dust in April, after NCI declined to support its research in radiotherapy with heavy ions. A group of Chicago doctors asked NCI for money to conduct a study on the possibility of using NAL's 200-Mev linear accelerator for proton therapy research, but the request was also turned down. Most recently, the National Aeronautics and Space Administration's Langley Research Center, informed by NASA that its synchrocyclotron would be going down the drain, has asked NCI for $50,000 to help support research with alpha particles. NASA will give limited support for another year if the grant comes through, but hopes are not high.

An NCI official explains that the institute's reluctance to support experiments with new kinds of radiotherapy stems, in part, from the fact that they are afraid of finding themselves carrying an accelerator which may produce nothing of clinical applicability. The deeper problem is that physicists and biologists have a long way to go in understanding each other's fields. Physicists make proposals that biologists think are naive; biologists can't see themselves putting money into a machine designed for physics research.

Even more fundamental is the fact that physicists, long accustomed to getting their way, have not taken the trouble either to establish links with other disciplines or to lay their case clearly before the public.

For these reasons, a report commissioned by the National Academy of Sciences, 2½ years in the making and the most extensive scientific survey ever undertaken by the academy, is being eagerly anticipated. The Physics Survey Committee, according to its director, Allan Bromley of Yale University, will undertake a comprehensive study of the present status, opportunities, and problems of physics. Says Edwin Goldwasser, deputy director of NAL, "For the first time, physicists are facing up to their problems in a quantitative way." The report is expected to be public in a matter of weeks, and if it lives up to expectations, it should supply physicists with potent rationales and a clear set of priorities to prevent further deterioration of the field and wrest back decision-making, which, in these times of stress, has increasingly fallen into the hands of the Office of Management and Budget.

—CONSTANCE HOLDEN

Science Committees: NRC Report Asks Better Mix in Advisory Groups

The committee of outside experts is the primary mechanism through which the federal government gets scientific and technical advice and gives money to support research. For the individual scientist or engineer, being appointed to one of these committees can be like being anointed. It is a mark of acceptance by one's professional peers and can open the way to practical benefits available only to the insider.

From the outset, there have been complaints that the system creates an advisory elite, that it favors a relatively few individuals and institutions, but over the two decades after World War II, when the system reached full flower, both sides, by and large, seemed satisfied with arrangements. More recently, however, critics have complained that younger scientists, members of minorities, and women are grossly underrepresented in the advisory process. In addition, antiwar sentiment has produced a questioning of the morality of scientists' advising government, particularly of serving on Defense Department advisory groups.

One result of the complaints was the formation in 1968 of a National Research Council (NRC) study group to deal with questions raised about advisory committees. The product is a report recently published by the NRC's parent National Academy of Sciences entitled *The Science Committee: A Report by the Committee on the Utilization of Younger Scientists and Engineers in Advisory Services to Government.**

As the report's subtitle implies, the original focus was the involvement of younger scientists and engineers in advisory committees. Funds for the study were provided through ARPA (the Advanced Research Projects Agency), so it is clear that the Department of Defense has a special interest in the matter. But the focus of the study was broadened considerably to comprehend general questions of recruitment, organization, and administration of advisory committees. For the academy, the report is timely because the NRC is in the throes of reorganization, and the NRC, after all, is really one big advisory committee.

Chairman of the study group was Detlev W. Bronk, former president of Rockefeller University, president of the academy from 1950 to 1962, and himself a grand sachem of the advisory system. Among the group's members were Frederick Seitz, Bronk's successor at both the academy and Rockefeller, and Robert K. Merton of Columbia, who is a pathfinder in the sociology of science.†

Nobody would mistake *The Science Committee* for a Nader Raider report. The assumption underlying the report is that the committee system is a necessity, that, on balance, it has proved its usefulness, but that it has some shortcomings which need to be corrected and some inherent weaknesses which need to be guarded against. If ARPA wanted detailed advice on how to recruit young scientists, it did not get it in the report, which it supported, incidentally, to the tune of $100,000. What it did get is a general anatomy lesson on the committee system. The authors, however, are frank in acknowledging the system's flaws as they did in the following excerpt:

> In our exploration and in our own experience we have found both concern and neglect. We have also found examples of the improper employment of committees—for example to avoid or delay executive decision. Sometimes an existing committee is used or a new one is formed out of habit or inertia simply because the advisory framework exists and is convenient, without a clear decision that reference to a committee is the best course in the circumstances.

* Available from Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, NW, Washington, D.C. 20418.

† Other members of the group were George S. Ansell, Rensselaer; Michael Ference, Jr., Ford Motor Co.; Timothy Merz, Johns Hopkins; J. A. Stratton, Ford Foundation; Lewis Thomas, New York University; and Robert K. Weatherall, Massachusetts Institute of Technology, secretary.

The criticisms are couched in the most general terms, however. There are no horror stories, which is a pity, both because Bronk, Seitz, and the others doubtless know some vintage ones, and because the report creates an appetite for concrete cases which it does not satisfy.

