant Director for Transformative Medicine and Health Innovation
4. Melissa Edwards, Assistant Deputy Executive Director
5. Kimberly Lawrence, Administrative Specialist

INVITED SPEAKERS (IN ORDER OF PRESENTATION)

1. David Goldston, Massachusetts Institute of Technology (MIT)
2. Lisa Margonelli, Issues in Science and Technology
3. Victor McCrary, University of the District of Columbia (UDC)
4. Karen Plaut, Purdue University
5. Arun Majumdar, Stanford University

6. Brandon Wales, Cybersecurity and Infrastructure Agency (CISA)
7. Caitlin Clarke, National Security Council (NSC)
8. Erica Kimmerling, Office of Science and Technology Policy (OSTP)
9. Jarah Meador, Government Services Administration (GSA)

START DATE AND TIME: WEDNESDAY, May 22, 2024, 12:30 PM Eastern Time

LOCATION: Virtual Meeting via Zoom.gov

WELCOME

The PCAST co-chairs called the meeting to order – Frances Arnold, California Institute of Technology; Francis Collins, Acting Science Advisor to the President; and Maria Zuber, Massachusetts Institute of Technology. Arnold stated that PCAST is obsessed with the future of science, and recognizes that scientific research must serve society and the nation to justify investing public funds in scientific endeavors. The sessions at this meeting, she said, would discuss why government has invested and continues to invest in research, along with the structure of science in terms of who gets to do research and how they do research. She then introduced the first session.

SESSION: NATIONAL PURPOSE OF RESEARCH

DAVID GOLDSTON

Goldston summarized the history of research and federal research policy in the United States. His goal for his remarks is to help PCAST think about research issues going forward, and to do that he made three points. His first point was that there is no consensus theory to guide science policy and no consensus on how to determine how much spending is enough, unlike with other fields. There have been efforts to determine this for science and science policy, but they have mostly generated anecdotes and shots in the dark when figuring out what to do in science policy.

Goldston's second point was that the federal government invests in science policy to attain public goals, such as improving public health, enhancing national security, strengthening American competitiveness, and creating jobs. The federal government may use science and scientific exploration for these things, but the ultimate goal of federal science funding is never to either make scientists happy or to explore science for its own sake. He noted that Vannevar Bush's *Science, The Endless Frontier*, stressed the practical benefits of science.

The third point Goldston made was that there was never a golden age in the United States in which science was beloved, scientists went to do what they wanted, and funding was easy and not subject to debate. Sometimes, he said, the immediate post-World War II period is portrayed that way, but in fact, it took five years of debate and a bill President Truman vetoed before the federal government created the National Science Foundation (NSF).

Goldston then posed three questions to ask when thinking about policies past and future:

- What problem are you trying to solve?
- What tool is appropriate to solve the problem and does it exist already?
- How will you know whether you have solved the problem?

Too often, he said, policy discussions start with the tools, such how to build an existing program.

Goldston noted key moments in federal science policy in each decade since the 1940s, starting with *The Endless Frontier* and ending with passage of the Chips and Science Act in the 2020s. The examples he picked were not necessarily the most important moments in science policy, but they say something about the different problems the nation was trying to solve and the extent to which they succeeded. One event he singled out was the Research Applied to National Needs program of the 1970s that attempted to get NSF to fund more work aimed at addressing social problems rather than supporting undirected research in basic and applied science. He also noted that it is still unclear what type of research the Chips and Science Act will ultimately fund, which he suggested was something PCAST might want to examine going forward.

Goldston pointed out that funding pure basic research is not the only option for the federal government. Use-inspired basic research, for example, still aims to solve fundamental science problems, but with a particular goal in mind, with the invention of semiconductors being an example. There is also the question of what types of institutions should benefit from science funding and if every state should benefit from research funding. He also noted that 90 percent of what determines the overall level of federal spending is the overall level of total discretionary funding.

While trust in science has declined since the COVID-19 pandemic, said Goldston, the public still trusts scientists more than any other group, such as religious leaders, journalists, business leaders, and elected officials. In addition, according to a 2023 Pew survey, 78 percent of U.S. adults believe federal investments in scientific research are worthwhile for society over time.

LISA MARGONELLI

Margonelli provided a list of issue that concern the scientific community and the three high-level questions emerge from that list.

- Are we doing the right science for the enterprise's goals?
- Are we doing science right?
- What are we missing?

