National Academy of Engineering: Move toward Separate Status

The members of the National Academy of Engineering (NAE) have voted to move toward separation from the National Academy of Sciences (NAS), but they have hardly burned their bridges behind them.

NAE's qualified declaration of independence was approved at a business meeting on 3 May. Its main point was a request to the NAE's governing council to come up with a proposal for converting NAE into a separate, nonprofit corporation. NAE was established in 1964 under the umbrella of the congressional charter of the National Academy of Sciences. NAE has shared the NAS building in Washington since then, and the two academies have tried to work out the details of the partnership envisioned in the original agreement. These efforts apparently reached a final impasse late this winter with the engineers feeling that NAE was frozen into a junior partnership, with no real prospect of NAE gaining power and status equal to that of NAS.

The breaking off of negotiations was announced publicly on 26 March, when NAE president Clarence Linder issued a statement saying that the NAE council recommended the incorporation of an independent NAE. Linder said the action "arises from the existence of apparently irreconciliable differences in arranging for the joint governance of the National Research Council [NRC] by the two Academies." (The NRC is the organization through which the NAS charter responsibility to advise the government on technical matters is carried out. NRC essentially serves to recruit and provide staff services for the thousands of scientists and other professionals who serve on NRC voluntary advisory committees.)

The resolution approved by the NAE membership on 3 May had two key parts:

> Resolved, that the members of the National Academy of Engineering request that the Council prepare a plan and a rationale for the incorporation of the National Academy of Engineering, as a nonprofit corporation, pursuant to the District of Columbia Nonprofit Corporation Act; and
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> Further resolved, that the Council of the National Academy of Engineering is authorized to seek approval of the plan for the incorporation of the National Academy of Engineering at the next stated meeting of members; to continue negotiations with the National Academy of Sciences, to draft a Congressional charter, and to propose to the membership at least two options for action prior to the next stated meeting; to give notice that such approval will be sought by all members not less than 30 days prior to the next stated meeting; and to permit voting on such approval by mail ballot so that members unable to be present at the meeting shall have the right to vote on such approval as if they were present at the meeting.

The NAE council is expected to make specific proposals at a meeting scheduled for 24 October. The council is given broad discretion by the resolution, and there are fewer clues to what direction will be taken than might be expected because of a turnover in the NAE top office. Linder, a retired General Electric vice president who assumed the NAE presidency in 1970 as the first full-time holder of the office, resigned effective the end of the NAE meeting on 3 and 4 May. His successor will be Robert C. Seamans, Jr., Secretary of the Air Force. Because Linder has been a lame duck and Seamans is winding up his duties at the Pentagon, neither man has been willing to comment on which course the council is likely to take. Seamans, a former No. 2 man at NASA and professor at M.I.T. before taking the Air Force post, is scheduled to take up the NAE presidency after the middle of May. NAE vice president, Chauncey Starr, dean of the School of Engineering and Applied Sciences, UCLA, will serve as acting president in the interim.

If the NAE resolution seems a trifle irresolute, it probably reflects a genuine wish not to generate friction with NAS and prejudice future negotiations. Despite public forebearance on both sides, however, it has been general knowledge that the negotiations have been plagued by chronic differences between the two academies (*Science*, 23 April 1971).

When NAE was established under the NAS aegis in 1964, the agreement provided for a review after 5 years of the relationship between NAS and NAE to determine whether it was viable and should continue. Formal negotiations, therefore, were begun 4 years ago and, with some lulls, have gone on since.

From the start, the engineers have referred to three basic criteria which they said NAE would have to achieve if progress in the negotiations was to be judge satisfactory:

- A high degree of visibility. NAE wanted decision-makers and the public to recognize the engineering community as a competent source of advice.
- Professional freedom. If NAE decided certain societal problems needed attention, it wanted to be able to study these problems.
- Financial responsibility. NAE leaders realized that to be effective the academy would have to be essentially self-supporting.

