Institute Idea Divides Mathematicians

Opponents and supporters argue over how to spend increasingly scarce research funds

For the past 2 years, a number of eminent mathematicians have been carrying on a crusade against the National Science Foundation (NSF). Their aim is to prevent the NSF from diverting $2 million, which is about 10 percent of the foundation's mathematics budget, to a proposed mathematics institute. Inevitably, supporters of the institute have gotten pulled into the fray as university has been pitted against university and, in one case, even brother against brother. The dispute offers a rare glimpse of how major projects can be pushed through the NSF and how difficult it can be to stop them.

The idea of an institute did not originate at the NSF. It has been floating around the mathematics community for at least a decade, the model being the Institute for Advanced Study at Princeton. The Princeton institute had an enormous influence on today's leading senior mathematicians, many of whom spent some time there during the 1930's and early 1940's. A number of mathematicians have wanted to re-create the excitement generated there and have suggested that the NSF start a similar institute, preferably at their own universities. But the proposed NSF institute would be somewhat different from the Princeton institute. Although it would be at a single location, it would have no permanent faculty. Visitors would be invited to stay for several years.

Saunders MacLane of the University of Chicago has been a leading proponent of an NSF mathematics institute. He has considerable influence on policy as past president of the 18,000-member American Mathematics Society (AMS), member of the National Academy of Sciences, and member of the National Science Board, which is the NSF's policy-making body. MacLane refused to discuss with *Science* his point of view as an institute partisan, saying he wants to appear neutral. But it is generally believed that his support for such an institute at least encouraged the NSF staff to promote it.

The NSF staff says it is taken aback by some mathematicians' reactions to the proposed institute. "At worst [the institute] is innocuous. At best it is a great thing for mathematics. I don't understand the emotional reactions," says William Rosen, head of the mathematics section at NSF. Although there are supporters as well as opponents of the institute in the mathematics community, the opponents are by far the more vehement, and seem to outnumber their opposition. Both factions tend to come from the approximately 5500 research mathematicians; mathematicians who do no research appear to be less concerned with how the NSF spends its money.

The institute supporters point out that just because the opponents are vociferous does not necessarily mean that they are right. The institute would undoubtedly take money that would otherwise go to support young Ph.D.'s and established programs. Mathematicians, unlike other scientists, are almost completely dependent on the NSF for research support, so how the agency spends its money in a a period of hard times is a major concern. But, Rosen says, one must ask whether the institute's opponents "desire to support lots of young people in order to stimulate mathematics or because [the young people] went through lots of training and deserve support."

The institute's opponents say that elitism is not the primary issue. The real problem is that even very good mathematicians are not given enough support. And establishing the institute would only make matters worse. For example, it would divert money from young mathematicians to senior faculty and overhead expenses. The opponents point to a consistent pattern over the past several years of the NSF asking the mathematics society for its opinion of an institute and then pushing ahead despite the mathematicians' objections. All the while, opponents say, the NSF protests that it is only carrying out the wishes of the mathematics community.

The mathematics section of the NSF first seriously discussed an institute in 1976, at which time it informally asked the science policy committee of the mathematics society for its opinion. The committee, whose members are appointed by the AMS president, is active on political issues. It issued a unanimous report saying that an institute is not the best way to spend the limited funds available for mathematics.

Following this rejection of the institute proposal, the NSF began trying to drum up support by telling mathematicians that an institute would draw new money from Congress. By this time, mathematicians were beginning to realize how seriously underfunded they are. Kenneth Hoffman of the Massachusetts Institute of Technology (MIT) says that mathematicians receive only half as much money as scientists in other fields, even when the costs of other scientists' laboratories and equipment are taken into account. Thus the inducement of extra funds was especially attractive.

In January of 1978, the NSF tried again to get official backing for the institute from the mathematics society. It asked the science policy committee to reverse its 1976 decision, but the committee deadlocked.

Despite the committee's reaction, the institute seemed to have gained momentum at the NSF. One close observer explains that such momentum is a normal aspect of getting large projects through the hierarchy at the NSF. The project must win agency approval at several steps along the way to its presentation before the National Science Board. Alvin Thaler, member of the NSF's mathematics section, concedes, "It took a lot of work to get the institute before the board. We had to become partisans." By the time an NSF project reaches the National Science Board, the NSF staff's reputation within the agency can be affected by the project's approval.

The March 1978 board meeting considering the NSF institute was marked by opposition to the proposal. Board member Charles Slichter, who is a physicist at the University of Illinois, began probing the NSF staff about the mathematics institute. He explained that he was not trying to be hostile, but that he was concerned about the wisdom of going ahead with the institute after receiving "a good deal of, shall I say, intensive queries" about a theoretical physics institute which the NSF had recently decided to fund. Apparently, quite a number of theoretical physicists strongly objected to

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the physics institute as a less than optimum way to spend NSF funds.

