

**APPROVED MINUTES  
PLENARY OPEN SESSION  
453<sup>RD</sup> MEETING  
NATIONAL SCIENCE BOARD**

National Science Foundation (NSF)  
Alexandria, Virginia  
November 8-9, 2017

**Members Present:**

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

France A. Córdova, *ex officio*

**Members Absent:**

Deborah L. Ball\*\*  
W. Kent Fuchs  
Emilio F. Moran  
G.P. Bud Peterson

\*Dr. Panchanathan, attended via teleconference on November 9.

\*\*Dr. Ball was present for open session on November 8.

There being a quorum, the National Science Board (NSB, Board) convened in open session at 8:30 a.m. on Wednesday, November 8, 2017, with Dr. Zuber presiding.

## NSB Chair's Opening Remarks

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Dr. Zuber welcomed everyone to the NSB's 453rd meeting.

Dr. Zuber began the meeting by welcoming everyone to the first meeting in the new NSF Headquarters in Alexandria. She thanked NSF Director Córdova and her staff for the masterful relocation from Arlington. Dr. Zuber also acknowledged the October 3, 2017 announcement that the 2017 Nobel Prize for Physics was awarded to Drs. Rainer Weiss, Kip Thorne, and former NSB member Barry Barish for their “decisive contributions to the LIGO detector and the observation of gravitational waves.”

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

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Dr. Córdova began with a welcome to the new headquarters and thanked all those responsible for making the move such a success, particularly Joanne Tornow and Brian MacDonald.

Dr. Córdova then revealed the results from the latest Federal Employee Viewpoint Survey (FEVS). She acknowledged that she had been concerned about the impact of the move on this year's FEVS results. She stated that she was pleased to see that NSF scores on Employee Engagement, Global Satisfaction, and Inclusion all rose from the previous year. Dr. Córdova also noted that NSF ranked fourth, fourth, and fifth, respectively, among mid-sized government agencies in these three indices.

Dr. Córdova continued by addressing two momentous announcements regarding the NSF-funded LIGO facility. She recounted the announcement on October 16 at the National Press Club that LIGO, the European-based VIRGO detector, and over 70 other ground and space-based observatories detected, on August 17, gravitational waves and light emissions resulting from the collision of two neutron stars. She also recognized the 2017 Nobel Prize in Physics recipients (named above in the Chair's opening remarks section) for their leadership in the development of LIGO.

Staying on the Nobel Prize theme, Dr. Córdova recognized other NSF-supported 2017 Nobel Prize winners, including, Jeffrey Hall, Michael Young, and Michael Rosbash in Physiology or Medicine, Joachim Frank, Jacques Dubochet, and Richard Henderson in Chemistry, and Ricard Thaler, winner of the Riksbank Prize in Economic Sciences.

In addition to the Nobel Prize acknowledgements, Dr. Córdova paid tribute to NSF-supported MacArthur Foundation “Genius” award winners. These are Regina Barzilay from MIT, Emmanuel Candès from Stanford, Jason De León from the University of Michigan, Betsy Levy Paluck from Princeton, and Stefan Savage from the University of California, San Diego.

Dr. Córdova also recognized Bill Bialek for winning the 2018 Max Delbruck Prize in Biological Sciences from the American Physical Society. She noted that throughout Dr. Bialek's career he

has been supported by the NSF Directorates of Biological Science, Computer and Information Science and Engineering, and Mathematics and Physical Sciences.

Next, Dr. Córdova reported on her trip to Europe in September during which she served as the United States Representative to the G7 Science Ministerial in Turin, Italy. She stated that the topics for the Ministerial were ones that NSF knows well: creating a more inclusive STEM workforce and better communicating science to the public, financing basic research through both public and private means, and research infrastructure and open science. While in Italy, Dr. Córdova also visited the Virgo gravitational wave observatory near Pisa and the Gran Sasso National Laboratories in central Italy. As mentioned above, the Virgo facility was instrumental in the August detection of the gravitational wave, which represented the first time LIGO and Virgo had both participated in such a detection. At Gran Sasso, Dr. Córdova visited five projects that receive NSF funding. Three are related to dark matter, one project is studying solar and geo-neutrinos, and another one is looking for neutrino-less double beta decay.

Dr. Córdova concluded her report by expressing the Foundation's concern for those impacted by the natural disasters, especially Hurricanes Harvey, Irma, and Maria, over the preceding months.