Apparently, there was a feeling within NAE that these criteria were not adequately met, and the issue of "professional freedom" appears to have figured fairly heavily in dispute over governance of the NRC that led to the break.

In the engineers' view, the March decision became inevitable after the NAE council for the third time rejected a formula on governance which had been worked out by negotiating teams from the two academies and had been accepted by the NAE council. The NAS council proposal on a joint governing board for NRC was felt by the engineers to allow an NAS veto of a project which the NAE might consider essential and thereby infringed professional freedom.

NAE officials are willing to acknowledge that the NAE has an "identity problem." The 1964 treaty with NAS deflected a move by engineers to apply for a congressional charter and set up a freestanding engineering academy. There is now a feeling that the NAE has been thwarted in its development and that, as one official put it, "we must have an answer to the question of who we are."

Underlying the split are professional and perhaps temperamental differences between scientists and engineers. Engineers tend to see scientists, particularly academic scientists, as interested in analyzing problems but rather ineffectual in designing practical solutions. The scientists, on the other hand, are inclined to see the engineers as inhibited in giving impartial advice by

their ties with industry and government agencies.

NAE has sought to come to grips with the implications of the industry ties of many of its members by making a distinction between bias and conflict of interest. NAE officials have worked on the principle that it is possible, so to speak, to achieve a balance of biases within a committee so that a final report reflects a fair discussion of issues by able people. Minority comments are said to be encouraged in reports to insure balance.

NAE officials tend to be critical of the management structure of NRC as well as of its governance. NRC staff members operate in an atmosphere influenced primarily by the NAS, and their allegiance seems to be mainly to the senior academy. As a result, the NAE tendency has been to work through a small phalanx of committees operating directly under the academy. NAE members, by and large, seem much more personally involved in committee work than are NAS members. Most of these NAE committees deal with problems in general areas such as transportation, environmental engineering, and telecommunications, and their reports are designed mostly, as one official put it, "to provide a viable basis for discussion." So far NAE has not done much detailed work, for example, on recommending standards in controversial areas, as NRC panels often are called upon to do.

The occupational mix of members in NAE is said to be changing, with the intake of industry executives declining and that of engineers with university ties rising. The distribution now is said to be moving to about 40 percent from industry, 40 percent from academia, and the remaining 20 percent made up of engineers who work in government, are consultants, or are retired.

The succession of Seamans brings to the academy a president with experience in the university, industry, and government. Seamans earned his undergraduate degree at Harvard and a Ph.D. in instrumentation from M.I.T. in 1951. He was active in teaching and project management posts at M.I.T. until 1955, when he joined RCA and held management posts in the corporation's systems and missile and electronics controls divisions. From 1960 to 1968 he served with NASA, first as an associate administrator and ultimately as deputy administrator, the NASA No. 2 man. He returned to M.I.T. and a professorship before taking up the Air Force post. It is noted that Seamans has been concerned with space and military matters throughout his career and has had little experience with societal problems. His partisans argue that Seamans is a highly capable manager and a good choice to lead NAE in a crucial development phase.

The NAE council's options are virtually unrestricted by the recent resolution, but there obviously are limiting factors. NAE occupies quarters in the NAS building and has been operating with what in effect is a subsidy from NAS. An NAE financial report indicates expenditures of $445,000 last year, and the finances of the two acad-

NAE Names New Members

The National Academy of Engineering (NAE) has announced the election of 70 new members. The NAE was established in 1964 to advise the federal government, upon request, in matters of science and engineering; to sponsor engineering programs aimed at meeting national needs; to encourage engineering research; and to recognize distinguished engineers. The new members bring the total membership to 429.

