

**APPROVED MINUTES
PLENARY OPEN SESSION
456TH MEETING
NATIONAL SCIENCE BOARD**

National Science Foundation (NSF)
Alexandria, Virginia
May 2–3, 2018

Members Present:

Maria T. Zuber, *NSB Chair*
Diane L. Souvaine, *NSB Vice Chair*
John L. Anderson
Deborah L. Ball
Roger N. Beachy
Arthur Bienenstock
Vinton G. Cerf
Vicki Chandler*
Ruth A. David
W. Kent Fuchs
Inez Fung
Robert Groves**
James Jackson
G. Peter Lepage
W. Carl Lineberger
Stephen L. Mayo
Victor R. McCrary
Emilio F. Moran
Ellen Ochoa
Sethuraman Panchanathan
G.P. Bud Peterson***
Julia M. Phillips
Geraldine L. Richmond
Anneila I. Sargent

France A. Córdova, *ex officio*

Members Absent:

There being a quorum, the National Science Board (NSB, Board) convened in open session at 8:00 a.m. on Wednesday, May 2, 2018, with Dr. Zuber presiding.

NSB Chair's Opening Remarks

Dr. Zuber welcomed everyone to the NSB's 456th meeting.

Dr. Zuber began the meeting by highlighting two agenda items for the meeting: the annual awardee presentations and the Board leadership elections.

After a preview of the upcoming meeting agenda, the Chair turned the meeting over to the Director for her opening remarks.

NSF Director's Remarks

Dr. Córdova began with a thank you to the members of the Board's outgoing class of 2012-2018. She thanked them for their service to the Foundation and for the close working relationship the Board and NSF have enjoyed in recent years.

Dr. Córdova then reported on the status of the Big Ideas. She noted that NSF has opened solicitations or Dear Colleague letters for all but "NSF 2026" in recent weeks and months. Dr. Córdova added that "NSF 2026" would be discussed in more detail in the Committee on Strategy session later in the meeting. Singling out one prominent Big Idea, "Quantum Leap," Dr. Córdova described one of NSF's first major investments in the Big Ideas. Enabling Practical-scale Quantum Computing (EPiQC) is a \$10 million collaborative project of the University of Chicago, MIT, Princeton, Duke and UC-Santa Barbara. She explained that EPiQC unites experts on algorithms, software, and hardware along with education to develop these elements in parallel, and to support training and workforce development in these areas. Overall, EPiQC will increase the efficiency of practical quantum computations by 100 to 1000 times, effectively bringing quantum computing out of the laboratory and into practical use much sooner than if NSF was to pursue these technology advances independently.

Dr. Córdova continued by highlighting three Congressional hearings in which she or her staff participated. On March 15, Dr. Maria Zuber and Dr. Joan Ferrini-Mundy joined Dr. Córdova to testify before the House Committee on Science, Space, and Technology. The testimony was an overview of the NSF FY 2019 budget proposal, which is level to the FY 2017 enacted budget at \$7.47 billion. On February 27, Ms. Rhonda Davis, Head of NSF's Office of Diversity and Inclusion, testified before the House Committee on Science, Space, and Technology's Subcommittee on Research and Technology on sexual harassment in science. On March 7, Dr. James Kurose, Assistant Director for the Directorate for Computer and Information Science and Engineering, testified before the House Oversight and Government Reform Subcommittee on Information Technology regarding the federal government's engagement on artificial intelligence.

Beyond the Congressional engagements, Dr. Córdova reported to the Board on her numerous discussions with leaders across government since the February 2018 Board meeting. She participated in a meeting of the National Science and Technology Council on STEM Education. Ms. Ivanka Trump, Mr. Michael Kratsios, Deputy U.S. Chief Technology Officer in the White House Office of Science and Technology Policy, and Dr. Jeffrey Weld, Senior Policy Advisor in STEM Education for the White House Office of Science and Technology Policy also participated. Dr. Córdova also met with Mr. Chris Liddell, White House Deputy Chief of Staff

for Policy Coordination. She reported that Mr. Liddell, as part of the American Innovation Office, visited NSF with members of this staff to hear about NSF programs, especially the Advanced Technological Education Program, because high on the White House's priority list is the future of the workforce.

