

Fiscal Year 2009 Budget Request for the National Science Foundation

Allyn Jackson

This article is the 36th in a series of annual reports outlining the president's request to Congress for the budget of the National Science Foundation. Last year's report appeared in the June/July 2007 issue of the *Notices*, pages 748–50.

The National Science Foundation's fiscal year 2009 budget request was unveiled in February this year against a backdrop of disappointment over the previous year's budget process, and into the political maelstrom of a nation at war and a presidential election. After a nearly flat budget in real terms for fiscal 2008, the fiscal 2009 requested increase of 13.6 percent¹ looks like a return to better times. Still, the refrain repeated every year—that the final budget, once Congress passes it, could look very different from the request—has never been more true. Even the simple hope that Congress might pass appropriations bills by the time fiscal year 2009 begins on October 1, 2008, has gone by the boards. It is highly unlikely that the NSF will have a budget before the new president takes office in January 2009.

Though lacking the monkey wrench an election can throw into the works, the appropriations process for the fiscal year 2008 budget was confounding. The fiscal 2008 request called for an increase of almost 9 percent for the NSF and the same for the NSF's Mathematical and Physical Sciences (MPS) directorate, the larger organizational structure that contains the Division of Mathematical Sciences (DMS). As Congress debated the budget, even higher numbers were bandied about. The congressionally authorized plan to double the NSF budget over ten years seemed to be on track—and there was even discussion of quickening the timetable. The appropriations process continued past the start of the fiscal year in October 2007 and dragged

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¹This figure takes into account the US\$33 million dollar rescission to the FY 2008 budget required by the FY 2008 Omnibus Appropriations and thus differs slightly from the figures in the accompanying tables.

on into the winter, but even then the outlook remained bright for the NSF.

“When we went off on our Christmas vacation, I remember I was saying, ‘I will take any one of those numbers,’” remarked Tony Chan, NSF assistant director for MPS. But Chan and his NSF colleagues were in for a rude awakening. Caught in what he described as “triage” between earmarks by Congress, the president's insistence on a cap on domestic spending, and the looming problem of continued funding for the war in Iraq, the NSF emerged with a 3.1 percent increase. The Research and Related Activities (RRA) segment of the NSF budget received an increase of 1.3 percent, which is less than the inflation rate; the MPS got slightly more, 1.4 percent. (The reason for the large difference between the NSF's overall percentage increase and that for RRA is that some programs outside RRA received large increases, such as Major Research Equipment and Facilities Construction, which rose over 30 percent.)

In this disappointing context, the DMS was fortunate to come out with a 3.0 percent increase. “We did in some sense extremely well, given the circumstances,” said DMS director Peter March. “The increase was good relative to the background figures, and we are very grateful for that increase. On the other hand, it comes in a somewhat targeted way. The bulk of the increase is for CDI.” CDI stands for Cyber-enabled Discovery and Innovation, an NSF-wide initiative in which the DMS



Tony Chan, NSF assistant director for MPS.

is playing a large role. The DMS increase of 3.0 percent amounts to about US\$6 million, and US\$5 million of that will support CDI activities. The MPS, as well as the NSF as a whole, had already committed to making CDI the top priority, so that was where the MPS concentrated its meager increase. The DMS thus profited from being the directorate's lead player in the initiative. By contrast, the fiscal year 2008 increases for other MPS divisions were held to around 1 percent.

According to the fiscal 2009 request, the NSF budget would climb 13.6 percent, to US\$6.9 billion.



DMS director Peter March.

The reason for the generous requested increase is the key role the NSF plays in the president's American Competitiveness Initiative (ACI), which seeks to enhance the nation's economic competitiveness in the global arena. The ACI emphasizes physical sciences and technology, and this emphasis can be seen in the way increases are distributed among the NSF's research directorates. The

MPS leads this group, with a requested increase of 20.2 percent; next comes the Computer and Information Science and Engineering directorate, with 19.5 percent, and the Engineering directorate, with 19.2 percent. The smaller requested increases for the other NSF research directorates—Biological Sciences; Geosciences; and Social, Behavioral, and Economic Sciences—also reflect the emphasis on economic competitiveness. Nevertheless even those smaller increases are quite good, so those areas would still benefit from the NSF's favored status as a key player in the ACI, as would the foundation's Education and Human Resources

AMS Grassroots Advocacy Network

This year the AMS Washington office launched the AMS Grassroots Advocacy Network to encourage mathematicians to talk to their senators and members of Congress about the importance of strong support of scientific research and education. For more information, visit <http://www.ams.org/government/grassroots2008.html> or contact the director of the office, Samuel M. Rankin III, at smr@ams.org.

—A. J.

directorate, which is slated for an increase of 8.9 percent.

