

**APPROVED MINUTES¹
OPEN SESSION
414TH MEETING
NATIONAL SCIENCE BOARD**

National Science Foundation
Arlington, Virginia
May 4-5, 2010

Members Present:

Steven C. Beering, Chairman
Patricia D. Galloway, Vice Chairman
Dan E. Arvizu
Barry C. Barish*
Camilla P. Benbow
Ray M. Bowen
Kelvin K. Droegemeier
José-Marie Griffiths
Esin Gulari
Louis J. Lanzerotti
Alan I. Leshner
G.P. “Bud” Peterson
Douglas D. Randall
Arthur K. Reilly
Diane L. Souvaine
Jon C. Strauss
Kathryn D. Sullivan
Thomas N. Taylor

Arden L. Bement, Jr., *ex officio*

Members Absent:

Mark R. Abbott
John T. Bruer
G. Wayne Clough
France A. Córdova
Elizabeth Hoffman*
Richard F. Thompson

¹ The minutes of the 414th meeting were approved by the Board at the August 2010 meeting.

* Consultant

The National Science Board (Board, NSB) convened in Open Session at 11:30 a.m. on Tuesday, May 4, 2010 with Dr. Steven Beering, Chairman, presiding (Agenda NSB-10-21, Board Book page 373). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

AGENDA ITEM 1: Presentation by Honorary Award Recipient: NSB Public Service Award - Individual, Dr. Nalini Nadkarni

Dr. Nadkarni, recipient of the 2010 Public Service Award (Individual) and Member of the Faculty at the Evergreen State College in Olympia, Washington, gave a presentation to the Board. (Brief biography, Board Book page 399)

Dr. Beering adjourned this portion of the Open Session at 12:00 Noon.

The Board reconvened in Open Session at 3:30 p.m. on Tuesday, May 4, 2010 with Dr. Beering presiding (Agenda NSB-10-21, Board Book page 373). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

AGENDA ITEM 2: Presentation by Honorary Award Recipient: Vannevar Bush Award, Dr. Bruce Alberts

Dr. Alberts, the 2010 Vannevar Bush Award recipient, gave a presentation to the Board. Dr. Alberts is Editor-in-Chief of *Science* Magazine and Professor Emeritus in the Department of Biochemistry and Biophysics at the University of California, San Francisco. (Brief biography, Board Book page 401)

Dr. Beering adjourned this portion of the Open Session at 4:00 p.m.

The Board reconvened in Open Session at 10:30 a.m. on Wednesday, May 5, 2010 with Dr. Beering presiding (Agenda NSB-10-21, Board Book page 373). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

AGENDA ITEM 3: Presentations by Honorary Award Recipients: Waterman Award, Dr. Subhash Khot; NSB Public Service - Group, The Expanding Your Horizons Network

Dr. Khot, recipient of the 2010 Waterman Award and Associate Professor of Computer Science at New York University, gave a presentation to the Board. (Brief biography, Board Book page 403)

The Expanding Your Horizons Network (EYH) received the 2010 Public Service Award (Group). Ms. Stacey Roberts-Ohr, EYH Executive Director, gave a presentation to the Board on behalf of EYH. (Brief biography, Board Book page 405)

Dr. Beering adjourned this portion of the Open Session at 11:30 a.m.

The Board reconvened in Open Session at 2:25 p.m. on Wednesday, May 5, 2010 with Dr. Beering presiding (Agenda NSB-10-21, Board Book page 373). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

AGENDA ITEM 9: Recognition of Class of 2010 and Executive Secretaries

a. Results of Board Elections

Dr. Beering announced the results of the Board elections, which took place in the Plenary Executive Closed Session. The Board elected Dr. Ray Bowen as Chairman and Dr. Esin Gulari as Vice Chairman for the 2010-2012 terms. Both were also elected to serve as members of the Executive Committee from 2010 to 2012.

b. Recognition of Class of 2010 and Drs. Beering and Bement

Dr. Beering recognized Board Members of the Class of 2010. On behalf of Dr. Arden Bement, NSF Director, Dr. Beering expressed appreciation for their dedication and willingness to work with complex policy issues that the Board Members addressed during their terms during the past 6 years. He stated that their service on behalf of the science and engineering enterprise and the Nation had been exemplary. Each Board Member of the Class of 2010 was presented with an award honoring “achievements in promoting the progress of science and engineering.”

Recognized were:

- Dr. Dan Arvizu
- Dr. G. Wayne Clough
- Dr. Kelvin Droegemeier
- Dr. Louis Lanzerotti
- Dr. Alan Leshner
- Dr. Jon Strauss
- Dr. Kathryn Sullivan.

The Chairman-elect, Dr. Bowen, presented two additional awards to:

- Dr. Steven Beering, Board Chairman, also part of the Class of 2010, and
- Dr. Arden Bement, NSF Director, departing NSF in June 2010 to return to Purdue University.

Dr. Bowen stated that Purdue University was a great university because of Dr. Beering’s contributions as its President for 18 years. He also mentioned that it takes more than a good university president to make a great university – it also takes a good faculty. Dr. Bowen stated that Dr. Bement had served science, engineering, and the Nation in a way that few individuals can claim. Dr. Bowen then commented on the contributions of each Member of the Class of 2010 and thanked them for their efforts. Lastly, Dr. Bowen stated that he would contact Board Members to get their input about highest priorities for the next 2 years, and that he looked forward to working with the Board as Chairman.

c. Recognition of Executive Secretaries

Dr. Beering then recognized the following Executive Secretaries for their dedicated service during the past 2 years to the Board's committees, subcommittees, and task forces. He presented framed certificates to:

- Dr. Robert Bell, Committee on Science and Engineering Indicators (SEI)
- Mr. Bruce Carpel, Committee on Audit and Oversight (A&O)
- Ms. Jo Culbertson, Committee on Strategy and Budget (CSB), Subcommittee on Facilities (SCF)
- Mr. Darren Dutterer, CSB
- Ms. Ann Ferrante, Task Force on the NSB 60th Anniversary (60ANN)
- Dr. Joan Frye, Committee on Programs and Plans (CPP), Subcommittee on Polar Issues (SOPI)
- Dr. Clifford Gabriel, Executive Committee (EC)
- Dr. Jill Karsten, Committee on Education and Human Resources (CEH)
- Mr. Rolf Lehming, SEI
- Ms. Lisa Lewis, CPP
- Ms. Sonya Mallinoff, CPP
- Ms. Patricia McNamara, SCF
- Ms. Jennifer Richards, Task Force on Cost Sharing (CS)
- Ms. Joanna Rom, A&O
- Ms. Karen Sandberg, 60ANN
- Ms. Holly Smith, CSB
- Ms. Kathryn Sullivan, CEH.

d. Reflections and Thanks from Dr. Beering

As this was his last Board meeting as Chairman, Dr. Beering noted that his time with the Board had been remarkable as he looked back on the Board's accomplishments over the past 8 years that he had been privileged to serve. He stated that he was struck by how much effort the Board Members, NSF management, NSF staff, and the Board Office staff has given to ensuring the Nation's science, engineering, and education communities are well served at the highest level. He thanked Dr. Patricia Galloway for her service as Vice Chairman during the past 2 years. He stated that it had been a great honor for both him and Dr. Galloway to serve in leadership positions.

