REPORT OF THE 2013 COMMITTEE OF VISITORS
DIVISION OF MATHEMATICAL SCIENCES
NATIONAL SCIENCE FOUNDATION
February 20-22, 2013

Submitted on behalf of the Committee by
Mark L. Green, Chair

to

Fleming Crim
Assistant Director
Mathematics and Physical Sciences

The mathematical sciences constitute a rich and complex ecosystem, one in which people and ideas move across boundaries. It is constantly evolving. For the mathematical sciences to be healthy, all parts of this ecosystem must be nurtured.

This is a period of rapid change in the mathematical landscape. As detailed in "The Mathematical Sciences in 2025," there has been a notable expansion in the impact of the mathematical sciences on other subjects, and in the types of mathematical and statistical ideas being used. It has been a Golden Age for core mathematical sciences, with major advances on longstanding problems and innovation in fundamental theory. It is also a time of economic strains on universities, with potentially quite significant implications for the mathematical sciences. These challenges and opportunities, as they unfold, will require continued evolution in how the mathematical sciences are funded.

The Committee of Visitors' fundamental mission was to assess the integrity and efficiency of the proposal review process in the Division of Mathematical Sciences (DMS) for the period 2010-2012. DMS was commendably forthcoming with the information that we needed for this study, even when it was hard to get, both in overall statistical information and in aspects specific to a program, panel or proposal. The Committee of Visitors was satisfied that the system in place functions very well overall.

We found the quality and significance of the division's programmatic investments to be extremely high. Award decisions and the goals of the division's programs are well-integrated into the goals of the National Science Foundation and to national needs and priorities. In keeping with recent NSF policy, the COV has focused on processes and has not dealt with specifics about outcomes, since NSF has other mechanisms of evaluation for this. Even without focusing on outcomes, it became apparent to us that there is a long list of highly important outcomes of DMS investments, both in the core mathematical sciences and in applications. DMS is to be congratulated on the success of its investments. This record is especially impressive in the face of a 3 year period of declining funding, continuing resolutions and the looming sequester.

There are several unique features of the mathematical sciences. Among core mathematical scientists, the NSF plays such a predominant role that not receiving NSF funding often means not being funded at all. Core mathematicians usually submit only one proposal to fund the basic research that they would like to undertake. The funding rate for proposals in the mathematical sciences thus plays a different role than in other divisions of MPS; for the mathematical sciences, the funding rate per investigator is a more meaningful benchmark. The result is that not only does DMS have a large number of unfunded proposals which are excellent, but more importantly it has a large number of unfunded investigators who are excellent. These unfunded excellent investigators in the core mathematical sciences and elsewhere represent a very important portion of the nation's scientific human capital, and it seems ill-advised that at a time when the nation has as a priority to increase the number of highly-trained STEM workers, the talents of these researchers, whose training represents a considerable investment, are not fully utilized to advance core research in the mathematical sciences.

Another unusual feature of the mathematical sciences is the mathematical sciences institutes. These are our community's large projects, our telescopes peering into the future and our microscopes focusing intently on the deepest fundamental problems, our laboratories experimenting with new configurations of people and ideas and a significant vehicle for cultural change in the mathematical sciences. The Committee of Visitors endorses the great value of the institutes, is happy with the way that they are managed, while recommending a few improvements, largely to adjust certain artifacts of the history of the program.

The workforce programs put in place by DMS have great value. The 2010 COV described them as constituting a "rich tapestry," and this remains a cogent description. DMS has shown laudable initiative in creating new programs and in scuttling those that do not draw a sufficient number of strong proposals. In some cases, some of the discontinued workforce programs strike us as having been needlessly complex and overly restrictive. These restrictions sometimes arise from a broader context than DMS, while others are specific to a particular program. We suggest that in designing workforce programs, where possible, DMS follow Einstein's dictum of making them "as simple as possible, but not simpler."

There is a part of the mathematical sciences pipeline which the COV felt is not adequately addressed—mid-career mathematical scientists. There is a substantial falloff in proposals from researchers 10-15 years out from the PhD. Often even a small amount of money for conferences and travel matters. A first step to improve this situation would be to allow for conference and summer school grants to request funding in this category, and to encourage the mathematical sciences institutes to do so as well. For example, an invitation to an institute is frequently helpful in the success of a sabbatical application. The COV is mindful that resources are limited, but a modest move in this direction would have a leveraged impact.

A different aspect of the pipeline is the issue of increasing the number of underrepresented minorities in the mathematical sciences. DMS has made great efforts in

this direction. That said, the number of PhD's annually in this category is woefully small. Care is needed to nurture promising underrepresented students and researchers as they move along the pipeline, with especial attention to seeing that they are recruited to the next step in their careers while in each DMS program. Fresh ideas are needed to make a breakthrough here.

Promoting diversity is a shared responsibility of the entire mathematical sciences community, not only of mathematical scientists who are women or underrepresented minorities. Mathematical scientists who are women or underrepresented minorities are burdened by a level of service on panels which, while beneficial to the peer review process, takes an inordinate amount of time away from their own research. The issue was raised by some of the women on the COV whether a better balance might be struck in the case of women between ensuring robust representation on panels and not overburdening women with panel service, since promoting diversity is a shared responsibility of the entire mathematical sciences community. COV members from underrepresented minorities felt that in their case, the situation is different. That is, COV members from underrepresented minorities understand that the extra burden being placed on them is crucial to continue participating in these important activities until a minimum critical mass of mathematical science PhDs from underrepresented groups are produced and therefore can help to lighten the load in this respect.