The Chair thanked Dr. Córdova for her report.

## Summary of DC Meetings and Louisiana Visit

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Dr. Zuber then summarized her meetings in Washington, DC since the last Board meeting and the Louisiana visit for listening sessions at Baton Rouge Community College and Xavier University, and a LIGO site visit. Dr. Zuber reported that she had several productive meetings in Washington since the August meeting, including with minority staff from the Senate Commerce Committee and with staff assistants from the House Appropriations Subcommittee on Commerce, Justice, Science and Related Agencies. She noted that the fate of the Arecibo Observatory in Puerto Rico was a common topic of these meetings. She reported that she had expressed her hope that potential partnerships would be viable for the future operation of the observatory. She then noted that these meetings had taken place before the hurricanes struck Puerto Rico, inflicting some damage on the Arecibo facility.

In addition to meetings on Capitol Hill, Dr. Zuber reported that she also met with officials from the Administration. The two primary topics were the nominations process for new NSB members for the class of 2018-2024 and the Board's Skilled Technical Workforce initiative. She stated that there was a strong agreement of the need for matching the retraining of workers to the current job market, and the important collaborative role industry can play to ensure the match is effective.

Finally, Dr. Zuber made some observations on the recently completed Board trip to Louisiana, where members visited the LIGO facility and participated in listening sessions at Baton Rouge Community College and Xavier University. She summarized the trip as "fantastic," noting that the listening sessions would be covered in more detail in the Committee on External Engagement session of the meeting. On the LIGO visit, Dr. Zuber remarked how timely and inspirational the Board visit was, coming on the heels of the Nobel Prize and observation of the neutron stars collision announcements. She added that the visit included an excellent science presentation, a play-by-play of the LIGO-Virgo gravitational wave detection, a tour of the education and visitor centers, and an inspiring story of a LIGO docent who is also a Baton Rouge Middle School math

teacher. Dr. Zuber also noted that some members took notice of the fact that there was no NSF branding at the LIGO facility, despite the long and storied history of NSF funding for its work.

With no questions or remarks forthcoming, Dr. Zuber adjourned the Plenary Session at 9:00 a.m. with the reminder that the Plenary Open session would reconvene at 11:30 p.m. the following day for a discussion on the Skilled Technical Workforce and a draft charge for a possible task force.

## **Session 2**

Dr. Zuber reconvened the Plenary session at 11:45 a.m. on November 9, 2017. She began by introducing the discussion of the Skilled Technical Workforce (STW) and the draft charge for a potential task force. In her introduction, she noted that it is time to formalize the Board's work in this area by establishing a task force to study the most productive role the Board can play. She then turned the floor over to Dr. Victor McCrary, who led the discussion.

After thanking Board members and Board staff who have assisted him in the development of the STW initiative, Dr. McCrary reviewed the highlights of the proposed task force charge. He stated that the purpose of the task force will be to identify the opportunities and challenges facing students, incumbent workers, businesses, educators and others involved in the skilled technical workforce and recommend to the NSB strategies including possible policies for strengthening the skilled technical workforce. He added that the task force will work closely with NSF and relevant stakeholders within and outside the government. Dr. McCrary also discussed the workplan that was included in the charge. The plan is for the task force to complete its major activities within 18 months and to provide an interim update to the Board after a planned stakeholder symposium to be held in 2018.

Ceding the floor back to Dr. Zuber, the discussion was open for questions. Dr. Cerf asked that there be consideration for including the role of apprenticeships in the task force's work. Dr. McCrary responded that this topic would be included.

With no further comments or questions, Dr. Zuber called for a motion to approve the task force charge. It was so moved and seconded. The charge was approved as presented. Dr. Zuber added that she had asked Dr. McCrary to lead the task force and requested that anyone wishing to join to please see her herself, Dr. Souvaine, or Dr. McCrary.

With no further business for this session, Dr. Zuber adjourned the meeting, to be reconvened at 1:00 p.m. following the lunch break.

## **Session 3**

Dr. Zuber reconvened the Plenary session at 1:00 p.m. on November 9, 2017.