Dr. Beering took the opportunity to recognize the Class of 2010, NSF leadership, and Board Office staff for enormous contributions, and to express special gratitude to a few Board Members completing their terms. He stated that the Class of 2010 had been so engaged in the work of the Board that a list of their many accomplishments would take too long to present in this particular venue.

Dr. Beering thanked Dr. Sullivan, who served as Vice Chairman during his first term as Chairman, Dr. Clough, who was part of the Engineering Education Workshop Leadership Group; and Dr. Leshner, the chairman of the *ad hoc* Committee on Nominating for NSB Elections (Elections Committee) and most recently the chairman of the Task Force on Merit Review. Dr. Beering acknowledged the special contributions of Dr. Arvizu, as A&O chairman and co-

chairman of the Task Force on Sustainable Energy (SE), and Dr. Strauss, who also served as SE co-chairman SOPI chairman, and chairman of the Task Force on International Science (INT).

In particular, Dr. Beering recognized two Board Members of the Class of 2010 who epitomized service by taking on leadership roles in a broad range of activities – Drs. Lanzerotti and Droegemeier. He stated that Dr. Lanzerotti spearheaded a number of efforts during his tenure on the Board. His thoughtful, well researched, and informed comments on a broad range of issues, such as the Board’s recompetition policy, guided the Board in important award policy decisions. Dr. Lanzerotti had been a major contributor to the important work of CEH - as a member of the *ad hoc* group that is developing the report, *Preparing the Next Generation of STEM Innovators*, and as a member of the *ad hoc* group that led the production of the Board’s report entitled, *Moving Forward to Improve Engineering Education* ([NSB-07-122](#)).

Most importantly, Dr. Lanzerotti served as chairman of the Committee on Education and Human Resources, Subcommittee on Science and Engineering Indicators. In recognition of the importance and demanding workload of that subcommittee, he oversaw the transition to a full standing Committee on Science and Engineering Indicators (SEI). During his tenure as chairman, he led the development of two biennial *Science and Engineering Indicators* reports in 2008 and 2010, and also developed a new outreach Web tool, the *Digest of Key Science and Engineering Indicators*, which was adopted as a regular product published with *Indicators*. Additionally, he led the Board in the production of two policy reports as companion pieces to each of the *Indicators* volumes.

Dr. Beering also especially recognized Dr. Droegemeier, who led a number of Board activities as CPP chairman, CS chairman, and as co-chairman of the Task Force on Hurricane Science and Engineering (HSE). The energy and excitement that Dr. Droegemeier brought to all his endeavors on behalf of the Board raised the level of enthusiasm for what at times could be a daunting workload. Dr. Beering thanked him for the dedication he showed throughout his tenure on the Board.

Additionally, Dr. Beering recognized the leadership and management of NSF. Dr. Bement, in his capacity as NSF Director, diligently served the Board for more than 6 years in addition to an earlier term as a regular Member of the Board. Dr. Beering stated that Dr. Bement’s steady hand, his vast knowledge of science and engineering, and his continuing efforts for public outreach combined to maintain and enhance NSF at the forefront of leadership in national and international science policy circles. Dr. Beering also thanked him for his service as chairman of the Board’s Executive Committee and his thoughtful contributions to all of the Board’s work. He stated that Dr. Beering’s legacy will no doubt be one of excellence in service to the Nation, and of inclusion for other countries. Furthermore, Dr. Beering thanked the entire NSF management team for their work over the years. The NSF Deputy Director, Dr. Cora Marrett, Assistant Directors, and Office Directors became increasingly engaged with the Board as well as the science, engineering, and education communities. With the positive relationship forged during the past few years, Dr. Beering was hopeful that this degree of interaction would continue.

Finally, on behalf of the Board, Dr. Beering expressed gratitude for support by Board Office staff members, especially Dr. Craig Robinson, Acting Executive Officer for the past 2 years, who proved to be an extraordinary leader. Dr. Beering noted that it is not easy to support

25 presidential appointees in their work and guide them through the intricacies of Federal regulations, but each of the Board's staff members served the Board well. In particular, he thanked Ms. Betty Wong, who, since joining the Board Office last year, provided superb efficiency and unmatched energy in support of Board meetings and the Awards Dinner and Ceremony. He also thanked Ms. Jennifer Richards, who worked on a number of issues, most substantively, the cost sharing report and the honorary awards. Ms. Richards would be leaving the Board Office during the summer to pursue a graduate degree at Emory University in Atlanta. He also recognized Dr. Elizabeth Strickland, who has continually shown enthusiasm and skill for every project. He especially thanked Dr. Strickland for her work on the Board's STEM Action Plan, and for her support for CPP and SCF. Lastly, he recognized and thanked Ms. Ann Ferrante for all her efforts to assist and support the Chairman, Vice Chairman, and Board Members in her capacity as NSB Executive Secretary during his tenure.

On a final note to all Board Members, Dr. Beering stated that it had truly been a pleasure and a wonderful opportunity that the Board had given him to serve as Chairman and to serve NSF and the Nation in that capacity over the last 4 years. He wished them all the best in their future endeavors.

AGENDA ITEM 10: Approval of Open Session Minutes, February 2010

The Board unanimously APPROVED the Open Session minutes of the February 2010 Board meeting (NSB-10-18, Board Book page 377).

AGENDA ITEM 11: Closed Session Items or August 2010 Meeting

The Board unanimously APPROVED the Closed Session items for the August 25-26, 2010 meeting (NSB-10-22, Board Book page 431).

AGENDA ITEM 12: Chairman's and Report

Dr. Beering announced and reported on several items.

a. Annual Awards Ceremony and Dinner

Dr. Beering described the annual Awards Dinner at the Department of State's Diplomatic Reception Rooms. He stated that the event is one of the few opportunities that the Board has to recognize the distinguished contributions of individuals and organizations to the advancement of science. The Board was also honored to receive a message from President Obama.

The Awards Dinner recognized the following honorary award recipients:

- Dr. Bruce Alberts, Editor-in-Chief of *Science* Magazine and Professor Emeritus in the Department of Biochemistry and Biophysics at the University of California, San Francisco, received the Vannevar Bush Award.
- Dr. Subhash Knot, Associate Professor of Computer Science at New York University received the Alan T. Waterman Award.

- Dr. Nalini Nadkarni, Member of the Faculty at the Evergreen State College in Olympia, Washington, received the individual NSB Public Service Award.
- The group NSB Public Service Award was presented to The Expanding Your Horizons Network.

