

**APPROVED MINUTES¹
OPEN SESSION
438TH MEETING
NATIONAL SCIENCE BOARD**

National Science Foundation
Arlington, Virginia
November 20, 2014

Members Present:

Dan E. Arvizu, Chairman
Kelvin K. Droegemeier, Vice Chairman
John L. Anderson
Deborah L. Ball
Roger N. Beachy
Vinton G. Cerf
Vicki L. Chandler
Ruth David
Inez Fung
Robert M. Groves
James S. Jackson
Alan I. Leshner
W. Carl Lineberger
Sethuraman Panchanathan
Anneila I. Sargent
Diane L. Souvaine
Maria T. Zuber

France A. Córdova, *ex officio*

Members Absent:

Bonnie L. Bassler
Arthur Bienenstock
G. Peter Lepage
Stephen Mayo
G.P. “Bud” Peterson
Geraldine Richmond
Robert J. Zimmer

The National Science Board (Board, NSB) convened in Open Session on Thursday, November 20, 2014 at 1:15 p.m. with Dr. Dan Arvizu, Chairman, presiding (Agenda NSB-14-51, Board Book page 95). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

¹ The minutes of the 438th meeting were approved by the Board at the February 2015 meeting.

AGENDA ITEM 9: Approval of Open Session Minutes, August 2014

The Board unanimously APPROVED the Open Session minutes of the August 2014 Board meeting (NSB-14-48, Board Book page 206).

AGENDA ITEM 10: Chairman's Report

In the Chairman's Introduction and during the Chairman's Report, Dr. Arvizu announced and reported on several items.

a. Redesign of NSB Website

Dr. Arvizu announced that a new NSB website design was in development and intended to be launched in the coming weeks. It is hoped that users will find the new website easier to navigate. Dr. Arvizu encouraged Members to review the new website, when available, and provide feedback.

Dr. Leshner asked that the NSB logo on the National Science Foundation (NSF) website be made more prominent and easier to find (moved from the bottom of the page to the top) for users looking for the NSB website link while perusing the NSF website. Other Board Members added that they, too, had trouble locating NSB's website link on the NSF website.

b. Discussion of New NRC Report on Federal Research

Dr. Arvizu referenced the National Research Council report, "Furthering America's Research Enterprise," which addresses societal benefits of federal research by focusing attention on three pillars of the research system: 1) a talented, interconnected workforce; 2) adequate and dependable resources; and 3) world-class basic research in all major areas of science. Dr. Arvizu noted that a few Members have been active in this area and asked Dr. Droegemeier to lead a brief discussion on this topic.

Dr. Droegemeier stated that this new report is very important among a body of other significant reports. While these reports overlap to some degree, he noted each also offers unique dimensions. Dr. Droegemeier suggested the Board consider an analysis of these reports, a synthesis of the recommendations and work with NSF to evaluate how the reports' various recommendations could be helpful to the agency

Dr. Arvizu stated that the Board previously had a number of conversations regarding strategy—how to get the message out better about the evolving nature of the science and engineering enterprise, and essentially Board engagement on these topics. He then invited Board comments on the idea that this would be something valuable to pursue. He added that the Board must figure out a mechanism and a tasking approach to ensure traction.

Dr. Groves shared that he found the report interesting and that it might be quite helpful to the Board, when combined with the other reports. He described it as a system viewpoint of the U.S. enterprise, thinking of this as a production unit with their inputs, outputs and processes. He added that at a higher level, recognizing those interconnections is important and thought provoking.

Dr. Cerf noted that historically there has been a disconnect between basic research and the things the general public enjoys every day. He suggested selecting a few popular products or services and then delving into where they came from and how they came to be. This might be a way to demonstrate the contributions of NSF-supported research to daily life.

Dr. Arvizu noted that this was a good segue to the next topic, to formally establish an *ad hoc* Discussion Group on Communications.

c. NSB *ad hoc* Discussion Group on Communications

Dr. Arvizu stated that he had asked Dr. Cerf to lead a new NSB *ad hoc* Discussion Group on Communications. He clarified that two important components the group would focus on are messaging and communications with specific focus on determining how to approach various stakeholders—the general public, the science and engineering community and elected officials making policy.

Dr. Cerf indicated that he had been meeting with NSF and NSBO staff and learned that a considerable amount of educational material was regularly being produced, much of it consumed in the educational sector, but not making it out to the general public. He noted that finding alternative ways of drawing attention to the significance of what's being done is an important task to be undertaken by the communications group. Dr. Chandler echoed her agreement and stated that a number of other organizations were dealing with the same issues. Dr. David suggested that perhaps they look to form partnership and discover best practices in dissemination methods and ideas. A brief discussion ensued about the organizations the group might contact in search of ideas. The communications group is expected to report their progress during the next Board meeting.

