

# NSF Readies New Engineering Program

*A major effort to establish multidisciplinary centers on university campuses is being viewed with some apprehension*

Academic scientists and engineers have been watching with a mixture of anticipation and apprehension as the National Science Foundation (NSF) gears up to launch a major new initiative in engineering research. The mixed reaction stems from the fact that the initiative, which involves the creation of multidisciplinary research centers on university campuses, could grow over the next few years into a \$100-million-a-year program. That would make it one of NSF's largest endeavors.

The lure of so much money has attracted virtually every engineering school in the country. They have submitted a total of 142 proposals to establish centers that would require \$2.2 billion in federal funds over the next 5 years. But it has also raised concerns among NSF's traditional clients in other fields that the new engineering program will grow at their expense, and it has led to unease in some engineering departments that funding for individual investigators will be reduced in order to help pay for the new centers.

The new program is an attempt to encourage multidisciplinary research in areas such as computer-aided manufacturing and biotechnology that are likely to be important to the national economy. It is also aimed at stimulating further collaboration between industry and academe and at involving students in the kinds of cross-cutting projects they are likely to encounter in the real world.

The idea for the centers emerged late in 1983, when there was a good deal of pressure on NSF to increase its support for academic engineering. For example, the National Science Board, responding to widespread concern about growing international economic competition, had adopted a statement urging the foundation to "expand and alter its traditional role in support of engineering sciences at academic institutions."

George A. Keyworth, II, President Reagan's science adviser, enthusiastically supported the idea, and a panel of the National Academy of Engineering was put together to advise NSF on the scope and operation of the program.

The Academy committee, which delivered its report in less than 2 months, concluded that the program would be an important new initiative which, if carried out correctly, could have a substantial

impact on academic engineering research and education. The committee noted that academic engineering tends to be small scale and narrowly focused, and overemphasizes analysis rather than "hands on" experience. The engineering centers, it said, could help overcome these shortcomings.

The committee suggested that 25 centers should be established in the first 5 years of the program. Each center should receive between \$2.5 million and \$5 million a year in federal funds and involve at least 10 percent of the graduate students in the host university.



**Nam P. Suh**

*Wants a \$500-million engineering budget.*

The foundation is following the Academy's script closely, which is not surprising since two members of the committee have recently been appointed to top posts at NSF. Erich Bloch, a former vice president of International Business Machines, is now director of the foundation, and Nam P. Suh, a professor of engineering at Massachusetts Institute of Technology, was appointed in October as assistant director for engineering.

Last summer, universities were invited to submit proposals to establish centers in fields of their choice. The response was beyond all expectations: the 142 proposals submitted—about half of which were in the fields of manufacturing, microelectronics, materials, chemical processing, and computers—

involved 3000 researchers from 107 universities.

The attraction for the universities is not just the potential size of the program but the flexibility of the funding and the chance to secure some support for state-of-the-art equipment.

The program is starting modestly with a budget of \$10 million this year, enough to provide start-up funds for between five and ten centers. According to Lewis Mayfield, director of the office of interdisciplinary research in NSF's engineering directorate, the candidates have been winnowed down to about 40. Site visits will be conducted in the next few weeks, and the winners will be selected in April. The foundation will be looking for substantial industrial participation in the centers, with private corporations perhaps putting up as much money as the federal government.

The uncertainty over how many centers will be chosen in the first round stems from the fact that NSF did not know by the third week of December what the budget request for next year will be. Nevertheless, Suh says he hopes to build up the program over the next 5 years to the full 25 centers recommended by the Academy, which would require about \$100 million a year from NSF. To accommodate such an expansion without curbing the foundation's existing engineering programs would require roughly doubling the budget of the engineering directorate, which currently stands at about \$140 million.

In view of the political focus on the federal deficit and the corresponding pressures to hold down government spending, that kind of growth will be difficult to achieve. Hence the concern over what might be squeezed to make room in the budget for the centers.

The concern was put into writing by program managers in the engineering directorate soon after Suh arrived in Washington. In a three-page memorandum, they expressed alarm that support for individual investigators is being eroded to make way for new initiatives, especially the centers program. Similar concerns have prompted the establishment of an ad hoc committee of researchers in fluid mechanics, who met with Suh on 17 December to air their fears. The Academy committee itself also stressed the need to strengthen support for traditional

engineering disciplines, and in a covering letter to the report, Robert M. White, president of the engineering academy, noted that "Without a complementary move to provide such support, cross-disciplinary research would be sapped at its roots."