Dr. Beering stated that it was both an honor and a privilege to present these awards to such distinguished, talented, and creative people. On behalf of the Board, he thanked the Board Office and NSF staff responsible for the planning, coordination, and smooth operation of this event.

b. Committee Announcements

Dr. Beering discharged the *ad hoc* Committee on Honorary Awards with thanks to Dr. Ray Bowen, chairman, and Drs. Douglas Randall and Thomas Taylor, members. He also discharged the *ad hoc* Committee on Nominating for NSB Elections with thanks to Dr. Alan Leshner, chairman, and Drs. Kelvin Droegemeier, Esin Gulari, and Douglas Randall, members.

c. Congressional Outreach

On March 10, 2010 Drs. Beering and Bement testified before the House Subcommittee on Research and Science Education of the House Science and Technology Committee. They presented concerns for American science leadership as addressed in *Science and Engineering Indicators 2010*, the FY 2011 Budget Request, National Science Board priorities, and NSF investment in research infrastructure. (Board Book page 407)

On March 12, 2010 Drs. Beering and Lanzerotti met with the President's Council of Advisors on Science and Technology (PCAST) where they outlined Board policy positions on shared interests that PCAST will be addressing - such as sustainable energy, public attitudes toward scientific research, globalization trends in science and engineering, research and development employment of U.S. and foreign multinational corporations, and STEM education.

d. Board Member Recognition

Dr. Clough received an Honorary Degree from Oglethorpe University in Atlanta. Before his appointment as Secretary of the Smithsonian Institution, Dr. Clough served as President of the Georgia Institute of Technology for 14 years. Among his many honors is his induction into the Technology Hall of Fame of Georgia in 2009. Georgia Tech recently became a member of the Association of American Universities (AAU).

Bryant University in Smithfield, Rhode Island announced the appointment of Dr. José-Marie Griffiths, of the University of North Carolina at Chapel Hill, as the next Vice President for Academic Affairs, effective June 2010.

Dr. Sullivan was inducted into the Women in Aviation, International Pioneer Hall of Fame. Dr. Sullivan was a member of the first Space Shuttle astronaut class, a veteran of three space shuttle missions, and the first American woman to walk in space.

Dr. Richard Thompson, a behavioral neuroscientist who has spent nearly a half-century researching the physical basis of memory, won the American Psychological Foundation's 2010 Gold Medal Award for Life Achievement in the Science of Psychology. The honor recognizes a distinguished career and enduring contribution.

AGENDA ITEM 13: Director's Report

Dr. Arden Bement, Jr., NSF Director, reported on the following items:

a. NSF Staff Introductions

Dr. James S. Ulvestad began his IPA assignment on March 1, 2010 as the Director, Division of Astronomical Sciences (AST), Directorate for Mathematical and Physical Sciences (MPS). Dr. Ulvestad came to NSF from the National Radio Astronomy Observatory (NRAO), where he served as the Interim Head of the NRAO Square Kilometer Array Program Office. He received his Ph.D. in Astronomy from the University of Maryland at College Park in 1981.

Ms. Docia Casillas, the new Labor Relations Officer, joined NSF on April 26, 2010, and came to NSF from the Department of Justice, Federal Bureau of Prisons where she represented the agency in third party proceedings and responded to grievances and appeals of agency-initiated actions, and provided guidance and direction to the agency in the area of union negotiations. Ms. Casillas received a B.A. in Advocacy Administration from George Mason University.

Ms. Martha (Marty) Rubenstein agreed to serve, on a permanent basis, as NSF's Chief Financial Officer (CFO) and Head, Office of Budget, Finance, and Award Administration (BFA). Ms. Rubenstein served in this capacity since Mr. Thomas Cooley's departure in December 2009. She previously served as Director, BFA Budget Division, since 1997. Prior to coming to NSF she held several senior-level budget and management positions at the Office of Management and Budget (OMB).

Mr. Michael Sieverts assumed the role of Director, BFA Budget Division. He previously served as Deputy Director, BFA Budget Division. Mr. Sieverts served with NSF for 19 years holding positions in the Office of Legislative and Public Affairs (OLPA) and BFA, and held prior positions at the Congressional Budget Office.

b. Open Government Directive

In response to President Obama's Open Government Directive, NSF is finding ways to make its work more accessible to the general public. Through an Open Government Directive Plan released on April 7, 2010, NSF will continue to inform the public about activities taking place at NSF. Additionally, NSF developed a Web site where the public can provide comments about the Plan and make suggestions to NSF regarding ways to improve transparency and better integrate public participation and collaboration into the agency's core mission in an effort to enhance innovation and efficiency.

c. Reflections and Thanks from Dr. Bement

Dr. Bement reserved some of his comments for the unveiling ceremony of his official portrait later in the day. However, he paid tribute to the current Board Members, and stated that the Board came to a level of greatness primarily because of its unified action, alignment with NSF and the interests of NSF, and ability to work as a team and focus on prioritization and better delineation and planning of its activities to a much higher extent than he had witnessed over the 12-1/2 years as a Member of this Board. Dr. Bement also thanked each Board Member, for their camaraderie and direct advice through some challenging issues over the years. Dr. Bement especially noted Dr. Beering, Chairman, and Dr. Galloway, Vice Chairman, for their guidance, assistance, and leadership.

Additionally, Dr. Bement recognized Dr. Robinson. He stated that the smooth operation between NSF and the Board depends directly on the NSB Executive Officer, and requires not only an even temperament but an objective tone and an extraordinary range of knowledge as that person represents the Board to NSF and NSF to the Board. He commended Dr. Robinson for accomplishing this feat in an exemplary way.

AGENDA ITEM 14: Open Committee Reports

a. Executive Committee (EC)

Dr. Arden Bement, EC chairman, recommended that the Board accept the 2009 Executive Committee Annual Report, covering the period from May 2009 – April 2010.

The Board unanimously ACCEPTED the 2009 Annual Report of the Executive Committee (NSB/EC-10-4, Board Book page 285). (Appendix A)

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

Dr. Dan Arvizu, A&O chairman, reported that the committee heard from Dr. Marrett on the latest developments in NSF's support of human resources at NSF. Dr. Marrett reported on the President's Executive Order to create labor-management forums to improve the delivery of government services. The purpose of the Executive Order is to help promote cooperative and productive labor-management relations throughout the executive branch. She also reported that NSF management, in collaboration with NSF union representatives, submitted a written implementation plan for establishing a labor-management forum. She recognized Ms. Carter Kimsey, President of AFGE Local 3403, and announced the appointment of Ms. Casillas, the new NSF Labor Relations Officer. Dr. Marrett noted that the labor-management forums are in addition to the ongoing monthly meetings that the NSF Director and Deputy Director have with the Union President.

Ms. Rubenstein reported on the status of the 2010 Financial Statement Audit and follow-up work underway to address issues identified in the 2009 Audit. She also updated the committee on NSF's success in managing a robust American Recovery and Reinvestment Act (ARRA) recipient reporting process. Additionally, she provided A&O with a status report on plans to modernize NSF's financial system.

Ms. Allison Lerner, NSF Inspector General (IG), briefed the committee on OIG's recent ARRA efforts. The Office of Inspector General (OIG) is continuing its proactive work on a series of external reviews to assess the financial capability of selected ARRA-funded institutions. An alert memo, summarizing the work done so far, will be issued by the end of the month. OIG is also preparing in a broad review under the auspices of the Recovery Accountability and Transparency Board to evaluate the data quality of reports submitted to ARRA recipients and is looking at various aspects of the three large facilities being funded by ARRA. The IG ended her remarks by citing two recent examples of the OIG and the NSF working collaboratively to improve agency policies pertaining to conflicts of interests and audit resolution.