d. NSB Staff Updates

- Dr. Arvizu welcomed Rebecca Kelley as a new member of the NSB staff. Ms. Kelley joined the Board Office in June on a detail from her position as the operations officer for NSF's Directorate on Education and Human Resources. Prior to coming to NSF two years ago, Ms. Kelly served as the Director of Administration for the Office of Extramural Research at the National Institutes of Health. Previously she served as the Director of Science Programs at the Department of Energy's Office of Science Programs.
- Dr. Arvizu also announced the impending retirement of Ms. Ann Ferrante, Executive Secretary to the Board. Ms. Ferrante began her work in the NSB Office

11 years ago. Dr. Arvizu noted that Ms. Ferrante had served four NSB chairmen in her role as Executive Secretary. Additionally, she served for several NSB committees: NSB Elections, Transformative Research, NSB 60th Anniversary, and Honorary Awards. Dr. Arvizu lauded her for her attention to detail and precision. He thanked her for her service and wished her the best in retirement.

AGENDA ITEM 11: Director's Report

a. Science Presentation

Dr. Córdoba mentioned she had been at the White House earlier that morning with the Medal of Science winners, who received their awards from President Obama. She described the ceremony as very special and the President, a gracious and charming host with astute remarks about the importance of science and technology. Dr. Córdoba also thanked the Board for hosting an event the previous evening for the Medal of Science recipients. She noted that that evening, the Medal of Science recipients would be celebrated at a ball and that she would thank them for their contributions to our country.

Next, she presented a slide with an image of a proto-solar system a few hundred light years from Earth. Dr. Córdoba said that from this meeting forward, she would regularly feature, as part of her Director's Report, a scientific discovery. In reference to the proto-solar system, she described the evolution in technology that eventually led to the impressive image. Subsequent slides demonstrated the evolution and clarity over time of images from Caltech's Owens Valley Radio Observatory in the 1980's, and then more recent observations in 2007 and 2009 with other telescopes owned and run by Berkeley and Owens Valley. This body of research led to the current observations and findings.

Dr. Córdoba noted that her inspiration in presenting this particular astronomical discovery was Dr. Anneila Sargent, who performed the earlier observations, which subsequently led to students and post-docs who are now virtually running the ALMA telescope. It was their decision to point the telescope at this particular object to test the resolution of the telescope. Dr. Córdoba then asked Dr. Sargent to briefly discuss her work in this area.

Dr. Sargent stated that the largest fraction of the funding for both Caltech's Owens Valley Radio Observatory, for Combined Array for Research in Millimeter-wave Astronomy (CARMA), and for Atacama Large Millimeter/submillimeter Array (ALMA) all came from NSF---this is an NSF story. In reference to the image, Dr. Sargent said that it was the gas that showed radial velocity that researchers thought was a rotating system. She noted that this discovery is a measure of what NSF does. It gets into the earliest stages and funds unusual instrumentation, whether it is mid-sized or large, that produces enormous returns.

Dr. Cerf added that this is a stunning demonstration signifying that solar systems are actually common. Dr. Sargent noted what is most unusual about this solar system is that

it is very young, only about one million years old. She also stated that this kind of discovery is only the beginning for ALMA, which currently has 26 telescopes and will eventually have 50 in its array. The work has proven to be transformational.

b. Congressional Update

Dr. Córdoba noted that as a result of the midterm elections, Republicans will have control of the Senate and have increased their majority in the House in the 114th Congress that convenes in early January. Currently, the House and Senate are in session, attempting to either extend the current continuing resolution, which funds federal agencies through December 11th, or pass a comprehensive omnibus appropriations package. The expectation is that Congress will adjourn following resolution of the current year funding issue.

The House committee leadership elections are finishing up this week. Dr. Córdoba announced that she had learned that Congressman John Culberson (R-TX) was announced as the Chairman of the Subcommittee on Commerce, Justice, and Science Appropriations. Additionally, Congressman Lamar Smith (R-TX), Chairman of the Science, Space, and Technology Committee has several bills on the House floor this week related to the transparency of science used by the Environmental Protection Agency (EPA) in rulemaking, as well as the structure of its science advisory board.

Dr. Córdoba noted that since the last NSB meeting, she had met with six members of the House of Representatives and two Senators. This was fewer than she had previously met with, because of the long recess for the election period. She stated that the meetings continue to go well and provide opportunities to reiterate NSF's importance in scientific research. She also noted that she would continue to make these meetings a priority in the new Congress. Congressional members she has visited include: Senator Elizabeth Warren (D-MA) and Senator John Thune (R-SD), the new Chairman of the Committee on Commerce, Science, and Transportation in the 114th Congress.

c. Transparency and Accountability

The next topic Dr. Córdoba discussed was that of transparency and accountability, which she noted had been brought forward by House Science Committee Chairman Lamar Smith. She discussed information now available on the NSF website. Dr. Córdoba's first slide described why transparency and accountability is important. She stated that gaining the public trust requires knowing what is being funded and how investments are promoting the NSF mission, which includes the progress of science and economic return, the defense of country, and its health. NSF needs to be able to show continuous improvement, which is also a core principle. NSF can achieve being good stewards of public resources entrusted to it, in part, by continuing to examine its processes and procedures.