The feedback that panels give to declined proposals is of variable quality. Given the high cutoff for funding, good feedback about the shortcomings of a proposal is crucial to encourage researchers, especially new researchers, to come back with a revised proposal in the next round. DMS program directors are proactive in attempting to ensure that panel summaries are substantive and clearly indicate where improvement is needed, but reviews prepared before the panel arrives at NSF are less likely to do this. We would like to see DMS experiment with new ways to educate reviewers about the importance of giving substantive and useful feedback.

Finding meaningful methods to assess the effectiveness of DMS programs in a way that captures multiple layers of outcomes is by its nature difficult, and DMS to its credit has not jumped at easy answers. This is an area where, carefully and deliberately, further progress needs to be made.

The quality of the program directors and DMS management, both career and rotators, is excellent. They are overworked. The COV values the balance between career program directors, who are the institutional memory of DMS and who train new program directors, and the rotators, who bring fresh ideas and a first-hand knowledge of the latest trends and developments in the mathematical sciences community. We would not want to see this balance tilt too far in either direction. The rotators are given considerable independence and are involved in working groups across DMS. Nevertheless, we would like to see them consulted more consistently about major policy initiatives and decisions, since the viewpoint they bring is different from that of the career program directors and is extremely valuable. Former rotators at DMS are a valuable resource to the mathematical

sciences community, coming with administrative skills and a breadth of knowledge that cannot be easily obtained elsewhere.

The number of administrative staff at DMS is, on a per-proposal basis, less than the level in any other division of MPS. The COV is not in a position to do an educated comparison here, but recommends that such a comparison be done. The program directors expressed the need for a science assistant, which the COV agrees would be quite useful and would promote a more efficient use of program directors' time. Generally, the level of technology used to assist in workflow of program directors, and which the COV experienced when it was at NSF, is at best late 20th century. We understand that an MPS-wide effort to improve workflow technology is under way, which the COV commends.

The administration and program directors at DMS have the difficult task of keeping abreast of the latest developments in what is, as alluded to earlier, a rapidly changing field. They do an admirable job of this, in part because there are funds available to attend conferences, visit institutes, etc. The benefits of this small amount of funding to the quality of decisions made at DMS are disproportionate to the expense. Such funding also has the benefit of allowing rotators to remain active in research during their time at NSF.

The COV process itself, in its fundamentals, works well. The intensity of effort on the part of the COV in order to accomplish a large task in a short time seems inevitable, and provided the COV with a window into what daily life is like for the overworked administration and program staff at DMS. The COV received complete cooperation of the Division Director, Deputy Division Director, program directors and staff of DMS, and had very useful interactions with the MPS Directorate, especially in understanding the function of the COV, the conflict of interest rules, and in debriefing. The Chair visited NSF several months in advance of the COV and was informed early of the template of questions to be answered, and DMS, at considerable effort, provided the spreadsheets requested to provide data by categories. A new feature this year was the inclusion of complete data for one panel in each program, which aided in evaluating the panel review process. Another new feature was a meeting with the program directors as a group—here, the committee recommends breaking this down into half the committee meeting with the permanent program directors and half with the rotators. The COV recommends that the staff meeting and program director meetings should be on the second day. There were a number of IT issues which resulted in considerable time being lost and in it being impossible to query the data in ways that were pertinent to the template questions--the committee feels this reflects an overall weakness in the NSF-wide IT environment. The division of the COV into two different sets of subcommittees was new this year, and added a layer of complexity to the process that we would like to see avoided in the future—the arrangement this year was necessitated by the fact that conflicts of interest with the institutes, workforce and special research programs and infrastructure portfolios do not line up with field expertise, and while aligning this would make committee selection more difficult, there would be a substantial payoff in efficiency once the COV arrives. Should it prove impossible to have only one set of subcommittees, the COV suggests having a different subcommittee chair for each of the 6

subcommittees. The COV found the opening presentations by the different programs useful; given the number of programs, they should be short and to the point. The previous COV recommended, and this committee concurs, that the Chair and subcommittee chairs arrive half a day early, so as to lay the groundwork for the COV to hit the ground running on the first day.

The dataset covering proposals handled by DMS over the three years 2010-2012 is a large complex dataset. There are many parameters about proposals that must be chosen in order to compile overall statistics. The NSF systems that were used to provide overall statistics to the COV reflect choices that, while presumably reasonable, were not made sufficiently explicit to the COV during the period when it was doing its work. When small numbers of proposals are involved, changes to these parameters can have an impact on the overall statistics that is considerable. The COV as a result found it difficult to quote explicit percentages in an authoritative way in this report. It would be helpful to have a clearly-explained "gold standard" for these overall statistics.

The Committee of Visitors is grateful to everyone at the National Science Foundation for their help in enabling the work that went into preparing this report, especially Dr. Fleming Crim and Dr. Celeste Rohlfing of MPS, Dr. Sastry Pantula and Dr. Henry Warchall of DMS, and the program directors and staff of DMS. The COV asked a lot of them, and they worked above and beyond the call of duty to come through with what we needed.