The influence of the ACI can also be seen in how decisions are made about distributing the MPS increase within the directorate. Chan said that the decision-making process about the distribution is "very complex" and takes place in discussions between the upper echelons of the NSF and the Office of Management and Budget, and also in discussions that he has with colleagues in the foundation and the scientific community at large. "The budget process has at least two components," Chan explained. "One is how we respond to the president's and the nation's needs and initiatives. It's the president's budget, no doubt about that. But the other part is recognizing the core disciplines. And in fact, everybody's job here at NSF is to somehow balance that. One has to really keep both in mind."

An instructive example is the Astronomy division, which received the lowest requested increase in the MPS, 14.8 percent. "Astronomy is a basic science, it is very core...it inspires new generations of young scientists to come in, the public loves it, and so on," Chan said. But, looked at from the point of view of economic competitiveness, astronomy is less central. The attempt to balance these two

Table 1: National Science Foundation (Millions of Dollars)

	2005 Actual	Change	2006 Actual	Change	2007 Actual	Change	2008 Estimate	Change	2009 Request
(1) Mathematical Sciences Research Support	\$ 200.2	-0.3%	\$ 199.5	3.1%	\$ 205.7	3.0%	\$ 211.8	16.0%	\$ 245.7
(2) Other Research Support (Note a)	4199.7	6.8%	4483.5	5.2%	4718.9	2.4%	4830.4	13.8%	5495.8
(3) Education and Human Resources (Note b)	843.5	-17.0%	700.3	-0.6%	695.6	4.3%	725.6	8.9%	790.4
(4) Salaries and Expenses (Note c)	237.3	10.6%	262.5	0.6%	264.1	12.5%	297.2	8.4%	322.2
(5) Totals	\$5480.8	3.0%	\$5645.8	4.2%	\$5884.4	3.1%	\$6065.0	13.0%	\$6854.1
(6) (1) as a % of the sum of (1) and (2)	4.55%		4.26%		4.18%		4.20%		4.28%
(7) (1) as a % of (5)	3.65%		3.53%		3.50%		3.49%		3.58%

Tables prepared by Notices staff. Totals may not add up due to rounding. **Note a:** Support for research and related activities in areas other than the mathematical sciences. Includes scientific research facilities and instrumentation. **Note b:** Support for education in all fields, including the mathematical sciences. **Note c:** Administrative expenses of operating the NSF, including the National Science Board and the Office of the Inspector General.

considerations led to an increase for the Astronomy division that is good, but quite a bit below the 20 percent increase for the MPS overall. As March summed it up, "Every division inside MPS is doing well. It's just that some are being singled out for extraordinary increases, and that I think is related to competitiveness."

As Chan and March put it, the increases within the MPS determine three clusters: Chemistry and Materials Research, which received the highest increases; then DMS and Physics; and finally Astronomy. Thus the mathematical sciences are in the middle of the pack, perceived as important but not leading contributors to economic competitiveness and, at the same time, as key core disciplines in scientific research as a whole. The 16.0 percent requested increase for the DMS reflects these perceptions. "I always make the argument that DMS actually can contribute a lot to American global competitiveness," said Chan. "It's not so obvious to some people! So I have to make that argument, and I do. On the other hand, I am not saying the DMS is the leading division for that purpose. But the core of the mathematical sciences is important for all of science. And I make that argument as well."

Under the terms of the fiscal 2009 request, the DMS would receive an increase of almost US\$34

million, "which is enormous, actually, in historical terms," March remarked. About 60 percent of that increase, or US\$21 million, would be devoted to core research in the mathematical sciences. The remaining 40 percent, about US\$13 million, would primarily support research related to the targeted initiatives in which the DMS is participating; prominent among these is CDI, in which according to the 2009 request the DMS would invest about US\$9 million, up US\$4 million from the 2008 level. The other initiatives the DMS will participate in are Science and Engineering Beyond Moore's Law, Quantum Information Sciences, MPS-Life Sciences Interface, and Adaptive Systems Technology. The DMS request also contains increases for support of young people, particularly through the ACI Fellows program and through the Faculty Early Career Awards. For the latter the DMS request contains an increase of about one-third, to US\$8 million.

Within the DMS, the median size of a three-year award is about US\$180,000. This means that the DMS could make over 100 additional grants should the US\$21 million requested increase for core research become a reality. Could that money instead be spread around to support, say, 200, or even 500 additional grants? Don't count on it. The DMS award size is already half of the average

Table 2: Directorate for Mathematical and Physical Sciences (Millions of Dollars)