Suh says the fears are groundless. "The rumor mill is churning out lots of wrong information," he says. It is true that new initiatives are claiming a growing share of the engineering directorate's budget, but even so, support for individual researchers has risen from \$82.9 million in fiscal year 1983 to \$95.4 million in 1985, he notes. "So far it hasn't been the case [that individual research awards have been squeezed], and I don't intend to make it the case."

Members of the fluid mechanics delegation say they came away from their 17 December meeting with Suh greatly reassured. In essence, he told them that the engineering centers program would not be allowed to grow at the expense of existing programs, and that he hoped to secure sufficient growth in the engineering directorate's overall budget to accommodate the new initiative.

Indeed, securing major growth in the directorate's budget is Suh's chief priority. The foundation's expenditure on engineering is "totally inadequate," Suh told *Science*, noting that it has sufficient funds to produce, on average, only one Ph.D. per engineering field per state per year. He says he hopes to see the total budget climb to \$500 million by the end of the decade, a level that he still regards as "peanuts," but which would provide room for the centers and other initiatives he is planning. Those are the kinds of projections that make NSF's clients in the basic sciences nervous about their slice of the foundation's pie.

In particular, Suh says he would like to increase support for projects involving multiple investigators, expand the Presidential Young Investigator Awards program—a program begun last year that provides a flexible support to young researchers—and encourage more research in fields such as design that do not now have a strong science base.

He has already begun to put his stamp on the engineering directorate by withholding 10 percent of the directorate's budget for this year for possible reprogramming into priority areas. He has told program managers that the money will be available for high-risk, high-return projects.

As for the grumbling in the community, Suh says "It is what you expect when you do things differently."

—COLIN NORMAN

## Europeans Adopt R&D Plan

*Brussels.* Research ministers from the ten member countries of the European Economic Community (EEC) agreed on 19 December to a major shift in the focus of their joint research efforts away from topics such as nuclear power and radiation protection—which have dominated these efforts since the community was established in the 1950's—toward technological fields that are likely to strengthen Europe's ability to compete commercially with the United States and Japan.

The shift is embodied in a 5-year, \$1-billion package of research projects which was approved by the ministers largely at the urging of the outspoken commissioner for industry and research, Etienne Davignon, who has just reached the end of his 4-year term of office.

Davignon was largely responsible for one of the most significant developments in European technology policy in recent years, the EEC's strategic program in information technology (ESPRIT). The program, which will cost \$1.3 billion over 5 years, will be jointly financed by the commission and European companies and is a direct response to the challenge from U.S. and Japanese computer industries. Full funding for the second year's operation of ESPRIT was approved at last week's meeting.

The broader research package represents an attempt to apply the same approach to a variety of precompetitive research projects in fields ranging from materials processing to biotechnology. The biggest new element in the package, for example, is a program known as basic research in industrial technologies for Europe (BRITE), which aims to get research workers together from universities, research institutes, and industrial laboratories to work on topics of industrial interest in more than one EEC member country.

The ministers agreed to allocate \$100 million of the community's research budget to BRITE over the next 4 years. Fields in which joint research projects will be sponsored include laser technology, catalysis and particle technology, membrane science, polymer chemistry, and computer-aided design. According to Cyril Silver, head of the EEC's new technology division who is responsible for the BRITE program, the aim is to adapt to a European setting many of the ideas that have been explored in the United States in the past few years on ways of stimulating innovation in strategically important fields without requiring massive government-directed intervention.

Other new initiatives included in the package are a \$45-million 4-year program to support efforts in biotechnology, primarily for research and training activities in national institutions, and a \$50-million program aimed at stimulating greater cooperation between research groups in different EEC countries.

Working within severe budgetary limitations, the ministers were forced to cut back on some of their existing research activities to make way for the new programs. Research into the safety of nuclear reactors, for example, which was previously a separate project, is now to be made the responsibility of the EEC's Joint Research Center at Ispra in Italy, but without any extra funding being provided to the center.

The largest single cut will come in the fusion program, by far the biggest item in the total package. The commission had asked for \$790 million over the next 5 years, but the ministers cut this back to \$690 million, which will mean a reduction in the EEC's overall fusion effort. About half of this sum will be spent in the next 2 years alone, allowing full operation of the Joint European Torus (JET) at Culham in the United Kingdom. The cuts will be absorbed by stretching out the technology research programs that are directed by the next step after JET.

The overall package of \$1 billion over a 4- to 5-year period was considerably smaller than the commission of the EEC had originally asked for, largely as a result of pressure from the British and German governments. However, the ministers agreed that almost half of this sum will be spent in the first 2 years; a review will be carried out at the end of this period to assess whether increased support is justified.—DAVID DICKSON