Dr. Córdoba also noted that another reason that this effort is important, is because merit review is at the heart of NSF's processes, and ensuring its integrity is critical to fulfilling

NSF's mission. She noted that NSF receives over 50,000 proposals every year, and is only able to fund approximately 11,000 of them. Therefore, NSF's merit review process is deserving of continual improvement, demonstrating why this process is important to maintaining public trust.

Dr. Córdova proceeded with a discussion on roles and responsibilities and the significance of ensuring that they are understood across NSF. Specifically, NSF staff should know what their role is in the merit review and priority setting processes, and provide input to those processes.

Dr. Córdova reiterated that transparency and accountability strengthens the process to ensure the highest quality of science portfolio investments. This is why emphasis on transparency and accountability has been so important to NSF.

Dr. Córdova discussed steps taken to enhance transparency and accountability. First, NSF has looked at award abstracts and titles, revised the policy, and revisions will go into NSF's policy guide that will be released on December 26, 2014, along with the Office of Management and Budget (OMB) Uniform Guidance revisions.

Specifically, she mentioned a revised policy and the implementation of new practices, the development of guidelines, and training of staff to ensure that the titles and the abstracts are clearer. This will benefit public understanding of how this research fulfills NSF's mission. NSF has worked for nearly a year to strengthen its processes with a great deal of attention focused on the abstracts and titles, which has resulted in improvements.

The portfolios compiled by the NSF directorates represent what their particular mission and goals are as part of the overall mission of NSF. The NSF Assistant Directors (ADs) have had a great deal of ongoing discussion with their program officers, division directors, and all other leadership in the agency to align their portfolios with the national interest, as defined by the NSF mission, and continue to enhance the portfolios, and examine everything that's approved within the directorate. There has been a lot of attention paid to strengthening and enhancing the description of NSF's portfolio—why it's important and how it serves the national interest.

Dr. Córdova mentioned that NSF has focused on clarifying and standardizing the role of the program officers, the division directors, all the way up to the ADs as related to the merit review process. She noted that previously, some inconsistencies existed across the agency. However, there is now alignment in defining the role of the division director and how much responsibility she or he has in accepting evaluations, or challenging them, and how one goes back to reviewers and program officers in order to address questions that come up.

A website has been created, which addresses transparency and accountability and provides resources on what NSF is doing in this area. Dr. Córdova stated that NSF has a continuous improvement cycle with respect to transparency and accountability.

The final slide discussed by Dr. Córdova demonstrated how NSF has strengthened transparency and accountability. She specified that it had been done through several efforts. Dr. Peter Arzberger has led two, cross-agency working groups on the topic. The first group focused on finding a path forward on policy and practice and recommendations. This group established some of the improvements mentioned by Dr. Córdova. The second work group produced a final report, which discusses the division director's roles and responsibilities. In addition, the ADs have led discussions, initiatives, and collaborations within their own directorates to look very seriously at abstracts and titles and how to take policy to practice and define what is a portfolio and how it aligns with the mission and new opportunities.

Dr. Córdova invited three ADs to the table to make brief comments on their involvement and how the whole agency has approached this accepted responsibility for enhanced transparency and accountability. The following ADs joined her at the table: Dr. Fay Cook of the Directorate for Social, Behavioral, and Economic Sciences (SBE), Dr. Roger Wakimoto of the Directorate for Geosciences (GEO), and Dr. Fleming Crim of the Directorate for Mathematical and Physical Sciences (MPS). She also asked that Dr. Arzberger join them at the table as the leader of the two cross-agency work groups.

Dr. Cook said that SBE has always had post-panel discussions between the program officers, the division directors, and the deputy division directors but that SBE had enhanced those post-panel discussions by emphasizing transparency and accountability. She noted that SBE has improved those meetings so that each proposal recommended for funding has been examined very carefully, the title clearly represents the importance of the research, and the abstract represents the significance of the research. SBE program officers ensure that the title and the abstract of each proposal represents the broader purpose and the importance of the grant proposal. In addition, an overview of the larger portfolio in which that award resides, is written.

Next, Dr. Cook shared with the Board, an example of the new approach. She noted that in a recent article in *The Hill* entitled, "Research in the National Interest," Chairman Smith questioned several science proposals, referring to one proposal by NSF that he entitled, "How Local Asian Indian Politicians Can Improve Their Performance." That was not the title, which was unfortunately reported incorrectly. The proposal was actually entitled, "Information and Governance: Experimental Evidence from India" and is part of the portfolio of SBE's economics program. The project tests a key theory about the causes of global poverty. The theory is that uninformed voters are a major barrier to establishing effective and honest local government. The research uses randomized controlled trials of interventions designed to inform voters. Earlier research showed that corrupt, local officials are a huge barrier to economic growth in rural areas of developing countries. This project helps in understanding the causes of that corruption. Broader impacts include informing U.S. efforts to promote democratization by developing state of the art methods to evaluate effectiveness of democratization programs. The project is part of an overall portfolio that invests in research designed to understand the causes of poverty around the globe, improve economic outcomes in other countries, and promote U.S. security interests.

