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BOARD ON CHEMICAL SCIENCES AND TECHNOLOGY

Douglas J. Raber
Director

Progress Report
for Period June 15, 1991 - December 31, 1992

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National Academy of Sciences - National Research Council
Commission on Physical Sciences, Mathematics, and Applications

BOARD ON CHEMICAL SCIENCES AND TECHNOLOGY

The Board on Chemical Sciences and Technology serves as the focal point within the National Research Council for concerns and issues affecting chemistry in its broadest sense.

In addressing its mandate to foster the growth and health of research and education in chemical sciences and technology, the Board will:

- o undertake studies that define opportunities and needs for education and research in the chemical sciences and technology, particularly where a significant impact on national policy is plausible;
- o conduct its assigned oversight role for standing and ad hoc committees and for the chemistry-related National Committees of International Unions of Biochemistry, Crystallography, and Pure and Applied Chemistry; and
- o establish and maintain a high level of communication with scientists and scientific organizations that represent chemical sciences and technology.

Board activities require extensive planning for potential studies (including the determination of feasibility, evaluation of scope, and acquisition of funding), private-sector fund raising, and a broadly directed effort to communicate Board activities to the chemical community. All of these are *core activities*, which are not chargeable to specific project budgets. The capacity to develop a new project while paying costs partially or fully from core funds greatly enhances the freedom and ability of the Board to act responsively to important issues in the field of chemistry and chemical technology.

The Board meets three or four times per year. In addressing its mandate to provide advice that will foster the growth and health of research and education in chemical sciences and technology, Board activities fall into three general areas:

- o To undertake studies that define opportunities and needs for research and education in the chemical sciences and technology, particularly where a significant impact on national policy is likely.
- o To conduct its assigned oversight role for standing and ad hoc committees and for the chemistry-related National Committees of International Scientific Unions.
- o To establish and maintain a high level of communication with scientists and scientific organizations that represent chemical sciences and technology.

The BCST organizes and oversees work of the following committees charged with addressing specific issues important to the chemical sciences and technology community:

- o Committee on Nuclear and Radiochemistry
- o AFOSR Review and Evaluation Panels
 - AFOSR Chemical Sciences Review Panel
 - AFOSR Atmospheric Sciences Review Panel
 - AFOSR High Energy Density Materials Panel
- o USNC for the International Union of Biochemistry
- o USNC for the International Union of Crystallography
- o USNC for the International Union of Pure and Applied Chemistry

Core funding has played an important role in the success of the Board's efforts, not only in facilitating the conception and planning of studies, but also in organizing follow-up activities to highlight and disseminate the reports' conclusions. During the present reporting period the BCST published a report titled, *Critical Technologies: The Role of Chemistry and Chemical Engineering* (1992). The distribution of this report is over 17,500. Active dissemination activities were also carried out for *Catalysis Looks to the Future*.

Also during this reporting period, under the auspices of its Committee on Nuclear and Radiochemistry, the Board published the latest in a series of monographs on nuclear medicine: *The Chemistry of Technetium in Medicine*.

Two additional projects undertaken by the Board are now nearing completion that will lead to publications in the near future. These will be of widespread interest to the broad chemical community, from traditional chemistry and chemical engineering to the new frontiers of biotechnology:

- o *Examination of Research Needs in Advanced Extraction and Processing of Oil and Gas*, 1993 (spring). The Department of Energy, Office of Fossil Energy asked the Board to carry out a study that would update the Board's 1987 report, *Future Directions in Advanced Exploratory Research Related to Oil, Gas, Shale and Tar Sands Resources*. This report will reexamine (1) future needs and priorities in novel and promising areas of fundamental research related to oil, gas, shale, and tar sands, (2) scientific questions that cut across the full spectrum of fossil fuels; and (3) crosscutting research areas, (4) reservoir access and drilling technology and, (5) physical, chemical, and thermodynamic properties of heavy hydrocarbons from oil and coal-derived liquids.
- o *Polymer Science and Engineering: The Shifting Research Frontier*, 1993 (spring). This report will identify new directions, national needs, and scientific opportunities in the field of polymer chemistry and chemical technologies.

A full listing of BCST committees for FY 1992 is summarized in the Appendix.

SCOPE AND SIGNIFICANCE

The Board on Chemical Sciences and Technology is concerned with areas that can contribute to the solution of important national problems, particularly for those areas of chemical science and technology in which federal interagency cooperation could be productive, where gaps can be found in the support of key areas of research and education, or where increased attention of the scientific and technological community is needed to advance the frontiers of research and education.

The activities of the Board are of considerable benefit to all aspects of the community it serves. BCST reports on research needs and opportunities provide information about the shifting frontiers of knowledge in highly specialized areas, helping the research community to focus its efforts for maximum effectiveness. The same information enables administrators, policymakers, and funding agencies to make plans that optimize the use of limited resources.

As the Board increasingly initiates its own projects rather than awaiting government requests for studies, BCST staff efforts are expanding significantly. These endeavors include private-sector development and fund raising programs, extensive planning for a variety of new studies, and a broadly directed effort to communicate Board activities to the chemical community. These are all *core activities*, which are not chargeable to specific project budgets. The availability of core funds to plan and develop new projects greatly enhances the capability of the Board to act responsively to important issues in chemistry and chemical technology.