Science committees obviously perform diverse functions, and some combine two or more of these functions. Some science committees provide purely technical advice in narrow scientific sectors. "Study sections" in such agencies as the National Institutes of Health evaluate grant applications and judge their comparative merits. General advisory committees meet to provide guidance on the science program of a particular agency, and policy committees may give even more broadly pitched advice on how an agency can achieve the mission it is assigned. Despite the differences, science committees face many of the same generic problems.

Predictably, the NRC study group found that the science committees were dominated by white, middle-aged males. According to the study, the median age of members of NRC committees is 50 years—virtually the same median age as Defense Department advisers. The median age of scientists holding the doctorate is 40. Women hold 7 percent of all doctorates, but only 1 percent are NRC committee members.

The study group urged that more people under age 35, more women, and more members of minority groups be identified and appointed to committees. The report's ambit is considerably broader than recruitment, however, and it puts forward a total of 21 recommendations, grouped under headings of administrative considerations, selection and recruitment of committee members, relations between advisory committees and sponsoring agencies, and an "ethic of service." The report was published in two sections—(i) a slim, pamphlet-sized section containing the recommendations and (ii) slightly weightier appendixes, which include a brief history of science committees and descriptions and evaluation of the data—much of it gleaned from NRC files—on which the recommendations were based.

Science committees have proliferated until, the report estimates, there are now about 1,500 operating. This means a total of roughly 15,000 members and perhaps 2,000 reappointments of incumbents and 3,000 new appointments a year. For science committees in general, the report contains a number of sensible and widely applicable ground rules. A committee should be established only if a real need for it exists and should be continued only if the need persists. When formed, a committee should have its assignment clearly stated and should get adequate staff and supporting services. The report recommends that agencies conduct annual reviews of its committees and terminate committees when their usefulness wanes. The group takes a Jeffersonian

David Visits Japan, Far East

When superpowers start making agreements with each other, they often have to mend fences with other little-, medium-, and big-sized powers. This seems to be also true of scientific summitry. After President Nixon went to Peking, and before his recent trip to Moscow (see *Science*, 9 June), Presidential Science Adviser Edward E. David, Jr., made a 2-week May trip to Japan, Korea, and Taiwan, to review U.S. scientific relations with those countries.

So far, nothing specific seems to have come from the mission but goodwill, although some reassurance was probably needed, since the big agreements with Russia on arms, science, health, environment, and space were in their final stages of preparation at the time. Relating his impressions of his first foray into that part of the world to reporters last week, David said he was "sanguine" about our scientific ties with the Far East. He said that, despite advance reading about the ambitious, thriving country of Japan, one doesn't realize how alive it is until one gets there. "One has the feeling when one goes to these countries that it is a very vigorous environment. It's educationally, technically, and creatively vigorous."

However, David said he saw "nothing miraculous" about Japanese research, although he praised it as "highly competent and admirable." In communications, space technology, jet aircraft, and computers, Japan's research lags behind that of the United States. "The Japanese have been so expert in taking the results of science and technology and making out of them marketable products," he said. This has been particularly true in shipbuilding, optics, steelworking, and some electronics industries.

"We heard the words self-sufficient many times . . . ," he said. The problem in Japan is less a technology gap with the United States than a research gap. The Japanese badly need a solid research base of their own, and would like our help. Might the United States use this wish as a card in persuading the Japanese to open more of their markets to American goods, a longtime wish of American businessmen? he was asked. David replied that that might be a "possible strategy."

The group also visited Korea where the United States has aided in developing advanced technology through the Korean Institute of Science and Technology (6 March 1970), and where the Agency for International Development (AID) is very involved with building up R & D. The group also went to Taiwan, where AID no longer plays a role, but where other American advisers participate in several programs. How will David's going to Taiwan help the chances of scientific exchanges between our country and Mainland China? "Science and technology should be participated in by all countries," David replied. "I don't see any help or hindrance to our relationship with China" for continued U.S. advice to Taiwan. "The people in Taiwan seemed to accept that."

Also on the trip were Herman Pollack, Director of International Scientific and Technological Affairs for the Department of State, Ivan L. Bennett, Dean of the Medical School of the New York University, Frederick Seitz, President of Rockefeller University, John R. Pierce, Professor of Engineering at California Institute of Technology, and two members of David's staff at the Office of Science and Technology.

Continuing his global excursions, David plans to go to Moscow within the next month to meet with his Soviet counterparts to discuss the proposed Joint Commission on Science and Technology agreed on during the Nixon summit meeting.—D.S.

view of the virtues of rotation in office and recommends that a committee member's service be limited to a 3-year term.

In the matter of recruitment, the study group recognizes that the "telephone method" and the buddy system are dominant methods of selection and urges that agencies find new ways of identifying well-qualified nominees. They suggest, for example, the "snowball technique," which, according to the report, "would start with nominations solicited from a relatively few trusted nominators."