Dr. Cook noted that the intention of the presentation is not to be defensive or argumentative, but rather an effort to raise public, Congressional, and media understanding of the work supported by SBE.

Dr. Wakimoto offered additional examples from GEO. He first addressed the portfolio, and offered some ideas of the endpoints used in geosciences, noting that many of these will sound familiar such as: community workshops, divisional retreats, and Committee of Visitors (COV). He shared his strategic planning exercise, which is consistent with that of the portfolios. He noted that when GEO does these portfolio reviews, it includes the importance of broadening participation.

Lastly, he discussed details about program officer training, which includes what should constitute an abstract. He noted that very recently he received an email of about 30 to 40 titles and abstracts from a GEO division that demonstrated the transformation that occurred as a result of the training.

Discussion ensued with several Board Members asking questions. Dr. Droegemeier asked if the PIs were involved in the abstract rewrites. Dr. Wakimoto replied that they were marginally involved, but the program officers and section heads within GEO largely did the work.

Dr. Crim stated that the abstracts belong to NSF, so it is appropriate that NSF's division directors and program officers are involved in improving the abstracts. Dr. Crim then discussed the portfolio process. He said that identifying, articulating, and shaping a portfolio is a challenge at NSF. MPS has had a big challenge, because of the heterogeneity of the areas covered. So, in MPS they've spent time with the advisory committee, with community input from studies, and other ways to receive feedback. He noted that last spring the leadership in his directorate discussed portfolios going into the budget season. The idea was that each division director would articulate a vision of a portfolio and lay out the broad themes. This, he said, was a formative exercise. Earlier this month, MPS did another exercise where they discussed their portfolio and provided examples of how specific awards mapped onto that portfolio and their vision. The added benefit is that it promotes discussion and enhances awareness of what other parts of the directorate are doing.

Dr. Córdova then asked Dr. Arzberger to say few words about the working groups. Dr. Arzberger stated that NSF is an agency that tries to continue to improve. The work groups he noted, were the job of many people. Dr. Arzberger was the co-chair of the overall activity and Dr. Mark Weiss is a co-chair of both of the two working groups. Dr. Arzberger noted that Dr. Weiss brought a great deal of experience from NSF to this project. The working groups were comprised of people from each of the directorates. He specifically noted that the process that was put together was enabled by the ADs, which was very important. The ADs would have working group members come talk on a regular basis to the senior management, as well as having the individuals on the working group speak with program officers regularly. This raised awareness, which is very

critical. He pointed out that the Board was seeing some of that impact in the current discussions.

Dr. Arzberger stated, “It’s one thing to mandate a policy change. It’s another to actually get people to say, “This is really the right thing to do.” And certainly, with the clarity underlined for the abstracts, I think most of the program officers felt this was really the right thing to do.” He noted that GEO and OLPA, both developed materials and created a notion of good abstract/bad abstract to provide resources and guidance.

He stated that it’s also very important that NSF continues to educate people on the process when they are new to NSF. He explained that NSF is a collaborative culture by nature, particularly with regard to merit review. Knowing this is a shared responsibility also makes it paramount that individuals understand their roles and responsibilities. Importantly, NSF is a culture in which trust is important. Lastly, he said that this is an ongoing effort.

Dr. Córdova thanked the ADs and Dr. Arzberger and moved on to staff updates.

d. NSF Staff Updates

- Dr. Córdova announced that Dr. Peter Arzberger is leaving the Office of the Director (OD), effective December 1, 2014 to join the Computer and Information Science and Engineering (CISE) directorate as the Senior Advisor to the AD.
- Dr. James Olds joined NSF the previous month as the AD of the Directorate for Biological Sciences (BIO). Dr. Olds is from George Mason University where he served as Director and Chief Academic Unit Officer of the Krasnow Institute for Advanced Studies.
- Dr. Steven Bernasek joined NSF as Division Director, Division of Chemistry in MPS in August, and comes to NSF from Princeton University.
- Dr. Paul Shepson joined NSF as Division Director for the Division of Atmospheric and Geospace Sciences in GEO in mid-September, and comes to NSF from Purdue University.
- Dr. Joanne Tornow will take over the position of Office Head of Information and Resource Management (OIRM), effective December 1, 2014. In this position she’ll also serve as NSF’s Chief Human Capital Officer.
- Dr. Cliff Gabriel, who has been Acting Head of OIRM since April 2014, will serve as Acting Deputy Assistant Director in SBE while a nation-wide search is conducted for Dr. Tornow’s replacement in SBE.
- Lastly, Dr. Córdova thanked Dr. Robert Bell for his service as NSB’s Executive Secretary to the Committee on Science and Engineering Indicators as well as his

contributions in SBE. Dr. Bell plans to retire on November 28, 2014.