Charge to the Committee of Visitors

By NSF policy, each program that awards grants and cooperative agreements must be reviewed at three-year intervals by a COV comprised of qualified external experts. NSF relies on their judgment to maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation. Reports generated by COVs are used in assessing agency progress in order to meet government-wide performance reporting requirements, and are made available to the public. The COV is charged to address and prepare a report on:

- the integrity and efficacy of processes used to solicit, review, recommend, and document proposal actions;
- the quality and significance of the results of the Division's programmatic investments;
- the relationship between award decisions, program goals, and Foundation-wide programs and strategic goals;
- the Division's response to the prior COV report of 2010; and
- any other issues that the COV feels are relevant to the review.

The COV report is made available to the public to ensure openness to the research and education community served by the Foundation.

Decisions to award or decline proposals are ultimately based on the informed judgment of NSF staff, based on evaluations by qualified reviewers who reflect the breadth and diversity of the proposed activities and the community. Systematic examination by the COV of a wide range of funding decisions provides an independent mechanism for monitoring and evaluating the overall quality of the Division's decisions on proposals, program management and processes, and results.

The review will assess operations of individual programs in DMS as well as the Division as a whole for three fiscal years: FY 2010, FY 2011, and FY 2012. The DMS programs under review include:

- Algebra and Number Theory
- Analysis
- Applied Mathematics
- Computational Mathematics
- Mathematical Sciences Infrastructure
- Mathematical Biology
- Probability, Combinatorics, and Foundations
- Statistics
- Topology and Geometric Analysis
- Mathematical Sciences Research Institutes
- Mathematical Sciences Workforce

Organization by Subcommittee

The Committee of Visitors did its work divided into two different configurations of subcommittees.

First configuration:

Special Research and Infrastructure Programs
DMS Institutes Portfolio
DMS Workforce Program

Second configuration:

Subcommittee A: Topology and Geometric Analysis; Applied Mathematics; Mathematical Biology
Subcommittee B: Algebra and Number Theory; Probability, Combinatorics and Foundations; Statistics
Subcommittee C: Analysis, Computational Mathematics

Each of these 6 groups has provided a detailed subcommittee report.

SPECIAL RESEARCH AND INFRASTRUCTURE PROGRAMS

Subcommittee Roster:
Alejandro Adem, University of British Columbia

Henry Cohn, Microsoft Research New England
Susan Ellenberg, University of Pennsylvania
Fariba Fahroo, Air Force Office of Sci. Research
Sheldon Katz, University of Illinois UC
Diane Lambert, Google
Javier Rojo, Rice University, Chair
Jeff Saltzman, AstraZeneca
Kannan Soundararajan, Stanford University
Fred Weissler, University of Paris XIII

The subcommittee felt very positive about both programs.

Infrastructure Program

A large number of proposals were reviewed under the Infrastructure Program. The proposals are diverse in scope, and include proposals for research in networks of mathematicians, funding for large conferences (AMS & SIAM), funding for research communities for young mathematicians (MRC), the Park City Mathematical Institute, CBMS lecture series, support for broader impact activities aimed at increasing the number of underrepresented groups (Alliance, SWIM, EDGE, etc.), funding for undergraduates to study in Moscow, activities aimed at very advanced high school students (IMO & MIT's PRIMES), travel funding for US mathematicians to go to premier research institutes abroad (e.g. IHES), and even a couple of interesting proposals were concerned with popularizing mathematics through movies.

The proposals were evaluated using ad hoc mail reviews and through expert panels. A small number of proposals were evaluated internally, and in these cases several program directors were involved in evaluating the proposal. All proposals appeared to be thoughtfully evaluated with reviewers paying due attention to the intellectual merit and broader impacts criteria.

The committee was pleased to note that the infrastructure program was able to support a number of excellent proposals with a very strong broader impact.

The review methods seem appropriate, and the individual reviews are fair, thoughtful, and substantive with the program directors' analyses providing an accurate summary of the reviews while the jacket documentation seems appropriate, and gives a good indication of the process and a justification for the funding decision. As it was the case with the disciplinary programs, the program directors did a good job in the selection of reviewers. When necessary, reviewers with experience in the management and execution of large programs were engaged.

COI's were detected when they occurred. There were marginal instances where reviewers had recently been awardees but their conflicts of interest had expired according to NSF policy. These reviewers acted in good faith, being both balanced and informative.

Management of the program review of the variety of proposals under this program and the decisions made suggest no major deficiencies in overall program management. Comments regarding assessment of program effectiveness are only intermittent and perhaps should be more broadly considered. Similarly, comments regarding attempts to ensure diversity of participants are infrequent and again should probably be more routinely assessed. Perhaps DMS could consider specifically requesting comments on these issues for at least a subset of applications.

DMS is well aware of emerging opportunities and acts on these opportunities, as demonstrated by the regular creation of new funding programs and phasing out those that fade in terms of interest and/or productivity. In the area of infrastructure grants, this particular issue is somewhat less relevant, except for categories like equipment grants and education/training programs in emerging areas.