Mr. Sal Ercolano, partner-in-charge of NSF's financial statement audit, presented an overview of the NSF Financial Statement Audit Plan for 2010. In addition to their usual audit procedures, the auditors this year will be focusing on (1) the impact of NSF ARRA funds on its administrative operations; and (2) reviewing the status of last year's significant deficiency related to contract monitoring and all corrective measures that NSF has applied. The auditors will also be revisiting three deficiencies identified in the management letter, including grant processing and documentation, functionality of NSF's aging financial systems, and other contract administration issues. Mr. Ercolano also discussed this year's IT security program review, known as the Federal Information Security Management Act (FISMA), which will emphasize the testing of network controls and assess the status of deficiencies pertaining to the U.S. Antarctic Program (USAP) contained in last year's report.

Ms. Pat Bryant, Director, Division for Administrative Services (DAS), gave a presentation regarding "Future NSF," in which she described the complex series of steps that will be required as NSF's lease expires in 2013. NSF is working closely with the Government Services Administration (GSA) and the Office of Management and Budget (OMB) to ensure that a space meets the needs of NSF and is compliant with the numerous requirements for Federal buildings.

Dr. James Lightbourne, Mr. Nick Proferes, and Ms. Beth Ann Velo presented the FY 2009 Report to NSB on the NSF Merit Review Process. The presentation included an overview of the report structure and highlighted new items in this year's report. The presentation also included information on the NSF implementation of the ARRA, as well as update on trends concerning funding size, award size, support of new Principal Investigators (PIs), and personnel supported by research grants.

A&O discussed its intent to work with CPP to review, and potentially revise, the policy on award thresholds that requires NSB approval. A white paper was provided to CPP by the Board Office, and A&O expected continued discussion on this report with NSF management and a report-out at the August 2010 meeting.

The committee voted to recommend approval by the full Board of the draft transmittal letter and management response for the March 2010 *Office of Inspector General Semiannual Report to Congress*.

The Board unanimously APPROVED the transmittal letter and management response to the March 2010 *Office of Inspector General Semiannual Report to Congress*.

Lastly, Dr. Arvizu expressed his thanks to Ms. Joanna Rom and Mr. Bruce Carpel, A&O Executive Secretaries, for their excellent support during the course of his 4 years as committee chairman. He also thanked the Board Members, especially those who served on A&O, for their diligent contributions to the work of the committee.

c. Committee on Education and Human Resources (CEH)

Dr. Camilla Benbow reported on behalf of Dr. John Bruer, CEH chairman. She stated that the committee reviewed the final draft of the report, *Preparing the Next Generation of STEM Innovators* (NSB/CEH-10-3, Revised April 20, 2010; Board Book page 295). The latest version of the report incorporated feedback received from more than a dozen external reviewers who praised the document as being well-written, engaging, important, and timely. Dr. Leshner, who provided substantial feedback on earlier versions, felt that the most recent revisions improved the paper and that the inclusion of additional data made the underlying rationale of the report more convincing and compelling.

The committee supported a motion to bring the latest draft of the report, *Preparing the Next Generation of STEM Innovators*, before the Board for final approval with the following three minor edits: include explicit mention of mentoring under Recommendation I, Policy Actions D and E, pages 314 to 315; remove reference to the Institute of Research and Policy on Acceleration and their guidelines under Recommendation I, Policy Action A; and revise language regarding "malleability" of intelligence in the last paragraph on page 310. CEH recommended approval of the report by the Board subject to final edits.

The Board unanimously APPROVED the *Preparing the Next Generation of STEM Innovators: Identifying and Developing Our Nation's Human Capital* report, subject to final edits by the Board Chairman, the CEH chairman, and Dr. Benbow.

Dr. Benbow reported that the committee also selected a cover for the report, which she displayed to the Board. The cover art shows ideas and building blocks of STEM; for example, equations, gears, and DNA molecules, springing from the mind and forming future discoveries and innovations. As requested by the committee, the cover colors will be enhanced.

The committee briefly discussed the timeline for publication. After incorporation of final edits, the Board Office anticipates delivery to the print shop at the end of June 2010 and an August 2010 publication date. Dr. Robinson noted that the Board Office will work with senior Administration leadership, including the Secretary of Education, to have a high profile rollout of the report.

Dr. Benbow thanked members of the *ad hoc* Task Group on STEM Innovators: Drs. John Bruer, Louis Lanzerotti, José-Marie Griffiths, Diane Souvaine; the team of experts in the Directorate for Education and Human Resources (EHR); Dr. Cora Marrett, Acting Deputy Director; Dr. Patricia Johnson, U.S. Department of Education, and especially Dr. Alan Leshner for all of his comments. She also stated that the committee acknowledged the significant efforts and leadership of Dr. Matthew Wilson, Board Office staff.

The committee also focused on proposed changes to programs managed in the EHR Division of Human Resource Development (HRD) that support broadening participation of underrepresented students in STEM education and career pathways. Drs. Joan Ferrini-Mundy, Acting EHR Assistant Director, and Caesar Jackson, Acting HRD Division Director, provided a presentation on some of the proposed changes summarized in “NSF Comprehensive Broadening Participation of Undergraduates in STEM (CBP-US), Draft Concept Paper for Community Review” (NSB/CEH-10-6, Board Book page 343). Dr. Lee Todd, Jr., chairman of the EHR Advisory Committee, also participated in this session.

Dr. Ferrini-Mundy reported that the considered changes were motivated by the President's FY 2011 Budget for HRD, which includes a 14 percent, \$13 million, increase over FY 2010 to be used for the development of a comprehensive program to increase attainment of bachelor's degrees in STEM-related fields among underrepresented minority student groups. EHR is considering how best to use this opportunity to accelerate its efforts to broaden participation in STEM and build on lessons learned from current HRD investments and programs.

Dr. Jackson described the four components of a comprehensive program that were currently considered: (1) Louis Stokes Model Alliances would incorporate effective strategies developed through previous LSAMP investments and help to create better pathways for underrepresented students that capitalize on intramural networks and collaborations across a variety of institution types; (2) transformative initiatives would focus on building institutional capacity and infrastructure to support recruitment and retention; (3) targeted initiatives would focus on supporting individual faculty or departments at levels needed to improve the direct experiences that influence student success; and (4) education research would continue to explore and test innovative models for effective recruitment and retention of underrepresented students in STEM.

EHR hoped that outcomes of these changes will include: new, wider and more innovative pathways for students; more synergistic collaborations among minority-serving institutions; more effective capacity building; increased co-funding and leveraging with other NSF directorates and other agencies; new alliances with science-rich organizations, including with large labs; and greater potential for replication, implementation, and scale-up of productive practices through collaborations.

Dr. Ferrini-Mundy indicated the next steps in this process included plans to engage other NSF directorates and agencies, seek input from the community through regional workshops and public forums, continue discussions already underway related to White House initiatives, and synthesize best practices from recent research in this area.

Further committee discussion highlighted the concerns about finding the right balance between spreading the wealth and more focused investments; effective integration with the research experiences for undergraduates (REU) programs, which provide an important additional resource; and the tradeoffs between continual innovation and increasing the adoption of known effective approaches. Dr. Todd shared his views on the importance of identifying specific mechanisms for meaningful engagement between NSF and appropriate entities elsewhere in the government and private sector that can help with dissemination and scale-up of useful programs.

d. Committee on Science and Engineering Indicators (SEI)

Dr. Louis Lanzerotti, SEI chairman, reported that the committee heard accounts of rollout activities for *Science and Engineering Indicators 2010 (Indicators)* since the February 2010 Board meeting, including the press event at the American Association for the Advancement of Science (AAAS) Annual Meeting in San Diego on February 19, 2010 that featured the Board's Companion Piece and the Web's State Indicators Chapter attended by about 40 people.