## Chair's Remarks

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Dr. Zuber welcomed the NSF staff, guests, and members of the public listening via webcast. She began her remarks by recognizing notable achievements by Board members since the last meeting. She started by announcing that Dr. James Jackson is the inaugural recipient of the University of Michigan's Distinguished Diversity Scholar Career Award. Dr. Jackson was cited for his significant contributions to understanding diversity, equity, and inclusion while addressing disparities in contemporary society. Dr. Zuber then announced that Dr. Geraldine Richmond had been awarded the 2018 Priestley Medal of the American Chemical Society, its highest award. Dr. Richmond was honored in recognition of her pioneering contributions to our understanding of the molecular properties of liquid surfaces and her extraordinary service to chemistry on a global level. Dr. Zuber noted that Dr. Richmond is only the fourth woman to receive this award since it was begun in 1923. The third Board recognition went to Dr. Vinton Cerf for receiving the 2018 Benjamin Franklin Medal in Computer and Cognitive Science with his collaborator, Dr. Robert Khan.

Dr. Zuber went on to acknowledge the “Cal Ripken-like” service award of 50 years to Kay Rison, senior staff associate in the Office of the Director. Turning to the Board Office, Dr. Zuber welcomed the Office's two new AAAS fellows, Drs. Mateo Munoz and Christina Maranto.

## Director's Remarks

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Dr. Córdoba began her remarks by thanking Susan Mason and the Office of Legislative and Public Affairs staff for the excellent Grand Opening event held the evening of November 8 to commemorate the new Headquarters.

Dr. Córdoba continued by advising Board members that a written update from Amanda Greenwell on Legislative and Public Affairs was in the Board Book.

Dr. Córdoba then provided an update on the NSF response to the recent hurricanes, Harvey, Irma, and Maria, that had struck the U.S. in August and September. She stated that NSF had issued important notices to the field indicating that researchers and institutions in the disaster areas could work with program officers to extend the end dates of existing awards or extend the submission deadline for proposals on a case-by-case basis, if researchers or sponsored program staff are unable to meet publish deadlines. At a programmatic level, the Graduate Research Fellowship Program extended the application and reference letter deadline by over two months, to December 29th, for applicants from Puerto Rico, the U.S. Virgin Islands, and other hurricane-impacted places. Dr. Córdoba also stated that a webpage, <https://nsf.gov/naturaldisasters/>, had been established as a “go-to” resource for information related to natural disasters. Also, she announced an email address, [naturaldisasters@nsf.gov](mailto:naturaldisasters@nsf.gov), had been created to serve as a single point of contact for all related inquiries. She also reported that nine NSF staff members had deployed as members of the Department of Homeland Security's Surge Capacity Force to support communities affected by the hurricanes.

Dr. Córdoba continued with announcements of new senior additions to the staff. Dr. Anne Kinney will begin her assignment as the Assistant Director for the Directorate of Mathematical and Physical Sciences on January 2. Dr. Evan Heit has assumed his new position as Division Director for the Division of Research on Learning in the Directorate of Education and Human

Resources. Dr. Richard Green began his IPA assignment as the Division Director for Astronomical Sciences in the Directorate of Mathematical and Physical Sciences in September. Finally, Dr. Margaret Cavanaugh moved to be the Deputy Assistant Director of the Directorate of Biological Sciences on September 1.

## Approval of Prior Minutes

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

## Open Committee Reports

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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 began her National Science and Engineering Policy (SEP) Committee report announcing that the committee had approved the *Science and Engineering Indicators 2018* report and the *Indicators 2018 Digest* for consideration by the full Board. She also stated that the committee discussed four possible topics for a policy companion statement that would accompany the *Indicators 2018*. The topics include 1) the U.S. Innovations System as a system in interconnected parts, 2) the state of the U.S. Science and Engineering (S&E) enterprise as it relates to risks and rewards of the globalization of S&E, 3) the importance of basic research, and 4) strengthening the STEM-capable U.S. workforce to compete in the global economy. Dr. Richmond stated that number four seemed to attract the most interest and that she had requested staff to develop a draft for discussion in the coming weeks.

Dr. Panchanathan reported for the Committee on Strategy (CS). He stated that the CS heard a status update on the FY 2018 appropriations. The committee also heard two briefings, one on the Windows on the Universe Big Idea, and the other a portfolio brief from the Directorate for Engineering.

Dr. Lepage reported that the Committee on Awards and Facilities (A&F) heard a presentation on the ongoing NSF efforts to strengthen oversight of NSF's major research facilities. The committee also discussed the Annual Facilities Plan and took a vote to eliminate the annual requirement. Replacing this will be an A&F retreat discussing NSF facilities across the entire lifecycle at the portfolio level.

