

Division of Mathematical Sciences Response to the 2010 Committee of Visitors Report

Introduction

The Division of Mathematical Sciences (DMS) received the report of the 2010 Committee of Visitors (COV) and it thanks the COV for a thoughtful and constructive document. The Division is pleased with the report's summary statement that *"The COV was impressed with the excellence of the DMS. Its awards supported work of the highest quality. Its portfolio of disciplinary and interdisciplinary research, institutes, workforce programs, and infrastructure projects is well balanced and healthy."* Nevertheless, the COV report contains a number of major findings, recommendations, and concerns to which we respond in the numbered sections below.

DMS wishes to express its gratitude to the chair, Prof. David Levermore, and the sub-committee chairs, Prof. Mary Ellen Bock, Prof. Mikhail Kapranov, and Dr. Juan Meza, whose effective leadership of the 2010 Committee of Visitors was essential to its success.

1. Proposal Review Process

The COV took up three aspects of the proposal review process: merit review criteria, conflicts of interest, and review of interdisciplinary proposals. We address them separately in this section.

1.1 Merit Review Criteria

The COV "judged that the DMS proposal review process has generally worked extremely well" but identified several areas where it could be improved. Citing steps taken by DMS in response to the 2007 COV report, the 2010 COV found that there has been "considerable improvement" in the understanding of the Broader Impacts criterion by reviewers but observed that "widespread misunderstanding persists among proposers." It also observed that there is "considerable confusion" about the meaning of potentially transformative research among proposers, reviewers and even program officers. The report states, *"The COV therefore recommends that the DMS take further steps toward clarifying its review criteria. We recommend that the "Dear Colleague" letter addressing "Broader Impacts" be updated, and one addressing "Intellectual Merit" be created. ... Additionally, we recommend that links to these letters and a clear advisory that they should be read should be placed on every solicitation webpage and where project descriptions are submitted."*

Response

DMS agrees that it must continue its efforts to clarify the meaning of the Broader Impacts criterion, and of the concept of potentially transformative research contained in the Intellectual Merit review criterion, to the mathematical sciences community. We will revise or rewrite one or more Dear Colleague letters so as to clarify and illustrate various aspects of the two NSF merit review criteria and we will be pro-active in directing the attention of reviewers and principal investigators to those letters.

2011 Response Update:

Shortly after the DMS response to the 2010 Committee of Visitors report, the National Science Board (NSB) began conducting a review of the NSF merit review criteria. At the Board's May 2011 meeting, the NSB Task Force on Merit Review proposed a revision of the two merit review criteria, clarifying their intent and how they are to be used in the review process. In addition, the Task Force identified a set of important underlying principles upon which the merit review criteria should be based.

The Task Force looked at several sources of data for information about how the criteria are being interpreted and used by the NSF community, including an analysis of over 190 reports from Committees of Visitors. The Task Force also reached out to a wide range of stakeholders, both inside and outside of NSF, to understand their perspectives on the current criteria. Members of NSF's senior leadership and representatives of a small set of diverse institutions were interviewed; surveys about the criteria were administered to NSF's program officers, division directors, and advisory committee members and to a sample of 8,000 of NSF's Principal Investigators (PIs) and reviewers; and the NSF community at large was invited to provide comments and suggestions for improvements through the NSF web site (http://www.nsf.gov/nsb/publications/2011/01_19_mrtf.jsp). The stakeholder responses were very robust—all told, the Task Force considered input from over 5,100 individuals.

One of the most striking observations that emerged from the data analyses was the consistency of the results, regardless of the perspective. All of the stakeholder groups identified similar issues, and often offered similar suggestions for improvements. It became clear that the two review criteria of Intellectual Merit and Broader Impacts are in fact the right criteria for evaluating NSF proposals, but that revisions are needed to clarify the intent of the criteria, and to highlight the connection to NSF's core principles.

The two draft revised criteria, and the principles upon which they are based, are presented on the page http://www.nsf.gov/nsb/publications/2011/06_mrtf.jsp. Comments were collected through July 14, 2011. It is expected that NSF will develop specific guidance for PIs, reviewers, and NSF staff on the use of these criteria after the drafts are finalized.