Dr. Lanzerotti stated that he and Dr. Beering discussed the *Indicators* data in a briefing to PCAST. Mr. Rolf Lehming, Director, Science and Engineering Indicators Program, Division of Science Resources Statistics (SRS), briefed the American Society of Mechanical Engineers R&D caucus on Capitol Hill. Mr. John Gawalt, SRS, presented utilization data on Web views for *Indicators*, the Digest, and Companion Piece since the rollout. His major findings and major report showed a sizable increase over comparable 2008 numbers in each category, especially for the *Indicators* Digest. Ms. Lisa-Joy Zgorski, OLPA Public Affairs Specialist, summarized press activities since the rollout, which suggested an increased use of *Indicators* as a resource for science and technology, science and engineering stories.

The committee also discussed the aftermath of the Board's decision not to include data from two true/false survey questions about evolution and cosmology in the 2010 *Indicators*. *Science* magazine reported on this decision and summarized some of the reasons that led the Board to conclude that responses to these questions were not a reflection of public understanding, but rather that the simple questions conflated understanding with beliefs. Dr. Lanzerotti stated that he took responsibility for not having added a note of explanation about this decision in *Indicators*, and noted that the Board publicly discussed concerns with these questions several times in the past. He stated that several cosmologists recently told him that the true/false question on the "Big Bang" issue, so-called "explosion," substantially misstates the essential findings of the science in this area.

Dr. Lanzerotti also stated that scientific literacy questions reported in *Indicators* should be thoroughly reexamined. He raised this matter with Dr. Myron Gutmann, Associate Director, Directorate for Social, Behavioral, and Economic Sciences (SBE), through several communications over the past month or so. Dr. Gutmann agreed to use his expertise and that of his office and the social science community to consider a wide range of views about the design and analysis of questions on science literacy for the upcoming edition of *Indicators*.

Dr. Gutmann was in the early phases of planning a study on this issue. He expects to consider how we should think about scientific literacy broadly, especially as it relates to the topics of these two questions, and what is the right methodology to examine this topic overall in terms of ascertaining Americans' understanding and knowledge base on science and engineering topics. Dr. Gutmann plans to hold two or more workshops in the fall to draw on the full range of knowledge in the sciences. He expects to prepare a preliminary report for the Board's December 2010 meeting and an additional report, possibly a final report, for the Board's meeting in early 2011.

Dr. Lanzerotti stated that SEI saw a demonstration of the draft *Indicators* Web-based Education Tool in December 2009, which is being developed for the Board by the Science and Technology Policy Institute (STPI) and designed to expand the audience for *Indicators* data, targeting pre-college education. Since December 2009, an expanded and enhanced version of this Web tool

was distributed to the Board that included draft chapters and texts and a "help" facility for comment. All of the comments received were incorporated with the exception of what to call this enhanced Web tool. Dr. Gutmann suggested testing several titles to see how users respond to them, and the committee agreed. The committee recommended the Educational Tool, close to final form with the exception of the title, be brought to the full Board for approval, subject to final edits.

The Board unanimously APPROVED the *Indicators* Education Tool, subject to final edits and a final determination of the title approved by the Board Chairman and SEI chairman.

Finally, Dr. Lanzerotti thanked all of the Board Members, SRS staff, and Board Office staff who worked on *Indicators* over the last 6 years during which Drs. Beering and Lanzerotti served as SEI chairmen. He recognized Dr. Robert Bell and Mr. Rolf Lehming from SRS for their outstanding support, work, encouragement, and advice during the past 2 years. He also thanked the Board Office for its help, especially Dr. Robinson for his insights on numerous occasions. Lastly, he thanked the "unsung" Ms. Jean Pomeroy, Board Office staff, for her reliable guidance and suggestions.

e. Committee on Programs and Plans (CPP)

Dr. Kelvin Droegemeier, CPP chairman, reported on the award recompetition policy addressed at the February 2010 Board meeting. Dr. Bement provided an update on the award recompetition policy and noted that as NSF did not feel that it had clear guidance in the *Large Facilities Manual* regarding a recompetition policy, Dr. Marrett will develop stronger guidance and return to the Board in August 2010.

CPP continued discussion on strategies for handling the substantial CPP workload in an effort to balance programmatic and planning related issues. CPP will distribute a white paper, prepared by Dr. Elizabeth Strickland, Board Office staff, to continue that conversation and bring some possible scenarios forward at the August 2010 meeting.

The committee heard two information items. The first information item was for the iPlant Collaborative. Dr. Joann Roskoski, Acting Assistant Director, Directorate for Biological Sciences (BIO), and Dr. Judy Verbeke, Deputy Division Director, BIO Division for Biological Infrastructure (DBI), updated the Board on the status of this project, which is geared toward using cyberinfrastructure to build a broader user community to identify and prioritize "grand challenges" in the plant sciences.

Additionally, the CPP heard from Dr. José Munoz, Acting Assistant Director, Office of Cyberinfrastructure (OCI), and Dr. Philip Bogden, OCI Program Director, who presented an update on the DataNet program, which is an important part of the OCI portfolio and timely. DataNet is a program that will integrate library and archival sciences, cyberinfrastructure, computer and information sciences, as well as domain expertise, to catalyze a national and international data network of data nodes and virtual communities. Board Members asked questions about discrepancies in potential DataNet directions, and whether it will be for specific researchers or for users looking to establish some type of community. Dr. Bogden explained that they view those two approaches as complementary, and it was too early to determine the ultimate

direction of the project. Board Members also asked about whether NSF has learned much in the two previous awards made last year. CPP expects to see three award recommendations before the Board at the August 2010 meeting.

In closing, Dr. Droegemeier thanked a number of colleagues: Dr. Beering for allowing him to be CPP chairman; Dr. Bement as well as the NSF Deputy Directors, Drs. Kathie Olsen and Cora Marrett, for their leadership and inspiration; and the Board Members and CPP members who served with him. He stated that the Board worked hard and effectively to steward this Nation's resources to ensure that the scientific community benefits as much as possible and moves forward. Additionally, he thanked the NSB Executive Officers, Drs. Craig Robinson and Michael Crosby; Dr. Elizabeth Strickland, Board Office Liaison to CPP; Ms. Sonya Mallinoff and Ms. Lisa Lewis, CPP Executive Secretaries; Ms. Jennie Moehlmann, Board Office Policy Branch Chief; Ms. Jennifer Richards, Executive Secretary for the Task Force on Cost Sharing; and Ms. Ann Ferrante, Board Office Writer-Editor.

CPP Subcommittee on Polar Issues (SOPI)

Dr. Droegemeier stated that Dr. Karl Erb, Director, Office of Polar Programs (OPP), provided an update on activities at the South Pole Station. He began by reminding the committee that December 2011 will mark the 100th anniversary of Roald Amundsen's successful exploration of the South Pole. Also, IceCube met its stretch goal of installing 20 strings last year while reducing the per string fuel consumption by 13 percent. Dr. Erb further reported that the South Pole Station is almost 98 percent complete.

