Interview with Judith S. Sunley

Judith S. Sunley served as director of the Division of Mathematical Sciences (DMS) of the National Science Foundation (NSF) from 1987 until 1992. Before that she served as deputy director of the DMS and as program officer for Algebra and Number Theory. Last year she was named executive officer of the NSF's Mathematical and Physical Sciences (MPS) directorate. During her tenure as DMS director, she received the Presidential Rank Award for her distinguished service to the NSF. On May 17, 1993, she was interviewed by ***Notices*** Associate Managing Editor Allyn Jackson. The interview, edited for conciseness and clarity, follows.

Judith S. Sunley

Notices: Can you describe what you're doing in your current position?

Sunley: As executive officer for MPS, I do a variety of things. One of the biggest parts of my job has to do with budgeting and planning within the directorate, both for staff and things of that sort and also for the budget requests that go to the Congress, and developing the current plans and operating plans by which we actually spend funds. In fact that's probably the most interesting part of the job because it gives me the opportunity to see what's going on in each of the five MPS divisions and what is most important to them scientifically. There are a lot of other things involved as well. A lot of the oversight functions for the directorate, from a management point of view, come through this office, and I currently chair the MPS Management Coordinating Council where we have discussions of how we are going to balance needs for travel and equipment, how we might change the MPS ways of doing business, and things of that sort. I also see a lot of things like reconsideration requests from all the divisions.

Notices: [DMS director] Fred Wan has said that for the DMS budget to do well, the MPS budget must do well.

Sunley: Well, one can take the argument one level further and say that the better the whole NSF budget does, the better MPS will do and the better mathematics will do too. The larger the percentage increase for the Research and Related Activities portion of the NSF budget, the larger the MPS line gets, and the better off mathematics is. When you look across the Foundation, the organizations that have probably gained the most in NSF have been Engineering, CISE [Computer Information and Science Engineering], and Education. This shift is not a new one; it's something you can see in NSF budgets over a period of several years. And I think that part of what Fred is trying to say is that mathematical and physical sciences disciplines should argue that their funding is important because of the long-term impact they have on everything, not just for the sake of the mathematical and physical sciences themselves. Certainly mathematicians can make that case as well as physicists and chemists, and they should make it. As a whole, mathematical and physical sciences play an incredibly important role in science and engineering. As five separate organizations, the MPS divisions aren't as effective as when they work together. This is part of the reason why Bill [Harris, MPS director] and I have emphasized that MPS divisions should work together as a team.

Notices: This year, DMS is operating on something like a modified flat-rate scheme. What do the other divisions think of this?

Sunley: Every division looks at things differently, and every division has problems that are different. One of the things that Bill Harris is very concerned about is making sure that awards to world-class individuals have the dollars in them that allow these people to do what they need to do to carry out their research. I think that Fred has managed to accommodate this very well in the plan he has worked out with the DMS staff.

I actually didn't have much of a role in the flat-rate experiment as it was outlined by the DMS [in the summer of 1992]. In my current position I had seen some preliminary drafts, but I felt any involvement on my part in either establishing, revising, or stopping such an experiment would make it very difficult for any incoming division director to believe they could manage the division without my interference in the future. I think that the final version went forward at a time when I wasn't here.

There are a variety of things going on in the Foundation that concern the size and composition of grants that maybe weren't stimulated by the experiment but are related to it. I doubt that mathematics, or any other discipline, will do something like that until some of the issues that are percolating in Foundation-wide task forces are resolved.

Notices: The current NSF policy is to increase the size and duration of grants. DMS seems to be going in a different direction this year. Is this dangerous for the DMS?

Sunley: Well, I think the way Fred is approaching things is not inconsistent with the policy. You have to look at what makes up a mathematics grant before you can talk about what it means to increase grant size and duration. There's no question that the NSF is increasing the duration of both standard and continuing awards, making more of them at least three years duration. I think one can say that soon the norm will be three years. When you talk about what goes into an award, generally speaking, you're talking about salary that pays for time the researcher is using toward the research project and costs associated with that, such as fringe benefits and overhead; you're talking about such things as graduate students, travel money, maybe funds to bring in a consultant or a visitor. When [former NSF director Walter] Massey or anyone else talked about increasing grant size, they weren't talking about increasing it in a frivolous way, they were talking about increasing it in what is needed to carry out research. The focus has now moved from absolute dollars to also looking at the composition of the grants. So I think, by and large, DMS is not out of step with this effort.

