NSB-2021-24
August 4, 2021

APPROVED MINUTES
PLENARY OPEN SESSION
472ND MEETING
NATIONAL SCIENCE BOARD

National Science Foundation (NSF)
Via Videoconference
May 18-19, 2021

Members Present:

Ellen Ochoa, *NSB Chair*
Victor McCrary, *NSB Vice Chair*
Sudarsanam Babu
Roger Beachy
Arthur Bienenstock
Maureen Condic
Aaron Dominguez
W. Kent Fuchs
Suresh Garimella
Dario Gil
Melvyn Huff
Steven Leath
W. Carl Lineberger
Matthew Malkan
Emilio Moran
Julia Phillips
Dan Reed
Geraldine Richmond
Anneila Sargent
Scott Stanley
S. Alan Stern
Stephen Willard
Heather Wilson

Sethuraman Panchanathan, *ex officio*

Members Absent:

There being a quorum, the National Science Board (NSB, Board) convened in Open Plenary Session at 11:00 a.m. on Tuesday, May 18, 2021, via videoconference with NSB Chair Ellen Ochoa presiding.

NSB Chair's Opening Remarks

Chair Ochoa welcomed everyone to the NSB's 472nd meeting. She began by acknowledging Asian American and Pacific Islander Heritage Month, noting that it had been a particularly challenging period for those communities in our country. She thanked Asian Americans and Pacific Islanders for their contributions to the nation and to the science and engineering (S&E) enterprise.

Ochoa then reviewed the meeting's agenda.

NSF Director's Remarks

Director Panchanathan began by thanking the NSF and NSB staffs for the work they do to make these meeting successful in the all-virtual environment.

Panchanathan then offered examples of NSF-supported research that have contributed to the fight against COVID-19. This included investments since the 1960s in PCR, investments in additive manufacturing and 3D printing in 1980s, and investments in CRISPR. Such research has contributed to rapid COVID testing as well as speedy manufacture of personal protective equipment, masks, and ventilators. He also stressed NSF's role in educating the research workforce that is combatting the pandemic and in supporting groups such as the Social Experts Action Network (SEAN) that connect policy makers with social, behavioral, and economic sciences researchers to help communities navigate the COVID-19 challenge. He observed that the fight against COVID-19 illustrates how curiosity-driven research and use-inspired, solutions-driven research have long composed the two strands of NSF's DNA. He added that it is crucial to strengthen the U.S. S&E enterprise at this time when the importance of S&E is so apparent.

Panchanathan expressed his thanks to Congress and the Administration for the $600 million provided to NSF in the American Rescue Plan. These funds allow NSF to provide support to the most vulnerable segments of the research community. Between the American Rescue Plan and the Fiscal Year (FY) 2021 budget NSF will be devoting close to a billion dollars to strengthening the research community and ensuring recovery from the pandemic.

The Director noted that the Administration's American Jobs Plan includes a $50 billion investment for NSF and that the President's FY 2022 Budget Request proposes $10.17 billion for NSF, a 20 percent increase over the previous year. Priorities for NSF in the President's request include enhancing fundamental research and development, climate and clean energy-related research, broadening participation, establishing the new technology directorate, constructing major research facilities, and strengthening U.S. leadership in emerging technologies. Panchanathan expressed his appreciation to the Administration and Congress for ensuring that NSF and the science community are supported at this very important time.

The Director stated that he also continues to share his vision for NSF with the research community and provided examples of his engagements with S&E stakeholders and partners since the February NSB meeting.

In closing, the Director stressed that strengthening NSF at speed and scale means increasing the capabilities of the research community to make bigger breakthroughs and speed technological innovation, seizing opportunities, and increasing the power of everything that NSF does by an

order of magnitude. Increased investment and attention are essential to realizing this and it is critical that this moment be seized. He thanked the Board for its advice and counsel and for its oversight which is making NSF better.

Chair's Activity Summary

Ochoa continued the meeting by summarizing her Congressional activities since the Board's February meeting. Specifically, Ochoa and Vice Chair Victor McCrary met with the majority staff of the House Science, Space, and Technology Committee and with the majority and minority staff of the Senate Commerce, Science, and Transportation Committee to provide updates on *Vision 2030* implementation and share principles related to NSF-focused legislation. Ochoa and McCrary also spoke with House Commerce, Justice, Science Appropriations staff and Ochoa spoke with Senate Commerce, Justice, Science Appropriations staff. *Vision 2030* was also the focus of those conversations.

