National Research Council (II): Answering the Right Questions?

If this Academy is to contribute to solution of the nation's problems, it requires easy access to those who are knowledgeable and have a kind of expertise that most members of the Academy lack. In a sense, this reflects one of the difficulties that I find in the structure of the National Research Council. The Divisions are organized along disciplinary lines: biology, chemistry, physics, behavioral sciences, engineering. But few of the problems of our society neatly pigeon-hole in the same way.—Philip Handler, in a 1969 interview when he was president-elect of the National Academy of Sciences.

Soon after Philip B. Handler took office as president of the National Academy of Sciences (NAS) in 1969 he appointed a special committee headed by Cornell's Franklin A. Long to consider changes in the National Research Council (NRC), the organization through which the NAS carries out its responsibilities to advise the government.

Critics argue that the organization of NRC along disciplinary lines limits its effectiveness in dealing with interdisciplinary problems, particularly those affecting the environment (*Science*, 16 April). Some Academy members have also felt that, as the NRC budget and staff increased, NAS members exercised inadequate control over NRC and its extensive committee operations and that some staff people indulged in uninhibited empire building.

Long says that his committee's examination of NRC structure was complicated by the unsettled status of the National Academy of Engineering, which had been established in 1964 under the NAS charter. A movement to form an Academy of Medicine was also under way, and Long says these stresses and strains inevitably influenced his committee in framing their report.

The Long committee recommendations were taken up at the NAS meeting last April and figured in a day of rather testy debate unusual for the Academy's staid business sessions.

Although phrasing its recommendations in general terms, the Long committee proposed extensive changes in the structures of both NAS and NRC. Historically, NAS has been organized along disciplinary lines in sections to which members are elected. The Long committee suggested replacing the section structure with what would be essentially subacademies of mathematical and physical sciences, life and social sciences, health sciences, and engineering. Ultimately, perhaps a fifth subunit in the behavioral and social sciences would be hived off.

NRC was to be restructured along interdisciplinary lines with major units organized to deal with major problem fields such as health, agriculture, the environment, peace, space, natural resources, and manpower.

To enable the Academy to continue serving the broad interests of the scientific enterprise, an "institute" of the Academy was proposed to deal with policy matters and with international scientific contacts and programs. Strengthening of Academy management was recommended and substantial increases in Academy membership were strongly urged, particularly in behavioral and social sciences and in health sciences. Such an increase was viewed in part as a way to prevent a diaspora of disciplines into separate academies.

Academy members had been sent a letter describing the proposed changes a month in advance of the meeting, but the Long committee's prescription proved too potent for the membership. The typical reaction seems to have been that insufficient time had been provided for reflection and discussion. The report also came up at the tag end of a day on which the members' equanimity had already been frayed. The members had again debated and resisted what has become a perennial effort by Academy member William Shockley to persuade the Academy to encourage research to establish genetic differences among racial groups (*Science*, 8 May 1970). The members had also taken up but not acted on proposals by member Richard Lewontin of the University of Chicago to alter procedures of electing NAS officers and council to open up the process. By the time the Long committee report was brought up, many members were departing to make plane connections, and there was some irritation with Handler about the timing.

The formal action taken by the membership was to "receive" the report, accept the spirit of the recommendations, and ask that a new committee carry the work further. Long says he felt after the meeting that the members' action could be taken as an act of courtesy to a hard-working committee or, on the other hand, says Long, the wording was vague enough so that an activist president and council "could do quite a lot of things." In the year that has followed, some steps have been taken on the path pointed by the Long committee but at a pace calculated not to make the members giddy. The issue of the NAS-NAE relationship remains unresolved; perhaps the major symptom is the failure of NAE to participate in a significant way in the work of NRC.

The differences between the two academies arise from a complex of causes. There have been clashes of personalities, an underlying conflict of style and outlook between scientists predominantly based in universities and engineers with industrial backgrounds and bases, friction involving status and financing between an established older organization and a fledgling newer one, and problems of NRC's prior links and loyalties to NAS. Important also was the fact that the original agreement was loosely drawn and that the hoped-for natural burgeoning of relationships did not occur. Negotiations between the two organizations are apparently at a fairly delicate stage, and both parties are being very discreet about discussing differences.