Dr. Córdova then concluded her Director's Report.

e. Board Discussion

Dr. Arvizu called on Dr. Panchanathan who had a question about the abstract revision process as it related to the involvement of Principle Investigators (PIs). He suggested that it could be helpful to have PIs involved in the future because they could learn from the process, which would lead to better abstracts. Secondly, he suggested the idea of having PIs write their proposals using key challenges. For example, if “global poverty” and “national security” is a key challenge then we might consider having PIs address this in their proposals. Dr. Córdova thanked Dr. Panchanathan for his suggestions.

Dr. Arvizu thanked Dr. Córdova and the ADs and NSF staff for the thorough, comprehensive review about where NSF stands on transparency and accountability. He noted that they have “embraced the philosophical approach of continuous improvement.” He also commended her on behalf of the Board, on her efforts, and the opportunity to hear more specifically from the ADs about what they're doing. Dr. David added that she was impressed with the buy-in and mobilization, and that the leadership and staff are truly embracing the changes.

Dr. Córdova expressed her thanks and praised the ADs and Dr. Arzberger, stating that the past week had presented a seminal moment, seeing the culmination of the work they had done together. Lastly, she thanked Chairman Smith for pointing out the weaknesses and noted that NSF is appreciative of the opportunity to rise to the challenge.

AGENDA ITEM 12: Open Committee Reports

Dr. Arvizu moved on to the Open Committee Reports. He noted that they would continue with the process established in May 2013, where he asked each of the committee chairs to submit their more comprehensive committee meeting report for the record and include them with the plenary minutes. Committee chairman were then asked to offer any highlights.

a. Committee on Audit and Oversight (A&O)

Dr. Ruth David, A&O chairman, stated that they had two sessions the day prior, which included updates from the Office of the Inspector General (OIG) and Chief Financial Officer. One of the points of discussion was the successful implementation of the iTRAK system. The Committee also had a very comprehensive briefing on the audit resolution process to educate the Board on how it works inside the agency. Lastly, Dr. David reported that the Committee had voted on and recommended for approval to the full Board, the transmittal letter and management tables that accompany the September 2014 OIG Semiannual Report to Congress.

Dr. Arvizu called for a full Board vote to approve the September 2014 OIG Semiannual Report to Congress and the accompanying documents. The Board approved the documents unanimously. Dr. David submitted a report summary for the record (Appendix A).

b. Committee on Science and Engineering Indicators (SEI)

Dr. Kelvin Droegemeier, SEI chairman, stated that the Committee met in open session that morning and highlighted a few items. The Committee is preparing a letter from the full Board in response to a Federal Register notice on the potential removal of the so-called “field of degree” question from the American Community Survey. The data from this survey are very important for understanding the STEM workforce and production of *Science and Engineering Indicators* itself, and keeping this question on the survey represents the best, most efficient, cost-effective, and least-burdensome way to collect the information.

It was a consensus of the Committee, and other present Board Members, that the full Board should respond to the Federal Register notice. The full Board should also respond directly to the Director of the Bureau of Census, and the Department of Commerce leadership, and additionally alert constituents about the issue. Dr. Droegemeier also noted that an updated draft of the letter had been circulated among Board Members.

Dr. Droegemeier proceeded with his report, indicating that the SEI Committee approved the 2016 chapter outlines for 2016 *Indicators*. The Committee discussed the first draft of the *Indicators Companion Report*, which is on the topic of the STEM workforce. The next steps are to send a revised version of the report to the full Board. He requested that any additional input be sent to Matt Wilson, SEI Committee Liaison. Once the Committee approves the draft, it will be sent to the full Board for review and approval. Dr. Droegemeier then submitted a report summary for the record (Appendix B).

c. Committee on Programs and Plans (CPP)

Dr. Anneila Sargent, CPP chairman, thanked Dr. Kelly Falkner for her outstanding presentation on science in the Polar Regions, describing it as an excellent overview of what is going on in both the Arctic and the Antarctic. She mentioned that a number of Board Members told her how much they enjoyed it.

She also thanked Dr. Alicia Knoedler for joining the Board as a guest speaker to speak about research development and the work being done by the National Organization of Research Development Professionals. She mentioned that it was good to hear about the potential support for scientists in all disciplines. Dr. Sargent submitted a report summary for the record (Appendix C).

d. Committee on Strategy and Budget (CSB)

Dr. Alan Leshner, CSB chairman, stated that the Committee had met in open and closed session that morning with most Members in attendance. As such, he had no further highlights to add. A report summary was submitted for the record. (Appendix D).

CSB Subcommittee on Facilities (SCF)

Dr. Carl Lineberger, SCF chairman, noted that the Subcommittee had met the day prior. During the meeting, Mr. Matt Hawkins, Acting Head of the Large Facilities Office (LFO), provided an update on activities underway in LFO to strengthen NSF's internal processes for oversight and assurance on large facilities.