Dr. Córdoba also reported that in April she participated in a session of the "Unleashing American Innovation Symposium" sponsored by the National Institute of Standards and Technology (NIST). The symposium brought together leaders from across government, industry, and academia to discuss how agencies, corporations and universities can work together to address systemic barriers to catalyze the full potential of American innovation. She stated that her specific session focused on Federal Perspectives and that she spoke about Convergence Accelerators, new structures within NSF that are intended to facilitate convergent and translational activities in areas of national importance. Dr. Córdoba noted that Mr. Michael Kratsios moderated her panel which included: Walter Copan, Under Secretary of Commerce for Standards and Technology and NIST Director, Andrei Iancu, Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office, and Christopher Austin, Director of the National Center for Advancing Translational Sciences at NIH.

Dr. Córdoba added that she met individually with Walter Copan and Andrei Iancu. She held other meetings with Tim Gallaudet, Acting Administrator of the National Oceanic and Atmospheric Agency, Heather Wilson, Secretary of the Air Force, and Paul Dabbar, Under Secretary for Science at the Department of Energy.

Dr. Córdoba continued her report with a summary of her international outreach. She stated that she attended the Next Einstein Forum Global Gathering in Kigali, Rwanda. While in Rwanda, she also represented the United States at a ministerial-level meeting with science ministers and high-level representatives from Germany, Canada, and across Africa. She added that she participated in the session "Changing the Way We Learn: Building Scientific Culture Early On," along with Romain Murenzi, Executive Director of The World Academy of Sciences, Sidy Ndao, NEF fellow and founder of the Dakar American University of Science and Technology, and José M. F. Moura, the Philip L. and Marsha Dowd University Professor at Carnegie Mellon University and president-elect of the Institute of Electrical and Electronics Engineers (IEEE). Dr. Córdoba noted that she spoke about NSF's work with Africa (almost 400 projects in 43 countries), NSF's education programs, early learning in science, and informal education.

Dr. Córdoba also recounted a number of international interactions in the Washington, D.C. area. In March, she went to the Norwegian Ambassador's residence to honor the Kavli Prize Committee for Neuroscience, joined other U.S. government officials at the House of Sweden for a reception hosted by the Swedish Prime Minister and Swedish Ambassador to the U.S. honoring the 200th anniversary of diplomatic relations between the two countries, and joined Science Foundation Ireland for a panel on the importance of the reciprocal relationship between Ireland and the U.S. Also participating in the panel were the Prime Minister of Ireland, Leo Varadkar, and Professor Mark Ferguson, Director General of the Science Foundation Ireland and Chief Scientific Advisor to the Government of Ireland. In April, Dr. Córdoba hosted Professor Dorothee Dzwonnek, Secretary General of the DFG – the German Research Foundation, and Professor Li Jinghai, President of the National Natural Science Foundation of China, at NSF. In early May, Dr. Córdoba hosted a delegation from the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT), including Minister Hayashi.

Dr. Córdova highlighted NSF's participation in the USA Science and Engineering Festival Expo held in Washington, DC on April 7-8. She noted that 60 NSF staff and 22 NSF-funded exhibits utilized 11,000 square feet of the convention center space to showcase the Foundation and the science and engineering it supports. She stated that more than 370,000 people participated in the festival.

Dr. Córdova stated that she and NSF COO, Dr. Joan Ferrini-Mundy, met with NSF's AAAS Science and Technology Policy Fellows. The 2017-2018 year of the Fellowship program marks the 45th anniversary of this opportunity for scientists to learn first-hand about policy and to contribute their scientific knowledge and skills to policymaking. Dr. Córdova thanked the NSF Fellows, who comprise the largest portion of the 240 Fellows placed in executive branch agencies across Washington, DC, and the NSF staff leads for the program, Leah Nichols and Erika Rissi.