NAE president Clarence H. Linder, however, says the major outstanding issues between NAS and NAE are "how the two academies will relate as entities and how they will work in the common structure of NRC."

NAE does have basic criteria for judging attempts at reconciliation, says Linder. An NAE inside the Academy structure would have to have "high visibility." There are differences between the scientist's and engineer's approach to problems, and Linder says it is necessary that engineers "find a way to express themselves" and take

National Academy of Sciences: Council Members

Philip H. Abelson, director, Geophysical Laboratory, Carnegie Institution of Washington and editor, *Science*

William O. Baker, vice president for research, Bell Telephone Laboratories, Inc.

George W. Beadle, director, Institute for Biomedical Research, American Medical Association

Kingsley Davis, director of international population and urban research, University of California, Berkeley

Saunders Mac Lane, Max Mason Distinguished Service professor of mathematics, University of Chicago

Clement L. Markert, professor and chairman, biology department, Yale University

James V. Neel, professor and chairman, human genetics department, University of Michigan

James A. Shannon, professor and assistant to the president, Rockefeller University

Robert L. Sinsheimer, professor and chairman, biology division, California Institute of Technology

Kenneth V. Thimann, provost, Crown College, University of California, Santa Cruz

Charles H. Townes, professor at large, physics department, University of California, Berkeley

John W. Tukey, chairman, statistics department, Princeton University

leadership in their own kinds of projects. The engineers also want to be financially able to undertake some projects they feel are important without waiting for the government to come to them. Finally, says Linder, it is "very desirable to find ways to work through a reconstructed NRC."

The real problem dividing the academies, says Linder, is not structure but governance and decision making. Control of NRC is vested in the NAS council and, unless NAE is given a share in decision making, the NAE would be forced to continue to acquiesce to the scientists.

In the long interim since 1964, the NAE has to some degree gone its own way. It has developed about a dozen of its own committees. These committees report to the NAE council and are operationally independent of NRC. The prevailing feeling in NAE is that its members should be more deeply involved in committee work than are most members of NAS. The engineers have, in effect, developed their own mini-NRC but without drawing as heavily on the scientific and engineering community at large as the NRC does.

For Handler and other NAS officials, the outcome of negotiations with NAE are crucial because of the precedents that will exist if other disciplines develop separatist sentiments. The demand for an Academy of Medicine appears to have been answered satisfactorily by the creation of an Institute of Medicine within the Academy. Apparently an acceptable division of activity has been agreed on: the NRC medical sciences division will continue to deal with specific medical problems, such as those posed by drugs or shock, while the institute will concentrate on policy issues such as those affecting medical education and the delivery of medical services (see box, page 355).

Handler says he is not aware of a significant movement for a separate academy of behavioral and social sciences but says he has "the hope and strong belief" that the Academy will begin to elect a sizable number of members in the social and behavioral and medical sciences. He thinks the Institute of Medicine will provide a satisfactory solution "for at least a decade," but, in the case of the engineers, he concedes "the crystal ball is not so clear." Of the NAS-NAE talks, "It would be fair to say that those involved in the conduct of negotiations are pledged to find a modus vivendi fully satisfactory to both sides." Handler points out that NRC utilizes the services of large numbers of engineers already and that an agreement between the academies "would enlarge the responsibilities of NAE for the activities of NRC." He would be surprised, says Handler, if the calendar year ends without resolution of the question.

Meanwhile the Academy is embarked on a course of evolutionary change. In addition to the Institute of Medicine and the planned new division of transportation discussed in the article on NRC last week, Handler has built on institutional innovations made before he took office.

Perhaps the first major effort by the Academy to come to grips with the changing role and status of science was made in the early 1960's during the Academy presidency of Detlev W. Bronk. Academy member George Kistiakowsky, while serving as President Eisenhower's science adviser in the late 1950's, had grown concerned about relations between science and government, and particularly about deficiencies in planning for federal support of various fields of science. Discussions between Kistiakowsky and Bronk led to creation of the group ultimately called the Committee on Science and Public Policy (COSPUP) with Kistiakowsky as first chairman. [The origins and operations of COSPUP were described in an article in *Science*, 28 April 1967.] In its early years, COSPUP, which is made up entirely of members of the NAS, sponsored a series of studies of financial needs and scientific opportunities in various scientific fields. These studies were designed to assist federal budget planners. COSPUP also issued reports on selected important policy issues, including an influential report on population growth. Perhaps most significant, COSPUP reviewed all NRC reports with public policy implications.