In fact that's an important thing for the math community to think about: What do they need in order to get their research done, and what should the composition of a math grant look like if the objective is to support the research properly and to make sure that the next generation of mathematicians gets properly trained?

Notices: What do you see changing within NSF as a result of the change in the administration? Will there be more initiatives? Will there be less emphasis on "curiosity-driven" research?

Sunley: I doubt that there will be many more initiatives because there are limits to the effort that people can put into the coordination of these initiatives. It really does require a tremendous amount of coordination, both within an agency like NSF and across agencies. I think at one point they had decided they were going to keep the number of FCCSET [Federal Coordinating Council on Science, Engineering, and Technology] initiatives fixed. That was in the previous administration; I don't know whether the new administration feels the same. But my guess is that, rather than totally new initiatives, we might see offshoots of existing initiatives. For example, in addition to the Global Change initiative you may have an environmental component that's more local; in addition to the High Performance Computing and Communications initiative you may have a more targeted emphasis on networking and the national computing superhighway. I believe manufacturing is scheduled to begin in fiscal year 1994 or 1995 as a formal FCCSET initiative, and again, you may see different kinds of things imbedded in that initiative.

There's no question that the new administration is committed to science and technology. The emphasis in a lot of the documents seems to be more on technology than on science, but there's also language that recognizes the importance of basic science to addressing some of these broad national needs. I think the fact that NSF was part of [President Clinton's] initial stimulus package is a very important statement about their concern for basic science.

I personally don't like the term "curiosity-driven research" because I think all research, if it's decent research, is curiosity-driven. In the same way, all research in one sense is "directed research", directed by different kinds of things, from the imperatives of one's own discipline to wanting to make ties to other disciplines, or something of that sort. I think we've created a dichotomy that isn't real with such terms. The initiatives form a strategic package, and every individual piece of research that is part of that collection doesn't have to be strategic in its focus. It's the package of things taken together that creates the strategic nature. You can do research that is every bit as basic as anything else as part of one of these strategic packages.

Notices: Do you think that the mathematics community has unrealistic expectations of what the DMS can do?

Sunley: I think people expected things not to change, and there is now a more realistic assessment that things are changing. There are a number of things at issue here that make it hard to answer this question directly. I think there was an expectation on the part of many mathematicians that, if you did research at a certain level of quality, you were more or less guaranteed funding. When the community found people at that level of quality being turned down, there was a lot of confusion. They didn't understand why some of these people were being turned down, and they didn't understand how difficult it was for many of the program directors to do that. There was an increasing gap between the number of people at the level of quality where the community felt there should

be funding, and the dollars that we had to do that. I think there's better recognition of that now. A lot of the discussion of flat-rate grants and other things has helped stimulate that recognition.

There's another sense in which one can answer that as well. It is the policy of NSF not to talk about declinations and proposals by name, so it's difficult sometimes to explain to the community how you were comparing one proposal to another proposal; where one ended up as an award and the other one ended up as a declination. By and large, the committees of visitors that we had last year came to the conclusion that the relative comparisons were on track.

I think another thing that the community at large perhaps did not fully recognize was that we were having serious problems with success rates for younger people. The number of new Ph.D.s was growing, and, until we made a concerted effort in fiscal year 1991, we really hadn't been focusing on insuring that those just coming out really had an equal opportunity. So we did try to focus some of our funds on relatively new Ph.D.s, say, within the first five years. That created some of the disconnect with the expectations of senior people. Yet if you asked people individually, they would say that one of the real problems was that their junior faculty colleagues couldn't get awards.

I also think there was a disconnect about what the community expected to see in budget requests. They expected more funding, perhaps focused in the core mathematics areas. But they were not fully aware of the environment in which that funding was taking place, and that has something to do with expectations also.

Notices: I'd like to ask you about your time at the DMS. What was your favorite aspect and your least favorite aspect? What was most satisfying?

Sunley: Well, of course, anyone's favorite thing is being able to tell people "Yes", and everyone's least favorite thing is having to tell people "No". As division director I always thought it was wonderful that someone in the Division of Grants and Contracts got to sign all the award letters, but I had to sign all the declinations!