Finally, Dr. Córdova announced the impending departure of Dr. Ferrini-Mundy, who has been selected to become the 21st President of the University of Maine and the President of the University of Maine at Machias, effective July 1, 2018. Dr. Córdova expressed her deep gratitude for all that Dr. Ferrini-Mundy has contributed to the NSF mission, first in the Directorate for Education and Human Resources, and most recently as the NSF Chief Operating Officer.

The Chair thanked Dr. Córdova for her report.

Summary of DC Meetings

Dr. Zuber then summarized her activities since the last Board meeting. She began by expressing her gratitude for the impressive listening session held at Macomb Community College in Michigan. Dr. Zuber continued with a summary of a meeting with Michael Kratsios, Deputy Assistant to the President for Technology and Policy, and Chris Liddell, Deputy Chief of Staff to the President. She stated that the discussions covered three major areas: the Board's role in oversight of NSF and the skills and background needed in Board members to most effectively execute that responsibility, the most pressing challenges that NSF faces in fulfilling its mission of supporting the most outstanding basic science and how the Board can best help in that work, and the status of the Board's Skilled Technical Workforce initiative.

Dr. Zuber mentioned that she also met with Secretary of the Navy, Richard Spencer, and the National Security Agency's Director of Research, Deborah Frincke, to discuss the role of basic research in supporting national security priorities, as well as strategies for increasing the pipeline of STEM talent into national security careers.

She finished her report with some brief comments about her testimony with the NSF Director and Chief Operating Officer before the House Committee on Science, Space, and Technology regarding the FY 2019 Budget Request. She stated that the message to the Committee was clear, the U.S. cannot remain a leader in basic science and engineering research without reliable funding. She said that she emphasized in her testimony that leading-edge research and innovation is not achieved by playing it safe. If the U.S. is to remain a global leader producing STEM-degreed graduates, and advancing the fields of super computing and artificial intelligence, the U.S. expenditures for R&D need to remain a priority. She noted that she relied heavily on the *Science and Engineering Indicators 2018* report for her message.

With no questions or remarks forthcoming, Dr. Zuber adjourned the Plenary Session at 8:30 a.m. with the reminder that the Plenary Open session would reconvene at 11:30 a.m. to hear presentations from two of this year's annual honorary award recipients.

Session 2

Dr. Zuber reconvened the open Plenary session of the 456th Board meeting at 11:30 a.m. on May 2, 2018, to recognize and hear brief presentations by the 2018 Annual National Science Board and National Science Foundation Award recipients. The first two of four presentations took place before the lunch intermission, with the remain two taking place after lunch. The award recipients presenting were: Dr. Jane Lubchenco (Vannevar Bush Award), Dr. Kristina Olson (Alan T. Waterman Award), Mr. Dean Kamen (NSB Public Service Award), and the Council on Competitiveness (NSF Group Public Service Award).

Dr. Zuber adjourned the second session at 2:30 p.m., following the presentation by Hon. Deborah Wince-Smith, representing the Council on Competitiveness. She announced that the Plenary would reconvene at 1:00 p.m. on Thursday, May 3.

Session 3

Dr. Zuber reconvened the Plenary session at 1:00 p.m. on May 3, 2018.

Chair's Remarks

Dr. Zuber welcomed the NSF staff, guests, and members of the public listening via webcast. She began her remarks by thanking all the staff who organized the annual award ceremony and dinner, with special recognition to Kathy Jacquart from the NSB Office for her leadership in planning the event.

Replacing her traditional acknowledgment of notable achievements by Board members, Dr. Zuber recognized the departures of two members of the NSB/NSF family. First, she added to Dr. Córdova's earlier accolades for NSF Chief Operating Officer, Dr. Joan Ferrini-Mundy, on the announcement of her pending departure to assume the position of President, University of Maine and University of Maine at Machias. She thanked Dr. Ferrini-Mundy for her many years of dedicated service and leadership to NSF and wished her well in her new position.

Second, Dr. Zuber recognized a longtime staff member of the NSB Office, Annette Dreher, who retired after 40 years of federal service, 34 of which were at NSF. She thanked Ms. Dreher for her decades of support to the Board.