Proposals submitted in response to the Antarctic support contract competition will require additional time to evaluate; consequently, the current contract was extended by 1 year and the ceiling raised by \$170 million as a result of that delay. Dr. Erb also circulated a draft Charter of the Review of the U.S. Antarctic Program (USAP) Committee for comment, and Mr. Simon Stephenson, OPP Division Director, reported on the recent State of the Arctic Conference that was supported by NSF, the National Oceanic and Atmospheric Administration (NOAA), and others.

CPP Task Force on Support of Mid-Scale and Multi-Investigator Research (MS)

Dr. Droegemeier reported that this task force was formally established in February 2010 with the following task force members: Drs. Mark Abbott, Esin Gulari, Diane Souvaine, and Thomas Taylor. Also joining the task force are: Dr. Thomas Peterson, Assistant Director, Directorate for Engineering (ENG), and Dr. Joann Roskoski, Acting BIO Assistant Director.

Dr. Droegemeier reminded CPP that the important central focus of this task force is to ensure that Principal Investigators (PIs) have flexibility to creatively design unsolicited mid-scale projects and propose those projects to NSF.

Dr. Bement noted that this investigation is an ideal place to explore how to incorporate graduate talent via traineeship programs like the Graduate Research Fellowship Program at NSF. He also noted that incorporating graduate researchers is one of the more difficult challenges in starting mid-scale projects with normal modes of funding. Dr. Robinson commented that Congress is interested in looking at the issue of mid-scale instrumentation and facilities. Dr. Droegemeier

reported that MS will continue collecting data on NSF's past and current support of mid-scale research activities in preparation for the August 2010 meeting.

f. Committee on Strategy and Budget (CSB)

Mr. Arthur Reilly, CSB chairman, reported that Dr. Bement provided an update on the FY 2011 Budget Request. He noted that, to date, he testified at three congressional hearings, but it was still considered early in the budget process, and no action was imminent. As in the recent past, NSF may need to initially operate under a Continuing Resolution. Dr. Marrett provided an update on the ARRA funding. She noted that NSF continues to be on track to obligate the \$3 billion appropriated to it under ARRA. Dr. Marrett described the substantial amount of effort by NSF staff to meet the administrative reporting requirements associated with ARRA funds. In particular, she noted that OLPA made great strides in communicating to the public the outstanding research that NSF has been able to support with these funds. Board Members continued to express concerns regarding the additional burden on staff in meeting the extensive requirements associated with the increased number of awards as a result of the ARRA funding.

Dr. Clifford Gabriel, Acting MPS Executive Officer and Chairman of the NSF Strategic Plan Working Group, provided an update on the NSF's progress on revising the NSF Strategic Plan. The Plan is needed to guide the early phases of the development of the FY 2012 Budget. Dr. Gabriel thanked the Board for their inputs to the document, noting that the Board influenced many areas, including the Vision Statement and strengthening of the education component. CSB recommended to the Board that after NSF staff and Advisory Committee comments were addressed, the initial draft Plan should be reviewed by EC and forwarded to OMB for review and comment prior to the August 2010 meeting. Mr. Reilly asked if there were any objections by the Board to go forward on this basis, and no objections were stated.

Mr. Reilly also reported that Dr. Robinson discussed the NSB Budget, and provided a breakdown of the current budget and projected budgetary needs. For greater clarity, Board Members requested more detailed budget information with background materials and information on current Board Office staffing and duties at the August 2010 meeting.

As this meeting was the conclusion of Mr. Reilly's CSB chairmanship, he thanked the CSB members and Board Members for their many contributions to the work of the CSB, with special thanks to Mr. Darren Dutterer and Ms. Holly Smith, CSB Executive Secretaries, in helping plan, conduct, and report on the CSB meetings. He also thanked Dr. Droegemeier who worked closely between CSB and CPP, along with other committees. Lastly, he commented that the camaraderie and the teamwork exhibited by the Board Members had been exemplary.

CSB Subcommittee on Facilities (SCF)

Dr. José-Marie Griffiths, SCF chairman, identified the following key issues for discussion: the concept of balance at the NSF directorate and division levels; the guidance that the NSB can provide that would be most helpful to NSF; and how to think about cost and risk drivers in future years. The subcommittee noted the complexity of the portfolio review and the time needed to analyze the data in a meaningful and accurate way.

The discussion of potential areas for NSB guidance highlighted the need to structure and manage the research infrastructure portfolio to optimize scientific impact, serve a broad-based research community, maintain flexibility to respond to emerging opportunities, and address the changing global context for research. To ensure effective progress towards developing recommendations for the August 2010 meeting, a meeting between SCF and the NSF Assistant Directors will be scheduled during the summer. The purpose of the meeting would be to identify the issues for which NSB guidance might be most helpful and the framework for providing such guidance. SCF will explore the development of broad principles and alternative planning scenarios to help NSF in framing decisions on research infrastructure investment. Additionally, the subcommittee will also identify data that will be needed for the 2011 portfolio assessment, and will consult with the Task Force on Support of Mid-Scale and Multi-Investigator Research.

CSB Task Force on Data Policies (DP)

The new task force held its initial meeting with Dr. José-Marie Griffiths, DP chairman. Dr. Edward Seidel, Acting MPS Assistant Director, provided an update on current NSF data policy activities. He described examples of data policies currently in use by other U.S. and international science organizations. He noted NSF's intent to unveil a change in the implementation of long-standing NSF policy, and the changes would be designed to address trends and needs the modern era of data-driven science brings. About October 2010, NSF will begin requiring that all proposals include a data management plan in the form of a two-page supplementary document. These plans will be subjected to peer review and will allow flexibility at the directorate and division levels to tailor implementation as appropriate. Details of the proposed changes were discussed and Board Members expressed interest in being kept apprised of any changes prior to implementation.

g. Task Force on the NSB 60th Anniversary (60ANN)

Dr. Patricia Galloway, 60ANN chairman, reported on the accomplishments and status of various plans associated with the 60th Anniversary of NSB and NSF. The Symposium entitled "The Future of NSF on Its 60th Anniversary," held at the AAAS Annual Meeting in San Diego, on February 20, 2010, was a successful opportunity to bring together a distinguished panel of five current and former NSF Directors, who gave enlightening presentations to a well-attended seminar. She thanked the Symposium speakers for their exceptional participation: Dr. Arden Bement, Mr. Erich Bloch, Dr. Rita Colwell, Dr. Neal Lane, and Dr. Walter Massey. She also thanked Mr. John Tsapogas and Ms. Ann Ferrante, Symposium Organizers, as well as NSF staff Ms. Susan Mason, Ms. Karen Sandberg, and Ms. Tracy Gorman, for their efforts in assisting with the many details of the event. As a follow-up to the Symposium, the NSB Web site now has a special section called "NSB-NSF 60th Anniversary Events for 2010" under the heading "Topics of Interest," which includes information and photographs related to the Symposium, the Distinguished Lecture Series, as well as links to the Symposium and lecture videos on the NSF Web site.