Dr. Lineberger noted that in other activities, they discussed the 2013 Annual Portfolio Review recommendations, and reviewed background on the academic research fleet relevant to the upcoming 2014 Annual Portfolio Review. Dr. Lineberger submitted a report summary for the record (Appendix E).

e. Committee on Education and Human Resources (CEH)

Dr. Deborah Ball, CEH chairman, thanked Dr. Joan Ferrini-Mundy for presenting a useful report about the education portfolio on behalf of the ADs. She recognized that a great deal of work went into providing the Board with information about the scope and distribution of investments in education. Accordingly, many good questions were raised during that discussion and CEH will move forward on those questions. Dr. Ball then submitted a report summary for the record (Appendix F).

f. Work Group on Administrative Burdens

Dr. Kelvin Droegemeier reported on behalf of Dr. Arthur Bienenstock, work group chairman. He stated that the report on administrative burdens was complete and the task force disbanded. The current work group was formed to continue work in this area. He noted that several science policy groups around the country are engaged in activities to implement the report's recommendations.

Dr. Droegemeier reported that the NSF Inspector General has begun discussions with members of the research community on looking at the various audit concerns to reduce administrative burdens. One of the points made in the report was that universities often impose significant additional burdens on faculty and researchers to avoid audits.

Next, he reported that NSF staff are working on piloting some just-in-time submissions for certain portions of research proposals, which would allow PIs to spend more time on the science. He also noted that one of the key things the report focused on was engaging the Academies to work on research regulations and reporting requirements. That group was briefed in October 2014.

The work group also discussed and agreed upon a scope statement for the work group. As it moves forward, they will continue communicating with the Office of Science and Technology Policy (OSTP), the National Academies, and the Inspector General; and also work with universities to help develop some best practices.

AGENDA ITEM 12: Chairman's Remarks

In closing, Dr. Arvizu thanked everyone and wished all in attendance a happy holiday season and safe travels.

As there were no further comments or business of the Board, the Chairman adjourned the Plenary Open Session at 2:33 p.m.

[signed]
Kim L. Silverman
Acting Executive Secretary
National Science Board

Appendices:

- A: A&O Report Submitted for the Record
- B: SEI Report Submitted for the Record
- C: CPP Report Submitted for the Record
- D: CSB Report Submitted for the Record
- E: SCF Report Submitted for the Record
- F: CEH Report Submitted for the Record

**Committee on Audit and Oversight (A&O)
Open Meeting Summary Submitted for the Record
Dr. Ruth David, Chairman**

Dr. Joan Frye presented the transmittal letter and management tables that accompany the September 2014 OIG Semiannual Report to Congress. The Committee voted to recommend approval of the materials to the full Board.

Dr. Ruth David, Chairman updated the Committee on the status of audits related to budgeting for contingency in large facility projects. As noted in previous discussions, the OIG did not agree with NSF's resolution of some of the audit issues related to contingency budgeting and escalated those issues to the agency's Audit Follow-Up Official, the NSF Chief Operating Officer. With the transition from Dr. Marrett to Dr. Buckius, an additional review was undertaken by Dr. Buckius. On October 16, 2014, Dr. Buckius, consistent with Dr. Marrett's findings, determined that NSF's practices properly follow OMB guidance by budgeting for contingency in large facility construction awards. Final determination on the remaining findings in the audits is still underway. It is important to note that NSF continues to work closely with the OIG to assure that there are responsible, well-documented, compliant practices in place to protect federal funds and support effective research.

Inspector General Allison Lerner provided an update on OIG's activities including the status of its use of data analytics to perform audits. She noted that the program began in 2011 and that thus far 30 audits have utilized analytics to identify high risk transactions, with 17 audits still active. She said that as more audits are complete, OIG would use the results to help refine the application of data analytics in future engagements. During her update, the IG also noted the successful prosecution of an SBIR award recipient last month who was convicted on 7 of 8 criminal counts, including receiving stolen government money.

IG Lerner then introduced Dr. Brett Baker, Assistant Inspector General for Audit, who presented the OIG's FY 2015 Audit Plan. He discussed how the plan is developed, the sources it draws from, and some of the specific audits planned. This coming year, the Office of Audit expects to focus on five issue areas including the NSF relocation, USAP's health and safety program, and financial and program accountability.

Dr. Brett Baker and Ms. Mary Santonastasso of BFA/NSF briefed the Committee on the roles of the agency and the OIG in the audit resolution process. Dr. Baker described the process of conducting audits of awardees, and the different types of recommendations (monetary and non-monetary) that result. Ms. Santonastasso addressed the audit resolution process and the importance of collaboration between NSF management and the OIG audit team. She also noted how audit resolution is only one part of a larger, and largely pro-active, NSF "ecosystem" for managing awardee oversight and accountability. She also described the joint communication effort between BFA/NSF and the OIG, the Stewardship Collaborative and described some of this initiative's most recent successes.