2012 Response Update:

In January 2012, the National Science Board (NSB) released the report "National Science Foundation's Merit Review Criteria: Review and Revisions." The report is the culmination of a thorough review by the NSB Task Force on Merit Review to determine if the Merit Review Criteria used since 1997 by the National Science Foundation to evaluate all proposals remain appropriate. Based on the Task Force's analyses, as well as on the fact that the America COMPETES Reauthorization Act of 2010 included a provision mandating the retention of the Broader Impacts criterion, the NSB concluded that the two current Merit Review Criteria of Intellectual Merit and Broader Impacts remain appropriate for evaluating NSF proposals, though with revisions. The revisions to the Criteria are described in the report, accessible via the page http://www.nsf.gov/news/news_summ.jsp?cntn_id=122793.

In response to the NSB's report, the Foundation established a Merit Review Criteria Working Group responsible for developing implementation actions. An important component of the overall implementation effort was the inclusion of both the internal NSF community and the external grantee community in the revision process. Updates to the Proposal and Award Policies & Procedures Guide (PAPPG), Proposal and Award Manual (PAM), written materials such as FAQs, and town hall meetings have been used to disseminate information about the revisions. Through these efforts, the NSF seeks to ensure that there is a clear and consistent understanding of the underlying principles inherent in the merit review criteria, as well as how the criteria should be used during the review and decision-making processes.

A concise description of the revisions may be found on the page http://www.nsf.gov/bfa/dias/policy/merit_review/overview.pdf. A set of Frequently Asked Questions (FAQs), found on the page http://www.nsf.gov/bfa/dias/policy/papp/papp13_1/pappgfastlane_faqs.jsp, has been developed to assist proposers, reviewers, and NSF staff in understanding the changes to the NSF FastLane system that have been made to incorporate revisions to the NSF merit review criteria. Details about the revised criteria can be found in the recently released Proposal & Award Policies & Procedures

Guide (PAPPG), which went into effect for proposals submitted or due on or after January 14, 2013. DMS believes that the recent clarifications incorporated in the revised merit review criteria, together with the associated FastLane format changes, will help the mathematical sciences community become more aware of the Broader Impacts criterion. Now that the changes have become effective, the Division will attempt to track associated improvements in the use of both merit review criteria during the coming year.

A parallel pilot effort conducted by the Division of Mathematical Sciences took place in FY 2011 and FY 2012. Some DMS panels experimented with a two-dimensional panel ranking procedure, in which a proposal receives two separate panel ratings, for Intellectual Merit and Broader Impacts, with proposal placements in a planar array governed by the two ratings. This procedure drew additional attention on the part of panelists to the fact that two distinct merit review criteria are under consideration, but panelists and program directors felt it necessary to subsequently project the two-dimensional results onto a one-dimensional final ranking. DMS will continue to experiment with explicit distinct Intellectual Merit and Broader Impacts panel ratings for proposals in the coming fiscal year.

1.2 Conflicts of Interest

The report states, *“The COV found that on the whole the DMS handled “conflict of interest” situations well. However, there were instances that were disruptive because some panelists had a serious conflict of interest and did not reveal the extent of their conflict until late in the review process. When these conflicts were discovered, the DMS took immediate and appropriate steps to address the situation. However, we recommend that steps be taken to avoid such events.”*

Response

DMS agrees with the COV on the importance of maintaining the Division’s high standards with respect to conflicts of interest and feels encouraged to take additional steps that minimize the chance that they are discovered late or unexpectedly. The COV report makes a number of constructive suggestions, which we take under advisement for future use. We will be certain to lay additional stress on assisting panelists to identify serious conflicts of interest in advance of panel meetings and will continue to stress COI issues during the panel briefings.

2011 Response Update:

DMS has continued to emphasize to panelists the importance of identifying conflicts of interest early in the panel formation process. As a consequence of a meeting with the Foundation’s chief Conflicts of Interest Officer, DMS recently put in place updated guidelines for handling certain conflicts of interest that can be waived, which may serve to improve the panel process. DMS is exploring the use of webinars for pre-panel communication with panelists on several topics, including identifying conflicts of interest.

2012 Response Update:

DMS continues to emphasize to panelists the importance of early identification of conflicts of interest, and this year DMS updated the language of its standard panel briefing to increase clarity. DMS has also added to its training for new rotators a discussion of effective, minimally disruptive techniques to handle late-breaking conflicts of interest in panel review. The Division explored but ultimately did not implement the staging of pre-panel webinar briefings for panelists on conflicts of interest, in view of timing and workload considerations. In particular, the Division holds over 60 panel reviews annually, each of which includes more than 12 panelists on average. To schedule real-time pre-panel briefings for the more than 700 panelists who serve annually was considered logistically unrealistic.

