Writing Engineering's Ticket at NSF

Hearings on new amendment ventilate old worries about basic research, also provide outlet for current concern about U.S. competitiveness

In recent years, encounters between the House Science and Technology Committee and the grandees of science and engineering have generally proceeded harmoniously amid expressions of mutual esteem. For moments on 21 March, however, there were hints of the old thrust and parry at hearings on proposed amendments designed to give engineering equal emphasis in the National Science Foundation legislative charter.

While the main issue was the status of engineering in NSF, a strong undercurrent at the hearing was generated by the broader question of what role the federal government should play and how it should be organized in dealing with the decline in U.S. competitiveness in world markets.

The claims of engineering for equal status at NSF have long been a sensitive issue in the scientific community where parity for engineering in the foundation has been seen as a threat to funding for basic research. The temperature at the hearing rose briefly when the lead witness, National Academy of Science's president Frank Press, made the traditional case against symmetry.

While not flatly opposing the wording changes, which would generally make engineering equal to science in NSF's so-called organic act, Press forecast trouble if the revisions were adopted. "What are the likely outcomes?" he asked in his prepared testimony. "A major change, I fear, may be to dilute the fundamental mission for which the foundation was created—to support basic research in all the sciences."

In the questioning that followed his testimony Press stated his objections more sharply, saying that the amendment could bring about a "symbolic partitioning of NSF" between science and engineering. Press expressed the view that the changes might be "used by some groups" to press for funding for engineering at the expense of science.

The amendment in question was introduced by Representative Joe Skeen (R–N.M.), but Press's chief interlocutor was Representative George E. Brown, Jr. (D–Calif.). Brown, a veteran member of the Science and Technology Committee and a friendly but persistent critic of NSF's performance in promoting engineering and technology, was author of an earlier amendment similar to Skeen's.

In a colloquy with Press, Brown noted that Press represented an institution that had an "academy for engineering and an academy for science" and inquired whether a "positive, productive relationship" prevailed. Press responded that under his administration, the National Academy of Engineering (NAE) had achieved a full partnership role. Brown then asked if he saw "any parallel here" for NSF. He said that what was suggested by the "modest language changes" proposed was a "program that better supported national needs."

A further bit of byplay resulted when it was noted that Press's counterpart, NAE president Robert M. White, had sent a letter calling the amendment a positive step in reinvigorating the national engineering effort. Press observed of White that "by the nature of his constituency, he can't come in here and oppose it." And Brown retorted a little chidingly to Press that "By the nature of your constituency, you can't come in here and support it."

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The main point Press sought to develop throughout was made in his prepared testimony when he said, "One needs to remember that in contrast to engineering, many of the sciences depend on the NSF for a predominant fraction of their support." And later, "this is not an argument against increasing the engineering research budget within NSF; it is an argument for protecting those fields which do not have the multiplicity of potential funding possibilities open to engineering research."

Press pointed out that support for engineering research in other agencies such as the Departments of Defense and Energy and NASA far exceeded such support in NSF. Asked how to remedy the widely acknowledged shortcomings in engineering research and education, Press replied that a "cross-government" effort was needed. Noting that as science adviser in the Carter White House and as NAS president he had been a consistent advocate of action to attack the problems of engineering, Press argued that collaboration by the heads of the agencies represented in the Federal Coordinating Council for Science, Engineering, and Technology was the proper course. "I think that can succeed."

The feasibility of this course of action was implicitly questioned later in the hearings by Donald D. Glower, dean of engineering at Ohio State who also represented a phalanx of academic and professional organizations at the hearings. Emphasizing the importance of reinforcing the engineering function in the NSF charter, Glower said "There is no other federal agency which has the ability to support civilian, academically-based research in a manner that has an impact on BOTH the research and the talent. NSF has the unique ability to contribute to both the research and education needs of our increasingly technically dependent society."

Glower pointed the main dilemma facing Congress and NSF. The mission-oriented agencies have money to spend on engineering, but are limited by law to spending it on applied research of a narrowly defined sort. NSF, on the other hand, has a flexible legislative mandate that enables it to do many of the things engineering is deemed to need. But, with limited resources and the prospect of a tight fiscal future, expanded support for engineering could squeeze funding for basic science.

Another witness, former Commerce assistant secretary for science and technology Myron Tribus, who is now at Massachusetts Institute of Technology, warned of taking too narrow a view of the issues under discussion. Although he endorsed the amendments under consideration, he said that he felt many of the same objectives could be achieved under "existing structures and statutes." He said he regarded the discussion about NSF as a "small part of a big problem"—that of bolstering U.S. competitiveness.

Tribus saw the "difficulty of getting support from mission oriented agencies" as "the reason NSF has to be in the business." But he said that many large issues are not amenable to research, such as improving product quality and manufacturing efficiency. Tribus ex-

pressed the view that "the present practices and procedures of government are inappropriate to the problems that face us," and added that he would "like to see an agency which goes beyond NSF."