In 1966 Kistiakowsky was succeeded by Harvard engineering dean Harvey Brooks (Brooks steps down as chairman in June to be replaced by chemist and Nobelist Melvin Calvin of Berkeley). During the latter half of the decade, COSPUP's relations with government altered significantly. Academy contacts generally had been with the Executive, but in the later 1960's Congress, which had paid little attention to the Academy since 1863 save for occasionally amending its charter, "redis-

National Academy of Engineering: Council Members

Leo L. Beranek, president, Bolt Beranek and Newman Company

Gordon S. Brown, Dugald C. Jackson professor of engineering, Massachusetts Institute of Technology

Henri G. Busignies, senior vice president and chief scientist, International Telephone and Telegraph Corporation

Robert W. Cairns, vice president and member of the board of directors, Hercules Incorporated

Edward E. David, Jr., science adviser to the President and director, Office of Science and Technology

John H. Dessauer, vice chairman of the board of directors, Xerox Corporation

Eugene G. Fubini, consultant

T. Keith Glennan, president emeritus (retired), Case Institute of Technology

Martin Goland, president, Southwest Research Institute

Patrick E. Haggerty, chairman of the board, Texas Instruments Incorporated

Philip Handler, president, National Academy of Sciences

Walter R. Hibbard, Jr., vice president–technical services, Owens-Corning Fiberglass Corporation

H. Guyford Stever, president, Carnegie-Mellon University

covered" the Academy. Mainly on the initiative of former Connecticut congressman Emilio Q. Daddario, the Academy through COSPUP began to serve an advisory role to Congress. A collection of essays titled "Basic Research and National Goals" was the first significant product, and then COSPUP developed a Daddario idea into a report on technology assessment (*Science*, 14 November 1969), which Brooks says in retrospect is the piece of work done by COSPUP during his chairmanship of which he is proudest. [NAE established a COSPUP parallel in its Committee on Public Engineering Policy (COPEP), now headed by former executive secretary of the federal marine resources council Edward Wenk. COPEP produced its own technology assessment report.]

By reviewing reports COSPUP did exercise quality control over NRC work to some extent, but a minority of reports were affected. Again Kistiakowsky, who is the Academy's elected vice-president and a sort of inspector general in spirit, collaborated with Handler in designing a new Report Review Committee (RRC), which for a year has exercised a mandate to review all NRC reports. The RRC does not play the role of censor—committees are made up of volunteers whose sensitivities are acute—but the review group does seek to assure that reports are complete, fair, clearly and concisely written, and free of conflicts of interest. RRC members are all members of the Academy, and, in view of the noninvolvement of many academicians in NRC affairs, it is revealing that fewer than five of the 80 members originally approached turned down the job. Purely technical reports are still assigned to divisions for review, but NRC committees are aware that RRC cares. Reports directed to the White House or Congress are still reviewed by COSPUP.

In addition to COSPUP and the RRC, other new mechanisms through which the NAS council exercises influence over NRC are boards and committees established outside the NRC framework. Among these are joint NAS-NAE entities, perhaps most notably the Environmental Studies Board (ESB). Created in 1967 during the presidency of Frederick Seitz who headed the Academy from 1962 to 1969, the ESB was established to oversee NRC attempts to come to grips with environmental problems which were surfacing then.

In its early period ESB activity was confined mainly to commenting on committee reports with environmental aspects, and the committee drew some unfavorable comment from critics who alleged that the group's views too strongly reflected the industry background of some of its members. Under a new chairman, Gordon J. F. MacDonald, who was last year appointed to the three-member Environmental Quality Council which advises the President, ESB adopted a more activist role. A report of the Florida jetport proposal contributed to a decision to limit the size of the airport to protect the fragile ecology of the Everglades and other neighboring areas (*Science*, 10 October 1969). Later an ESB summer study of the potential ecological effects of the extension of Kennedy International Airport runways into Jamaica Bay undergirded a decision to halt plans for extension.