To Margonelli, one important goal for the science and technology enterprise is to support technology-based regional economic development. Every state, she said, wants to be involved, and organizations in 54 states and territories, for example, submitted applications for NSF's Innovation Engines program. This is nothing new, though. In 1984, Bruce Babbitt, the governor of Arizona called for there to be more technology-based research hubs akin to what Austin, TX, was creating with its Microelectronics and

computer Technology Corporation. She noted that Austin is now reconfiguring its research campus to reflect what experience has taught about technology transfer and workforce development and create a vibrant innovation economy that brings together research facilities, maker spaces, and venture capital.

Margonelli discussed an idea promulgated by Grace Wang, president of Worcester Polytechnic Institute, who described "creating a central ecosystem that can support continual outward growth". The crucial element of success, said Wang, is having workers who are not only technically capable, but also create problem solvers, collaborators, and who are adept at spanning various social and cultural context. Getting this type of worker requires a deliberate intention to education children so they grow up to be adults with those characteristics.

The idea that science can be the driver of regional economic growth is not new, said Margonelli. In 1862, the federal government founded the Department of Agriculture to promote regional economic development. After the Civil War, prominent Southerners saw improved fruit as a key to economic development and realized the key to success to develop science-guided industrial farmers who could grow predictably pretty peaches on time. This led to the recently formed land grant institutions and historically Black colleges and universities (HBCUs) to distribute knowledge to farmers to change their behavior, which in turn led to creating experimental stations, agricultural extension services, and 4-H clubs, that latter of which taught kids scientific principles for growing and handling food. This paved the way for decades of continuous innovation in agriculture mechanization, production of hybrid seed, and the widespread use of fertilizer and pest control. This story, said Margonelli, shows how a commitment of significant resources to scientific research along with community problem-solving, outreach, and implementation can promote regional economic transformation.

Regarding whether the nation is doing science right, Margonelli said the scientific enterprise usually considers various concerns, such as research novelty and reproducibility, diversity and inclusion in science, technology, engineering, and mathematics (STEM), and workforce preparation, separately. However, an approach to addressing these concerns together is to ask systemic questions rather than pointillistic ones. Along these lines, Lindy Elkins-Tanton, vice president of Arizona State University's Interplanetary Initiative and principal investigator for NASA's Psyche mission, questioned whether research funding is too anchored to principal investigators. She argues for moving to a system that focuses on solving specific problems by bringing together interdisciplinary teams with professional project managers, along the lines of some NASA projects. This approach could change many of the power dynamics and perverse incentives that are costly to the research enterprise today.

For her third question, she provided a wish list for the science and technology enterprise:

- Opportunities for everyone to learn wherever they are
- Involve more people in defining questions for research
- Use artificial intelligence (AI) to learn what you want, when you want
- Easily consult with experts
- Collectively generate local knowledge

- Structure knowledge for decision making
- Monitor effects of climate change at every level
- Use social media to strengthen community rather than alienating each other

Achieving even two or three of these items seems almost impossible said Margonelli, but everything on this list can be accomplished with a single smartphone app called iNaturalist. iNaturalist provides accessible AI and expertise on her phone to help make decisions. This is often labeled as citizen science, but she wants to reimagine citizen science into scientific citizens, with science acting as part of civil society and citizens collaborating and engaging with science. She noted that Finland has found that an effective way to counter misinformation is to teach kindergarteners to "think like scientists" when they hear new information. The curriculum continues through high school.

ARNOLD MODERATED THE Q&A AND DISCUSSION BETWEEN PCAST MEMBERS AND GOLDSTON AND MARGONELLI.

SESSION: EMERGING RESEARCH MODELS AT UNIVERSITIES

VICTOR MCCRARY

McCrary noted two reports from the National Academies of Sciences, Engineering, and Medicine (NASEM)—*Defense Research Capacity at Historically Black Colleges and Universities and Other Minority Institutions* and *Minority Serving Institutions: America's Underutilized Resource for Strengthening the STEM Workforce*—that discussed how to build research capacity at HBCUs and other minority-serving institutions and how to use and intertwine research to foster workforce development. Today, there are 101 accredited HBCUs, of which 11 are R2 institutions classified as doctoral universities with high research activity and many others, like UDC, that are emerging research institutions. HBCUs produce 20 percent of all Black graduates and enroll 10 percent of the nation's Black students, 24 percent of Black students in STEM disciplines, and 30 percent of all engineering students at the 4-year degree level. HBCUs also were the top eight institutions that graduated Black students who went on for STEM doctoral degrees.