Dr. Jackson represented the Committee on External Engagement (EE) and reported that the Committee engaged in an energized discussion about the Board's recent listening sessions in Louisiana. Two sessions were held. One at Baton Rouge Community College focusing on the Skilled Technical Workforce and the second at Xavier University addressing the issue of under-represented groups in STEM. Dr. Jackson reported that members who participated in the Louisiana listening lessons identified common themes across conversations, such as equity issues and pervasive cultural barriers to technical training and vocational careers. Committee Members agreed that it would be beneficial for the Board to hold additional listening sessions in other parts of the United States, as well. Finally, Dr. Jackson provided an update on the pilot program under

which Board members will host Members of Congress in their home districts. Dr. Kent Fuchs will lead the way, hosting Representative Ted Yoho at the University of Florida on November 17.

Dr. Anderson reported for the Committee on Oversight (CO). He reported that Inspector General Allison Lerner provided an overview of the Office of the Inspector General's (OIG) Semi-Annual Report to Congress, covering the period ending September 30, 2017. The Committee members will receive the full report, including a management response and data tables, for their review as soon as it is finalized. Assuming all is in order, the Committee will forward the report to the Board Chair for her transmittal of the report to Congress.

Dr. Anderson also stated that Assistant Inspector General for Audit, Mark Bell, presented the OIG's Annual Audit Plan. Dr. Tornow provided a presentation on the headquarters relocation, highlighting some of the challenges and actions taken to successfully mitigate any risks. The Committee members congratulated Dr. Tornow on her leadership of a very successful move. Dr. Anderson concluded by stating that there were no actions required on the remaining agenda item, the Chief Financial Officer's Report.

## Votes

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Dr. Zuber continued the meeting with a series of votes on items referred to the full Board from committee sessions. The first was the recommendation from the Committee on Awards and Facilities that the Annual Facility Plan be eliminated as an annual requirement for NSF management. This was approved as presented. The second and third items were the approval of the *Science and Engineering Indicators 2018 Report* and the *Science and Engineering Indicators 2018 Digest* referred by the Committee on National Science and Engineering Policy. These were both approved subject to final edits that would be approved by the Committee Chair and Board Chair.

## Discussion of NSF's Efforts Related to Risk Management

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Dr. Zuber concluded the business portion of the meeting by handing the floor to Director Córdova, who introduced Mr. Michael Wetklow, Deputy Chief Financial Officer. Mr. Wetklow also leads the Foundation's work on NSF's compliance with the Office of Management and Budget's (OMB) Enterprise Risk Management (ERM) program. He emphasized that the Foundation's approach is very compatible with the Board's own evolving risk management portfolio. He added that OMB's program is focused on agencies having appropriate risk management processes in place across silos to identify the most significant challenges and opportunities early, to bring them to the attention of leadership, and to develop solutions. Mr. Wetklow continued with an announcement that NSF had met OMB's initial deliverable to develop an initial agency risk profile. He also stated that NSF is well-positioned to meet the next deliverable, due by June 2018, of a complete risk profile.

Mr. Wetklow presented a five-step framework being followed by his team and NSF leadership to develop a full ERM program. He stated that it is very similar to the Harvard framework that the NSB leveraged, focusing on external, strategy, and preventable risks. The first step consisted of a series of workshops throughout NSF attended by all NSF directorates and management functions

to have meaningful discussions about risks, particularly to think about a meaningful way to identify risk. Second is a process for assessing risks, as Mr. Wetklow pointed out that not all risks are created equal. Third, Mr. Wetklow stated the framework sets out a process for evaluating risks to make decisions and tradeoffs between positive and negative outcomes of those risks. Fourth, is acting on those risks, taking specific steps to reduce risks and maximize opportunities to increase benefits to NSF. Mr. Wetklow concluded with the final step, which encompasses continual monitoring to gauge the effectiveness of the Foundation's efforts over time.

Opening the floor for discussion, Dr. Zuber thanked Mr. Wetklow for this presentation. Dr. David asked if the materials being generated to socialize risk throughout the agency would make a distinction between good and bad risks. Mr. Wetklow responded that, yes, there has to be an acknowledgement that risk also entails opportunities.

There being no further comments or questions, Dr. Zuber ended the discussion.

## Chair's Closing Remarks

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Dr. Zuber closed the meeting by wishing the Board members departing for Antarctica safe travels. There being no further business, Dr. Zuber adjourned the meeting at 1:40 p.m.

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