On April 28, Ochoa and Panchanathan testified before the House Science Committee's Subcommittee on Research and Technology. Both emphasized that the NSF is the right agency for new investment and that new investment is needed in science, technology, and talent to match the scale of today's science and engineering challenges.

Ochoa thanked McCrary for his extensive outreach on *Vision 2030*, noting that McCrary would say more about his activities during the *Vision 2030* session at this meeting.

Nominations Update

Ochoa invited Alan Stern, chair of the Nominations Committee for the NSB Class of 2022-2028, to provide an update on this year's nominations process. Stern summarized the committee's activities to date, which have included issuance of a Dear Colleague Letter and outreach to individuals. He listed the components of a nomination package and reminded everyone that the deadline for nominations is May 31, 2021.

Stern listed the areas of emphasis for the Class of 2022-2028. They include cyberinfrastructure, computational sciences, geosciences, engineering, private sector technology management, science of learning, promotion of diversity, and minority-serving institutions in STEM education.

The committee will rank the various nominations and present a book of recommended nominees to the NSB at its August meeting. Thereafter, Stern and Ochoa will report the results to the Office of Science and Technology Policy.

Women, Minorities and Persons with Disabilities Report

Ochoa invited Arthur Lupia, Assistant Director for the Directorate of Social, Behavioral and Economic Sciences, and John Finamore from the National Center for Science and Engineering (NCSES), to present.

Lupia introduced the presentation by noting that the biennial, congressionally mandated Women, Minorities, and Persons with Disabilities in Science and Engineering (WMPD) report is an important contribution to national conversation on STEM participation. Finamore defined underrepresentation and provided statistics that illustrated the extent to which different groups are underrepresented at the undergraduate and doctorate science and engineering (S&E) degree levels and in the S&E workforce. He then highlighted some of the information in the report. The numbers of engineering degrees awarded to women and the numbers of postdoctoral positions at academic institutions held by women and underrepresented minorities continue to increase but remained below their shares in the general population. He noted that the current report includes a section on the skilled technical workforce in response to recommendations from the Board. He encouraged NSB members to visit the WMPD report website for more detail.

Member questions focused on key new trends, outreach plans, and data for geographic distribution and economic strata. Finamore observed that the data in the report suggests continued slow progress in the representation of women and underrepresented groups in STEM. NCSES is continuing its outreach effort for the WMPD report and will work with the Board and Board office on opportunities to broaden such work. While the current report has limited data on the geographic distribution of S&E talent, Finamore noted that actions are underway for the 2023 WMPD report for an analysis of the regional impact on under-representation in S&E. The current report does not include economic strata within the demographic data. NCSES will explore whether such data could be included in the future.

Session 2 **(May 18, 4:45 p.m.–6:15 p.m.)**

Celebrating Science & Public Service with the 2021 Waterman, Bush, and Public Service Award Winners

Ochoa opened this special session acknowledging the continued impact of COVID-19 pandemic on the NSF and NSB's annual Honorary Awards celebration. She welcomed the award recipients for the 2021 NSB Vannevar Bush and Public Service Awards, as well as those for the NSF Alan T. Waterman Award. The awardees were Ralph Gomory, IBM, (Vannevar Bush Award), William Jackson, University of California, Davis (Public Service Award), William Hammack,

University of Illinois at Urbana-Champaign (Public Service Award), Nicholas Carnes, Duke University (Waterman Award), and Melanie Matchett Wood, Harvard University, (Waterman Award). Ochoa explained the significance of the NSB awards and congratulated all the winners before handing the floor to Panchanathan, who spoke about the Waterman Award and congratulated the winners.

Ochoa then introduced former Waterman Award recipient Jennifer Dionne of Stanford University, the moderator for the evening's panel discussion. Dionne led a rich interview style panel highlighting the work and contributions of each awardee.

Session 3 **(May 18, 11 a.m.–12:15 p.m.)**

Lessons from Minority Serving Institutions

NSB Chair Ochoa invited Committee on External Engagement Chair Geraldine Richmond to introduce the panel moderator, NSB Vice Chair Victor McCrary. McCrary opened by noting that although millions are missing from the U.S. S&E enterprise, many students from underrepresented groups are flourishing in Minority Serving Institutions (MSIs). He then introduced the panelists invited to highlight the successes of MSIs and the lessons other higher education institutions can learn from MSIs. The panelists were: Thai-Huy Nguyen, a policy researcher at the RAND Corporation and senior research associate at the Rutgers Center for Minority-serving Institutions; Arthur Tinoco, a tenured associate professor of chemistry at the University of Puerto Rico, Rio Piedras (a Hispanic Serving Institution (HSI)); Twyla Baker, president of Nueta Hidatsa Sahnish College (a Tribal College and University (TCU)); Ronald Mason, president of the University of the District of Columbia (an Historically Black College and University (HBCU)); and Evan Núñez, an astrophysics, NSF-Graduate Research Fellowship recipient at the California Institute of Technology. Each speaker gave a five-minute presentation.