When thinking about the demographics of the U.S. STEM workforce, said McCrary, there is an urgent need to address the so-called missing millions, the members of demographic groups underrepresented in STEM needed to fill the ranks of the STEM workforce. While the number of people from these groups has increased over the past decade, closing the diversity gap so the STEM workforce represents the U.S. population, the National Science Board estimates that the number of women must nearly double, Hispanic or Latinos and Black or African Americans must more than double, and the number of American Indian or Alaska Natives science and engineering workers needs to quintuple.

McCrary explained that UDC is the only public university in the District of Columbia. Chartered as a land grant institution in 1862, UDC now has five campuses and is aiming to receive an R3 designation as an emerging research institution by 2025. UDC's research strengths and assets in advanced manufacturing

and biomedical engineering, STEM education, urban farming, and machine learning. UDC researchers received the institution's first patent in 2021. UDC also functions as the District of Columbia's government research laboratory, with a central theme of urban sustainability and resilience.

Today, said McCrary, educational institutions are being asked to demonstrate a positive return on investment for the public. One analysis showed that UDC has a 4:1 return to the DC economy, producing some $406 million in annual total economic impact and $535 million annual economic impact for the Washington, DC, metropolitan region. He noted that 10 HBCUs formed the science and technology research council to focus on research partnerships with NASA and the Department of Defense.

KAREN PLAUT

Plaut said Purdue University prides itself on its focus on national and economic security to provide a safe and secure livelihood for all. In the life and health sciences area, for example, the university's comprehensive partnership with Lilly has provided some $100 million in research funding. The partnership has a programmatic rather than individual project focus. Lilly provides the areas it wants the university to work on and the university then designs a cohort of researchers across disciplines that can meet the needs across the entire program, which currently is working on developing improves delivery of injectable medicine, developing models to predict the outcome of new therapies in humans, and reducing the risks associated with investing in drug development. The newest program focuses on expanding research in genetic medicine, intrathecal delivery, and nanoparticle drug delivery.

In addition to supporting research, Plaut, Lilly has provided $42 million to fund the university's Lilly Scholars program to recruit the best, brightest, and most diverse students to Purdue to build a pipeline of pharmaceutical manufacturing talent for Lilly. For the first cohort, the university made 200 offers that included full tuition, a co-op or internship opportunity, mentorship, and a pharmaceutical training program. Of the 98 students who accepted the offer, 58 percent were from underrepresented minoritized populations, 77 percent were female, and 45 percent were first-generation college students. For the second cohort, the program received 550 applications and has made 70 offers.

Plaut said the Purdue-Lilly partnership has generated over 150 publications across a range of disciplines, 111 intellectual property disclosures, and nine filed patents in its first five years. Nearly 250 students have engaged with the program, 15 post-docs completed their training, and 41 graduate students received degrees.

Purdue also has invested heavily in plant sciences, said Plaut. The university's plant sciences pipeline brings together multidisciplinary research and education to move discoveries from the benchtop to application and commercialization. At the time Purdue, in partnership with IBM, and the University of Queensland received a $6.6 million award from Department of Energy's Advanced Research Projects Agency-Energy Transportation Energy Resources from Renewable Agriculture program to build a genotype-to-phenotype research effort. Purdue has also invested in a partnership with several industrial partners and the state's farmers to establish the Indiana Corn and Soy Innovation Center. This effort has

created a phenotyping gantry that can examine every stalk of corn in the field. At the program's indoor phenotyping facility, researchers have developed techniques for imaging live plants with computed tomography and hyperspectral imaging.

Plaut said the university's flagship plant phenomics, digital agriculture, and big data has generated $300 million in new grants since its inception in 2014, produced 9000 publications from 150 faculty members from five of the university's colleges, received 17 patents over the past two years, and spun off 23 plant-related startup companies commercializing Purdue's intellectual property. The program has seen a 20 percent growth in undergraduate enrollment since 2014, and students accounted for one of the startup companies, which has since received funding from NSF and other sources. Another startup commercialized the use of drones to monitor farm fields. Other startups include one focused on data analytics and another detected a method for detecting plant diseases.