Ms. Martha Rubenstein, Chief Financial Officer, updated the Board on NSF's successful implementation of its new financial system, iTRAK. The system is now live and over \$682,000,000 payments as well as many other transactions have been made through the system since its inception in October 2014. Stabilization efforts continue, with special attention to resolving issues between the travel system, Concur, and the Oracle product.

Appendix B to NSB-14-61

**Committee on Science and Engineering Indicators (SEI)
Open Meeting Summary Submitted for the Record
Dr. Kelvin Droegemeier, Chairman**

The Committee on Science and Engineering Indicators (SEI) met from 9:00 a.m. to 10:30 a.m. on Thursday, November 20, 2014.

The Committee was briefed on the potential removal of the "Field of Degree" question from the American Community Survey (ACS). At NCSES's request, the Census Bureau added this question to the ACS in 2009. It enables NCSES to design a national survey of college graduates that can provide detailed information on people in the labor force with S&E credentials.

A content review by the Census Bureau led to the item being classified as low cost (in terms of respondent burden), but also low benefit (as defined by level of usefulness). The question (and the data development it facilitates) is important to the Board and the Nation. Additionally, without the question, the data collection would be less efficient, more costly, and likely result in lower quality data.

The Committee recommended that the Board provide a response to the Federal Register Notice that proposes removal of the question. A draft letter has been produced that will be reviewed and shared with the full Board. The Committee also will be exploring ways to raise awareness of the issue.

The Board was provided with a draft of the Indicators 2014 companion report on the STEM workforce. The focus for the next steps of the report will be to incorporate the comments from the Committee members and the working group, and to determine how to use the report as a launching point for follow-up activities by the Board.

The Committee was provided with a summary of responses from staff to their questions on the narrative outlines. The committee approved the *Science and Engineering Indicators 2016* narrative outlines without revision, noting the staff's plans to explore changes in *Indicators* content in light of suggestions the Committee made at the August meeting. Drs. Droegemeier, Anderson, and Panchanathan agreed to serve on the state indicators working group. The Committee reviewed previews of cover art options for

Indicators 2016 and suggested that the artwork better reflect NSF's mission and contribution to S&E.

The Chairman provided a brief overview of the outreach and engagement discussion by the Committee this past September. At a follow-up teleconference, the Committee will determine the next steps that they would like to take to put in place a framework for evaluating engagement opportunities and building a process to engage in those opportunities.

The Committee deferred the discussion on the STEM Education Online Resource because some key members were not at the meeting. Staff will follow-up with those members to discuss the presentation of demographic data in the tool.

Finally, the Board recognized the departure of Ms. Cheryl Roesel, NCSES Publication Manager, and the retirement of Dr. Robert "Bob" Bell, Director, NCSES Indicators Program.

Appendix C to NSB-14-61

**Committee on Programs and Plans (CPP)
Open Meeting Summary Submitted for the Record
Dr. Anneila Sargent, Chairman**

Chairman's Remarks

Dr. Anneila Sargent drew attention to the updated CY 2015 schedule of action and information items for NSB review and noted that there are many items scheduled for the upcoming calendar year. She emphasized the fluidity in the schedules as review timing on actions can be unpredictable. As an example, she drew attention to several items that had been scheduled and pulled from the agenda, and turned to Dr. Fleming Crim, Assistant Director for the Directorate for Mathematical and Physical Sciences (MPS), and Dr. Marge Cavanaugh, Deputy Assistant Director for the Directorate for Geosciences (GEO), to briefly review the rationale for rescheduling in certain circumstances. To give CPP members context for delays, it was suggested when scheduled items were deferred short informational updates should be scheduled.

Science Briefing on the Poles

CPP heard a Science Briefing on the Poles from Dr. Kelly Falkner, Division Director of Polar Programs within the Directorate for Geosciences (GEO). Dr. Falkner described highlights of the science conducted in both the Antarctic and Arctic regions and the history of the international cooperation in the Antarctic. CPP members thanked Dr. Falkner for the excellent overview and noted that the committee anticipates scheduling

additional discussions at future meetings to focus on challenges and opportunities at the poles.

Drs. Bonnie Bassler, Peter Lepage, and Geri Richmond had recently returned from a site visit to the Antarctic, and gave a report. All agreed that the visit was a great experience, and emphasized that not only was the science exciting, but complex McMurdo operations were seamless and efficient.

Information Item: MPS Advisory Committee, Subcommittee on NSF Response to Strategic Plan for Particle Physics Outlined in the May 2014 Particle Physics Project Prioritization Panel (P5) Report

Next, CPP heard an information item on the MPS P5 report. Dr. Fleming Crim and Dr. Denise Caldwell, Division Director for Physics within MPS, gave the presentation. Dr. Caldwell noted that the MPS Advisory Committee met recently and was tasked with providing recommendations to address the report's findings. The main goal is to develop a long-term strategy for particle physics.