The real issue, Slichter said, is whether the mathematics community wants an institute even though it would cause a shrinkage in support for mathematics research. Despite what many mathematicians had been led to believe, no new money could be promised for an institute; furthermore, in funding an institute, the NSF would have to pay administrative and secretarial costs that normally are picked up by universities. So the total funds available to support research will decrease, even if the NSF mathematics budget remains the same.

Taken aback by Slichter's questions, the NSF staff contradicted itself several times in trying to justify the institute. First it said, yes, the mathematicians wanted the institute. Then it said that it was not sure the mathematicians wanted the institute, but if they did not want it they would not send in good proposals for institute projects. Slichter pointed out that calling for proposals is no way to find out what the mathematicians want. Mathematics departments will send in proposals even if they think the institute is a bad idea, reasoning that if the NSF is committed to spending money on an institute, they may as well apply for it. Finally, the NSF staff changed its tune again, saying that sometimes you have to do things for a scientific discipline's own good, even if the scientific community would vote against the project.

The board members then asked MacLane to explain what the mathematics community thought of the institute. He replied at length, describing the various ways the mathematics community's opinion had been solicited. In conclusion, he said, "So it is my view that the mathematics community, never being one to have unanimity about anything . . . is not wholly unanimous about this."

The board decided to allow the NSF to solicit proposals, with the proviso that it be made clear that the agency is not committing itself to funding an institute. When word of what transpired at the board meeting reached the mathematics community, a number of the institute's opponents were outraged. They were particularly upset, they said, because they had thought the institute would bring in new money. "We'd been misled," says Elias Stein of Princeton University.

As last summer wore on, the mathematics society decided to take formal actions to slow the NSF down in its apparent rush to fund an institute. The AMS Council voted overwhelmingly for a res-

Environmentalists Chide Carter

Environmental groups see in President Carter's proposed new energy supply mobilization policies a "centralization of power in the hands of a few" that threatens people's rights as well as their enivronment. These policies were condemned in such strong language at a news conference held by environmental leaders on 20 July that some reporters were left wondering if the environmental community might not be nearing a political break with Jimmy Carter, whom environmentalists generally supported in 1976.

At the news conference, Brock Evans, head of the Sierra Club's Washington office, presented a statement for 11 groups that included nearly all of the major national environmental organizations, plus the League of Women Voters. "We are here to warn you that the President's plan would if implemented pose the strongest kind of threat to the laws now protecting the rights of the public," Evans said.

Another speaker, Richard Ayres, an attorney with the Natural Resources Defense Council, was more specific. He said that the President's proposal to establish an Energy Mobilization Board and an Energy Security Corporation were "the most extraordinary authoritarian measures."

Ayres said, in particular, that these bodies would be exempt from the Administrative Procedures Act, which requires the holding of hearings and the basing of decisions on the information presented. Also, the Freedom of Information Act, a statute intended to curb government secrecy, would not, he said, apply to these agencies.

According to Ayres, "fast-track licensing" would eliminate open debate on massive energy projects and "place great power in the hands of three people in Washington," that is, in the hands of members of the Energy Mobilization Board. What Carter was trying to do, he said, was "remove energy from the normal political process" and leave the decisions to himself and his appointees. A nation that has so recently experienced the Vietnam war, he said, "should worry about trying to resolve conflicts outside the political process."

When reporters asked the environmental leaders whether they were breaking politically with the Carter Administration, their replies were ambiguous but seemed to suggest that, while this has not happened yet, things may be tending that way.

Ayres said that Carter was putting "very serious pressure" on his ties with environmentalists, adding, "If the President passes this [mobilization package], he will be remembered for his destruction of the environment."

Rafe Pomerance of Friends of the Earth said: "I think we have been the President's most consistent supporters, yet we have gotten the worst possible option for [dealing with] the energy problem." Later, Ayres said that the President, in his television address on Sunday 15 July, did not acknowledge that there was an alternative path, along which energy conservation and development of renewable energy resources are emphasized.

Garry Deloss of the Environmental Policy Center described a set of energy conservation policies which the environmental groups saw as preferable in every way—economically, environmentally, and politically—to the proposed energy supply mobilization. These included a proposal for a program of "house doctors" who would analyze and correct heat losses from existing buildings.

A reporter asked why, in the environmentalists' opinion, had the President gone so far astray?

"He got some bad advice," Ayres replied. Brock Evans added that, as best they could tell, the only environmentalist among the scores of individuals invited to Camp David recently was Russell Peterson, formerly chairman of the Council on Environmental Quality and now president of the National Audubon Society, one of the groups that had joined in the statement condemning the President's new policies. Some other environmental leaders went to Camp David uninvited but had to leave their statement for the President at the gate, which was as far as they got, he said.

"The advice he is getting is that it's good politics to run over the environmentalists," Evans said.—LUTHER J. CARTER

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olution asking the NSF to hold up its solicitation of institute proposals until the mathematics community had more time to discuss the situation. The council, whose members are elected, consists mostly of research mathematicians and speaks for the research community.

