

## MEMORANDUM TO MEMBERS OF THE NATIONAL SCIENCE BOARD

**SUBJECT:** Summary Report of the March 30, 2006 Meeting

The major actions of the National Science Board (NSB, the Board) at its 391st meeting on March 30, 2006 and a preliminary summary of the proceedings are provided. This memorandum will be publicly available for any interested parties to review. A more comprehensive set of NSB meeting minutes will be posted on the Board's public Web site (<http://www.nsf.gov/nsb/>) following Board approval at the May 2006 meeting.

### 1. Major Actions of the Board (not in priority order):

- a. The Board approved the minutes of the Plenary Open Session (NSB-06-20) for the February 2006 meeting ([http://www.nsf.gov/nsb/meetings/0329/open\\_minutes.pdf](http://www.nsf.gov/nsb/meetings/0329/open_minutes.pdf)). Minutes for the Plenary Executive Closed and Closed Sessions for the February 2006 meeting of the Board were also approved.
- b. The Board approved recipients for the 2006 Alan T. Waterman Award, Vannevar Bush Award, and the NSB Public Service Awards. Alan T. Waterman Award: Dr. Emmanuel Candes, Professor of Applied and Computational Mathematics, California Institute of Technology. Vannevar Bush Award: Dr. Charles Townes, Professor in the Graduate School, University of California, Berkeley; and Dr. Raj Reddy, Mozah Bint Nasser University Professor of Computer Science and Robotics, School of Computer Science, Carnegie Mellon University. NSB Public Service Awards - Individual: Mr. Alan Alda, actor, writer, and director; and Dr. Craig Barrett, Chairman of the Board and former Chief Executive Officer, Intel Corporation. National Public Service Award – Group: Association of Science-Technology Centers (ASTC), Washington, DC.
- c. The Board approved a resolution to close portions of the upcoming May 9-10, 2006 Board meeting dealing with staff appointments; elections of Chair, Vice Chair, and Executive Committee Membership; future budgets; grants and contracts; specific Office of the Inspector General investigations and enforcement actions; and National Science Foundation participation in a civil or administrative action, proceeding, or arbitration (NSB-06-36) (<http://www.nsf.gov/nsb/meetings/2006/0509/closing.pdf>).
- d. The Board authorized the NSF Director, at his discretion, to extend the existing cooperative agreement with the California Institute of Technology for the operation of the Laser Interferometer Gravitational-Wave Observatory (LIGO) laboratory in FY 2007 and FT 2008 and for a program of research and development (NSB-06-31).

- e. The Board elected Drs. Jane Lubchenco, Daniel Simberloff, John White, and Mark Wrighton to the *ad hoc* Committee on Nominating for NSB Elections. The committee is charged with creating a slate of candidates for the election of Board officers in May.
- f. The Board Chairman announced the establishment of the *ad hoc* Committee on Board Nominations for the Class of 2008 – 2012. The committee is charged with developing a slate of candidates to fill the eight Board Member vacancies that will occur on May 10, 2008 to transmit to the President in early 2007. Members will be appointed to the committee at the May Board meeting.
- g. The Board Chairman discharged the *ad hoc* Task Group on Vision for NSF, and thanked Dr. Kathryn Sullivan, chair, and Drs. Barry Barish, Nina Fedoroff, and Douglas Randall for their efforts on producing the publication *National Science Board 2020 Vision for the National Science Foundation* (NSB-05-142).
- h. The Board unanimously approved the establishment of a Board Commission on 21st Century Education in Science, Technology, Engineering and Mathematics (STEM) and approved the charge to the Commission (NSB-06-39) (Attachment).

## **2. Board Chairman's Report**

Dr. Warren Washington, Board Chairman, reported that, as approved at the February meeting, he notified Senator John McCain that the Board will, as the Senator requested, examine the existing policies of Federal science agencies concerning the suppression and distortion of research findings and the impact on quality and credibility of all future Government-sponsored scientific research results. Dr. Michael Crosby, NSB Office Director, gave an update on the results, to date, of the Board's requested examination and possible recommendations for Senator McCain. Dr. Washington asked Drs. G. Wayne Clough, Louis Lanzerotti, and Alan Leshner to help draft a formal response to Senator McCain providing findings and recommendations resulting from the Board review. The draft response will be provided to the Board for Review in advance of the Board meeting in May.