1.3 Review of Interdisciplinary Proposals

In this section, the COV is considering the review of interdisciplinary proposals submitted to core programs, rather than interdisciplinary proposals submitted in response to a solicitation. The report states, *“The COV felt that the DMS disciplinary programs should do a better job of reviewing those interdisciplinary proposals that they handle. ... The COV therefore encourages DMS to explore ways to introduce more interaction into the process by which interdisciplinary proposals are evaluated.”*

Response

DMS welcomes constructive suggestions from the COV for improvement of its processes to ensure fair and expert review of every proposal it receives. For highly interdisciplinary proposals submitted to core programs this may entail review by more than one panel or review by a combination of panel and ad hoc mail review. We are well aware of the potential pitfalls of review by multiple panels. For example, it is a Division practice to ask panels if there are aspects of an interdisciplinary proposal that lie outside the panel’s expertise and, if so, to identify which other panels or ad hoc reviewers do have the required expertise. It is a complementary practice for program officers to explain to panels when certain interdisciplinary proposals are on the agenda only for the panel’s expertise in a specific area that is needed to complete the expert review. We feel encouraged by the COV to increase our efforts in this area.

2011 Response Update:

The final report of the NSF Working Group on Facilitating Transformative and Interdisciplinary Research (FacTIR) was approved in December 2009, shortly before the COV meeting. The group was established to develop recommendations to facilitate transformative and interdisciplinary research across the Foundation. In response to the suggestions of that report, the Foundation introduced in November 2011 a new mechanism for review of interdisciplinary proposals for potentially transformative research, the NSF-wide program in "Creative Research Awards for Transformative Interdisciplinary Ventures" (INSPIRE/CREATIV). See <http://www.nsf.gov/pubs/2012/nsf12011/nsf12011.jsp> for additional information. DMS is currently implementing the program and plans to monitor its success closely.

2012 response Update:

In FY 2012, DMS embraced the CREATIV program, participating in co-review of several interdisciplinary projects, and co-funding 3 of the 41 CREATIV awards Foundation-wide in FY 2012. The Division is looking forward to continued participation in the successor program “Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE)” (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504852).

In FY 2010 – FY 2012, DMS engaged in development of a set of new interdisciplinary programs that provide funding opportunities for the mathematical sciences community. During this time period, DMS discontinued 10 funding programs and developed, co-developed, or began participation in 12 new funding programs, of which 8 are explicitly interdisciplinary. These new interactions of DMS with different scientific communities have opened new opportunities for support of interdisciplinary research.

2. Diversity and Broadening Participation

The COV report makes several observations about support of women and groups historically under-represented in the mathematical sciences. It paints a mixed picture in which there are some cases of improvement in funding rates (e.g., via additional awards made to new researchers with American Recovery and Reinvestment Act (ARRA) funds; cf., Section 2.2); of no change in funding rates despite availability of additional ARRA funds (e.g., Mathematical Sciences Postdoctoral Research Fellowships; cf., Section 2.2 and Section 2.5); and of increased support and participation by women at Institutes

programs but no discernable improvement in support and participation by underrepresented minorities (cf., Section 2.6). The report states, “*The COV found that some progress has been made regarding the numbers of female PIs over the past three years. However the same cannot be said regarding underrepresented minorities. Needless to say, the DMS must continue its efforts to improve the situation across all the mathematical sciences.*”

Response

DMS is pleased that the 2010 COV recognizes that some progress has been achieved in the support of women in the years since the 2007 COV report laid stress on this issue. On the other hand, the Division remains concerned by the relative lack of progress in the support of under-represented minorities. DMS commits to taking a more pro-active approach than in the past to raise the profile of this issue in the mathematical sciences community through increased emphasis on diversity and broadening participation. We will also continue to report data on funding rates for women and under-represented minorities in annual updates to the COV. Of course, reporting does nothing in itself to improve the situation but it is an important act of public accountability and a measure of the importance the Division attaches to the issue of diversity.

2011 Response Update:

DMS funded an award supplement to the Mathematical Sciences Research Institute to support a series of workshops for members of groups that have been historically underrepresented in the mathematical sciences. The workshops, a collaborative endeavor between eight of the NSF-funded US mathematical sciences institutes, include four Modern Math Workshops, two Spring Opportunity Workshops, two Infinite Possibilities Workshops, and two Blackwell-Tapia Conferences. These specialized programs are complementary to the core activities of the institutes and are important for the goal of increasing participation of members of minorities in mathematics and statistics.