The Jamaica Bay study marked a milestone, since the committee was accused by some of exceeding its charge by advising against the building of the runways. There was friction within the steering committee and among members of the ESB about the frame of reference for the study. In addition

Hogness to Head NAS Medical Unit

John R. Hogness, director of the University of Washington Health Sciences Center in Seattle, has been appointed the first chairman of the Institute of Medicine, which was formally created last December within the National Academy of Sciences (NAS). He will begin his 5-year term in Washington next August.

The Institute, which supplants the NAS Board on Medicine, represents a compromise for some members who had been pushing for a separate National Academy of Medicine. Unlike the Board, which has limited its studies primarily to substantive, scientific aspects of health care, the Institute will survey the nation's health system from top to bottom. It is expected to be particularly interested in problems of medical education and the delivery of medical care.

Hogness is the "ideal man" for the job of building the Institute, according to its interim chairman, Robert S. Glaser. He was "the top guy on our list from the beginning," says Glaser, because of his prestige in the medical community and his broad background, which includes teaching, research, the practice of medicine, and various administrative positions. Hogness was graduated from the University of Chicago School of Medicine in 1946 and served his internship and residency in internal medicine at Columbia Presbyterian Medical Center in New York. He has been associated since 1950 with the University of Washington, where he has served as medical director of the University Hospital, dean of the Medical School, and chairman of the Board of Health Sciences. He became chairman of the Health Sciences Center last November.

Although Hogness has spent most of his career in academia, Glaser emphasizes that several years of private practice, as well as past membership in the American Medical Association's House of Delegates, has equipped him with an unusually comprehensive understanding of the nation's health problems.

According to Hogness, the Institute answers the need for a single institution that "speaks with a background of distinction" for the entire field of medicine. Studies and research, mostly sponsored by the federal government and private foundations, will be conducted in three categories: medical education, health care delivery, and biomedical research. There are some studies under way which relate to health care, and the Institute has already published a report on physicians' assistants.

The charter membership of the Institute is made up of the 28 members of the Board on Medicine, and membership is soon to be expanded to 100. Ultimately, the Institute will have 400 members, one-fourth of whom will be recruited outside the Academy from fields such as law, political science, and medical economics.—C.H.

NAE Names New Members

The National Academy of Engineering has announced the election of 29 new members, bringing the total membership to 356. Election to the Academy, which was founded in 1964, is the highest professional honor available to an American engineer and is reserved for those who have made significant contributions to engineering theory or technology.

Three prominent public officials are included in the 1971 selection: Hubert Heffner, deputy director of the President's Office of Science and Technology; John Erik Jonsson, mayor of Dallas and honorary chairman of the board of Texas Instruments Inc.; and David Packard, deputy secretary of the Department of Defense.

The other new members are:

Jack Anthony Baird, Bell Laboratories
Benjamin Paul Blasingame, General Motors Corporation
Sidney Allan Bowhill, University of Illinois
Malcolm Roderick Currie, Beckman Instruments, Inc.
Jacob Henrick Douma, Army Corps of Engineers
Rolf Eliassen, Stanford University
Charles H. Elmendorf, III, American Telephone and Telegraph Company
Michael Ference, Jr., Ford Motor Company
Robert Alan Frosch, U.S. Navy (assistant secretary for research and development)
John C. Frye, Illinois State Geological Survey
Edward John Gornowski, Esso Research and Engineering Company
Roy Walter Gould, Atomic Energy Commission
John Dickson Harper, Aluminum Company of America
Lester Lees, California Institute of Technology
David Sloan Lewis, General Dynamics Corporation
John Grimes Linvill, Stanford University
Robert Gustov Loewy, University of Rochester
John Howard Ludwig, Environmental Protection Agency
Thomas Lyle Martin, Jr., Southern Methodist University
George Francis Mechlin, Jr., Westinghouse Electric Corporation
Samuel Cochran Phillips, U.S. Air Force
Thomas Leonard Phillips, Raytheon Company
Robert L. Pigford, University of California
Eugene D. Reed, Bell Laboratories
Joseph Francis Shea, Raytheon Company
Ronald Smelt, Lockheed Aircraft Corporation.

there were difficulties with the NAS council, and the NAE officials felt they hadn't been adequately informed on the progress of the study. All in all it was a major learning experience.