The response to the COV report from 2010 is appropriate although it is clear that not much progress has taken place in the area of representation of women and underrepresented minorities in funded programs. The subcommittee recommends that mechanisms be put in place to resolve this issue.

The size and duration of the awards seem appropriate.

The Doctoral Alliance for Mathematical Sciences seems very promising for increasing the number of underrepresented minority members in doctoral mathematics programs. Research Networks is a new program with large potential impact.

The portfolio of evaluated proposals funded through the various programs include a non-trivial number of inter- and multi-disciplinary proposals, and there is appropriate diversity of proposals according to geographical distribution and types of institutions.

There are some outstanding examples of awards that integrate research and education. Two such examples are the Doctoral Alliance and the PRIMES program at MIT.

The Doctoral Alliance and other programs address the goal of increasing the participation of underrepresented groups in the mathematical sciences but more attention in this regard is warranted across all of NSF.

The Infrastructure portfolio covers important national and international priorities for the mathematical sciences in the US. This ranges from conferences, to special programs for minority students, to crucial support for activities by societies like SIAM, AMS and MAA. Funding for BIRS, Oberwolfach and IHES are a crucial international contribution by DMS.

Special Research Programs

The subcommittee was impressed with the breadth and success of the interdisciplinary/multidisciplinary programs and their ability to bring additional funding into the DMS to support disciplinary investigators. In particular, with the high demand for statistics and applied mathematics in industry, and as backbones for many applications in science and engineering, statistics and applied mathematics have had and will continue to have a strong impact on the solution of problems arising in engineering, the biomedical, the social, and the physical sciences. Two compelling examples are the DMS-NIGMS and the DMS-DTRA-NGA programs. Overall, in 2010-2012, DMS showed laudable initiative in seeking co-funding and received very considerable amounts in co-funding from other federal agencies for interdisciplinary/multidisciplinary activities.

The portfolio of Special Research Programs contains a rich variety of programs that includes inter-federal agency programs as well as collaborations with industry, academia, and other NSF divisions.

NSF inter-division and inter-directorate activities

As it has been the case in other settings, the subcommittee was impressed with the choice of reviewers, who covered a broad range of fields in both mathematics and other disciplines, and who were drawn from many sources (academia, industry, government agencies). The NSF seems to be very successful in recruiting appropriate reviewers even for highly interdisciplinary proposals.

A substantial fraction of the proposals showed a split in the ratings, with reviewers from one discipline being more in favor than those in another. This is an unavoidable aspect of reviewing interdisciplinary proposals: not all proposals will be equally compelling in all ways, and not all reviewers will be able to appreciate all the aspects of a proposal. The panel summaries and review analyses show that these splits are generally handled sensibly.

A subcommittee member was initially concerned that the INSPIRE and CREATIV programs are designed to accept proposals without external review, and that this may lead to a lower quality of the review process. After study, these concerns were assuaged as the actual practice seemed to be quite sensible, and no evidence that it is causing any harm could be found. Nevertheless, it is recommended that the internal review process be used sparingly.

Overall, the funded proposals constitute an excellent portfolio of research, which covers a broad range of topics and forges connections with many fields. In a number of cases the DMS financial contribution is relatively modest, but building these links with other disciplines is nevertheless of great value intellectually and for society overall.
The PIs represent many schools and geographic locations, and they seem to show adequate diversity given the state of the field (although continued efforts in this direction are needed). The intellectual breadth of the PIs was impressive

As always, there are always sporadic, minor issues, but no evidence of systemic problems could be found.

The Focused Research Groups (FRG) program uses a screening panel that recommends whether further review is justified. About 50% of the projects are not recommended for further review. Mail reviews are solicited for the remaining proposals. The final ranking is made in a meeting of all the program directors in DMS. It is felt that this method is very well adapted to the FRG program.

Examination of the ejacket information reveals that both merit criteria are discussed by the panel and the mail reviewers. In addition, special attention is given to the FRG criteria that seek to fund proposals with potential for a major breakthrough and significant advance.

Feedback to the principal investigators gives a detailed analysis based on the panel and (where applicable) additional mail reviews, and both merit criteria, as well as the specific FRG criteria, are discussed in the decision letters to the PIs.

The funded projects tend to involve several institutions and there is geographical diversity and diversity of types of institutions, although California and Massachusetts have disproportionally more projects funded.

The FRG proposals funded by the statistics program have at least one woman PI or co-PI. This is a laudable set of circumstances. The committee noted that, using self-reported underrepresented minority status, the funding rate for underrepresented minorities in the FRG competition from 2010-2012 was approximately 17% and that the number of proposals submitted to this program by underrepresented minority PI's is low. It is hoped that the DMS FRG program will be able to encourage more proposals from underrepresented minorities.

The proposals in the Algorithms for Threat Detection (ATD) program are evaluated on innovativeness of the mathematical algorithms and general relevance to the ATD programs. Most of the declined proposals were not relevant to the overall goals of the program although they were technically meritorious. The documentation clearly provided this rationale.

The review panels in this program have a good balance of expertise from academia, other federal agencies, and industry. The subcommittee observed that the reviews from academicians seemed to be much more detailed in assessing technical merit of the proposals and their linkage to the program goals, while other types of reviewers tended to look more closely at the broader impact or relevance to the program. Therefore it is important that every proposal be reviewed by a well-balanced group of reviewers from academia, industry, and other federal agencies.