Director's Remarks

Dr. Córdova began by adding her thanks to those of Dr. Zuber's for all who contributed to the success of the annual award dinner. She then commended to the Board the written update from Amanda Greenwell on Legislative and Public Affairs that was in the Board Book.

Dr. Córdova then announced new senior staff moves and additions across the Foundation. Ms. Caitlyn Miller Fife assumed her new position as the Budget Division Director in the Office of

Budget, Finance, and Award Management on April 30. Caitlyn came to NSF from the Department of Health and Human Services. Dr. Córdova thanked Mr. Antony DiGiovanni for his superb service as Acting Budget Director. Lastly, Dr. Córdova announced that Mr. John Gawalt, Director of the National Center for Science and Engineering Statistics, retired on March 31. She noted the invaluable service of John to the Foundation and the country through his leadership of NCSES.

Approval of Prior Minutes

Dr. Zuber presented the minutes of the [February Open Plenary](#) for approval. Those minutes were approved as presented.

Open Committee Reports

Dr. Zuber then turned to the open committee reports, noting that the full record of committee activities would be detailed in the respective committee minutes.

Dr. Richmond reported that the National Science and Engineering Policy (SEP) Committee had received an update on the effort to reimagine science and engineering indicators to make it more useful, timely and sustainable. She thanked NCSES staff for their expertise and Dr. Fay Cook, the Assistant Director for the Directorate for Social, Economic and Behavioral Sciences, for her support in this effort. Dr. Richmond also stated that SEP had received an outline for the second companion to the *SEI 2018* on the state of U.S. S&E in light of the globalization of S&E. She noted that the outline was met with several substantive comments and excellent suggestions.

Dr. Panchanathan reported for the Committee on Strategy (CS). He stated that the CS heard a status update on the FY 2018 appropriations and the FY 2019 budget request. He added that the committee had also received a briefing on the Convergent Accelerators and Big Ideas.

Dr. Lepage reported that the Committee on Awards and Facilities (A&F) heard a presentation from Dr. Ruth David, the Chair of the Risk Management Working Group. Dr. David reported on the group's work and submitted a draft NSB Risk Philosophy and Principles for recommendation to the full Board. Dr. Lepage stated that this document was approved by the committee.

Dr. Jackson represented the Committee on External Engagement (EE) and reported that the Committee heard a report on the continuing *Indicators 2018* rollout activities. He also reported on the Board's listening session held at Macomb Community College in Michigan, outside Detroit. He stated there was a plan for a following listening session at the ATE National Resource Center in South Carolina later in the year. He acknowledged that there were requests by some members to expand the listening session locales to the western part of the U.S. He noted that the committee also discussed ideas to engage more broadly with industry, state, science and education stakeholders.

Dr. Phillips reported for Dr. Anderson for the Committee on Oversight (CO). She reported that Dr. Anderson provided an update to the committee on his discussions with NSF staff to examine aspects of the merit review process and report. Central topics discussed were proposal success rates, avoidance of institutional bias, and geographic distribution of NSF funding. Dr. Phillips continued by stating that the committee received briefings from the NSF Inspector General,

Allison Lerner and Chief Financial Officer Teresa Grancorvitz. Ms. Lerner revealed an unusual case in which the OIG had investigated an incident in the Small Business and Innovation Research Program concerning research misconduct. The case involved the use of an NSF-funded supercomputer for the mining of bitcoin. The recovered bitcoin was auctioned for nearly \$820,000, which was returned to NSF. The Committee also heard a brief overview of the recently-started FY 2018 financial statement audit from Mr. David Zavada of Kearney and Company. Mr. Zavada also informed the committee that the polar program testing scheduled for this summer had to be postponed until November 2018.

Dr. Carl Lineberger filled in for Dr. Victor McCrary to report on the work of the Skilled Technical Workforce Task Force. He reported that the task force discussed recent activities and upcoming opportunities, such as the Community College Innovation Challenge breakfast listening session. He also stated that there was a discussion about establishing a website resource page. Dr. Lineberger said that members were generally supportive of the idea, but advised that thought be given to how to generate traffic to the website.