Nguyen provided context for the panel by highlighting data on MSIs and their contributions to diversifying the STEM-educated workforce. He enumerated the various types of MSIs – in addition to HBCUs, TCUs, and HSIs, there are Asian American, Native American, Pacific Islander serving institutions (AANAPISIs), Native American serving nontribal institutions, and predominately Black institutions – that together comprise around 1000 different institutions, educating 30% of all undergraduate students. Nguyen highlighted the historical creativity of MSIs to innovate with significantly fewer resources. He attributed the success of MSIs to constructing learning spaces that advance racial equity in STEM education and push back against cultural norms. In particular, MSIs have space to rethink pedagogical practices, recruit faculty and researchers of color, and grow a faculty committed to student success in STEM. Nguyen closed by noting that AANAPISIs (over 50% of which are community colleges) are an essential part of the MSI-ecosystem, reaching an economically, ethnically, immigration-status, and first-generation status diverse student population.

Tinoco spoke to the successes of HSIs. Because HSIs target non-traditional students (adult learners, low-income, 1st generation, or non-native English speakers, immigrant students, those

supporting families), their students benefit from inclusive programming that meets them where they are. Tinoco stated that HSIs are successful because they employ a bevy of support systems from financial to bilingual to cultural competency workshops designed to bridge the transition points from secondary education to college and beyond. Such student-centered programs work because HSIs are intentional about what their students need. The emphasis on sustainability is also apparent. He stated that University of Puerto Rico students are successful in part because UPR focuses on training students for high demand STEM jobs.

Baker spoke about how a culture of resiliency characterizes TCUs and how native American culture is intentionally tied to the mission of TCUs. The success of TCUs, she said, depends on ensuring that students recognize that their culture – who they are as people, their identities, their lifeways, their languages – is not a hindrance to a STEM education, but a boon. Baker spoke to the need for students to identify and own their culturally-derived bodies of knowledge and to recognize that those bodies of knowledge complement mainstream STEM knowledge. Despite the successes that Baker highlighted, she acknowledged that youth of TCUs relative to other MSIs and the paucity of infrastructure, tools, and resources are limiting factors to expanding the number of students that they serve.

Mason contextualized the work of HBCUs in the broader story of race and wealth distribution in the United States. He stated that talent elimination is an intentional by-product of inequitable wealth distribution. This framing, he posited, leads both to national mediocrity over time and talent shortages. Mason stated that HBCUs have produced a disproportionate number of black STEM degree holders because they actually diagnose the challenges black students and faculty face by calling out the system of white supremacy that disadvantages them. HBCUs are intentional about having these hard conversations, about rethinking the talent pipeline, and talking with future employers to change the dynamics.

The panel concluded with Evan Núñez, who spoke of his academic journey from community college, through a 4-year MSI institution, to the California Institute of Technology. He highlighted how a summer research internship at his community college (El Camino) sharpened his interest in astronomy and astrophysics, paving the way for entry into a four-year program at Cal Poly Pomona. In addition, the summer program gave him the requisite research experience to pursue research immediately as an undergraduate. These opportunities ultimately led him to graduate study. Opportunities to engage with field scientists in these programs and being with a diverse cohort gave him the bump he needed to believe that astronomy was a viable career path.

During the question-and-answer session, NSB members delved deeper into how MSIs support students and how they create cultures that welcome students of diverse backgrounds.

Vision 2030 Implementation Working Group Update

McCrary, who chairs the Vision Implementation Working Group (VIWG), began by thanking the VIWG working group members and the staff team for its support. He provided a brief update on *Vision 2030*-related external engagement activities since the Board's last meeting. Many of

the Board's outreach activities focused on developing diverse domestic talent. Among the groups with whom NSB has engaged were: the Association of Public and Land-Grant Universities' Council on Research, the 2021 Black Engineers of the Year Awards (BEYA), the American Institute of Physics' Assembly of Society Officers, the Coalition of Academic Scientific Computation, the American Chemical Society, the Advancing Research Impact on Society (ARIS) group, as well as groups at Virginia Tech, the University of New Hampshire, West Virginia University, and Georgia Tech. He then noted upcoming events including a roundtable that Suresh Babu will host with Tennessee state leaders. McCrary also noted the had done a radio interview with KGNC out of Amarillo, TX and that the Board's external engagement committee is talking about how to incorporate radio into its media plan. McCrary emphasized that it is critical to get the word out diverse groups that realizing *Vision 2030* requires the participation of all entities in the S&E ecosystem.