Perhaps the most perplexing and vexing experience arising from an environmental problem, however, came with NAS involvement in the radiation standards controversy (*Science*, 26 February). A group of federal agencies funded a major review of radiation standards by the NAS and National Council on Radiation Protection and Measurements (NCRP). NAS agreed to assess, through NRC, the biological effects of radiation on humans.

Criticism of NAS involvement in the project came from Senator Edmund S. Muskie (D–Maine), chairman of the Senate air and water pollution subcommittee, and from Senator Mike Gravel (D–Alaska). Questions about delays in undertaking the study and about the completeness of data to be studied were asked. But the main question raised was whether some members of the committee were under obligation to the Atomic Energy Commission. After the interrogation, the Academy expanded the committee and altered its composition to balance the dominance of radiologists.

NAS was further implicated in the standards controversy last year in the amendments to the Atomic Energy Act proposed by Representative Chet Holifield (D–Calif.), chairman of the Joint Atomic Energy Committee. Holifield wanted the Environmental Protection Agency to enter into contractual arrangement with NAS and NCRP to carry out a "comprehensive and continuing" study, with NAS focusing on the biological effects of radiation on man. The Administration opposed the measure, apparently successfully, on the grounds that Congress would move decision-making power out of the Executive to private organizations.

The incident poses a problem that is likely to be multiplied for the Academy since Congress has grown skeptical about placing exclusive trust in federal agencies' handling of scientific and technical issues. This is particularly true now that the Executive is controlled by Republicans and Congress by Democrats, but the doubts began long before the 1968 election. Congress looks on the Academy as a competent, independent, scientific authority, perhaps the only one around. Under these circumstances, federal agencies are even likelier to take projects to the Academy for its seal of approval.

The new congressional inclination to write NAS into legislation and to give it statutory function could create several serious problems for NAS. The Academy's option of saying no to a job could be reduced and the independence of the Academy compromised. The Academy bureaucracy would also have to be built up to handle routine business. Since the Academy is a private organization, its committees can now operate in closed session and without public records of proceedings. Insiders say this private, informal atmosphere is essential if volunteers are to continue to serve NRC willingly. If NRC had decision-making functions thrust upon it, its processes would have to be more open to public scrutiny.

Defining the mission of the Academy is difficult because its congressional charter permits such flexibility of action and the NRC is so decentralized in its operations and, in fact, it exercises such independence in accepting work. NRC policy is really defined by the contracts it accepts.

Academy critics have accused it of being a "rubber-stamp" organization by passively accepting commissions offered it by federal agencies. Handler and other Academy officials insist that work is accepted only if the job is important to the nation and nobody else can do it just as well.

Still the criteria for NRC jobs is ill defined. Some Academy members feel that the organization should tackle only narrowly defined technical questions as the only way to protect the credibility of the Academy. Those who disagree say the Academy would speedily become an anachronism since important questions have broader implications.

The current Academy attitude seems to be to exercise caution—but hardly to reject the tough questions. NRC, for example, is engaged in a study of the ecological effects of defoliant spraying in Vietnam. And under amendments to the Clean Air Act passed last year, the Academy has contracted to review the advance of auto-emissions control technology to advise on how rapidly deadlines should be imposed for reduc-

ing pollution. Kistiakowsky, a chemist, who is in close touch with the project, calls it a "hot potato" because it involves "not only technical problems but enormous economic content."

Quality control over the NRC's activities is exercised through COSPUP and the new report review committee, but this is essentially control over the final stage of the process, the "output." The NAS council, the governing body of the Academy, approves all projects at the outset, but many observers say that the bimonthly, weekend meetings with big agendas provide insufficient time for the NAS council—a group of distinguished part-timers—to be really affective gatekeeper.

After his experience as chairman of the committee scrutinizing NRC, Long says he felt that the council should concentrate on playing a policy role and be less involved in the management of the NRC. As for the administration of NRC, Long's view is that division chairmen should serve full time for terms of 2 or 3 years (two divisions are now headed by full-time chairmen—engineering and medical sciences). Long also feels that a new Academy office should be created carrying the duties of vice-president for research.