ARUN MAJUMDAR

Majumdar spoke about the Doerr School of Sustainability, the first school Stanford University launched in 70-plus years. The school grew out of a grassroots effort by students and faculty to start a program that would explore issues related to energy, water, food, biodiversity, ecology, climate change effects, and public health. These issues, he said, do not fit neatly into the typical university department structure. After much deliberation, the new entity is organized in three levels:

- Departments, which hire faculty, grant degrees, and develop curricula. Of the 140 Doerr faculty, half hold joint appointments across schools, including the business school, humanities, sciences, and graduate schools of education, engineering, and medicine, that form a microcosm of the entire campus of people who want to lean into and be part of curriculum development and research.
- Institutes, including the Woods Institute for the Environment and the Precourt Institute for Energy. These institutes were created over the past 15 to 20 years to form a connective tissue across campus and bring students and faculty together to look at solution-focused research. They also have connections to industry, nongovernmental organizations, foundations, and government. The university plans to launch a third institute, the Sustainable Society Institute, that will also join the Doerr School.
- Sustainability Accelerator to scale discoveries that will be transformative for society. The idea is to de-risk challenges on campus and then launch them at scale to provide value to society at large.

Majumdar said it was important when establishing the new school to have a balance between fundamental and solutions-driven research. The school has established internal mechanisms, including seed funding, to foster both types of research and to identify knowledge gaps that appear during solutions-driven research. The school has also created two new departments, one focused on the ocean, the other merging environmental and social sciences that is run jointly with the business school. He noted an important focus of the Doerr School is developing curricula that bridge disciplines. For example, a course he and a colleague developed is called Sustainable Energy for Future Presidents that has students

figuring out how to decarbonize the nation's electric grid by 2035. The idea here is to throw a difficult problem at the students and in trying to solve it, they see the connectivity and interconnection between fields.

ZUBER MODERATED THE Q&A AND DISCUSSION BETWEEN PCAST MEMBERS AND MCCRARY, PLAUT, AND MAJUMDAR.

SESSION: ACTIVITIES RELEVANT TO PUBLISHED PCAST REPORTS

Zuber said the goal of this two-part session was to explore how PCAST reports are contributing to solving important national challenges and improving the lives of Americans. The presentations discussed the framing of the reports and activities other federal agencies to support the work represented in the PCAST reports. The first part of the session addressed cyber-physical resilience, and the second part covered public engagement with science.

CYBER-PHYSICAL RESILIENCE REPORT

BRANDON WALES

Wales said the PCAST report on the convergence of cyber and physical resilience was well timed given the administration's focus on cybersecurity, particularly concerning resilience of the nation's critical infrastructure. A few weeks after this report's release, the White House issued National Security Memorandum 22 (NSM-22) on critical infrastructure, security, and resilience, which updated a decade-old policy.

The third recommendation in the PCAST report, said Wales, was to break down silos and strengthen government's ability to improve resilience, which is what NSM-22 was designed to do. It laid out key responsibilities across government agencies to take ownership of the security and risk management challenges in their respective sectors. It also empowered CISA (Cybersecurity & Infrastructure Security Agency) to serve as the national coordinator for critical infrastructure to manage this collaborative whole-of-government effort. One aspect of this involved taking a cue from the PCAST report and make sure there is a clear understanding of the risks cutting across critical infrastructure and a whole-of-government strategy to address systemic risk points.

Wales said one important difference between the NSM-22 and the previous policy is that agencies across the U.S. government have a year to assess where they lack the necessary authorities to drive the needed security outcomes. CISA's responsibility will be to look across those gaps in potential authorities and draft proposals for how the Administration will address and close the most critical gaps. Meanwhile, CISA is envisioning what the end states of this work will be and thinking about goals and the tools needed to meet

those goals and address the gaps.

Wales explained that under an earlier National Security Memorandum, CISA developed a set of cross-sector cybersecurity performance goals and ranked them by importance, cost, complexity, and impact. The idea here is to give companies, as they think about the limited security dollars they have to invest, the information so they can use those funds to have the biggest impact given the level of technical skills they can bring to bear on these challenges. Over the next several months, CISA will issue performance goals for individual sectors and the unique cybersecurity challenges they face. At the end of 2024, CISA will update its cross-sector goals to reflect changing technology, and changing evaluations by CISA, and feedback from industry partners.