> The nominees themselves would then be asked to suggest other colleagues in specified categories for advisory service, and so on, in chain-letter fashion. The process might begin with 20 carefully picked nominators, and a multiplying factor of five might be used. Two or three successive stages would yield perhaps 1000–2000 unduplicated nominations. This could be done in various sectors of special interest: e.g., industry, younger people, emerging fields. Such a method would take full advantage of peer judgments and might well turn up advisory talent which would escape more conventional searches. It would not obviate the need for boldness on the part of sponsoring organizations in appointing a few relatively unknown people.

Other innovative ideas floated by the study group are for "self-nominated" committees, meaning that the proposed committee assignment, along with the qualifications for committee membership, would be made known to the scientific community. People would then be invited to nominate themselves or their colleagues. Selections would be made in the standard way. The study group also suggests that the sponsoring agencies might experiment with appointing duplicate committees to tackle the same task and then compare results.

Potentially squalid aspects of advisory-committee life are touched on only glancingly, as in the following excerpt:

> On the negative side, the possibility of conflict of interest arises when some members of committees reviewing technical proposals represent institutions or companies whose operations may be affected by the proposed actions. Organizations that sponsor committees must be acutely sensitive to this issue and weigh carefully both the composition of the committee and its terms of reference. In addition, the question of the proper mix of "insiders"—those who are close to the problem—and "outsiders" deserves far more consideration than it has rereceived.

The possibility that some members of study groups trade on their positions to snare grants for themselves or their colleagues, or that they appropriate research ideas from incoming applications is not directly acknowledged in the suggested ethic of service, which emphasizes that a scientist should agree to serve on a science committee only if he is prepared to invest the often considerable amount of time and energy required.

On the question of whether qualified younger scientists are increasingly unwilling to serve in the science advisory apparatus, the study group comments that they found the problem to be "less severe than we thought."

The evidence for this conclusion seems rather sketchy. The report notes that efforts to stimulate scientists' interest in work on advisory bodies has met with some success and cites experience with the ARPA-sponsored Defense Science Seminars in the summers of 1964, 1965, and 1966. These seminars, says the report, represented a frank effort to interest competent younger scientists in the full range of defense-related technical problems. About 30 scientists from ages 30 to 35 were involved in month-long sessions each year. A follow-up inquiry in 1970 showed that some 40 alumni of the seminars had subsequently been active in at least one Defense Department advisory activity and that only a single scientist indicated less interest in participating in Defense advisory activities.

More light might be thrown on these questions if the advisory process were an area of research more frequented by social and behavioral scientists. Work in this area is difficult, in part because confidentiality is traditionally one of the conditions that nongovernmental advisers insist on and because records of proceedings of advisory groups are usually incomplete. But even evidence on the effectiveness of advisory committees—the extent to which their advice is actually followed—is extremely meager. The study group notes the gaps and urges federal agencies and foundations to support more research on the advisory process.

The practical problems besetting the science committee system are to a significant degree generational. The sponsoring agencies have depended mainly on a group of scientific advisers whose relationship with the government was shaped during World War II and the early cold war era, and who accepted the value-free premise that the committee system had reciprocal advantages for the government and for the scientific enterprise. Many of these advisers have reached emeritus age or are past their prime as technical advisers. At the same time, the number of potential advisers among younger scientists has increased so tremendously that the old ways of identifying and selecting advisers no longer work. In addition, the experience and attitudes of these younger scientists unquestionably differ from those of their elders.

The report is no doubt correct in saying that the reluctance of younger scientists to serve in advisory posts should not be exaggerated. But a critical spirit is growing. And while a genuine effort seems to be afoot to make the science committees more fairly representative, there remains the problem of attracting increasing numbers of able young scientists to an advisory system that asks them to give technical advice, often in sensitive areas such as defense, without offering them significant influence over the uses to which their expertise is ultimately put—in effect, to give advice without consent.

—JOHN WALSH

RECENT DEATHS

John N. G. Finley, 72; former director, George Mason College, University of Virginia; 27 November.

John W. Frey, 82; professor emeritus of geology-geography, American University; 13 December.

John W. S. Griemsmann, 55; professor of electrophysics, Polytechnic Institute of Brooklyn; 16 December.

Harold Gunderson, 58; professor of zoology and entomology, Iowa State University; 14 December.

Howard J. Hassell, 66; professor of engineering, University of Utah; 24 December.

E. Harold Hinman, 67; former dean, School of Medicine, University of Puerto Rico; 25 December.

George R. Johnstone, 83; professor emeritus of botany, University of Southern California; 12 December.

Elon G. Salisbury IV, 91; former professor of mathematics, University of Maryland; 15 March.

Hans Simons, 78; former president, New School for Social Research; 28 March.

Lee N. Starker, 49; manager, science information services, Warner-Lambert Research Institute; 20 March.