Academy management has been viewed as anything but top-heavy, since the chairmanship of NRC is combined with the Academy presidency and the offices of vice-president, home secretary, and foreign secretary are all part-time jobs. The chief administrative officer—the title is executive officer—of both NAS and NRC is John S. Coleman. Coleman is an alumnus of the staff of the NRC's undersea warfare committee and a former executive secretary of the physical science division, long regarded as the elite division of the NRC. Coleman has worked closely with Bronk, Seitz, and Handler and played a pivotal role in maintaining NRC's clubby, personal style in picking committees, hiring staff, and administering projects.

To bolster his administration, Handler brought in comptroller Aaron Rosenthal from the National Science Foundation and, as special assistant, Paul Sitton, who served in appointive posts in the last Administration and brought management experience and a knowledge of the federal system to the job. Unless structural changes are made, however, the prevailing manner of management is likely to continue.

An obvious policy issue confronting the Academy involves the frame of reference in which its committees are expected to operate. Critics have scored the Academy for its passivity, particularly on environmental issues. Former Interior Secretary Stewart L. Udall, for example, told a panel audience at the last AAAS meeting that "Whether I agree with their every conclusion or not, I admire Barry Commoner, Garrett Hardin, Kenneth Watt, Paul Ehrlich, George Wald, René Dubos, and all the others for the contribution they have made to an exciting new national debate over science, public priorities, and the future of man." Udall then went on to say that he thought the Academy had been retrograde.

Where to Draw the Line

Certainly there will be increased pressure on the Academy to take initiatives on what are being called "societal" problems. The question is where to draw the line between advice and advocacy. Academy members and officials seem acutely aware that the prestige and the credibility of the Academy depends on the degree to which the advice it gives stands up under scientific scrutiny. In a way, the disembodied conscience of the Academy is its loyalty to the scientific method. Furthermore, in a political sense the Academy membership covers a broad spectrum. As Handler put it in reply to a question of whether he thought the Academy might be "Naderized," "If we began to behave in an evangelical style, we'd no doubt be brought up short by the membership." In sum, there seems little sentiment inside the Academy for a shift from answering questions to espousing causes, but significantly many of the officials and members interviewed for this story said in almost the same words that it was important for the Academy to "answer the right questions."

The Academy style is changing, as the Jamaica Bay study testifies. When committees go beyond purely scientific and technical judgments, ways must be found to make it clear that this has been done. One study now in the works is said to carry a statement that the study reflects the views of a particular group. The matter of candor in caveats is likely to grow more important, and the whole issue of conflict of interest within committees is one the Academy will have to face squarely. NAE is said to be developing a "disclosure" rule to protect itself and its committee members.

One question that hovers over the effort at restructuring is whether the NRC should limit its efforts to work on problems of genuine national importance or should continue in the present pattern of accepting projects that range from the most important to the most routine. The Academy issues a few reports which appear to be trivial potboilers. But the controversy centers on a middle group of projects of middling value. In a sense the Academy is trapped. For an organization of volunteers to do good work it is necessary to have a good staff, and to have a good staff it is necessary to have work.

Pressure for a more selective policy is coming from within the Academy. The NAE attitude is that Academy members should be more directly involved in projects and that only projects of high national priority should be undertaken. The engineers also seem to feel that NRC is a loosely managed operation and that it could be made more responsive and efficient if a more selective policy were adopted.

Neither Handler nor the Academy council have committed themselves on this issue. Realistically, to be more selective in accepting work and to take the initiative on projects it feels are important, the Academy would require more "free money." Institutional funds available for the Academy to mount its own projects amount to only about $100,000 a year, and greater independence requires new sources of funds.

Although evolution is the operative word for the Academy and the question of NAS-NAE cohabitation remains unsettled, Academy members at their meeting next week will be faced with proposals to change the bylaws along lines laid out by the Long committee and Lewontin's suggestions for democratization of election of officers and council members. Debate is likely to be stirred by a proposal to increase the intake of new members to enlarge the membership from the present level of about 850 to some 1200 over the next several years, with the increases concentrated in the social and behavioral sciences and medical fields.

The Academy has been moving from an almost exclusive concern with the relation of science to government to consider also the relation of science to society. Its critics say it is not moving fast enough.

Doubtless the Academy, however reformed and restructured, will continue to serve the interests of science and to serve government, but it is unlikely, in the future, to define the public interest simply in terms of the requests for advice from contracting agencies.

—JOHN WALSH