Regarding the 60th Anniversary Distinguished Speakers Series, "Voices from the Future," Dr. Galloway reported that Dr. Paul Oh, Director, Autonomous Systems Lab at Drexel University and Associate Department Head of Drexel's mechanical Engineering Department, was the first of the distinguished speakers to give a presentation to the full Board and the public at the February 2010 meeting. OLPA videotaped the presentation and conducted an interview

with Dr. Oh. The videos were also added to the NSF Web site as a special report as well as the NSF History Web site, with an additional link on the NSB site. Videos of the other distinguished speakers, who will be presenting at the August and December 2010 meetings, will be added to the Web sites, following their talks.

Dr. Galloway reported on several updates relating to 60th Anniversary activities and events. Ms. Sandberg gave an update to the task force on the OLPA activities relating the 60th Anniversary. She announced that the "Sensational 60" document was been completed, and printed copies were provided to Board Members. "Sensational 60" was the result of a concerted effort of staff across all of NSF, with each directorate and office providing input. The document will also be available on the NSF Special Report and NSF History Web sites on NSF.gov. Additionally, the NSF History Web site will host a number of the 60th Anniversary activities and events including the "Sensational 60," the "Voices from the Future," the AAAS Symposium videos, as well as an interactive NSF History timeline.

Ms. Sandberg also provided an update on several congressionally related accomplishments. She announced that House Resolution 1307, which honors NSF for 60 years of service to the Nation, was introduced by House Committee on Science and Technology Chairman Bart Gordon and Ranking Member Ralph Hall on April 29, 2010. The Resolution was passed on May 4, 2010. Also, a Presidential Proclamation for NSF's 60th Anniversary was in the White House review process. Finally, Ms. Sandberg reported that a flag will be flown over the U.S. Capitol commemorating NSF's 60th Anniversary on May 10, 2010. The flag will be displayed at NSF.

Mr. Tsapogas, former chairman of the NSF 60th Anniversary Working Group, gave an update on implementation of several activities. He noted that banners with the 60th Anniversary theme were hung inside the north and south entrances to Stafford I, and posters with the theme were displayed in Stafford II. The theme and anniversary logo were used by NSF staff in activities and events throughout this year, including NSF's Annual Staff Awards Ceremony to be held in June 2010. Additionally, theme-based presentations for NSF staff were planned for 2010, including NSF videos from the 1980s, which reflect how work was conducted at NSF some 30 years ago. Mr. Tsapogas also noted the celebration of the 50th Anniversary of NSF's Tokyo Office during 2010, and that the U.S. Ambassador to Japan accepted an invitation to host an event in Tokyo to honor the 50th Anniversary of the Tokyo Office.

Dr. Galloway added that NSF now offers the 60th Anniversary logo on apparel, which is available from the NSF Employee Association.

h. Task Force on Merit Review (MR)

Dr. Alan Leshner, MR chairman, reported that the task force established a workplan, and thanked Dr. Joanne Turnow, MR Executive Secretary, and Ms. Kim Silverman, Board Office Liaison, for their assistance. He stated that the task force formalized the draft charge and workplan (NSB/MR-10-3, Board Book page 357). The task force engaged in a full-ranging discussion and identified a number of potential questions, sources of input, and potential mechanisms for gathering data. The workplan dictates that the task force will report back to the Board in 1 year. Dr. Gutmann and his colleagues agreed to do a search through the Committee of Visitors reports on issues related to the use of the review criteria. The task force recommended that the charge

and workplan for approval by the Board be amended to add Mr. Jeffrey Nesbit, OLPA Director, as an NSF Liaison. Based upon this recommendation, the Board acted as follows:

The Board unanimously APPROVED the charge and workplan of the Task Force on Merit Review. (NSB-10-45) (Appendix B)

Dr. Beering adjourned the Open Session at 3:50 p.m.

[signed]

Ann A. Ferrante
Executive Secretary
National Science Board

**2009 Annual Report of the Executive Committee
National Science Board**

In accordance with the requirements of 42 U.S.C. § 1865 (d), I hereby submit this annual report of the National Science Board (Board, NSB) Executive Committee, as approved at the Executive Committee meeting on May 4, 2010. This report covers the period from May 2009 through April 2010. I served as Director of the National Science Foundation and the Board's Executive Committee chairman during the above time period.

The elected Board membership of the Executive Committee during the past year was as follows:

Dr. Steven C. Beering
Dr. Patricia D. Galloway
Dr. Camilla P. Benbow
Dr. Ray M. Bowen

Dr. Clifford J. Gabriel, acting Executive Officer, Mathematical and Physical Sciences Directorate, served as Executive Secretary of the Executive Committee during this time period.

The Executive Committee met 7 times during this period (May 2009, September 2009, October 2009, November 2009, December 2009, and February 2010). The September meeting was held in Columbus, Ohio and was chaired by acting Deputy Director Dr. Cora Marrett. The remaining meetings were held at the National Science Foundation in Arlington, Virginia. Oral reports of its activities were made at meetings of the full Board and are reflected in the minutes of those meetings. The October and November meetings were closed sessions held by teleconferences.

The Executive Committee's powers and functions are based on a delegation of authority to it by the Board according to 42 U.S.C. § 1865(a). The Board's current delegation to the Executive Committee (Attachment B to NSB-99-158) authorizes the Executive Committee to approve awards on behalf of the Board when an immediate decision is required between Board meetings and when the necessary action is not within the authority of the Director of the National Science Foundation. The Executive Committee did not act on behalf of the Board during this reporting period.

/s/
Arden L. Bement, Jr.
Chairman
Executive Committee

NATIONAL SCIENCE BOARD TASK FORCE ON MERIT REVIEW

Background

All National Science Foundation (NSF) proposals, as part of the Merit Review process, are evaluated with respect to two equally important Merit Review Criteria—Intellectual Merit and Broader Impacts. The two-criteria system was instituted in 1997, replacing a four-criteria system in place since 1981, in which reviewers had evaluated researcher performance competence, intrinsic merit of the research, utility or relevance of the research, and effect on the infrastructure of science and engineering. The new system was implemented after careful study by the National Science Board /NSF Staff Task Force on Merit Review whose report, *National Science Board and National Science Foundation Staff Task Force on Merit Review: Discussion Report*, was released for community comment in November 1996, after which it was revised and approved by the Board in March 1997. At that time, a set of contextual elements was established for each of the two criteria and defined by questions to assist the reviewer in understanding their intent. These elements were seen as not necessarily relevant or complete for the evaluation of all proposals; other considerations may be important for the evaluation of some proposals. Additionally, reviewers were requested to address only those elements that they consider relevant to the proposal at hand and for which they feel qualified to pass judgment. The new system was communicated to the research community via *Important Notice 121, New Criteria for NSF Proposals*, (<http://www.nsf.gov/pubs/1997/iin121/>) on July 10, 1997 and implemented October 1, 1997.

