

MEMORANDUM

07 April 2004

To: MPS Advisory Committee

From: Michael S. Turner, AD/MPS

Subject: Response to the Division of Mathematical Sciences Committee of Visitors Report

Please find attached the MPS response to the Committee of Visitors (COV) report from the 11-13 February 2004 COV review of the Division of Mathematical Sciences. The review was thorough and insightful, and the findings will be very helpful to me and to the Division of Mathematical Sciences in fulfilling our responsibilities to the scientific community and to the nation.

The Division of Mathematical Sciences drafted the attached response, and I concur with its substance. I therefore adopt it as the official response of the MPS Directorate. I hope the full MPS Advisory Committee finds this COV review and the MPS response useful and acceptable.

MEMORANDUM

DATE: March 19, 2004

TO: Dr. Michael Turner
Assistant Director, Directorate for Mathematical and Physical Sciences

FROM: Dr. William Rundell
Director, Division of Mathematical Sciences

SUBJECT: Response to the DMS Committee of Visitors Report

The Division of Mathematical Sciences (DMS) appreciates the extremely positive assessment of the Division's activities and future provided by the report of the Committee of Visitors (COV). We are appreciative that the COV identified the historic changes and unprecedented growth of the mathematical sciences in its tripartite mission of core research activities, its dramatic relevance to science, engineering, business, industry, health, and national security, and the development of an enhanced workforce. We are also pleased that the COV is enthusiastic about the strategic focus of DMS on addressing these three major domains and that the underlying assumptions of the DMS are the appropriate ones to advance the contribution of the mathematical sciences to the nation's welfare.

The COV raised a small number of broad-based issues that the DMS will now address:

- 1. COV recommends that DMS devote attention to developing an assessment mechanism for the VIGRE program at an appropriate time. The timing and nature of such an evaluation needs careful thought because of the long-term nature of the program.*

DMS response, March 2004:

The DMS completely concurs with this assessment. We have been monitoring the funded sites, conducting annual workshops (with approximately 200 participants) to discuss progress and future directions of the program and, as the COV acknowledged, have been willing to make changes to our workforce portfolio in response. However, we must make a more detached and thorough analysis of what this program has achieved. As the COV notes, the timing is crucial. We believe that at a minimum, half of the current sites should have been through a complete cycle. In preparation for this review we will design the evaluation plan over the next two years with a view to implementation in late 2006.

January 2005 update:

DMS has instituted a 7 person management team of program officers representing broad scientific interests within the Division to oversee all our workforce activities, including the VIGRE program. One of the charges to this subcommittee is to begin the preparatory evaluation process for VIGRE. They are collecting, and verifying the accuracy of, data from the current and previously funded sites with a view to being able to respond to some of the obvious assessment questions.

October 2005 update:

DMS has analyzed the data from the VIGRE sites and has made some preliminary findings. It is the intention to share this compiled data with the community and to seek an external review of the program. We are actively discussing which group or organization should be charged with the evaluation and DMS will make a final decision on the exact process before the end of 2005.

- 2. There were, however, three concerns voiced about the institute program that COV believes need attention.*

- i. *Given the increased number of institutes, COV supports a serious evaluation of whether other programs previously supporting conference type activity should be decreased to minimize unnecessary duplication of efforts and allow more strategic re-allocation of those resources.*

DMS response, March 2004:

DMS is aware of the current potential overlap and believes that there are two or three substantial conference programs that have served the community well over several decades but whose purpose has now largely been subsumed by the more extensive institute portfolio. We intend to take a very hard look at the added value provided by these activities should a renewal of the current awards be requested. The Division also will ensure that monitoring of potential or actual portfolio overlaps is treated within our response to the third item.

January 2005 update:

In early January 2005, DMS issued a revised solicitation for its conference and workshop activities; all proposals in these areas must now be submitted through NSF 05-540. All proposals over a nominal amount will be reviewed in common and this will allow us to make strategic decisions on the allocation of this resource.

October 2005 update:

A first round of funding for NSF 05-540 took place this summer and proposals from a second round of proposals from the solicitation have just arrived.

- ii. *COV is concerned that core components of the mathematical sciences are not receiving adequate attention and resources in the overall work of the NSF institutes. COV recommends that DMS carefully evaluate this question and actively respond if appropriate.*

DMS response, March 2004:

DMS believes there may be a valid concern on this point. We are currently conducting an analysis of the distribution of programs, workshops and conferences hosted within the last three years and planned for the next three-year cycle by the institutes taken as a whole. This will provide a validation or a refutation of the point. In the former case we will certainly take action for it is an underlying premise that the institute portfolio be a reflection of our research portfolio as a whole.

January 2005 update:

Considerable effort in coordination of our institute portfolio has taken place. DMS has restructured how it manages the portfolio base and now uses a 6-person management team for better coordination. DMS has set up annual two-day meetings, which institute directors must attend, in order to achieve cooperation on a broad variety of activities. One of the outcomes will be the coordination of the long term institute programs to ensure suitable balance of intellectual content. DMS has made it very clear that this is an extremely high priority.