The Division has also expanded its outreach to groups underrepresented in the mathematical and statistical sciences through new annual participation of DMS program officers in the annual meeting of the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS). (To date, DMS has sent representatives to the October 2010 meeting in Anaheim, California, and the October 2011 meeting in San Jose, California.) DMS program officers and the division director also participated in the Association for Women in Mathematics 40th anniversary celebration at Brown University in fall 2011. The DMS director also has written an article in the National Association of Mathematicians Newsletter encouraging minorities to participate on review panels and to take advantage of various funding opportunities that DMS and NSF offer.

2012 Response Update:

Increasing diversity and broadening participation in the mathematical sciences continue to be priorities for the Division of Mathematical Sciences. DMS pursues these goals in all aspects of its operations: the language of solicitations; the organization of panels; the review and recommendation of proposals; the management of Mathematical Sciences Research Institutes; and the selection of REU sites. DMS integrates diversity and broadening participation into its portfolio of programs and everyday management practices. This is an ongoing long-term effort, not a one-time occurrence.

Among the seven new program directors who started in the fall of 2012, three are from under-represented minority groups. Several DMS program directors are members of the MPS working group on broadening participation. Another DMS program director was a member of the NSF-wide Implementation Group for the ADVANCE Program. One DMS program director is a member of the cross-agency working group to develop an initiative in K-16 mathematics education jointly with the Department of Education. DMS

Administrative Professionals participate in a Seminar Series on Management, Administration, and Science-Partnering for Excellence. The goal of the forum is to provide a diversity exchange that creates engaged dialogue among the Administrative Professionals.

There are many examples of active DMS awards that excel in areas such as community outreach, veteran outreach, recruitment, career development, mentoring, workforce planning and accountability. An October 2012 report on DMS diversity efforts highlighted twenty such high-impact awards. In addition, DMS granted five award supplements under the AGEP Graduate Research Supplement program (<http://www.nsf.gov/pubs/2012/nsf12021/nsf12021.jsp>) in FY 2012.

DMS provided both funding support and the participation of DMS staff in events aimed at increasing diversity in the mathematical sciences. The October 2012 report pointed out eight examples, which illustrate the expectation DMS has of its awardees to creatively address the challenge of broadening participation and increasing diversity in the mathematical sciences.

3. Disciplinary and Interdisciplinary Research

The report states, *“The COV found that the DMS received many high quality proposals that it was unable to fund. This was true even in 2009 when funding rates were higher due to the ARRA funds.”* It goes on to make two observations about resource availability. First, the report states, *“The COV believes that the funding of core DMS programs should not have been flat over the last three years.”* It then states, *“The COV was impressed by the success of the Interdisciplinary Program portfolio and recommends expanding it with an eye on emerging new applications.”*

Response

DMS agrees with the COV that many scientifically worthy proposals are declined each year for lack of funding – this is the problem of “too much unfunded excellence” identified in the 2007 COV report. Clearly, ARRA funding enabled DMS to make a larger number of awards than in previous years with larger award sizes and to a more diverse group of researchers in FY 2009 than in previous years. However, it persists that each year the number and quality of proposals DMS receives is sufficiently high that the gap between the budget line and the science line cannot be closed.

The statement that core DMS program budgets were flat is not accurate. Neglecting \$98M of one time ARRA funds in FY 2009, the DMS base budget grew from \$199.52M in FY 2006 to \$224.84M in FY 2009, for a net increase of \$25.32 or 12.7% over the three fiscal years FY 2007 – FY 2009. Over the same period, the base budget for core disciplines grew from \$112.5M in FY 2006 to \$126.28 in FY 2009, for a net increase of \$13.78 or 12.25% over the same three fiscal years. This is essentially the same percentage increase as Division’s aggregate base budget. While core program budgets were not flat over the last three years, the COV’s sense that they were may stem from the fact that the bulk of the increase, \$9.67M, occurred in the budget increment from FY 2006 to FY 2007 while increases for the core were modest in the next two budget cycles.

DMS agrees with the COV that healthy core disciplines and strong interdisciplinary programs are essential not only to the health of the mathematical sciences but to the nation’s scientific enterprise. We interpret the report’s implicit recommendation to increase funding in both areas as encouragement to strike an appropriate and dynamic balance in our portfolio of awards.

