The NSF and the Geosciences Community: Rotating Program Officers

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The National Science Foundation (NSF) is a federal agency charged with the care and feeding of basic scientific research in U.S. colleges and universities. NSF is a major contributor to the support of research in Earth, ocean, and atmospheric sciences, disciplines of great importance to AGU members. NSF operates slightly differently.

It brings to NSF people who have first-hand, recent knowledge of “what it is really like” beyond the Washington, D.C. beltway. Knowledge of new ideas, recent graduates, and a fresh look at the system are worth considering or are considered by those who have considered or are considering becoming rotating program officers (rotators) at NSF. We have chosen a “roundtable” format in order to convey the common elements of our activities, experiences, and impressions but also to indicate their diversity.

NSF is non-monolithic but rather consists of many individual programs, each of which operates slightly differently. Batiza was a rotator in the Marine Geology and Geophysics Program (MGG) of the Ocean Sciences Division (OCE) for 1 year (August 1985 to September 1986).

D. Rea was with the Climate Dynamics Program (CDP) within the Division of Atmospheric Sciences (ATM) for 15 months (May 1986 to August 1987).

D. Rumble was with the Petrogenesis and Mineral Resources Program of the Earth Sciences Division (EAR) for 2 years (July 1985 to June 1987).

What did you do as a rotator?

Batiza: A large part of the rotator job in MGG is to handle the new proposals that arrive by the truckload every few months or so. We also deal with problems/opportunities/and connected to a recorder working in the 10- to 125-Hz range.

After data processing, acoustical reflectors were clearly visible between depths of 600–1500 m. The greatest reflection intensity was observed in the 750–800-m layer, and signals were higher on the Goring Slope. The reflectors had wavy structures with slopes of 1°–3° oriented toward the abyssal plain. The vertical seawater density gradient had a secondary maximum in this layer, with a corresponding minimum Brunt-Vaisala period of 0.5 hour. The wavy form of the reflectors and their 1°–3° slopes are indicative of internal waves, whose generation can be explained by reflection of internal M2 tidal waves from the slope of the Goring Ridge (J. Gorrella, and D. Michon, C. R. Acad. Sci., Ser. 2, 306, 781–787, 1988).

Rea: My responsibility within the CDP was to deal with the paleoclimatology projects that it funded. Paleoclimatology makes up about 35–40% of that program in terms of dollars.
the remainder being the nature of modern climate and numerical modeling of present and past climates. About half my time was spent in the normal processing of proposals, somewhat less time than that of other program managers at NSF. The other half of my time was spent working on small meetings and climate change occurring at the various geological scales. Organizing, running, and participating in meetings is a major part of my job at NSF. The meetings I participate in are either the Foundation or other agencies of the system, or individual CDP program managers traveled to both China and the U.S.S.R. in various official capacities during my tenure there.

Rumble: The Earth Sciences Division (EAR) is organized in two units, a major projects department, and one that includes the Consortium for Continental Reflection Profiling, Deep Observations of the Continental Margin, and Incorporated Research Institutions for Seismology (CIRI) and Instrumentation and Facilities programs and a unit to support research of individual investigators. The latter are primarily undergraduates, but the program officer needs to decide what is the most important science in terms of some point of reference and then act accordingly. In Paleoclimatology, that reference is the clear need of society to understand the changes in the Earth's environment that will be forthcoming in the next 50-100 years. Because of CDP's need to focus the program on climate and numerical modeling at the various geological time scales and to make judgments on who is doing the best work on each aspect of this, the program officer needs to get to know the present and potential Principal Investigators (PIs). I accomplished this by traveling to large general meetings such as AGU or the American Meteorological Society where I could take the chance of success, to small meetings focused on topics of direct interest to the program, and to the home institutions of several individual PIs (site visits).

In a more proactive role, CDP organized a workshop for its PIs entitled Workshop on Paleoclimate Data-Model Interaction. The intent of this effort was to bring together and foster interaction among scientists who generate proxy data on the nature of past climates and climate change with those who develop computer-based mathematical models of climatic regimes. Organizing, running, and working on that meeting was more time than I anticipated, a number of weeks all together, even though all of those meetings varied in the amount of time. One was involvement in the long-term planning and budgeting process that goes on every year at NSF. Program managers have learned that in these days of tighter monies, about the only way to get a significant increase in one's budget is to respond to and communicate the need for support to scientific and community needs by helping to develop "initiatives" and work to have them adopted by the GEO as one of their top priorities. There are various avenues to success in these efforts; the shorter-term payoff is minimal, but in the long run the efforts can be fruitful. Last budget season there were several initiatives that dealt with one aspect or another of paleoclimatology developed and adopted by GEO. Working on these documents and adhering to the constraints of the system (i.e., to present large-scale concepts in what eventually must boil down to only two pages) lends a useful understanding of how NSF long-range planning functions.