There are too few projects supported in this program to judge geographical diversity, but California takes a lion share of the projects in this area.

There do not seem to be new investigators funded by this program. The PIs tend to be mixed groups that include senior PIs, and young investigators (with no new or fresh PhDs in the group). There are some women PIs in the list of awardees.

The program clearly addresses issues of national security and responds to the national priority needs in threat detection and reduction while engaging the best group of mathematicians, statisticians, and experts in biology and chemistry in multidisciplinary projects.

The DMS-NIGMS initiative funds proposals for research at the interface of the biological and mathematical sciences. In the 2012 competition, it was estimated in the program solicitation that $5,000,000 were to be invested in this program per year for new applications ($2,000,000 from NSF, $3,000,000 from NIGMS).

This is one of several programs where having interdisciplinary panels is essential for a fair and informed evaluation of the proposals. This program is an important component of the DMS special research program portfolio.

As far as some members of the committee could see, this is the best-managed multidisciplinary and multiagency program examined by the committee.

Final remarks: The NSF vigorously encourages submission of inter- and multi-disciplinary nature. These types of proposals are best reviewed by panels whose members bring a diversity of expertise to the review process. It appears, however, that except for some exceptional cases, the usual method of reviewing these proposals consists in taking them to at least two non-interacting disciplinary panels (e.g. mathematics and biology). Anecdotal information suggests that these proposals end up being rejected all too frequently; such proposals seen by a panel without mathematical scientists are unlikely to do well, so it is important that such interdisciplinary panels include mathematical scientists. The NSF has carried out an agency-wide study and their findings are included in an internal report that concludes that in fact, inter- and multi-disciplinary proposals are funded at a higher rate than regular discipline-based proposals. Unfortunately, the data on the type of proposal (inter/multi-disciplinary vs. disciplinary only) is made less useful by the fact that a proposal is classified as inter/multi-disciplinary based only on whether the proposal has been evaluated by more than one panel. This information usually contains errors since a disciplinary proposal may be evaluated by more than one panel due to the program directors' diligence in procuring funding from a different program or division for a particular proposal (s)he wants to champion. It is recommended that DMS tracks the funding rates of these inter/multi-disciplinary proposals after making sure that a precise identification of inter- and multi-disciplinary proposals is developed.

DMS INSTITUTES PORTFOLIO

SUBCOMMITTEE ROSTER:
Anthony Bloch, University of Michigan

James A. Carlson, University of Utah
Jeanne Clelland, University of Colorado
Mirna Dzamonja, University of East Anglia
Maria Emelianenko, George Mason University
Bjorn Engquist, Univ. of Texas, Austin, Chair
Steven Lee, DoE Adv. Sci. Computing Research
Alex Nagel, University of Wisconsin
Nancy Reid, University of Toronto
Angela Stevens, University of Muenster

The COV appreciates the very important contributions from the institutes. They provide an essential complement to other DMS sponsored activities. This is clearly true for the institutes initiated by NSF and also for the NSF sponsored activities in other institutes within United States and abroad.

The general review process for the institutes as conducted by DMS seems very thorough and well thought out. The relevant panel does a two-stage review, which first decides, based on the general merit of the proposal whether it is justified to conduct a site visit. We looked at instances where it was decided to conduct a site visit (and the proposal was subsequently declined) and where it was decided not to. In both cases we felt that the decisions were justified and that the reasoning given was thorough and helpful to the reader of the reports. We generally also felt that review of the existing institutes was very thorough, with the site visit seeming to be very well thought out. Some questions were raised about the compositions of the panels -- how these were chosen and whether it is a good idea to have the same people on different panels.

The NSF Institutes program has a well-conceived mechanism for responding to the emerging opportunities in various mathematical fields through delegating this task to individual institutes. A variety of thematic programs are being run each year, which cover a multitude of topics both in pure and applied mathematics and statistics, including an increasing number of interdisciplinary initiatives that range in size and duration. The fact that researchers from all over the country and abroad and from various areas have an opportunity to contribute to these competitive programs and suggest the topics of interest makes this an excellent opportunity for the institutes to keep abreast with current trends. Careful evaluation of the submitted workshop/long program requests by the institute director and staff is extremely important though in assuring the quality and breadth of the programs chosen for funding. Some oversight of this process on behalf of NSF is also needed to guarantee adequate balance between the programs offered concurrently at each of the locations, and this is done by having an annual meeting with the institute directors.

The COV is concerned about the spacing of the two Institute proposal cycles: the two 10-year cycles are set off by two years, so that there is one 2-year gap and one 8-year gap between proposal deadlines. The COV realizes that this timing arose as a historical accident beyond the control of the DMS, but it would be distinctly preferable to have either a single 10-year cycle (if the DMS wishes to have all competitive proposals evaluated simultaneously) or two cycles spaced at approximately 5-year intervals (we

realize that evaluating all of the institutes in the same year would be a very heavy burden on the DMS program directors, so a slight offset in the intervals between open competitions, such as 4 years/6 years would be reasonable). The COV leaves it to DMS to work out the best method to move to a better alignment of these cycles.