McCrary then turned to what's ahead, noting that at the August NSB meeting, VIWG will present a retrospective on the first year of Vision implementation and propose a NSB action plan for year two. In preparation, VIWG will be discussing in the coming weeks what NSB and NSF have accomplished toward vision goals this past year, how changes in the landscape – including the arrival of a new NSF director and a new administration – have affected implementation, and lessons learned from year one. VIWG will also look at opportunities to use its governance and external engagement hats to make progress on the four roadmap areas in the coming year.

Finally, McCrary showed a few slides that demonstrated by roadmap area where the Board had devoted its efforts on vision implementation and added that VIWG will continue to discuss what success looks like.

***Session 4 (*May 19, 5:15 p.m. –6:05 p.m.)**

NSB Chair's Remarks

Ochoa welcomed the NSF staff, guests, and members of the public listening via webcast. She began the session by announcing the election of Dario Gil and Julia Phillips to the Board's Executive Committee. She congratulated Anneila Sargent on her election to the National Academy of Sciences and Panchanathan on his receipt of the Research Development Champion Award from the National Organization of Research Development Professionals. The latter award was in recognition of Panchanathan's work at Arizona State University.

She observed that the meeting was one of transition with the departure of three members of NSF's senior management team: Assistant Director for Engineering Dawn Tilbury, Assistant Director for Geosciences William Easterling, and Chief Operating Officer Fleming Crim. She thanked them for their service to NSF and the nation.

Approval of Prior Minutes

Ochoa presented the minutes of the February 2021 Open Plenary for approval. Those minutes were approved as presented.

NSF Director's Remarks

NSF Director Panchanathan began his remarks by recognizing Ochoa for her receipt of the National Aeronautics Association's 2020 Katherine and Marjorie Stinson Trophy. He likewise thanked Tilbury, Easterling, and Crim for their service and expressed that he was privileged to work with them. He also noted the retirement of Scott Borg, Deputy Assistant Director in Geosciences and thanked Borg for his years of federal service. He then announced those who are joining the Foundation as senior executives. In March, Javier Inclán began an appointment as Deputy Office Head for the Office of Diversity Inclusion and Theresa Good became Division Director for the Division of Molecular and Cell Biosciences in the Directorate of Biological Sciences (BIO).

Panchanathan announced the passing of three NSF colleagues: Geneane Mason, Program Support Manager in the Director of Education and Human Resource's Division of Research on Learning; Kishan Baheti, Program Director in the Directorate of Engineering's Division of Electrical and Communications Systems; and John Schade, Program Director in BIO's Division of Environmental Biology. Both Mason and Baheti had worked at NSF for over three decades. Schade had come to NSF as a rotator and later returned in 2018. Panchanathan led a moment of silence in their memory.

In closing, the Director referred members to the report from the Office of Legislative and Public Affairs on its activities since the February meeting that could be found in the Board Book.

EPSCoR Update

Ochoa began by connecting this update with the work of Vision Implementation Working Group, noting that EPSCoR is a key component of efforts to expand the geography of innovation. She invited Suzanne Iacono, Head of the Office of Integrated Activities (OIA), and Loretta Moore, Section Head in OIA, to present.

Iacono introduced the presentation as a "tease" and committed to discussing the future of EPSCoR with the Board once NSF had made progress on its year-long, community-based visioning activity that had recently started. Moore focused on the program's evolution, investment strategies, and outcomes. The number of eligible jurisdictions has grown from five, when the program was created in 1978, to 28 today and three jurisdictions have "graduated". EPSCoR's mission is essentially unchanged, but its scope has expanded to include novel capacity-building strategies for which Moore provided several examples. EPSCoR's largest program, the Research Infrastructure Improvement Program, has four investment tracks that are aimed at improving statewide research capacity, promoting regional inter-jurisdictional collaborations, building diverse communities, and building research capacity at institutions and developing individual investigators. EPSCoR also co-funds a number of proposals submitted to other NSF competitions. Moore shared information about STEM professional development pathways and gave examples of students and faculty who have benefited from EPSCoR programs. Moore concluded by inviting the Board to join EPSCoR's year-long external visioning activity.