Stuart S. Bailey, Atlantic Research Corp.
William F. Ballhaus, Beckman Instruments, Inc.
Harvey O. Banks, consulting engineer
Norman H. Brooks, Caltech
Burton P. Brown, General Electric
Solomon J. Buchsbaum, Bell Telephone Laboratories
Joseph M. Caldwell, Office of the Chief of Engineers, U.S. Army
Robert H. Cannon, Jr., U.S. Department of Transportation
John D. Caplan, General Motors Research Laboratories
Jack E. Cermak, Colorado State University
Joseph V. Charyk, COMSAT
Ven T. Chow, University of Illinois
Frederick J. Clarke, Office of the Chief of Engineers, U.S. Army
Edgar M. Cortright, NASA
George C. Dacey, Bell Telephone Laboratories
Lee L. Davenport, GTE Laboratories
Robert M. Fano, M.I.T.
Phil M. Ferguson, University of Texas
Morris E. Fine, Northwestern
Ben C. Gerwick, Jr., University of California, Berkeley
Richard P. Gifford, General Electric
Charles P. Ginsburg, Ampex Corp.
William R. Gould, Southern California Edison Co.
Alfred Hedefine, Parsons, Brinckerhoff, Quade & Douglas
Eivind Hognestad, Portland Cement Association
Solomon C. Hollister, Cornell
Nick Holonyak, Jr., University of Illinois
Grace M. Hopper, U.S. Department of the Navy
Donald E. Hudson, Caltech
Arthur E. Humphrey, University of Pennsylvania
H. Richard Johnson, Watkins-Johnson Co.
Robert T. Jones, NASA
John F. Kennedy, University of Iowa
Fazlur R. Khan, Skidmore, Owings, and Merrill
Clarence E. Larson, U.S. Atomic Energy Commission
Joseph C. Lawler, Camp Dresser and McKee
Thomas M. Leps, Thomas M. Leps, Inc.
Robert W. Mann, M.I.T.
Hans A. Mauch, Mauch Laboratories
Gerald T. McCarthy, Tippetts-Abbett-McCarthy-Stratton
Percy H. McGauhey, University of California, Berkeley
Dwight F. Metzler, New York State Department of Environmental Conservation
Stewart E. Miller, Bell Telephone Laboratories
Phillip S. Myers, University of Wisconsin
Theodore J. Nagel, American Electric Power Service Corp.
Joseph H. Newman, Tishman Research Corp.
Daniel A. Okun, University of North Carolina
Thomas O. Paine, General Electric
Robert J. Parks, Caltech
Allen M. Peterson, Stanford
Milton Pikarsky, City of Chicago
David S. Potter, General Motors
William B. W. Rand, Submarex Corp. (retired)
Eberhard F. M. Rees, NASA
Harold A. Rosen, Hughes Aircraft Company
Joe B. Rosenbaum, U.S. Department of the Interior
Walter A. Rosenblith, M.I.T.
Ian M. Ross, Bell Telephone Laboratories
Rustum Roy, Pennsylvania State University
Robert W. Rummel, Trans World Airlines
Henry A. Schade, University of California, Berkeley
Anthony E. Siegman, Stanford
Morgan Sparks, Sandia Laboratories
Alfred D. Starbird, U.S. Army (retired)
Ivan E. Sutherland, University of Utah
Myron Tribus, Xerox Corp.
Howard S. Turner, Turner Construction Co.
Mac E. Van Valkenburg, Princeton
Aubrey J. Wagner, Tennessee Valley Authority
Lotfi A. Zadeh, University of California, Berkeley

emies are so closely intertwined that it is difficult to determine how much of that is not covered by income from projects being carried out by NAE. NAS president Philip Handler has recently been quoted as estimating an annual NAS subsidy of between $200,000 and $250,000.

NAE officials, however, seem confident that the academy could readily become financially independent. With a view to achieving the necessary "capitalization," a National Academy of Engineering Foundation has recently been formally established. The foundation's role is seen as administering an endowment fund created mainly from contributions from individuals and grants from private foundations.