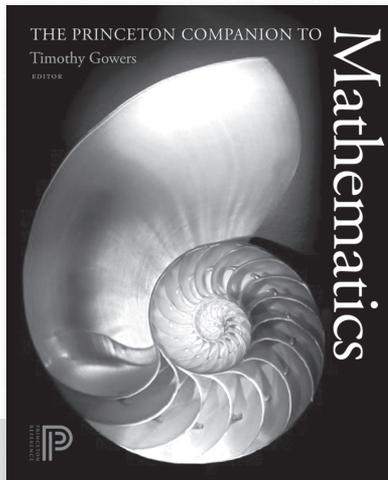
	2005		2006		2007		2008		2009	
	Actual	% of Total	Actual	% of Total	Actual	% of Total	Estimate	% of Total	Request	% of Total
(1) Mathematical Sciences	\$ 200.2	18.7%	\$ 199.5	18.4%	\$ 205.7	17.9%	\$ 211.8	18.1%	\$ 245.7	17.5%
(2) Astronomical Sciences	195.1	18.2%	199.7	18.4%	215.4	18.7%	217.9	18.7%	250.0	17.8%
(3) Physics	224.9	21.0%	234.1	21.5%	248.5	21.6%	250.5	21.5%	297.7	21.2%
(4) Chemistry	179.3	16.8%	180.7	16.6%	191.2	16.6%	194.2	16.6%	244.7	17.5%
(5) Materials Research	240.1	22.4%	242.6	22.3%	257.3	22.4%	260.2	22.3%	324.6	23.1%
(6) Office of Multidisciplinary Activities	29.8	2.8%	29.9	2.7%	32.6	2.8%	32.7	2.8%	40.0	2.9%
(7) Totals	\$1069.4	100.0%	\$1086.6	100.0%	\$1150.7	100.0%	\$1167.3	100.0%	\$1402.7	100.0%

Table 3: Compilation of NSF Budget, 2002–2008 (Millions of Dollars)

	2003	2004	2005	2006	2007	2008	2009	2003–2007 Change	2003–2009 Change
	Actual	Actual	Actual	Actual	Actual	Estimate	Request		
(1) Mathematical Sciences Research Support	\$ 178.8	\$ 200.3	\$ 200.2	\$ 199.5	\$ 205.7	\$ 211.8	\$ 245.7	15.0%	37.4%
<i>Constant Dollars</i>	97.2	106.0	102.5	99.0	99.2			2.0%	
(2) Other Research Support (Note a)	4054.7	4277.0	4199.7	4483.5	4718.9	4830.4	5495.8	16.4%	35.5%
<i>Constant Dollars</i>	2203.6	2264.2	2150.4	2224.0	2275.9			3.3%	
(3) Education and Human Resources (Note b)	934.9	944.1	843.5	700.3	695.6	725.6	790.4	-25.6%	-15.5%
<i>Constant Dollars</i>	508.1	499.8	431.9	347.4	335.5			-34.0%	
(4) Salaries and Expenses (Note c)	201.0	230.6	237.3	262.5	264.1	297.2	322.2	31.4%	60.3%
<i>Constant Dollars</i>	109.2	122.1	121.5	130.2	127.4			16.7%	
(5) Totals	\$5369.3	\$5652.0	\$5480.8	\$5645.8	\$5884.4	\$6065.0	\$6854.1	9.6%	27.7%
<i>Constant Dollars</i>	2918.1	2992.0	2806.3	2800.5	2838.0			-2.7%	

Current dollars are converted to constant dollars using the Consumer Price Index (based on prices during 1982–84). For Notes a, b, and c, see Table 1.

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for the NSF as a whole. And the success rate for proposals to the DMS is about 35 percent, versus about 21 percent NSF-wide. Against this backdrop, arguments for giving smaller grants to more people are unlikely to fly. “The way forward is to make compelling arguments for increases to the budget,” said March. “In order to really fund an appropriate fraction of our community and fund each of them appropriately to do the research that is in their proposals, the way forward is to increase the budget—for NSF, for MPS, for DMS.”

At the time of this writing, a concerted effort was under way to try to add money for science to the so-called “supplemental” bill that will provide funding for 2008 for the wars in Iraq and Afghanistan. Should this effort be successful, additional funds could be added to the NSF fiscal year 2008 budget. The AMS, through its Washington office, is working on this with over 200 other organizations that include professional societies as well as private sector companies. There are many complications surrounding this effort, including the possibility of a presidential veto should funds for science be tacked on to the supplemental. Whether the effort will be successful is unclear, remarked AMS Washington office director Samuel M. Rankin III. “There is pressure from the scientific community to do this, but there are pressures from many other constituencies as well,” he explained. “If we get a boost in the supplemental, it will help a little bit... But at this time, it is all up in the air.”

In fact, there is plenty of support within the administration and both houses of Congress for substantially increasing the NSF budget. But this support might not suffice to overcome the harsh fiscal and political pressures that are likely to shape the 2009 appropriations process. Whatever the outcome in terms of dollars, though, the broad outline of the NSF’s priorities is clear: Strengthening the nation’s economic competitiveness and emphasizing the core disciplines that support it. In this vein, March put a twist on a famous saying of John F. Kennedy, suggesting that the mathematical sciences community has to ask not what the federal government can do for the field, but rather what the field can do for the country. “What compels federal funding is arguments that show that an investment in basic research in the mathematical sciences yields a benefit for the nation,” he said. “The extent to which the community can [make this argument], is the extent to which we will see good increases in the budget.”

Note: For further information on the NSF budget request, visit the webpage <http://www.nsf.gov/about/budget>.