On March 2, 2006, Dr. Washington testified before the Committee on Appropriations, Subcommittee on Science, State, Justice, and Commerce, and Related Agencies. He discussed the FY 2007 NBF budget request, the Board's budget for FY 2007, and a summary of Board activities during the last year. The subcommittee asked the Board to participate in a broad outreach effort to counter cavalier treatment by several prominent commentators of the serious problem for the U.S. with respect to rapidly increasing global competition in science and technology research and education. The subcommittee also requested that the Board respond with editorials to negative comment and seek to educate major news sources for opinion leaders on the importance of investment and scientific research and education for the Nation. Additionally, the Board was asked to look into ethical issues of nanotechnology, and to coordinate with other Federal agencies involved in nanotechnology on this matter.

On another congressional issue, on March 17, 2006, the Board responded to Senator Jeff Bingaman's request to review and provide comment on "Protecting America's Competitive Edge" Acts, commonly referred to as PACE. The Board had issued a number of reports and policy statements over the last decade that address many of the issues highlighted in the proposed PACE legislation.

Dr. Washington acknowledged the accomplishment of Dr. Jane Lubchenco who was awarded the Public Understanding of Science and Technology Award from the American Association for the Advancement of Science last month. He also announced that the American Chemical Society will honor Dr. Arden Bement in April. Dr. Mark Wrighton announced that Dr. Washington was recently granted the special designation of "Honorary Member" of the American Meteorological Society. Also, Dr. Washington will be awarded an honorary doctorate from Oregon State University during its commencement in June.

The Board had sponsored three hearings concerning the proposed Board Commission on 21<sup>st</sup> Century Education in STEM. Those hearings were held during December at the Cannon House Office Building in Washington, February at the University of Colorado at Boulder, and March at the University of Southern California, Los Angeles. Dr. Steven Beering reported on the Education Commission hearings. Together with Drs. Elizabeth Hoffman and Jo Anne Vasquez, Dr. Beering concluded that the Board should establish a new Education Commission and approve the charge to the Education Commission. *[The full Board subsequently approved the charge to the NSB Commission on 21<sup>st</sup> Century Education in Science, Mathematics, and Technology (NSB-06-39).]* (Attachment)

### **3. NSF Director's Report**

Dr. Arden Bement, NSF Director, introduced the following new NSF staff: Dr. Daniel E. Atkins, Director, Office of Cyberinfrastructure (full time as of June 2006); Dr. Thomas Weber, Director, Office of International Science and Engineering (as of February 2006); and Ms. Mayra N. Montrose, Program Manager, National Medal of Science and the NSF point of contact with the Office of Science and Technology Policy for all Presidential awards (as of January 2006). Dr. Bement also announced the completed tenure of Dr. Michael Turner, Assistant Director, Mathematical and Physical Sciences (as of March 31, 2006), who has served NSF with distinction since his appointment in October 2003.

The House Committee on Government Reform recently graded 24 Federal agencies on how well each agency met the requirements in the Federal Information Security Management Act. In this annual report, NSF's score rose from "C+" to "A," although many agencies posted poor scores with an overall grade for the Government "D+." NSF's improvements were the result of the consistent hard work, dedication, and foresight of many individuals and reflect an NSF-wide commitment to excellence.

The NSF Director reported on the following congressional hearings held since the last NSB meeting that involved NSF. On February 15, 2006 he testified before the House Science Committee on NSF's 2007 budget request. Also on February 15, Dr. Richard Buckius, Acting Assistant Director for Engineering, testified before the Senate Commerce, Science and

Transportation Committee, on the latest developments in nanotechnology research. On March 1, 2006 Dr. Bement also testified before the Education and Early Childhood Subcommittee of the Senate Health, Education, Labor and Pensions Committee, on the subject of the PACE bill. With Dr. Washington, on March 2, 2006 Dr. Bement testified before the Committee on Appropriations, Subcommittee on Science, State, Justice, and Commerce and Related Agencies hearing on NSF's budget request. On March 29, 2006 Dr. Bement testified at the hearing for the Technology and Innovation Subcommittee of the Senate Commerce, Science and Transportation Committee, on a bill to establish a national innovation initiative. Lastly, the House Science Committee held a hearing, March 30, 2006 to discuss "K-12 Science and Math Education Across the Federal Agencies" at which Dr. Bement also testified.