The last aspect of my job that is amenable to categorization was liaison between NSF and other scientifically oriented agencies, such as the National Oceanic and Atmospheric Administration, National Aeronautics and Space Administration, U.S. Geological Survey, the Office of Naval Research, the National Academy of Science, etc. I learned (no surprise) that in Washington much of this interaction occurs among a group of science managers at the various agencies who generally know each other. Finally, CDP has commitments to assist either the Foundation or other agencies of the government in dealing with both international scientific societies and other government agencies. Individual CDP program managers traveled to both China and the U.S.S.R. in various official capacities during my tenure there.

Batiza: Since rotators at NSF, like permanent program personnel, have a great deal of contact with individual scientists during their research, they have a good vantage point for assessing general community attitudes. Lately, of course, the major issue a rotator confronts on a daily basis is the shortage of money to fund an increasing number of excellent research proposals. No one is more keenly aware of this problem than the program officer, for because no one else in the system (even review panel members) has to grapple with the twin issues of "scientific merit" and limited funds at the level of choosing among the smaller number of proposals. To further complicate matters, many other criteria may, in some cases, be used to make funding decisions, including disciplinary program balance, total level of funding that a PI may have, whether a proposal qualifies for certain NSF-wide special focus programs, whether the proposal is from a young investigator, ship schedules, and other considerations. Fairly strict guidelines for proposal evaluation and funding exist, and the decisions of program officers are carefully reviewed at several levels. Funding decisions will be made to make best use of the resources available, always trying to maximize the benefit using a very wide range of different criteria.

Scarce resources and increased competition for funding are healthy, but only up to a certain point. Higher-quality proposals may not always get higher numbers of proposals to fund their research. In principle, it would be better to spend this time writing fewer numbers of hopefully higher-quality proposals. However, most scientists perceive the system as a numbers game; more proposals submitted means a greater chance of success. This is probably not true, but there are several real factors which may contribute to this misconception: not all highly rated proposals are funded because of scarce resources; resubmittals of the same proposal may get higher or lower ratings than the original proposal; and funding decisions, at least in MGG, are made only 2 or 3 times a year, not continuously. This batch processing mode means that proposals are compared mostly with other proposals submitted at the same time and less so with those from previous panels. Since the mix of proposals varies from panel to panel, any high-quality proposal may get a very different treatment at a specific panel. These factors and the variety of criteria used for funding decisions can result in a perceived inconsistency within the peer review/panel/program evaluation and funding system. This "random element" is often misunderstood and, unfortunately, can lead to the perception that the system functions as a dart board.

Clearly, the issue of scarce resources and concerns about the peer review system cannot be satisfactorily resolved at the program staff level. Every effort must be made to make sure the system works. My overall impression is that while the system is certainly not flawless (but how does one objectively and quantitatively measure its success?), it generally works very well. Largely, this is due to the careful efforts of mail reviewers and panelists, but also it is because NSF is staffed by talented and dedicated scientists and administrators who take their responsibilities very seriously.

Other issues of daily concern include those of "big" versus "small" line items within the program of attracting talented young investigators into ocean sciences, the crucial need for long-term planning (both scientific and budgetary), the...
issue of high-risk, innovative science versus low-risk science, the problem of dwindling amounts of ship time for field programs, the problem of "soft-money" researchers who must rely on private foundations or unrestricted funding, the question of who should review proposals, the problem of diminished funding for graduate students, postdoctorals, and new equipment and a host of others. In short, the program officer (and rotator) is concerned with all issues that affect the health and vigor of research in their program. Obviously, rotators going to NSF for periods of 1-3 years cannot hope to solve these problems single-handedly, but their input is solicited and can be helpful in finding long-term solutions.

Rea: The single largest issue of concern is how to deal with the present situation of far more good proposals than there is money to fund them. Rodney Batiza has discussed this issue at some length so I will be brief here. In the past, CDP has tended toward the less used option in NSF, that of funding fewer programs well enough to do the job proposed, rather than trimming everyone to spread the dollars further around the community. This has proved budgetary restrictive, however, bring more and more trimming. We try to balance "big science" versus "small science" and hard-money versus soft-money investigators. We learn very quickly that the best research is accomplished both by single PIs and by multiinvestigator and multinational efforts. Larger groups, if well structured, can accomplish things that one or two PIs can never aspire to, but the problem is to find the proper balance for one's own program. An investigator with a soft-money appointment may need as much as twice the budget to accomplish the same amount of science as those with hard-money jobs and university support for students. Program managers try not to be influenced by budget levels in their initial evaluations but such idealism can not always be achieved.