2011 Response Update:

In fiscal year 2011, DMS operated under a budget smaller than that in fiscal year 2010. In spite of the budget cut, DMS maintained funding of its core programs at or above previous levels. DMS remains committed to continued strong support of the core disciplinary programs, while taking full advantage of some multidisciplinary activities involving national priorities where mathematical and statistical sciences play an enabling role in discoveries and innovation in other sciences and engineering.

2012 Response Update:

Again in fiscal year 2012, DMS operated under a budget smaller than that in fiscal year 2011. In spite of the budget cut, DMS maintained funding of its core programs at or above previous levels. DMS remains committed to continued strong support of the core disciplinary programs, while taking full advantage of some multidisciplinary activities involving national priorities where mathematical and statistical sciences play an enabling role in discoveries and innovation in other sciences and engineering.

4. Assessment

The COV comments on the process of developing a framework for the assessment of the Institutes portfolio. The report states, *“The COV also enthusiastically supports the DMS response to the 2007 COV request for an assessment. ... The COV was impressed with the results so far and the project plans.”* The COV also encourages DMS to develop a framework for the assessment of its workforce portfolio, stating, *“The significant DMS investment in workforce programs means that assessment is essential!”*

Response

DMS is pleased that the 2010 COV supports the efforts it’s made to establish a rigorous assessment of the Institutes portfolio. We feel encouraged to complete the process promptly and have an assessment mechanism in place in the near future. DMS has learned a great deal about the assessment of complex projects through its work with Institutes and commits to establishing a framework for assessment of the Workforce portfolio as soon as the Institutes assessment is in place.

2011 Response Update:

At the annual meeting of the Mathematical Sciences Research Institute Directors in May 2011, updated plans for assessment of the DMS Institutes portfolio were presented, and the Directors provided feedback on the planned activity. This feedback is now being incorporated into a revised plan for assessment of the DMS Institute portfolio. DMS is currently exploring possibilities for assessment of its broader portfolio.

2012 Response Update:

DMS has engaged the Science and Technology Policy Institute (STPI) to conduct a pilot study of two long-term programs run by DMS-supported Institutes. The goal of the pilot study is to determine whether sufficient data about results of an Institute program (new collaborations initiated, research projects engendered, resulting publications, career development of participants, etc.) can be assembled to assess the long-term impact of the activity and to compare this impact with that of other styles of DMS investment in mathematical sciences research. DMS anticipates a progress report from STPI in mid-2013.

5. Staff

The report states, “*The COV believes that the DMS is understaffed both in program officers and in administrative staff.*”

Response

The report makes several important observations about the critical role and heavy workload of program officers with which DMS is in full agreement. The report states, “*The COV did not have the opportunity to meet with the program officers as a group to discuss this heavy workload and other crosscutting issues, but we recommend such a meeting be set up for future COVs.*” DMS agrees with this suggestion and regrets it did not include such a meeting in the 2010 COV agenda. The report states, “*The COV was pleased to have the opportunity to meet with the DMS administrative staff.*” and notes that this had not been a feature of previous COVs. DMS accepts and supports the COV’s comments about the role and workload of administrative staff and its suggestions for improving communication within the Division.

2012 Response Update:

DMS is implementing this suggestion to include a meeting with its program officers in the 2013 Committee of Visitors evaluation.

6. COV Improvements

The COV made a number of observations aimed at improving the COV, including suggestions for improving the use of NSF databases, additional preparation for COV sub-committee chairs, accessing data in a more “panel-centric way”, and separate meetings on the second day with administrative staff and separately with program officers.

Response

DMS welcomes the suggestions to improve the COV process and will take these suggestions under advisement for future COVs. The issue of panel-centric tools will be explored as to its feasibility and utility. Some of the other suggestions can be easily implemented, such as scheduling a formal meeting with the DMS program directors and administrative staff. Others may be more difficult because of the structure of the databases available to us. For example, while data on funding rates, etc. was provided to the COV for each program, further detailed breakdown by subject area within programs may not be statistically significant or easily created as these definitions change over time.

2012 Response Update:

DMS is implementing these suggestions in the 2013 Committee of Visitors evaluation.

Acknowledgement The Division of Mathematical Sciences wishes to express again its gratitude to the Committee of Visitors for the effort expended by individual members in their preparations for the visit, in their attention to the big picture as well as the details, and to their drafting of a thoughtful, constructive report.