None of the DMS initiated Institutes has been phased out. It has been possible to gradually add new institutes after the reoccurring open competitions. Without substantial future increase in the DMS budget, the potentially painful decision to ramp down and not continue the funding of an existing institute must be considered in the mix along with the possibility of new ones.

The COV10 report noted that, in response to a request for assessment of the institute portfolio in the COV07 report, DMS had commissioned a study by Katherine Socha, a newly hired AAAS fellow. This effort is ongoing, and was presented in an overview session by Chris Stark. A very helpful and detailed expansion of this presentation was provided to the COV13 committee in the "Institutes Overview" document. A pilot study by the Science Technology Policy Institute is currently in progress. This pilot study will consider two particular institute programs, and conduct a detailed qualitative analysis of outcomes by interviewing a number of people involved in the programs, including the relevant institute director, program organizers, and a broad range of program participants. The results of this pilot study will inform next steps in finding ways to assess the whole portfolio. DMS is to be commended for undertaking this inherently complex and difficult exercise.

The COV10 report felt that with respect to diversity, particularly for under-represented minorities, the institutes were making some progress, but still had some ways to go. The response committed to a more pro-active approach to involving under-represented groups, and to reporting on the outcomes. In 2011 DMS funded an award supplement to the Mathematical Sciences Research Institute to represent a collaborative effort of eight of the mathematical sciences institutes to support a series of workshops targeting members of groups that have been historically under-represented in the mathematical sciences; in addition to the Blackwell-Tapia conferences, this effort supports Infinite Possibilities Workshops, Spring Opportunities Workshops and Modern Math Workshops. The response emphasizes the commitment of DMS to diversity in all aspects of its operation, and specifically mentions the management of the Mathematical Sciences Institutes.

The Institutes can help to fill in a gap in support for mid-career mathematicians by increasing the number of travel grants for active mid-career researchers who do not have other NSF support so they can participate in the activities of the Institutes. Invitations to institutes is also helpful to mathematical scientists in justifying sabbatical requests.

The COV10 report also makes specific recommendations to the institutes: about diversity, dissemination and reporting of the outcomes. These two recommendations are not addressed in the response, although presumably the assessment exercise outlined above is also intended to address the outcomes recommendation.

The COV10 report recommended further efforts to clarify the "Broader Impacts" criterion, and the response provides a very detailed summary of the steps taken in this regard. The report suggested in particular that for larger proposals, and presumably this was meant to include institute proposals, that panels be asked to rank "Intellectual Merit" and "Broader Impacts" separately—of course, for institutes there is a substantial synergy between the two categories. A pilot program of this double ranking is in progress.

DMS WORKFORCE PROGRAM

SUBCOMMITTEE ROSTER:
Andrew Bernoff, Harvey Mudd College
Anne Gelb, Arizona State University
Donald R. King, Northeastern University
Nancy Kopell, Boston University
Bryna Kra, Northwestern University
Steven Lalley, University of Chicago
William A. Massey, Princeton University
Juan Meza, University of California, Merced
Karen Vogtmann, Cornell University, Chair
Lai-Sang Young, New York University

1. **Quality and effectiveness of merit review process**
Questions about the review process are addressed separately for the different workforce programs in section 4 below.

2. **Selection of Reviewers**
2.1. *Appropriate expertise*. In all the workforce programs that we looked at we felt the quality of the panelists was excellent; this was noted especially in the RTG, REU and UBM panels. Some concern was raised by members of the COV that care should be taken that workforce review panels not overuse panelists already in high demand.

3. **Management of the program**
3.1. *Response to previous COV*. This COV still has some questions about whether DMS is doing enough to try to gather data about the results of their programs, in particular diversity issues and longer-term impacts of the program on the workforce, for example 10 years down the line. Assessment should continue to be an important component of every program.
The idea that chairs and subcommittee chairs should meet a day earlier than everyone else and do triage on the workload was independently brought up by our committee, which then noticed that this suggestion was already made in the last COV report. The last report suggested a meeting with program directors; this was a good idea, but we felt the meeting should be broken up into smaller groups (e.g. by discipline, by rotators vs. permanent staff). Not all COV members need to go to all meetings, e.g. with staff or with all program directors.

4. **Portfolio**

4.1. *MSPRF (Postdoctoral Research Fellowship) Program*.

This is a critical program in the portfolio, and as far as the panel can tell DMS does a very good job of selecting fellows. However, the COV did not feel it had (or at least could not find in the ejackets) enough information about what happened during the panel discussions to make an informed judgment about whether the process was appropriate. The COV found only the panelists' raw scores of the proposals, together with the final groupings. They would have appreciated a summary by the panel chair explaining such things as the structure of the panel's deliberations, the selection criteria which were actually discussed and how much weight was given to each criterion, the panel's judgment of the quality and diversity of the applications and any substantive issues which came up during the discussions.

Several members of the COV who have served on the postdoc selection committee in recent years expressed concerns about the size of the panel, and suggested that splitting the panel should be considered. These committee members also recalled a tendency of the panels to penalize proposals in areas of application for which the sponsoring scientist does not reside in a mathematics department – even when the research program proposed is clearly mathematical in nature.