There are a number of lesser concerns. One is how to identify high-risk/high-reward proposals; program managers are encouraged to fund such items occasionally. NSF program managers try hard to ensure funding for students and are concerned by the number of proposals that request technician funds without support. There is also concern about the growth of the bureaucracy and the increasing amounts of paperwork. Much of this is at the behest of Congress who grew as my appreciation for the problems in funding decisions is provided by the Division Director and his Deputy, by NSF's Division of Audit and Oversight, and by the Advisory Committee of Earth Sciences. The Advisory Committee, a body distinct from the proposal review panel, frequently examines in detail selected programs to verify that meritorious proposals are funded.

The current situation of increased proposal pressure, less rapidly increasing budget appropriations, and declining success rates imposes heavy burdens on individual investigators and program directors. Scientists are being asked to review more proposals but their own stand less of a chance of being funded. The process of deciding what does and what doesn't get funded is overloaded. At a success rate of 20%, choices inevitably have to be made between equally valuable proposals, coloring funding decisions with an apparent arbitrariness. The problem is not with the quality of proposals approved for funding; they have survived a rigorous selection procedure and have achieved consensus endorsement from reviewers, panelists, and program directors. The problem is that our programs are underfunded in relation to the existing research opportunities raised by new ideas and new instruments.

What are your overall impressions of NSF and its role in the community? Was your experience at NSF valuable?

Batiza: Overall, my impressions of NSF are very positive. While being a rotator involves doing a certain amount of routine paper shuffling, one has great freedom in choosing how to spend one's time. For example, during the first couple of months that I was at NSF, I was able to work on my own research at least 1 day each week. There are many negative misconceptions about the way NSF operates, but in fact, I expected that these would be borne out. Instead, they were dispelled within the first few weeks. My respect and admiration for the organization grew as my appreciation for the problems involved increased.

NSF plays a vital role in our community. It seems especially important that during times of very scarce resources such as now, the community work with NSF to successfully compete for funds with other disciplines. Being a rotator was a very valuable experience. In addition to learning more about the proposal evaluation and funding process, the job provided a new and broader perspective on the field of geosciences. Being a good program officer (and rotator) is a difficult, challenging and open-ended job. I would say that the ratio of rewards to frustrations is about equal to that in the academic world.

Rea: NSF distributes 95% of its total budget to the scientific community, a far higher percentage than any other agency. My single strongest impression of NSF was that the people "in the trenches," the program officers, are hard working, capable, creative group. I personally may not agree with the decisions they make, but those decisions are not made lightly or without knowledge of their ramifications. I left NSF with a much higher regard for the program officers than when I arrived. All of them struggle daily with the problems of grant applications, good proposals, and restricted budgets.

NSF role in the community is vital to the health of the nation's science. It is the only nonpolitical, nonapplied scientific funding agency doing much effective work in the geosciences and as such is highly respected by scientists both at home and abroad. The strength of the foundation lies in the peer review system. Therefore recent Congressional avoidance of that system in awarding large grants, based often on politics, is to be deplored.

My experience at NSF was valuable to me for several reasons. First, it provided a clear understanding of the internal operations of the foundation, how planning is done, how decisions are made, and who makes them. I'm not sure that I can write a better proposal than before, that merely requires more time and effort, but I do know more about exactly how the budgeting process is functioning. It does give me some understanding of why people like scientists are in Washington, and enjoy all the wonderful galleries and museums, live with daily soap operas of Congressional hearings, and learn why everybody seems to be a Redskins fanatic, observe the reality of Potomac Fever, and so on, is a unique educational experience. Finally, I don't think that there is a better way to get a clear and complete overview of the nature of U.S. science and scientists in the fields of interest to me. As a matrix-based scientist, I have met the broad range of paleoclimatologists who work on land, limnologists, palynologists, dendrochronologists, those who study the record in ice cores, those who construct all types of computer models of present and past climates, and people with a variety of other skills. It is probably this personal broadening that will be most rewarding in the long run.

Rumble: EAR is responsive to the changing needs of scientific progress and is bound neither by tradition nor by an excessively bureaucratic attitude. Funding priorities are established not by administrative directors, but rather by consultation with individual scientists acting as ad hoc reviewers, panelists, program officers, or as a member of the Advisory Committee. The reports of the Board of Earth Sciences, National Research Council, are a leading consideration in establishing scientific and budgetary goals. Officers of NSF's Division of Grants and Contracts exemplify a refreshingly nonbureaucratic attitude. In dealing with the innumerable "special cases" that arise in grant administration, grants officers usually held that if there was good scientific justification, and if it did not jeopardize the approved budget, a way would be found to do it.

I recommend serving as a term program officer very highly. You will make new friends, which can be a wonderful place to meet people and have the opportunity to advance the interests of your research community. Furthermore, the forced learning of subdisciplines not actively pursued since graduate school is effective at finding one out of midcareer ruts.

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