Finally, Dr. Bement reported on the following legislation. Senator Edward Kennedy (D-MA) introduced the 'Right TRACK Act' (S. 2357) on March 2, 2006. The bill authorizes funds for NSF Research and Related Activities, starting at \$4,826 million for FY 2007 and escalating to \$8,550 million for FY 2013. S. 2357 also authorizes funding to double NSF's Education and Human Resources Directorate, beginning at \$887 million for FY 2007 escalating to \$1,500 million for FY 2011.

#### **4. NSB Committee Reports**

(Note: The Executive Committee did not meet in March 2006.)

##### **a. Audit and Oversight (A&O) Committee**

###### Open Session

Clifton Gunderson LLP, the 12<sup>th</sup> largest accounting firm in the U.S., received a contract to audit NSF's financial statements starting in FY 2006. Mr. Salvatore Ercolano, a partner with Clifton Gunderson, introduced the new financial statement auditors to A&O.

Dr. Fae Korsmo and Dr. James Lightbourne presented highlights of the *Report to the National Science Board on the National Science Foundation's Merit Review Process, FY 2005* (NSB-06-21). This report includes an added feature that indicates the number of people supported by NSF research awards (e.g., graduate students, postdoctoral associates, principal investigators, and co-principal investigators), which has increased by 18 percent since FY 2000. It also provides an update of NSF actions underway in response to recommendations made in the September 2005 *Report of the National Science Board on the National Science Foundation's Merit Review System* (NSB-05-119).

Mr. Thomas Cooley, NSF Chief Financial Officer, updated the committee on the progress in remediation of the FY 2005 audit reportable conditions and the additional resources that will be provided to address them. The "reportables" were based on findings of the previous auditor, KPMG; and the new accounting firm will make an independent assessment. Mr. Cooley also reported on efforts to meet the requirements of the Office of Management and Budget (OMB) Circular A-123, "Management's Responsibility for Internal Control."

## Closed Session

OIG presented information about several ongoing investigations.

### **b. Education and Human Resources (EHR) Committee**

Dr. Donald Thompson, Acting Assistant Director, NSF Education and Human Resources (NSF/EHR) Directorate, provided background to the committee on the unique role of NSF in STEM education and the evaluation of NSF's education investments. Dr. Thompson reviewed the various evaluation tools used by NSF/EHR as it builds capacity in the evaluation of its programs.

Dr. Elizabeth Hoffman, EHR chair, introduced two reports summarizing recent evaluations of NSF/EHR programs. One report, *Revitalizing the Nation's Talent Pool in STEM*, 2006, Urban Institute, critically analyzes the impact of the Louis Stokes Alliances for Minority Participation (LSAMP) Program. The report contains striking data on the program's impact on participating institutions and educational and career outcomes for participating LSAMP students. The second report was a brief document summarizing the results of a 10-year evaluation of the impact of teachers, classroom practices, and use of instructional materials, *Lessons from a Decade of Mathematics and Science Reform: A Capstone Report for the Local Systemic Change through Teacher Enhancement Initiative*, updated February 2006, Horizon Research, Inc. Local Systemic Change was an initiative funded by NSF's Division of Elementary, Secondary, and Informal Education designed to address the professional development of all teachers responsible for teaching science and/or mathematics with educational systems. The committee also discussed the need for in-depth evaluations of all appropriate NSF/EHR programs, along the lines of the LSAMP evaluation, and agreed to invite representatives from the Council of Graduate Schools to report on their work related to NSF education activities at the May meeting.

Dr. Steven Beering and Dr. Hoffman reported to the committee on the three hearings that have been held by the Board over the last few months to consider a new Board Education Commission in STEM, and the revised charge to such a Commission that had been circulated for comment to the members before the Board meeting. The EHR committee agreed to give the full Board positive support for undertaking a Commission. [*The full Board subsequently approved the charge to the Board Commission on 21<sup>st</sup> Century STEM Education (NSB-06-39).*] (Attachment)

Dr. Louis Lanzerotti briefed the committee on next steps for the Board's "Workshop on Engineering Workforce Issues and Engineering Education: What are the linkages?" held at the Massachusetts Institute of Technology (MIT) in October 2005.