Several committee members expressed the view that DMS should make some attempt to document the effectiveness of the MSPRF program by tracking the longer-term success of awardees, if at all possible—the COV understands that this is challenging and may prove impossible. In particular, the COV believes that postdoc follow up data may be useful for providing strong justification for its continued support.

The majority of MSPRF awards in recent years have been made in Algebra and Number Theory, Analysis, and Topology and Geometric Analysis. The smaller number of awards in applied disciplines (Statistics, Mathematical Biology, Computational Mathematics) probably reflects, at least in part, the larger number of professional options and opportunities open to new Ph. D.s in Statistics and Computer Science. The DMS must take care to ensure that panel bias does not play a role here, especially in connection with proposals with a cross-disciplinary focus, where the sponsoring scientist might not be located in a mathematics department.

4.2. *Mentoring through Critical Transition Points (MCTP*). On the whole, the process is appropriate. We noted that the program directors make use of their autonomy to distinguish between very strong, competing proposals.

4.3. *Research Training Groups (RTG).* The RTG program is a strong and effective component of the workforce portfolio. It was felt that the review process was thorough. The combination of mail reviews and management team discussions were deemed effective. However, there was concern about a lack of clarity concerning the mission of the RTG. Furthermore, in reading the reviews of proposals that were accepted and

declined, there did not seem to be a consistent set of criteria that were uniformly applied in the evaluation process.

Greater clarification for reviewers would be helpful on the following issues: (i)To what extent do the research goals need to be coherent within the group? (ii) Should a fairly diverse subgroup of a department be eligible for an RTG? (iii) What is the weight on the research part of the RTG? What is the weight on the training component of the RTG? (iv) How should training be evaluated? For example, is data presented about how many people are completing the training? (v) What type of mentoring are the students receiving?

In terms of the broader impact on workforce training, given that minorities are 25% and women are 50% of the potential workforce, diversity concerns are of great relevance to workforce programs. This is evidenced in the quote below from the synopsis for the Workforce Program in the Mathematical Sciences which clearly states that their program is particularly interested in activities that improve:

> (1) Recruitment and retention: increasing the number and diversity of U.S. students who successfully pursue undergraduate and graduate degrees in mathematics and statistics;
> (2) Educational breadth: broadening graduate education and undergraduate education content in the mathematical sciences to prepare students for a wider range of career opportunities;
> (3) Professional development: enhancing the professional skills of mathematical sciences postdoctoral associates, graduate students, and undergraduate students to better prepare them for both academic and nonacademic employment.

The COV recommends that these three goals consistently be given equal weight.

4.4. *Research Experience for Undergraduates (REU)*. The REU program is a highlight of the workforce program. We have only favorable responses to the core questions, and particularly note the diversity in the institutions receiving awards, the attention paid to under-represented groups, and the variety of topics covered. We were also impressed with the communication between the program manager and the PIs in terms of helpful advice for recruiting REU participants. The REU program is successful, with a very good rate of funding (over 50% in the year we observed), and is an exemplary program in its broader impacts. We recalled in discussion with some NSF program directors that there are other REU programs within NSF and that the program directors will sometimes meet to discuss the different programs. We suggest that this might be a good opportunity to both share and document best practices among all of the REU programs.

4.5. Other programs, including discontinued programs.
Some programs have a natural arc, from introduction to removal. PRISM is one of these that seemed to have a large number of proposals with very few funded and then it was eliminated. Most of the proposals were viewed as not having sufficient impact and the proposals did not seem to match the solicitation. For this reason it was eventually eliminated. However, there is a new program that will likely fill the role intended for this program. UBM was eliminated for a different reason: it was a joint program between

biology and mathematics, and the Biological Sciences Directorate discontinued participation.

Overall, we felt that programs that were "mainstreamed," i.e. discontinued, were done so with careful consideration and the introduction of new workforce programs was done with thought and in response to perceived needs. An area for potential improvement is in publicizing the workforce unsolicited program option, having program directors discuss this option at meetings and during visits to departments.

4.6. *Additional comments on quality or balance?* The COV felt that needs of mid- career mathematicians may not be adequately addressed. They are concerned about mathematicians who may find themselves too narrowly focused, and want to learn new areas, as well as mathematicians who may have temporarily left the workforce and want to return. Mid-career mathematicians are a critical component of the pipeline; the US already has a heavy investment in these highly-trained individuals, and should do what it can to ensure their continued productivity.

Creative thinking is needed to find ways to funnel research funds to mid-career mathematicians. It would be good to have some program(s) that address the retooling of talented mathematicians. This might be done by including funding for mid-career mathematicians via adding a mid-career funding option for existing programs, such as conferences and summer schools, collaborative funding for grants as well as direct funding of some outstanding applications.

SUBCOMMITTEE A: Topology, Geometric Analysis, Applied Math, Math Biology

SUBCOMMITTEE ROSTER:
Alejandro Adem, University of British Columbia
Andrew Bernoff, Harvey Mudd College
Anthony Bloch, University of Michigan
Jeanne Clelland, University of Colorado
Susan Ellenberg, University of Pennsylvania
Maria Emelianenko, George Mason University
Nancy Kopell, Boston University
Jeff Saltzman, AstraZeneca
Angela Stevens, University of Muenster
Karen Vogtmann, Cornell University, Chair

1. **Quality and effectiveness of merit review process**

1.1 *Are the review methods appropriate? Are both merit criteria addressed?*

We found that the method of panel reviews is in general quite effective and that panel summaries touch on both merit criteria quite explicitly. However there is some variation in how panels weigh the different merit criteria. Some rank both criteria separately and give significant weight to both, while in other areas the intellectual merit was dominant.