The cybersecurity performance goals have generated several successes, and CISA is adapting that approach for physical infrastructure security. In December 2023, CISA issued Physical Security Performance Goals for Faith-Based Communities. This was prepared in response to specific requests and threats faith-based communities have experienced since the October 7, 2024 attack on Israel. Now, CISA is expanding these goals to capture a full array of security and resilience challenges and serve as a set of standards for cyber and physical security to build resilient infrastructure.

CAITLIN CLARKE

Clarke also noted the timeliness of the PCAST report and the role it played in drafting NSM-22. One key action in NSM-22 is the requirement to elevate the importance of minimum security and resilience requirements across all critical infrastructure sectors. In addition to CISA's work on cross-sector performance goals, the PCAST report also triggered the administration to clarify and strengthen the roles of the Sector Risk Management Agencies (SRMAs) and 16 sectors of critical infrastructure they oversee. Aside from serving as the day-to-day interface with the federal government, the SRMAs are now tasked with conducting risk assessments for their sector, understanding the risks in their sector, and developing a plan that prioritizes and mitigates risk. As per another recommendation in the PCAST report, the administration is trying to understand the resources the SRMAs would need to drive down the risk in their sectors.

Clarke then highlighted that NSM-22 reiterates the PCAST report's fourth recommendation on accounting for risk from private-sector owners and operators. While these owners and operators are ultimately responsible for any damage to the infrastructure they manage, it is important for the decision makers in the private sector to clearly understand the threats they face. Toward that end, the intelligence community is working on procedures for collecting, producing, and sharing intelligence with frontline owners and operators of critical infrastructure

PHIL VENABLES

Venables said the PCAST working group for this report had great partners from other parts of the federal government, including the Office of the National Cyber Director (ONCD), many of the SRMAs, and others. He then provided a long list of launch events, including social media dissemination. Major events have

included an in-person and live-streamed discussion with representatives of the PCAST working group, Department of Homeland Security, ONCD, and CISA; a meeting with the Council on Foreign Relations, and presentations to the World50 organization and RSA Security Conference. Members of the working group have also participated in a variety of briefings, podcasts, and conferences. They also briefed the National Institute of Standards and Technology Information Security and Privacy Advisory Board, as it is playing a key role in implementing many of the report's recommendations and working with the National Security Council, CISA, and ONCD on defining standards and metrics for the next set of performance goals. In addition, the MIT Lincoln Laboratory proactively contacted PCAST to brief it on the work they have been doing that will feed into the National Critical Infrastructure Observatory.

Other activities, said Venables, have included providing input to NASEM committees on resilience quantification and cyber hard problems and answering requests for information from other government agencies. Since the report's release, organizations outside the United States have contacted PCAST for input and to inform PCAST they are incorporating many aspects of the report into their national programs. Going forward, PCAST is working with its federal partners on planning three summits for July 2024 on performance goals, the National Critical Infrastructure Observatory, the Sector Coordinating Councils.

HORVITZ MODERATED THE Q&A AND DISCUSSION BETWEEN PCAST MEMBERS AND MCCRARY, PLAUT, AND VENABLES.

PUBLIC ENGAGEMENT WITH SCIENCE LETTER

ERICA KIMMERLING

Kimmerling said that on April 17, 2024, in direct response to PCAST's letter to the President, 16 federal agencies in the science and technology ecosystem convened a summit to discuss how to implement the letter's recommendations and build a more systemic approach to public engagement with science throughout the federal government. The summit included over 100 federal experts, practitioners, and senior leaders who started developing a shared language and understanding of the continuum of activities that constitute public engagement in federal science. The summit also addressed topics such as one-way communication awareness, public listening sessions, and the value of co-developed, community-led, and community-driven research.

The summit, said Kimmerling, provided the opportunity for federal experts to engage directly with the substance of the PCAST recommendations, especially the one on essentially standing up a new centralized office on public engagement in science to build that capacity. The summit held several interactive sessions to engage in real-time crowdsourcing of ideas for how to build that capacity. It provided the chance to understand how the ongoing public engagement in science work fits within larger government efforts, including the Executive Orders on racial equity, the efforts underway on open government, and the work the Office of Management and Budget (OMB) is doing to build a

framework that will broaden the types of people that public participation and community engagement can reach, expand the government's use of lived experiences and perspectives in its decision making, increase and embed public participation throughout agency functions, understand and show how public participation aligns with federal existing federal laws and priorities, and build on the successes and models that work.