The committee heard from Dr. Crosby, who noted that discussions have been taking place with the Sloan Foundation and the Council of Graduate Schools on the topic of professional Master of Science degrees, and will be an item for discussion on the agenda for the May EHR meeting.

### **c. EHR Subcommittee on Science and Engineering Indicators (SEI)**

Dr. Beering, SEI chairman, reported that *Science and Engineering Indicators 2006* (NSB-06-1) was transmitted by the President to Congress on February 14, 2006, which was the earliest date that it had been released by the White House—within a month of the statutory submission date. He also noted that the media rollout was held on Capitol Hill on February 23, 2006. Dr. Beering further reported that he and Dr. Vasquez initiated the media event with presentations on data and trends of interest and on the Companion Piece, *America's Pressing Challenge – Building a Stronger Foundation* (NSB-06-2), followed by an extended question and answer period, in which Dr. Kathie Olsen, NSF Deputy Director, also participated.

A discussion on the evolution of *Indicators* focused on options for enhancing the utility of *Indicators* to an expanded and broadened use community. *Indicators 2008* would be submitted to the President by January 15, 2008.

### **d. Committee on Programs and Plans (CPP)**

#### Open Session

The committee was updated on several issues: Dr. Michael Turner, Assistant Director, Directorate for Mathematical and Physical Sciences, reported on the Atacama Large Millimeter Array (ALMA). He stated that the largest budget item of the project was resolved, with both antenna contracts now signed. The project rebaselining was also completed, reviewed, and verified. NSF plans to bring an action item before the Board at the May NSB meeting. Dr. Deborah Crawford, Acting Director, Office of Cyberinfrastructure (OCI) informed the committee that Dr. Daniel Atkins, Director, OCI will be on staff permanently in June. The committee requested that NSF provide another draft of Version 6.0 of the CI Vision document by May that will take into account specific recommendations made at the March meeting. Dr. James Collins, Assistant Director, Directorate for Biological Sciences, also presented an update on the National Ecological Observatory (NEON).

One information item was presented to the committee: Plans for Review of the Proposed 5-Year Renewal of Support of the National Superconducting Cyclotron Laboratory (NSCL) (NSB-06-23) by Dr. Turner.

#### Closed Session

The committee considered and approved one action item: Extension of the Cooperative Agreement for Operation of the Laser Interferometer Gravitational-Wave Observatory (LIGO) in FY 2007 and FY 2008, California Institute of Technology resolution (NSB-06-5). [*The full Board subsequently approved the Extension of the Cooperative Agreement for Operation of LIGO in FY 2007 and FY 2008* (NSB-06-31).]

**e. CPP Subcommittee on Polar Issues (SOPI)**

SOPI heard reports on several issues: Dr. Scott Borg, Section Head, Antarctic Sciences, Office of Polar Programs (OPP), provided an update on International Polar Year activities. The FY 2006 solicitation, a partnership between NSF's OPP and EHR, was released, and emphasized three scientific focus areas: arctic observing network; life in the cold and dark; and ice sheet history. An additional solicitation will be issued in FY 2007. Mr. Lawrence Rudolph, NSF General Counsel, discussed the issue of tourism regulation by the Antarctic Treaty Consultative Parties. He introduced Dr. Polly Penhale, Environmental Officer, OPP, who provided a brief overview on the growing number of tourists to the Antarctic and environmental impacts related to tourism. Dr. William Wiseman, Program Manager, Arctic Sciences Section, reported on the Bering Ecosystem Study (BEST). He provided an overview of the importance of the Bering Sea fisheries for commercial and subsistence purposes. Lastly, Mr. Erick Chiang, Section Head, Polar Research Support, provided an update on the U.S. Antarctic Program resupply situation for 2005-2007.

**f. CPP Task Force on Transformative Research (TR)**

Dr. Nina Fedoroff, TR chair, discussed the upcoming workshop on May 16, 2006 at NSF that will focus on transformative research perspectives from non-government organizations, including industry and private foundations. The task force also discussed the compilation of a draft report to summarize the outcomes of four TR workshops in the past 2 years.