I believe that in DMS we had a very strong team approach to looking at what was happening in the division and balancing off the various needs of the mathematical sciences. It's a wonderful group of people to work with. I have continually had rotators come in from outside and tell me that the environment was so different from a mathematics department because there is a group of people working together to try to do the right thing for mathematics, instead of fighting over turf questions and parking rights and things of that sort. It really makes a difference when people feel that they're there to try to address things in a common way.

I think involving the division in the education and interdisciplinary activities was very important and will, in the long run, make things easier for the mathematical sciences. We will have a better basis for convincing, say, all of the MPS disciplines that it's important to help mathematics and not just to work toward their own interests. Having accurately assessed the opportunities in the education and interdisciplinary areas and worked to convince people, both inside the Foundation and out, that math could and should be involved is likely the most satisfying aspect of my five years as division director because I feel I did good things for DMS and for the Foundation as well.

I think the educational aspect is very important because, when you justify basic research, what you are arguing is the ability of faculty members who do basic research to be strong educators as well. The calculus initiative goes back to when I was first division director, so I suppose there's a particular soft spot for that, and I think it's done some very good things. The Education and Human Resources (EHR) directorate frequently uses it as an example of cooperation. The Regional Geometry Institutes were something that was quite different and quite a departure for DMS. I think we've built a cooperation with EHR in that area that has proven very valuable as well.

And there's the interface between mathematics and biology, for which Andre Manitius [former program officer and former deputy director of DMS] deserves a great deal of credit for having started, and which others, including myself, kept pushing for many years. That is something that has grown as a share of the Applied Mathematics program and of the Statistics and Probability program over a period of four or five years. If you look back five years ago and look now at the interactions with biology, the changes are quite significant.

Seeding some of the activities between mathematics and the geosciences is very important, and you can see some of those come to fruition in fiscal year 1994 budget requests, where DMS actually has a role in the Global Change program. These things take a long time to come to fruition.

I've also taken some satisfaction in watching the Computational Mathematics program evolve and mature over the years. Its existence helped DMS become part of the High Performance Computing and Communications initiative in a natural way. It has also made a real difference in how mathematics is done, and it's exciting to be part of such a change.

I should also say, however, that over that period of time it was the education questions and the interdisciplinary questions that were easier to move on because they fit better with the directions in which science policy and, therefore, budget requests were going.

I would like to have done more for some of the basic subfields of mathematics. If I regret anything in leaving at the time I left, it's that I wasn't there this year to take on the challenge of demonstrating ways in which geometers and analysts and algebraists and number theorists can contribute to and benefit from some of these interdisciplinary intiatives by being aware of what some of the ties are. There is real opportunity here for mathematics because these areas ask interesting mathematical questions that demand new mathematics if we're going to be successful in addressing them. I think Fred is doing a great job in making sure all parts of the division share in the initiatives. I like to think I could have done as well.

Notices: That brings us to the question of the fiscal year

1993 budget request and the community's reaction to the zero increase for disciplinary research. [That request contained a zero increase for the DMS "core" research programs, with the entire increase being framed in terms of federal or NSF-wide initiatives.]

Sunley: I was disappointed that the community would immediately assume that we were trying to kill core mathematics. At about the same time the budget request came out, I wrote a Forum column for the ***Notices*** (volume 39, April 1992, pp. 300–302). It explained some things about the complexity of the budget process and the changes that can take place between the time a division first outlines its opportunities and needs and the time a formal request to Congress is made. In the reactions to the situation from some members of the community, there was no sense that we might have had a very different structure to our initial formulation of plans. In a year when DMS had some significant breakthroughs in building its budget through cooperation with other parts of the Foundation, the overall reaction of the community was negative. It seemed to be impossible for people to recognize the positive aspects of the budget request because of the assumptions they made about our interest in disciplinary research.

There are, of course, questions of strategy in describing the budget. There were similar situations throughout the Foundation that were not so obvious because of how the other requests were structured. But Dave Sanchez and I both felt that describing things as we did would let the mathematics community know there were things in the planning environment that were threatening our ability to expand funding for core mathematics.

On the other hand, there have been people in the mathematics community who have been very strongly supportive, who understand the complexity of the process, and who have come and asked what they could do to help make a difference. They deserve a lot of credit because it wasn't always easy to work through the system to make a difference. Understanding its intricacies takes a lot of effort and persistence. I particularly appreciated their willingness to look for the positives in the overall budget picture and to work with the division in shaping a program we could all be happy with.