By coincidence, a House Banking subcommittee on economic stabilization was holding hearings at the same time on a bill to create an Advanced Technology Foundation (H.R. 4361). Introduced by the subcommittee chairman, Representative John LaFalce (D–N.Y.), the bill is intended to promote commercial application of advanced technology. It is the product of a 6-month inquiry by the panel into the causes of the decline in U.S. competitiveness. A revised version of the bill is expected to go to the full committee for action in April.

The bill reflects the preoccupation of Congress and the Administration with U.S. competitiveness. Confusion persists about the appropriate federal role, in part because Democrats in Congress lean to the adoption of an "industrial policy" approach implying firm federal action while the Administration prefers to rely on private sector initiative. While uncertainty prevails, it is inevitable that NSF be asked to take the lead in attacking the problem even if that requires changing the ground rules under which it operates.

The last time that occurred was in the late 1960's when Congress reacted to a lack of R & D on national problems including the environment by amending the NSF organic act to permit the foundation to support applied research. In hearings testimony, AAAS associate executive officer Thomas Ratchford observed, "There were concerns then, as now, that change would divert resources from basic scientific research. But the history of applied research at NSF indicates otherwise."

No objections to the amendment were registered by NSF director Edward A. Knapp or National Science Board Chairman Lewis M. Branscomb. In letters, both stressed NSF's increased emphasis on engineering and indicated that the foundation could live with the changes so long as basic research was not undercut. Neither seemed keen to see the emergence of new research agencies that might compete with NSF.

Brown and Skeen and other members of the committee reiterated their intent to protect basic research, and Skeen said that he intended no partition or division of funds and pledged to make that clear in the bill and in its legislative history. (A version of the amendment revised to incorporate suggestions invited by the subcommittee was included in the NSF authorization measure reported by the full committee on 22 March.)

Press's view was that whatever the present intent of Congress, circumstances could change. "Will there be other requests to change the Act?" he asked. "Will we have a 'Discipline of the month' series of amendments, leading to the ultimate decay of one of the most successful institutions established by the federal government?"

Press found himself much in the minority with his forebodings over the amendments. But on the larger issue he made a point on which there was no dispute. In his testimony Press noted that the problems of engineering require major joint action "by the science and engineering communities—academic, industrial, and governmental." On the evidence of the hearings, there is little sign of that happening soon.—**JOHN WALSH**

Do Tax Credits for R & D Work?

A new analysis indicates that tax credits for R & D which were approved by Congress in 1981 to help encourage innovation have had only a modest effect on R & D spending. The study, sponsored by the National Science Foundation, was directed by economist Edwin Mansfield of the University of Pennsylvania, who is well known for his work on R & D in the process of industrial innovation. In a summary of its findings made for the House Banking committee, Mansfield writes that in Canada and Sweden as well as the United States, "the increased R & D expenditures due to tax incentives seem to be substantially less than the revenue lost by the government."

Translated on Capitol Hill for a statement by Representative John J. LaFalce (D–N.Y.), chairman of the Banking subcommittee on economic stabilization, it was put this way: "In the U.S. for each dollar of tax revenue lost we are only getting about 30 cents in added R & D." LaFalce called this "expensive, inefficient, and not very effective in increasing our competitive posture."

Mansfield is more circumspect. He writes that while the results are interesting, "it is obvious that they should be treated with caution". He notes that while there is no evidence that the firms surveyed responded in a self-serving way, "such a bias may exist." In evaluating the results, he says it is necessary to remember that some firms are not affected by the tax credits. Some firms may want to cut back their R & D spending. Others do not have any tax liability against which to apply the credits. To take advantage of the credit, a firm must increase its R & D spending over a base amount, currently the average of the firm's R & D spending in the three previous years. In subsequent years, the higher spending is figured in the base, so the cost of R & D is not reduced very much.

The report also points out that some of the impact of the credit may be blunted because firms redefine some activities as R & D in order to take advantage of the credits. According to the report, "An important question is: To what extent has reported R & D expenditure increased merely because of the tax-credit-induced redefinition of activities as R & D?" Experience in Canada and Sweden, however, indicates that this effect tends to subside after the initial burst of redefinition.

Citing comments by company officials, Mansfield says that a major reason that R & D tax credits have not had a sweeping influence on R & D spending is that in the process of innovation, "R & D is a small percentage of a big investment." Other costs of bringing new products to market are much greater, so inducements to invest in R & D have limited effect.

For all these reasons, it appears that, in economists' parlance, the price elasticity of demand for R & D is not very great. The summary concludes that "Based on our findings it appears that these R & D tax incentives, in their present form, are unlikely to have a major impact on a nation's rate of innovation."

Mansfield emphasizes that the study, based on a survey of a sample of 110 firms with major R & D programs, is the first substantial attempt at a quantitative assessment of the subject in this country and amounts to early returns. But it certainly appears that tax incentives are not the potent pick-me-up for R & D that many of its proponents foresaw.—**JOHN WALSH**