**g. CPP Task Force on International Science (INT)**

Dr. Jon Strauss, INT chairman, and Dr. Crosby updated the task force on the recent meetings they had to discuss major issues in the area of the task force's charge. The task force agreed to hold the first hearing on May 11, 2006, immediately following the Board's May meeting in Washington, DC. This hearing will focus on Federal agencies actions relating to international science partnerships from the U.S. and abroad. The task force also discussed potential venues and a timeline for future activities abroad. Finally, the task force heard an update from Dr. Thomas Weber, Director, Office of International Science and Engineering, on the status of recommendations made in the Board's interim report *Towards a More Effective NSF Role in International Science and Engineering* (NSB-00-217).

**h. CPP Task Force on Hurricane Science and Engineering (HSE)**

The task force discussed the first two workshops and plans for the third and final workshop that will be held on April 18, 2006. Timing for the task force's analysis and the release of the final report were discussed, including the presentation of the findings at an appropriate national meeting. The group also discussed the task force's outreach activities, including participation in the annual Interdepartmental Hurricane Conference organized by the Office of the Federal Coordinator for Meteorological Services and Supporting Research.

**i. Committee on Strategy and Budget (CSB)**

Dr. Ray Bowen, CSB chairman, addressed three critical issues: strategic planning; budget development; and award size, duration, and success rates.

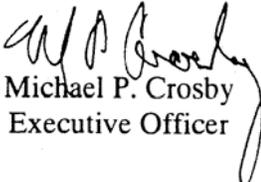
Dr. Olsen described the process for developing NSF's Strategic Plan for FY 2006-2011. The Plan integrates with the Board's Vision, provides framework for developing yearly budgets and performance plans, contains information required by law, and follows OMB guidance. A draft plan will be provided to the Board well in advance of the May meeting.

The NSF budget went to Congress in an information-gathering stage. Two House hearings were held, both with strong congressional support for NSF. The May Board meeting will focus on long-range planning, including identifying priorities for the FY 2008 budget. The starting point will be investment areas in the FY 2007 budget: advancing the frontier, broadening participation in the science and engineering enterprise, providing world-class facilities and infrastructure, and bolstering K-12 education.

Discussion of the Board guidance on award size, duration, and success rates was continued from previous meetings. Dr. Olsen established an NSF working group to investigate proposal and award management mechanisms. It could take up to a year for to complete the study. Dr. Bowen requested a summary of directorate activities at the May 2006 CSB meeting.

**j. *ad hoc* Committee for the Vannevar Bush Award**

The Vannevar Bush Award Committee selected a candidate for the 2006 award to recommend to the Board. *[The full Board subsequently approved the 2006 recipient of the Vannevar Bush Award.]*

  
Michael P. Crosby  
Executive Officer

Attachment: [NSB-06-39](#)

## **CHARGE TO THE NATIONAL SCIENCE BOARD COMMISSION ON 21<sup>ST</sup> CENTURY EDUCATION IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS**

### **BACKGROUND**

Over the last two decades, numerous reports and statements from eminent bodies representing the broad range of national interests in science and technology literacy in U.S. society and skills in the U.S. workforce have sounded alarms concerning the condition of pre-K-16 education in science and technology areas. Nevertheless, our Nation's education competitiveness continues to slip further behind the rest of the world. A number of spokespersons for the science and engineering education communities have urged the National Science Board (the Board) to undertake an effort similar to the 1982-1983 Board Commission on Pre-college Education in Mathematics, Science, and Technology. Congressional Appropriations Committee report language for FY 2006 stated that they strongly endorse the Board taking steps to "establish a commission to make recommendations for the National Science Foundation (NSF) and Federal Government action to achieve measurable improvements in the Nation's science education at all levels," and expects the Board to "report the commission's findings and recommendations to the Committee at the conclusion of the commission's work." Subsequently, the Board held three public hearings to explore the merit of establishing a special Commission on Education for the 21<sup>st</sup> Century. By approving this charge, the Board has decided to establish such a Commission to develop a national action plan addressing issues that have inhibited effective reform of U.S. science, technology, engineering, and mathematics (STEM) education.

### **STATUTORY BASIS UNDER THE NSF ACT**

Under 42 U.S.C. § 1862 (d): "The Board and Director shall recommend and encourage the pursuit of national policies for the promotion of...education in science and engineering." 42 U.S.C. § 1863(h) authorizes the National Science Board "to establish such special commissions as it may from time to time deem necessary for the purposes of this chapter." The Board Commission on 21<sup>st</sup> Century Education in Science, Technology, Engineering, and Mathematics (the Commission) will conduct its activities according to the Federal Advisory Committee Act (FACA) and other authorities, including applicable conflict-of-interest laws and regulations.