October 2005 update:

In June 2005 a meeting of the Institute directors, including NSF personnel and moderated by the chair of the National Academy Board on Mathematical Sciences took place in Minneapolis. This is the first of a planned annual series of such meetings. Broad co-operation agreements were laid out and we believe that this mechanism will allow a more holistic approach to programming at the institutes with less duplication and a broader range of programs. This process was an outcome of a two-day meeting at NSF in January 2005 where the broad outlines of future planning and co-operation between the institutes was laid out.

- iii. Given the increased number of institutes, DMS should regularly analyze how the strategic goals of the institute portfolio as a whole are being met.

DMS response, March 2004:

We concur that the growth in the number of institutes mandates a more strategic perspective on overall management. There are several possible approaches and DMS will weigh the pros and cons of each very carefully before putting a comprehensive plan in place. At the very least we intend to dedicate a single program officer position to oversee the entire institute portfolio.

January 2005 update:

This is one of the driving forces behind the efforts noted above. It is worth noting that DMS held a divisional retreat on best strategies for management of our institutes portfolio, we looked closely at how peer institutes in other disciplines are managed and coordinated and we have worked with the institutes management to build a much more coherent scheme that we had in the past. DMS wishes to again thank the COV for its astute insights on this point and for reinforcing the need for continuous stewardship.

October 2005 update:

See the remarks to the above response. We would also like to point out that the Institutes are charged with providing a common web page that will allow faster and easier access to information. It will also streamline the application process and allow better tracking of applicants. We believe this mechanism will be an effective means of opening the institute programs to a broader community.

3. *The integrity, energy, and commitment of the DMS staff were noted by the COV. However, the COV is concerned that current DMS staffing does not represent an effective balance of permanent program officers and rotating program officers. ... In particular, to develop an effective balance, COV recommends that there be at least one permanent program officer in each major programmatic domain.*

DMS response, March 2004:

This concern has been a long-standing one and, in particular, was highlighted by the previous 2001 COV report. Within the last year the Division has seen the loss of two further permanent program officers; one who took a department chairmanship and another who retired after more than 20 years service. DMS has recognized the need for at least one permanent program officer in each major programmatic domain and has even re-assigned individuals to achieve this goal. At the moment, we do have a permanent program director involved in every major program block, but the coverage is very thin. However, we have managed to recruit several excellent rotators within the last year and some of these have indicated a willingness to be considered for a permanent position. This January we placed advertisements widely within the mathematical sciences community with the result that we have several outstanding candidates. We expect to not only to make up for the recent losses, but also to make progress towards addressing the very valid concerns of the COV. We also view this process to be ongoing so would expect to make further hires in each of the next few years. The COV also correctly points out that effective recruiting requires offering an enhanced infrastructure environment such as adequate space and funds for travel, items that are certainly of longstanding Divisional concern. The DMS has pursued, and will continue to pursue, these issues with the Directorate and NSF.

January 2005 update:

As part of the process noted above, DMS made three permanent hires. We have just issued an advertisement for further such positions and expect to make between one and three additions this year.

Assuming we take no further losses, this will bring up the ratio of permanent to rotater program officers to almost 50-50. Clearly, finding the best blend of ability, experience and fit for particular programs needs will be our operating strategy.

October 2005 update:

Significant progress has been achieved. As a result of the last two years recruitment drive, 6 permanent program officers have been added to the Division and there is now at least one permanent officer in each of the six main subprogram areas.

- 4. Criteria II. The Broader Impacts. There was one particular concern, however, that we felt deserved special mention, namely the question of "broader impact" that proposed investigators are required to address.... these issues to be digested by the community.... However, because of the real potential for inequity caused by a lack of clarity, we recommend DMS immediately begin work with the community to accelerate this process.*

DMS response, March 2004:

As the COV was aware, the Division, and indeed many parts of the Foundation, has struggled with this question over the last several years. We are also pleased that they noted a considerable improvement from 2001 through 2003 and we agree that the grasp of this issue has not been uniform across different subgroups within the mathematical sciences community. DMS has made a discussion of the broader impact criteria a part of every panel briefing and we will certainly continue this practice. We will also use the opportunity offered by our annual open meeting with the community (*Dialogue 2004* will be held this April) to bring the importance of this issue to the attention of a wider audience. We will also work with the professional societies to place articles in their news periodicals.

January 2005 update:

This topic has been an element of several DMS interactions with the community. In April 2004 we funded a meeting co-organised by four of the professional societies at which broadening participation in general was a major theme. In January 2005 at the annual meeting of the AMS and MAA, DMS performed a re-enactment of a review panel that brought out several points, including the broader impact question.

October 2005 update:

Efforts continue here. We stress this at our new program officer training and have again been proactive with community presentations.