Vote: NSB Risk Philosophy and Principles

Dr. Zuber continued the session by bringing the NSB Risk Philosophy and Principles document to the floor. This was referred to the full Board from the Committee on Awards and Facilities. Following a motion from the floor and a full reading of the resolution by Executive Secretary Dr. Brad Gutierrez, the resolution was approved as presented:

Resolved, the National Science Board approves the NSB risk philosophy and principles to provide a framework for its future governance work.

Vote: Annual Executive Committee Report

Next, Dr. Zuber presented the annual Executive Committee Report for approval. The report was distributed to the members in their electronic Board Boards. With no additional comments offered by Dr. France Córdova, Chair of the Executive Committee, Dr. Zuber asked for a motion to approve. The motion was so made and seconded. The report was then approved.

Outgoing Board Member Farewell

Dr. Zuber moved to the final agenda item of the meeting, a short farewell ceremony for the 8 Board members whose terms were to expire on May 10, 2018. Those members were: Drs. Deborah Ball, Vinton Cerf, Ruth David, Inez Fung, Peter Lepage, Stephen Mayo, Geraldine Richmond, and Maria Zuber. Before presenting plaques to each outgoing member, Dr. Zuber offered a final statement:

During my first meeting as Chair of this Board, I presented one simple goal for my tenure: to ensure that the Board optimally executes the governance and advisory roles of its charter. I spoke about the need to be organized to address the current challenges to the Foundation, to work in partnership with the Director, and the need to speak with one voice. I emphasized that I wanted to play offense, to increase our focus on strategy and outreach, and to be unafraid and

unambiguous in remembering that scientific facts don't change with election cycles, but when new evidence demands it. We have worked with the Director and her leadership to assure that NSF supports the very best science, and that funding decisions are characterized by transparency and accountability.

As I look back over these two years, I am proud of what we have achieved, but also humble in the knowledge that this body still has work to do. We restructured the committee system to more closely align with the various functions of the Board and drafted new committee charges to help minimize overlap and gaps across committee mandates. With the participation of many of you, we have expanded our engagement across the Washington, D.C. policy space, strengthening relationships with Members of Congress. We also forged a productive working relationship with the Executive Branch. During the past two years the Board has been a strong, persistent and unified voice of support for science and technology in this country. With our collective effort, our message of the need to invest in science and scientists has risen above the white noise in Washington and beyond, but we must continue to strive to translate understanding to action. Thanks to the hard work of many Board members, we have developed a framework for risk management, and we have shone a bright spotlight on challenges of the skilled technical workforce. In strong collaboration with the team at NCSES, we have reimaged the face and format of the seminal Science and Engineering Indicators publication.

It has been my honor and privilege to serve as your Chair. But realize that nothing I accomplished in my term was the result of any one person's effort, least of all mine. This is a Board of 25 members, all pulling in the same direction, with the same goal; to ensure that the NSF is the best it can be and that its contributions to this country is understood by everyone. The partnership we have enjoyed with the Director is integral to the success we have achieved. Thank you, France for your leadership, your partnership, and your friendship. On a personal note, I would like to thank our wise and accomplished Vice Chair, Diane Souvaine. Working with her has been one of the fringe benefits of this job. I also want to thank each of the Committee Chairs for their dedicated service: John, James, Peter, Panch, Geri, and Vic, it has been a pleasure to serve with you.

Last, but certainly not least, I wish to thank the Board Office. While we come to the Board meetings or go to meet with Members of Congress on the Hill looking so smart and knowledgeable, the truth is we couldn't do half of what we do without the daily contributions of the Board Office staff, under the leadership of Dr. John Veysey. They do everything from arranging our travel to making sure we are fed during meetings to preparing talking points and Congressional testimony to reading and analyzing the reams of material necessary to conduct our business. This Board would not function without them. Thank you to you all.

Dr. Zuber then presented plaques to each outgoing member and received one from Dr. Córdova. There being no further business, Dr. Zuber adjourned the meeting at 2:15 p.m.

X *Brad A. Gutierrez*

Dr. Brad Gutierrez
Executive Secretary, NSB
Signed by: BRAD A GUTIERREZ