Finding a formula for an independent academy will not, however, be a particularly easy task. One reason that both sides were reluctant to fracture the existing relationship was that a satisfactory alternative was not in view. The prospect of two separate and equal academies raises possibilities of competition and the duplication of expensive resources, which could undermine the quality of their work. And in practical terms, the scientists and engineers need each other to be most effective. So now, after nearly a decade of having failed to find equality together, it looks as if they must find ways to cooperate apart.—JOHN WALSH

Agriculture: Social Sciences Oppressed and Poverty Stricken

Many years ago in England the industrial revolution resulted in dislocations and social problems that were largely ignored. It has become commonplace to criticize the leaders of that day for their callousness. It may be appropriate to ask whether we who promote today's agricultural revolution may in time come under similar indictment.—DON PAALBERG, former Director of Agricultural Economics, U.S. Department of Agriculture.

The agricultural revolution in the United States has been a gradual, but not a gentle, process. Since 1940, some 30 million people have left their homes in the countryside for the towns, a migration that continues at the rate of 800,000 people a year. Two thousand farms go out of business each week. Over half of those that are left produce sales of less than $5000 a year, which is part of the reason why some 14 million rural Americans live below the poverty line.

The exodus from the countryside has been spurred on in part by steady technical change, brought about by the flow of inventions and improvements pouring from the laboratories of the U.S. Department of Agriculture (USDA) and the land-grant colleges and universities. This cornucopia of new knowledge has increased agricultural productivity, lowered prices for the consumer, raised efficiency and profits for the few large producers who could keep up with the pace of change, and put the handwriting on the wall for the many small farmers who could not.

The USDA has not been a passive observer of the revolution which its research has engendered. Its system of price supports, USDA economists argue, has helped blunt the impact of market forces on marginal farmers and postponed or prevented their demise. Other social scientists contend that USDA professions of interest in saving the family farm have been only rhetoric, and that government policies have, in practice, rewarded bigness at the expense of the small farmer.

Whatever the merits of this debate, it is reasonable to suppose that a strong social science research program could have provided a source of knowledge whereby to cushion the impact of the agricultural revolution on rural people, for example in supplying data and predictions to guide policy decisions or in assessing the consequences of technological changes such as harvest mechanization. The possible benefits of such research are impossible to assess, but there are critics both within and outside the agricultural establishment who believe that the effort invested in social science has matched the need in neither quantity nor quality.

From such critics have recently emerged two reports of a rather different nature. *Hard Tomatoes, Hard Times,** written by Jim Hightower, is the work of the Agribusiness Accountability Project, a Nader-style, public interest research organization based in Washington, D.C. The Pound report on agricultural research† (other parts of which have been reviewed in *Science*, 5 Jan., 27 April, and 4 May) is the labor of a blue-ribbon committee of agricultural and academic scientists. In different language, and by different methods, both studies arrive at the same conclusion—that social science research has not been one of agriculture's finest achievements.

The theme of *Hard Tomatoes, Hard Times* is that agricultural research has been and still is "committed to the technological and managerial needs of the largest-scale producers and of agribusiness corporations and . . . to omit those most in need of research assistance." Less than 5 percent of research conducted at state agricultural experiment stations is devoted to "people-oriented research" (290 scientific man-years out of a 1969 total of nearly 6000) and much of this research is designed to benefit businesses, not rural people. A survey of projects undertaken at Iowa State University on the "housing needs of rural families" showed that two-thirds were concerned with the technical aspects of building construction.

Even the research that is focused on people tends to be of a somewhat trivial nature. A study at Cornell University revealed that "employed homemakers have less time for housekeeping tasks than nonemployed homemakers." Ac-

* J. Hightower, *Hard Tomatoes, Hard Times* (Schenkman, Cambridge, Mass., in press), paperback $4.95, hard cover $8.95. † *Report of the Committee on Research Advisory to the U.S. Department of Agriculture* (National Technical Information Service, 5285 Port Royal Road, Springfield, Va. 22151), PE 21338 (main report) $4.85; PE 21339 (appendices) $9.00.