- 5. Namely, we suggest that a statement from the Director concerning the strategic directions that DMS has followed, together with budgetary and programmatic information organized around these strategic directions, be sent to COV prior to the meeting. Some material of this type was actually presented by the Director in his opening presentation, but it would be very useful for COV to have this and additional such material beforehand.*

DMS response, March 2004:

The data presented by the Division Director in his opening statement was actually sent to the COV in advance. However, the presentation of strategic directions was in lecture/audience-dialogue format, less conducive to a non-interactive mode. However, in the future, with the advance material sent to the COV, we will include a statement about strategic directions.

In part two of its report the COV notes the following point with respect to Organizational Excellence:

6. *To ensure that DMS maintains state of the art business practices, NSF should consider periodically benchmarking with other government agencies, academic institutions, and private sector organizations. As the boundaries of the various areas of the Mathematical Sciences shift, for example due to external priorities, it should consider refactoring its areas so that focus is clear and inefficiencies caused by cross-area interaction are minimized.*

DMS response, March 2004:

It is not clear that benchmarking on business practices with other government agencies, academic institutions, and the private sector is best performed by DMS acting in isolation or is even desirable given the different mission of the federal agency. If this is an important topic for the Foundation, it may be more appropriate to address this issue in a larger NSF framework.

In addition, in part two of its report the COV notes some points with a mixed positive response from different evaluation subgroups.

- a. *Does the program portfolio have appropriate participation of underrepresented groups?*

DMS response, March 2004:

The response to this question was mixed. One of the three groups indicated that the encouragement of women and minorities remains a continuing challenge. However, they also agreed that once applications are received the process and outcomes are eminently fair. Other groups pointed out that applications from underrepresented groups are commensurate with their representation in the community served by DMS and that the issue of under-representation is outside the control of DMS. In its initial overview, the Division presented considerable data on this topic. While U.S. Ph.D. production figures show a continuing but slow growth of mathematical sciences Ph.D.s to women, there is no significant improvement in minorities. However, as noted above, the number of applications appears to be at least commensurate with demographics within universities. We say apparently because there is considerable uncertainty in the available information which is almost completely self-reported. In terms of success rate, there was a traditional gap of about five percent greater funding rate for males. However, this has been declining and in 2003 reversed to a five percent gain for women. The uncertainty in this data is relatively small, making a claim of parity extremely creditable. On the other hand, the number of non-responses in regard to ethnicity outweighs by a factor of two the number of positive responses and we know of specific examples (in both directions) where these responses are incorrect. In addition, the actual numbers are quite small. Given such a signal to noise ratio we can make no definite conclusions, but also see no reason to believe the figures we do have on success rate are in any way disturbing. Of course, we cannot but agree that the larger societal problem of under-representation of certain groups is certainly an issue in the mathematical sciences.

- b. *Panel versus mail review.*

DMS response, March 2004:

We noted concern by one of the reviewing groups that the pure panel system might be inferior to mail review or a hybrid system. It is interesting to note that the ratios of the various types of review within DMS are almost precisely at the Foundation average. It is also our experience that there is no such thing an optimal solution to the reviewing issue and a well implemented, but otherwise relatively minimal scheme, will out-perform a more extensive but less well-implemented one. The facts are that a pure mail review system is much more labor intensive (both on the program officer and the reviewing community) and, in any event, it is far from clear this is an optimal method for a new program officer. The hybrid system of “screening panels” can suffer from insufficient feedback to the

PI in the case of a panel decline – something in fact noted by one of the reviewing groups. As the COV noted, the Division was able to not only make its GPRA dwell time goals last year, but to do so in *every* program. This achievement, a first for the Division, would not have been possible without a heavy reliance on the panel system.

January 2005 update:

As mentioned above, we have tried to educate the community on how panels function and to see both their advantages and limitations. The “Panel” play was very well received and we intend to continue such activities.

October 2005 update:

DMS continues to be very proactive here. We had a two-day retreat where one of the two focal points was on optimal use of the panel system. Several innovative ideas came out of the process and we expect some experimentation over the next year as we continue to strive for excellence in the review process. DMS’s play “The Panel” was performed for the entire Foundation as part of MPS new program officer training this year. As a result of these discussions, the Probability and Statistics program has decided to eliminate screening panels and to merge towards a more standard version, although it is anticipated that use of mail review for competitive proposals will still take place.

c. Unevenness of documentation within programs.

DMS response, March 2004:

In fairness, the one reporting group that noted deficiencies saw, in the opinion of management, the greatest contrast within the Division, including a program whose analyses are truly exemplary. Nevertheless the criticisms of the other program(s) are germane, and the Division management recognizes this concern and will work with the identified program(s) to correct these deficiencies.

January 2005 update:

DMS management has changed the personnel in both these programs and made the new officers aware of the previous deficiencies.

Finally, the division wishes to thank the COV and in particular its chair Robert Zimmer, for their tireless hard work, thoughtful comments and extremely helpful guidance.

William Rundell
Director, DMS