In response to the mathematics society's resolution, the National Science Board again discussed the institute at its September 1978 meeting. At that meeting the NSF staff suggested that the project solicitations go ahead as planned but that a paragraph be inserted in the announcement asking for alternative proposals. The idea was that there be a competition for funds. If the NSF gets alternative proposals that are more deserving of money than the institute proposals, the institute will not be funded.

Although they approve the competition in principle, the opponents of the mathematics institute say they fear the competition may be rigged. Stein wrote to James Krumhansl, the assistant director for mathematical and physical sciences and engineering at the NSF, pointing out some "serious flaws" in the draft of the project solicitation announcement. It was titled "A Mathematical Science Institute," its introduction stated that "the Foundation plans to establish on a five-year trial basis an institute for research in the mathematical sciences," and it devoted six pages to discussing the institute but only one paragraph to soliciting alternative proposals. But despite Stein's objections, no changes were made in the draft of the announcement.

Hoffman and other critics also question the competition because the proposals for the institute have a 1 August deadline whereas alternative proposals have no deadline. The institute's critics ask how there can be a competition for funds if the competing proposals do not all have to be in at the same time. Rosen explains that the agency always solicits proposals for alternatives to an institute, such as conferences and postdoctoral fellowships. It would make no sense to set a deadline for such proposals, he says.

At the January 1979 meeting of the mathematics society in Biloxi, Mississippi, the AMS Council met to decide on its view of an institute in relation to other ways to promote research. MacLane attended the meeting and promised to give the National Science Board a summary of the discussion.

The meeting reputedly was acrimonious, with institute supporters and critics accusing each other of having selfish motives at heart. But the council eventually passed, by a vote of 31 to 5, an "ordered list" of its priorities for research. An institute was included as part of the third of four items. It was thrown in with special year programs and summer institutes and was coyly alluded to with the phrase "other forms of mathematical sciences research institute concepts." At its April meeting, the AMS decided to submit its own alternative proposal to compete for part of the institute funds. It is asking the NSF to support a series of the summer conferences and a postdoctoral fellowship program.

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Caught up in this clash of opposing interests and resolutions and proposals are some major issues involving how best to stimulate research. But it is hard to distinguish personal motives from the dispassionate claims of wanting to advance the fields of mathematics in general. Phillip Griffiths of Harvard University, for example, is in favor of an institute because he thinks it would draw the best people together in an exciting research atmosphere and would provide some unity to counter what he sees as an increasing fragmentation of mathematics into highly specialized subdisciplines. Besides, he thinks, the proposal that Harvard, MIT, and Brandeis are submitting is an exciting one.

Other institute supporters also tend to come from universities that are submitting proposals or to have agreed to serve on a board of directors of a university's proposed institute. For example, Isadore Singer of the University of California at Berkeley comes from a school thought to be a front-runner in the competition. He favors an institute, he says, because he cherishes the time he spent at the Institute for Advanced Study in Princeton. "The critical environment that institute supplied and still does supply is for young people to concentrate on research in toto. The problem is that the Princeton institute can't handle all of mathematics any more," he says.

Supporters of the institute charge that its critics are concentrated at universities that have no chance of getting an institute and are not even submitting proposals. "Without thinking of whether [the NSF institute] is a good idea, the mathematics community reacted by saying that if there is no chance of the institute coming to their school, they were against it. This is the real basis of their objections," say Griffiths.

The institute's critics say that their motivations are not so parochial. Peter Lax and Cathleen Morawetz of New York University's Courant Institute for the Mathematical Sciences, for example, say they think it is extremely important for research mathematicians to be in a university environment where they do some teaching and where they contact other scientists. "If you build an ivory tower you get ivory tower mathematics," Lax says.

Joseph Kohn of Princeton University argues that the NSF institute could never be the stimulus to mathematics that the Institute for Advanced Study was because the NSF institute would have no permanent faculty. "A successful institute requires people who are permanently there to provide leadership and continuity," he says. In addition, he, as well as other critics such as Morawetz and Lax, worry that the NSF may view the institute as a way to avoid paying overhead to universities when it funds research. They are concerned that the math institute and the theoretical physics institute may herald a new trend. Scientists will go to institutes for research and to universities for teaching. Yet the universities are in dire need of support. "I hate the idea of giving up on the universities," Lax says.

Still another objection to the institute is that everything it supporters say it could do can be done less expensively with postdoctoral fellowships, special years, conferences, and research grants.

Despite the charges leveled against his agency, Krumhansl says he is taking the fight in stride. "It's in the nature of a town meeting. There are some rather unusual citizens . . . ," he says. Yet he takes offense at some of the accusations. "This conspiracy theory is inconceivable. Whoever impugns motives in this is nuts," he remarks.

The institute's opponents, however, continue to question whether the NSF really intends to have a competition between the institute and alternative proposals or whether it is merely placating the opponents with an empty gesture. As Stein plaintively explains, "We're not organized politically and we're not very good at this but the crucial issue we are fighting for now is a genuine competition as promised."—GINA BARI KOLATA