PLAN OF ACTION

The Board on Chemical Sciences and Technology will continue its enhanced level of activities that includes extensive planning and development for a variety of potential studies (requiring determination of feasibility, evaluation of scope, and acquisition of funding in each case), a private-sector development and fund raising, and a broadly directed effort to communicate Board activities to the chemical community.

The following list of projects describes current and planned BCST activities for the immediate future and provides a good overall picture of the direction and scope of Board activities for the proposed funding period. Sources of non-core funding are indicated where appropriate. The new activities are in general not yet funded and therefore illustrate the need for core funds during the development stage of a project. Additional projects will be developed by the Board through its Planning Subcommittee with broad input from the chemical science and technology community.

- o *Committee on Nuclear and Radiochemistry.*

Fully funded through a core grant from the Department of Energy, the Board's Committee on Nuclear and Radiochemistry monitors the health of research and education in this critical area (which will become increasingly important as the U.S. increases its commitment to nuclear power). In 1992 the CNR organized a Workshop on the Availability of Isotopically Enriched Materials. The committee continues to sponsor the series of monographs in the field of nuclear and radiochemistry.

o ***AFOSR: Proposal/Program Review for Atmospheric and Chemical Sciences.***

The BCST has established several standing panels to assist the Air Force Office of Scientific Research in the formal evaluation of research proposals and in carrying out periodic evaluations of the related AFOSR programs. The activity is fully funded by the AFOSR through a contract period of 11/01/90-10/31/95.

o ***US National Committees for IUPAC, IUCr, and IUB.***

In addition to standard oversight and coordination responsibilities, the BCST provides staff support for meetings and other activities of the National Committees, particularly for IUPAC and IUCr. Current activities include

- coordination of the U.S. Affiliates program for IUPAC
- organization of the (*Younger Chemists*) observer program to increase participation of new scientists at the IUPAC General Assembly in August 1993.
- organization of the annual IUPAC Company Associates program

Support of program staff for these activities is funded through a grant from NSF to the Office of International Affairs of the NRC on behalf of ICSU (International Council of Scientific Unions).

o ***Prudent Practices for Storage, Handling, and Disposal of Chemicals in Laboratories.***

The Board is undertaking a substantial project to revise and update *Prudent Practices for Handling Hazardous Chemicals in Laboratories* and *Prudent Practices for Disposal of Chemicals from Laboratories*, two of the most widely distributed reports of the National Academy Press. Since their publication in the early 1980s the fields of laboratory safety, occupational health, and chemical waste handling have undergone substantial evolution, and there have been significant new regulatory developments. Both the laboratory and regulatory communities will benefit substantially from this study, which will provide an updated report that is responsive to current knowledge and regulations.

o ***Applications of Separations Technology and Transmutation to the DOE Waste Disposal System.***

The Board in collaboration with the Board on Radioactive Waste Management, is conducting a review of the applications of separations technology and transmutation to the Department of Energy's radioactive waste management programs. The main work of the study is being carried out under the aegis of the Board on Radioactive Waste Management.

The project has been approved by the NRC, which has also committed significant funds; additional funding is currently being sought from both Federal and private sources.

o ***Environmental Research: Opportunities & Needs in the Physical Sciences and Technology.***

Recognizing that many of the major problems in the environmental area are chemical in nature, the Board has initiated plans for a study to identify research needs and opportunities to obtain chemical and technological solutions to environmental problems. The focus would encompass

pollution prevention and reduction strategies as well as remediation of existing problems. The study would provide valuable information to government agencies for allocation of funds and would also alert the chemical and chemical engineering research community to the need for their increased participation. The NRC has provided funds for a planning meeting in May 1991 to determine the need and scope for a full study.

- *Mathematical Methods in Computation Chemistry.*

This activity will identify mathematical sciences research opportunities, both collaborative and independent, in the area of computational chemistry. The work of the study will be carried out under the aegis of the Board on Mathematical Sciences.

- *Curriculum Bites*

The Board will develop curriculum supplements for undergraduate chemistry. For a series of topics, relatively brief (5-10 pages each) review will be produced for important and high-visibility topics. Each review will enable the instructor to incorporate the material into an existing course.

- *Corporate Sponsorship Program.*

Corporate sponsorship of BCST activities is being solicited with a coordinated development campaign undertaken in cooperation with the NRC Development Office. Sponsorship is sought at the \$5,000 level with a target of participation by 20-30 major representatives of the U.S. chemical industry.

- *BCST Newsletter, REFLECTIONS.*

The Board's newsletter is produced on an annual basis. This again represents the greatly increased efforts by the Board to communicate effectively with its constituent community.

Reports resulting from the efforts supported by these funds will be prepared in sufficient quantity to ensure distribution to the sponsors, committee members, and other relevant parties in accordance with Academy policy. Reports of the Board or its committees may be made available to the public without restrictions.

An estimate of costs for the period June 15, 1993 through June 14, 1994 follows.

APPENDIX

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Terms expire June 30 of year shown

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Terms expire June 30 of year shown

August 1992

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