Member questions focused on future program directions, metrics, awardee use of cost-sharing support, and the eligibility criteria. Moore responded that she is interested in increasing

EPSCoR's reach to minority-serving institutions (MSIs) and under-represented populations, expanding into translational research, and evaluating cyber-infrastructure across the eligible jurisdictions to ensure accessibility. NSF is exploring ways to use data better to understand the program's impact. Jurisdictions have the flexibility to decide to use the cost-share for different purposes, such as external engagement or administration. Moore noted that NSF formulated the current eligibility criteria to be simple and stable so that jurisdictions would not be eligible one year but not the next.

Roger Beachy urged the EPSCoR visioning working group to be innovative, think boldly, and not to be limited by the current EPSCoR legislation. McCrary suggested that EPSCoR create a council of advisors comprised of stakeholders such as chambers of commerce or community colleges.

Open Committee Reports

NSB Chair Ochoa then turned to the open committee reports.

Heather Wilson reported for the Committee on Strategy (CS). She stated that the committee's meeting covered an update on the FY 2021 and FY 2022 budgets, and the FY 2022 request to Congress.

Geraldine Richmond reported for the Committee on External Engagement (EE). She stated that the committee discussed plans for NSB's congressional and media engagement and for future external panels. The committee also heard updates on plans for a *Vision 2030*-related events in Tennessee and to expand nomination outreach for the 2022 NSB honorary awards cycle.

Anneila Sargent reported for the Committee on Oversight (CO). At its meeting, the committee voted to forward to the Board a recommendation to submit the Office of Inspector General's semiannual report to Congress. The committee also voted to recommend that the Board approve and submit the NSF Management Response to that report. The committee also heard and update from the Office of Inspector General (OIG) on audit work examining EPSCoR. Chief Financial Officer Teresa Grancorvitz highlighted the successful transition of NSF's financial system and the upcoming publication of a new version of the NSF's Proposal and Awards Policies and Procedures Guide.

Carl Lineberger reported for the Committee on Awards and Facilities (A&F). He stated that A&F had voted to forward to the Board a resolution authorizing a spending cap increase on the Operations and Maintenance Award for Gemini Observatory.

Julia Phillips reported for the Committee on National Science and Engineering Policy (SEP). She stated that the committee heard from the National Center for Science and Engineering Statistics (NCSES) that the 2022 edition of the *Science and Engineering Indicators* is proceeding apace. The committee also saw a demonstration of the redesigned state data tool, which will go live in the coming weeks and heard updates on several policy products that the committee has in process. The committee agreed to develop a one-page policy product on elementary and secondary education to accompany the release in July 2021 of the *Indicators 2022* thematic report on that topic. The committee will also begin to think about the Board policy product that will accompany the delivery of *Indicators* in January 2022.

Votes

Ochoa stated that the last agenda item was to consider a series of votes.

The first was a resolution forwarded by A&F to increase the spending cap for the Gemini Observatory's Operations and Maintenance Award. Alan Stern, who was in conflict on this item, stepped out of the meeting. Ochoa stated that upgrades that NSF authorized during the course of the award would put NSF over the spending cap in FY 2022 if the Board does not raise the spending cap. Ochoa then asked for and received a motion to consider the related resolution:

"WHEREAS, the National Science Board authorized the Director of the National Science Foundation to make an award not to exceed $145,338,000 for the management and operation of the Gemini Observatory for a period of 72 months from January 1, 2017 in resolution NSB-2016-3,

AND, supplemental funding in the amount of $27,267,244 was subsequently awarded for instrumentation and related software systems for Gemini Observatory, which combined with planned operations funding will exceed said authorization,

RESOLVED, that the National Science Board authorizes the Director of the National Science Foundation, at his discretion to increase the NSF appropriated funding for the management and operation of the Gemini Observatory to an amount not to exceed $172,605,244."

The resolution passed unanimously.

Ochoa then turned to the submission of the OIG semiannual report to Congress and the approval and submission of the NSF management response. The Board voted unanimously to approve the NSF management response and submit both items.

Finally, Ochoa turned to the annual report of the Board's Executive Committee. NSB also approved this report unanimously.

Chair's Closing Remarks

Ochoa concluded the meeting by thanking the panelists who contributed to a very productive meeting and again offering her congratulations to the Waterman, Bush, and Public Service Award Winners. She also thanked the Board Office team for its work in support of the meeting.

There being no further business, the meeting was adjourned at 6:10 p.m.

Elise Lipkowitz
Acting Executive Secretary to the National Science Board