Kimmerling noted that the Office of Science and Technology Policy (OSTP) is supporting OMB's work because it sees the alignment between public engagement in science and public engagement with government. On May 17, OMB closed a request for information to gather best practices and understand what the federal framework should include. OMB also closed a prize challenge that will inform developing an evaluation tool kit that compiles methods and metrics agencies can use to evaluate the extent to which their public participation and community engagement activities are effective.

JARAH MEADOR

Meador's division at the General Services Administration, the Technology and Transformative Services Division, has many programs that support public engagement and open government, including the Open Government Secretariat that implements the National Action Plan for Open Government. It also operates regulations.gov, which allows the public to comment on rulemaking; data.gov, which hosts over 300,000 federal, state, and local government data sets; code.gov, the open code repository for the federal government; challenge.gov, and citizenscience.gov.

Challenge.gov and citizenscience.gov, said Meador, are a byproduct of the Obama Administration and OSTP's commitment to creating equitable forms of public participation and public engagement with innovation and with science. These programs came about because of the reauthorization of the America Competes Act, which gave the head of every federal agency the authority to run prize competitions and engage with the public in open forms of innovation to promote more equitable and sustainable transparent forms of science and discovery.

Meador said GSA leads some 1,500 federal employees and communities of practice in supporting, promoting, building upon, and diffusing forms of equitable participation with the public. GSA also has many decentralized programs that support federal agencies in their efforts to promote public engagement. One program mentioned in the letter to the President, called 18F, is an office of talented designers and developers that agencies can tap into when they need to improve their capabilities to build good websites. In addition, GSA works closely with the U.S. Digital Service that was also mentioned in the letter to the President.

SAUL PERLMUTTER

Perlmutter gave his impression of the summit Kimmerling discussed. First, there were many ways the federal government is engaging with the public on science and technology. He heard examples of how federal agencies are holding more elaborate engagements that require a true random sample

of the public or an expert to inform the public. NASA, for example, ran an event that brought in citizens to deliberate about asteroid defense missions. The NASA staff that spoke at the summit said they would be interested in working with an office that could support that kind of event.

VICKI SATO

Sato said she was excited by the turnout at the summit as a reflection of the broad based of interest in and support for more dialogue with the public on matters of science. She said the working group that drafted the letter to the President was concerned that a call for a centralized, shared service might be viewed as something akin to agency-specific public relations on steroids. However, this group is extremely sophisticated and advanced with regard to understanding the difference between necessary public relations for federal agencies and the evolution of more meaningful policy that stems from community dialogue.

Sato said there were a few explicit call-outs for a need for more enhanced access to social science skills and technologies and the recognition that this component of communication is probably underrepresented in the agencies right now. To her, that represents an entrée for introducing a common and shared skillset of the best modern social science techniques for getting feedback from the public and arriving at common solutions. She also noted that GSA's enthusiasm, interest, and support for how to engage with OMB on accessing this kind of support at a time of limited budgets.

MARIA ZUBER

Zuber, who attended the summit, thought it was telling that while all of the science agencies had enthusiastic champions of public engagement in science, many of these individuals did not know each other and were toiling in isolation, developing good and creative ideas without an obvious mechanism to share best practices. In that respect, bringing these people together to meet and talk with one another was valuable. She noted, too, that the idea of establishing a small coordinating office that would be the locus for sharing these best practices and communicating among the community was well received across the board.

ZUBER MODERATED THE Q&A AND DISCUSSION BETWEEN PCAST MEMBERS AND KIMMERLING, MEADOR, PERLMUTTER, AND SATO.

PUBLIC COMMENT

Two minutes of public comments were made.

CLOSING COMMENTS

Arnold thanked the speakers and PCAST members. She noted the day's discussions envisioning the future of research would help PCAST think about how to help that vision come to fruition and how its work over the past three-plus years is contributing to the well-being of Americans. Zuber noted the presentations on the impact of PCAST's work will inform its current work and the steps it can take to help its reports have an impact. Prabhakar also thanked the speakers, PCAST, and staff for the work they put into making these conversations valuable.

MEETING ADJOURNED: 4:45 PM Eastern Time

I hereby certify that, to the best of my knowledge, the foregoing minutes are accurate and complete.

Frances Arnold, Ph.D.
Co-Chair
President's Council of Advisors on Science and Technology

Arati Prabhakar, Ph.D.
Co-Chair
President's Council of Advisors on Science and Technology

Maria Zuber, Ph.D.
Co-Chair
President's Council of Advisors on Science and Technology