Information Item: Research Program Development

Finally, CPP heard from an invited speaker, Dr. Alicia Knoedler, immediate past President of the National Organization of Research Development Professionals (NORDP) and Associate Vice President for Research at the University of Oklahoma. Dr. Knoedler spoke about research development and the work being done by the National Organization of Research Development Professionals (NORDP) to support scientists in all disciplines. CPP agreed that it was an excellent and informative presentation and that NORDP can fill an important role in universities.

Appendix D to NSB-14-61

**Committee on Strategy and Budget (CSB)
Open Meeting Summary Submitted for the Record
Dr. Alan Leshner, Chairman**

Mr. Michael Sieverts, Division Director, Budget Division/BFA, updated the Board on the status of the FY 2015 Appropriations. He began by noting that the Congressional Marks for Appropriations haven't changed since October. The current House Mark of \$7.394 billion is 3% above FY 2014, while the current Senate Committee Mark of \$7.255 billion is 1% above FY 2014. Currently, we are under a continuing resolution through December 11. Either we will receive an appropriation in December or the actions will be pushed to the next Congressional session. The implications of the mid-term election results remain unclear.

CSB Subcommittee on Facilities
Open Meeting Summary Submitted for the Record
Dr. W. Carl Lineberger, Chairman

Dr. Lineberger began the session by welcoming Drs. Jackson and Souvaine to SCF. He also introduced Drs. Anderson and McCloud as new Executive Secretaries and Dr. Lipkowitz as AAAS Fellow working with SCF. The members approved the minutes from SCF's September 2014 teleconference.

Dr. Lineberger introduced Dr. Matt Hawkins, Acting Head of the Large Facilities Office, who provided an update on activities underway in LFO to strengthen NSF's internal processes for oversight and assurance on large facilities. SCF members Drs. David and Jackson lauded the changes and asked about support for staff and awardees as the new processes are rolled out; SCF member Dr. Zuber asked about implementation of risk management. Drs. Cerf, David, Drogemeier, Fung, and Groves asked for clarification of the makeup of the Integrated Project Teams and the roles of each member, the roles of the PI, and how broadly the revised procedures would apply. Dr. Hawkins addressed all these questions, clarifying the roles of each member of the IPTs, noting that FFRDCs are not under the purview of LFO, and explaining the rollout process and support being provided by LFO. Dr. Lineberger thanked Dr. Hawkins on behalf of the subcommittee.

Next, the members discussed two outcomes from the 2013 Annual Portfolio Review recommendations: facility synopses and improved information about "horizon projects". Drs. Lineberger, David, Mayo, and Sargent praised the new synopses and thanked NSF for preparing and providing them. Dr. David suggested that the synopses should be kept as living documents in some form of accessible electronic repository. Dr. Lineberger lauded NSF for providing information at an early stage for the potential AIMS project.

Finally, Dr. Lineberger shared information on the Academic Research Fleet (ARF) and possible Regional Class Research Vessels (RCRVs), emphasizing that this part of the meeting was to develop questions to be addressed in the future. Dr. Lineberger provided background on the upcoming Decadal Survey of Ocean Sciences, the composition and evolution of the ARF, and budget/cost issues relevant for the ARF. Dr. Córdova asked Dr. Lineberger to clarify where the MREFC process stands for possible RCRVs; he did so, noting that RCRV has passed through Preliminary Design Review, and that the timeline for future steps was still uncertain and would be informed by the DSOS report and other community input.

**Committee on Education and Human Resources (CEH)
Open Meeting Summary Submitted for the Record
Dr. Deborah Ball, Chairman**

Dr. Deborah Ball, Chairman of CEH, provided background information about demographic changes in the US and growing inequality, including unequal access to high quality learning opportunities in STEM. She framed three key categories for STEM human capital development: 1) future scientists and engineers, 2) people preparing for STEM-involved work; and 3) the broad American public, which needs to be aware of, value, and support science, technology, engineering, and mathematics.

Dr. Joan Ferrini-Mundy, Assistant Director of Education and Human Resources (EHR), presented an overview of the education portfolio at NSF on behalf of all the assistant directors. The presentation outlined overall spending on education and STEM education in the country, noting that the efforts of the federal government in general, and NSF in particular, must be focused and strategic to maximize the impact of a relatively small investment. She described NSF's investments in education, including types of funding mechanisms, levels of schooling, and research on STEM education versus other types of activities.

The Board and the Assistant Directors had an engaging discussion, with several board members requesting further information on key issues including: mechanisms and impacts of efforts to scale promising practices and interventions; the role of NSF in partnerships with the US Department of Education, states, local communities, industry, business, and other funding agencies addressing these pressing problems; the field's understanding and explanation for many of the results presented. Board members noted that it is important to characterize the problems of the future and frame the CEH and NSF efforts toward these longer-term goals. The discussion also stressed the importance of focusing not just on the future workers in STEM and STEM-related fields, but also the broader public.