Several years later, the NSB was requested by Congress to conduct a review of the NSF merit review process. The Board conducted the review and issued its report in September 2005, concluding that the NSF merit review process is fair and effective, and “remains an international ‘gold standard’ for review of science and engineering research proposals.” In the report, the Board provided several recommendations for NSF to improve the transparency and effectiveness of the NSF merit review process, while preserving the ability of the program officers to identify the most innovative proposals and effectively diversify and balance NSF's research and education portfolio. (*FY 2005 Report on the NSF Merit Review System*: http://www.nsf.gov/nsb/documents/2006/0306/merit_review.pdf). In response to the Board's recommendations, NSF implemented an agency-wide effort to address quality of reviews, transparency of the award/decline decision, and support of transformative research. (*Report to the National Science Board on the National Science Foundations' Merit Review Process FY 2005*: http://www.nsf.gov/nsb/documents/2006/0306/merit_review.pdf)

Charge to the NSB Task Force on Merit Review

Five years have passed since the last review of the Merit Review process and a new National Science Foundation Strategic Plan will be issued shortly. Moreover, the current review criteria have now been in effect for over a decade, and in light of reports of some confusion in the field and inconsistency of their application and impact, it is timely for the National Science Board both to evaluate the current criteria with respect to their definitions and the way they are applied to the NSF portfolio of increasingly complex and interdisciplinary projects, and to ask whether the Merit Review process could be enhanced or modified, by clarifying or amending the statements of the Merit Review Criteria.

The NSB Task Force on Merit Review is hereby reconstituted at the February 3-4, 2010 National Science Board meeting. The Task Force is charged with examining the two Merit Review Criteria and their effectiveness in achieving the goals for NSF support for science and engineering research and education. This may include revising the merit review methodology, revising one or both of the merit review criteria and the way they are interpreted and applied, or the task force may find that the methodology and criteria are clear and function as intended with no further changes or action required.

The first steps are for the Board and NSF senior staff to identify relevant data sources, to define the issues, and outline possible options to make the use of review criteria more effective in meeting NSF's mission. **A work plan should be submitted to the Board at its May 2010 meeting with the goal of a report with policy recommendations at the May 2011 meeting.** During that one-year period, the Task Force should solicit input widely from the research and stakeholder communities and may solicit special studies as appropriate.

Membership on the NSB Task Force on Merit Review are NSB members: Dr. Alan Leshner, Chairman, Dr. Ray Bowen, Dr. John Bruer, Dr. Esin Gulari, Dr. Lou Lanzerotti, Dr. Douglas Randall, Dr. Diane Souvaine, Dr. Thomas Taylor, and NSF Liaison members on the Task Force, Dr. Lance Haworth, Dr. Tim Killeen, and Mr. Jeff Nesbit.

NSB Task Force on Merit Review Work Plan

Process and Strategies

This work plan describes the process and strategies for gaining input from stakeholders regarding their understanding of the NSF merit review criteria as applied to the proposal and award process, analyzing and discussing the findings, and working with NSF leadership.

The stakeholder groups are both internal and external to NSF and mainly include research communities and their institutions (external) and NSF program officers (internal). The input gained from this study will inform the task force on how best to proceed with follow-up action, which includes detailing the findings, deliberating recommendations, discussing recommendations with NSF leadership, and working together to find the best solutions. This may include revising the merit review methodology, revising one or both of the merit review criteria and the way they are interpreted and applied, or the task force may find that the methodology and criteria are clear and function as intended with no further changes or action required.

The first steps are for the task force to identify relevant data sources, to define the issues, and outline possible options to make the use of the merit review criteria more effective in meeting NSF's mission.

The steps in the process are as follows:

- 1. Determine the way the current criteria, and their instructions, are interpreted and utilized by both proposers and NSF program staff.**
 - Survey program officers and NSF leadership - The goal of this internally-focused survey is to gain broad insight as to how program officers apply the criteria when 1) advising Principal Investigators on how they address the criteria within their proposals and 2) directing their reviewers in determining to what extent the criteria has been met within each proposal.

- Solicit and collect feedback from principal investigators and institutional research officials
2. **Integrate survey input, summarize findings and deliberate recommendations.**
 3. **Create draft recommendations and vet with NSF internal and external stakeholder groups that may include NSF staff, university administration, policymakers, OSTP, and Congress.**
 4. **Produce and publish a Task Force Report disclosing the process, strategies, findings and recommendations for the NSF Merit Review process going forward. (Report due by May 2011.)**

**NSB Merit Review Task Force
Timeline**

Date	Task
March 2010	Task Force teleconference to discuss work plan and finalize draft Task Force charge
March – May 2010	Task Force members develop a plan of action—determine the questions they want answered; the information necessary to attain the answers; and the means by which to gather the information
May 4-5, 2010	Task Force meeting at Board meeting to discuss next steps in proceeding with the internal and external survey (or study)
May – August 2010	Design and implementation of internal survey to program officers
May – Dec. 2010	Design, clearance, and implementation of external survey to Principal Investigators (Note: Approximately 6-9 months is needed for survey development and the required OMB clearance process for external surveys)
August 25-26, 2010	Task Force meeting at Board meeting to discuss progress on the surveys and results of the internal survey to NSF program officers
August – Sept. 2010	Review and compile findings from internal survey
September 2010	Offsite Board meeting/Informal discussion of progress
Sept. – Dec. 2010	Complete analysis of internal survey findings and begin to formulate recommendations
Dec. 1-2, 2010	Task Force meeting at Board meeting to review and discuss results of external survey
Dec. – Feb. 2011	Complete analysis for external survey, form draft recommendations and vet recommendations with NSF internal and external stakeholders
Feb. – May 2011	Draft final report with findings and recommendations for merit review criteria

REVIEW-IN-BRIEF OF THE CURRENT CRITERIA

Intellectual Merit

A critical criterion for NSF's funding of research has been the proposed project's intellectual merit, both in overall quality and in significance to the broader field. A concern has arisen over the past few years, however, that the current system is missing the importance of some more transformative (often also called high-risk, high-payoff) research and that the system has become a bit more conservative as funds have become more constrained, despite efforts by NSF to emphasize transformative research. (See Important Notice No. 130: Transformative Research, Sept. 2007: <http://www.nsf.gov/pubs/2007/in130/in130.jsp>). In light of the report of the NSB's Task Force on Transformative Research and the recommendation of the Companion Piece to *Science and Engineering Indicators 2010, Globalization of Science and Engineering Research* (NSB 10-3), namely "The National Science Foundation should assess its two criteria for funding of S&E research to ensure that the criteria encourage the proposing and support of truly transformative research, and should modify the criteria and/or merit review process if the assessment finds modifications necessary to accomplish this goal," special consideration should be given to whether the current criteria and their implementation are accomplishing the goal of supporting the best of all kinds of research.

Broader Impacts

The Broader Impacts criterion identifies the important outcomes and consequences of NSF-supported research. Anecdotal evidence suggests that this requirement can be very confusing to the research community, which continues to express frustration in interpreting and thus responding effectively to the Broader Impacts criterion when creating a proposal. In July 2007, *Merit Review Broader Impacts Criterion: Representative Activities* (<http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf>) was made available to PIs in the *Grant Proposal Guide*, which includes examples of ways that broader impacts could be incorporated into research projects. These examples are quite diverse but that diversity can also make them confusing to proposers and to NSF program staff attempting to address the Broader Impacts criterion in the review and decision process. There also is concern that these examples can appear to be directive yet are not fully inclusive. For example, they do not fully reflect the importance of impacts on such issues as innovation, national security and economic growth. Finally, there appears to be substantial confusion about how best to meet the requirements of this criterion, whether on an individual project level or at the proposing institution level.