### **OBJECTIVES**

The Commission will make recommendations to the Nation through the Board for a bold new action plan to address the Nation's needs, with recommendations for specific mechanisms to implement an effective, realistic, affordable, and politically acceptable long-term approach to the well-known problems and opportunities of U.S. pre-K-16 STEM education. The objective of a national action plan is to effectively employ Federal resources cooperatively with those of stakeholders from all sectors including but not limited to: Federal, State and local government agencies; parents, teachers and students; colleges—including community colleges; universities, museums and other agents of formal and informal education outside the K-16 systems; industry; and professional, labor and public interest organizations to encourage and sustain reform of the national pre-K-16 STEM education system to achieve world class performance by U.S. students, prepare the U.S. workforce for 21<sup>st</sup> century skill needs, and ensure national literacy in science and mathematics for all U.S. citizens.

In developing a national action plan, the Commission will address the following issues and identify the specific role of NSF in each:

- Improving the quality of pre-K-16 education related to both general and pre-professional training in mathematics, engineering and the sciences, including, but not limited to: the availability of competent teachers; the adequacy and currency of curricula, materials, and facilities; standards and trends in performance, as well as promotion, graduation and higher-education entrance requirements; and comparison with performance and procedures of other countries.

- Identifying critical aspects in the entry, selection, education and exploitation of the full range of potential talents, with special attention to transition points during the educational career where loss of student interest is greatest; and recommend means to assure the most effective education for all U.S. students as well as future scientists, engineers and other technical personnel.
- Improving mathematics and science programs, curricula, and pedagogy to capitalize on the Nation's investment in educational research and development and appropriate models of exemplary education programs in other countries.
- Promulgating a set of principles, options and education strategies that can be employed by all concerned, nationwide, to improve the quality of secondary school mathematics and science education in the 21<sup>st</sup> century, as an agenda for promoting American economic strength, national security, employment opportunities, and social progress that will support U.S. pre-eminence in discovery and innovation.

## **MEMBERSHIP AND STRUCTURE**

The Board Commission will consist of up to fifteen (15) members appointed by the Chairman of the Board, in consultation with the full Board, the Executive Branch, Congress and other stakeholders. The Board Chairman will designate a Commission chairperson and vice chairperson from among the members. No more than three Commission members will be appointed from current Board membership. Commission members will be persons whose wisdom, knowledge, experience, vision or national stature can promote an objective examination of mathematics, science and technology education in the pre-K-16 system and develop a bold new national action plan for the 21<sup>st</sup> century.

A quorum of the Commission will be a majority of its members. Terms of service of members will end with the termination of the Commission. The Commission may establish such working groups, as it deems appropriate. At least one member of each working group shall be a member of the Commission. A Commission member will chair each working group, which will present to the Commission findings and recommendations for consideration by the Commission. Timely notification of the establishment of a working group and any change therein, including its charge, membership and frequency of meetings will be made in writing to the Executive Secretary or his/her designee. Management (including Executive Secretary and Designated Federal Official (DFO)) and staff services will be provided by the Board Office under the direct supervision of the Board's Executive Officer. Commission working groups will act under policies established by the Commission, in accordance with FACA and other applicable statutes and regulations.

## **MEETINGS**

The Commission will meet as requested by the chairperson. Working groups will report to the full Commission and will meet as required at the call of their chairperson with the concurrence of the Commission chair. Meetings will be conducted, and records of proceedings will be kept, in accordance with applicable laws and regulations.

## **EXPENSES**

Per diem and travel expenses will be paid in accordance to Federal Travel Regulations.

## **REPORTING**

The future action plan will especially focus on the appropriate role of NSF in collaboration and cooperation with other Federal agencies, State government, local school districts, gatekeepers, business and industry, informal STEM educational organizations, professional associations, scientific organizations, and parents and other citizens interested in improving education in mathematics, science and technology for our Nation's children. In addition to its final report, which is expected 12 months from the initial meeting, the Commission will submit to the Board periodic progress reports at least every 4 months. The Commission will develop an action plan that includes a plan for public dissemination and outreach for Commission activities, recommendations, and reports.



Warren M. Washington  
Chairman