The general trend seems to be that mediocre broader impacts do not sink a proposal but mediocre intellectual merit does.

How broader impacts are valued varies with disciplines and solicitation. In Applied Math proposals the training component is often quite important, especially for RUI's, and in all disciplines CAREER proposals require an explicit educational component which is weighed heavily. Broader impacts are not emphasized as much in individual investigator grants. As expected, proposals with an explicit educational component have substantial broader impacts justification.

Broader impacts appear to play a role not only in the panel's ratings but also in the final NSF decision; it is clear that the program directorate is taking them seriously. Broader impacts were specifically cited in both positive and negative decisions about funding proposals.

The program directors seem to make every effort to support proposals that panelists place in the "fund if possible" category, but there are differences between how directors in the different disciplines approach this.

While the COV agreed that both merit criteria are well addressed, there were still some concerns. In some cases, it was not completely clear what attributes of the proposal led to the ultimate decisions. It might be possible to further clarify the thinking behind decisions. How are proposals compared in the "fund if possible" range, and how does the equalization process work? The panel summaries could be more detailed and explicit in the rationale for their rating. It should be possible to get a more accurate understanding of the panel process from the material available to the COV.

1.2 Are the written reviews substantive?

The COV felt that most written reviews are adequately substantive. The general pattern is one paragraph about the intellectual merit and the proposer's qualifications, and a few lines about the broader impacts. Some reviews have substantial, excellent content while others are perfunctory -- just a few lines. In short, there is a range, with most reviews being in the middle with satisfactory content. More detail in reviews is always helpful and should be strongly encouraged. In general, the written reviews of intellectual merit were better constructed than the reviews of broader impacts. The COV was pleased to see that quality of the writing in the proposal is used by most reviewers as a factor in their evaluation.

1.3 Do the panel summaries give sufficient rationale for the decision? Does the documentation in the jacket give sufficient rationale? Does the documentation to the PI provides sufficient rationale?

The COV appreciates the care and diligence of many of the reviewers and the constructive feedback they convey to the PI's. However, we feel there is room for the panel summaries to more clearly elucidate the panel's rationale for the proposal's ranking.

Many review summaries for proposals which were declined don't say which factors weighed most heavily in the decisions (this comment came from a review of proposals in Topology & Geometric Analysis). The broader impacts review often could be longer and more detailed and the panel discussions could give more information on how broader impacts were used in ranking the proposals.

For all programs, more constructive criticism in panel reviews/summaries would be useful to the proposer as well as to the COV; it would be useful to have more details about the panel discussion, how decisions were reached, and why. Particularly for negative decisions, this would help the proposer to improve the proposal on the next attempt. While the program director cannot add anything of substance to the review, they can prompt the panel along these directions.

Along these lines, sometimes it is difficult to tell what basis the panels used to compare and rank proposals within the delicate middle category, *Recommended for Funding*, from the Review Analyses. In Topology and in Geometric Analysis, program directors' explanations of borderline decisions were thoughtful and impressive. In this program, when a proposal was assessed by two different panels with different rankings, the program director made a choice and the rationale for this choice is well explained. In other programs, it was not always clear why some were chosen and some were not. We were heartened to see broader impacts playing a significant role in some of these borderline cases, with the program directors diversifying the award portfolio by recommending support for young investigators, investigators from under-represented groups and investigators at undergraduate institutions.

While the electronic jackets show how proposals were ranked during equalization meetings, better records of the rationale for these decisions from the equalization meetings would be helpful.

The committee asked for access to the files from declined proposals for which the PI requested formal reconsideration. Four relevant ejackets were supplied and reviewed. The committee agreed that the reconsideration process carried out for each of the cases was appropriate to the complaint.

2 Selection of reviewers

2.1 *Do the panels have appropriate expertise?*

For most panels the COV was quite impressed by the breadth, level of expertise and general scientific quality of the panelists. However, on a few panels there was more of a range, with some reviewers admitting in their review that they were unable to assess the technical aspects of a proposal assigned to them. For applications in mathematical biology, it appeared that some grants might have benefited from review by someone with primary expertise in biology or the medical area of focus for the grant; on the other hand, those grants submitted to the DMS/NIGMS program were more likely to have reviewers with both mathematical and content expertise.

In more interdisciplinary topics expertise is needed in an extremely wide range of topics, and it is probably impossible to get sufficient expertise for all of them. One committee member suggested that it might be useful to make the review criteria more explicit and objective, to avoid potential biases.

2.2 *Are conflicts of interest adequately addressed?*

As far as we could tell the program directors were extremely careful to avoid conflicts of interest.

3. Management of the program

3.1 *Management, responsiveness to emerging opportunities, program planning and prioritization*

Opportunities .
Decisions to open up new funding opportunities involve multiple working groups within and outside of DMS, and the COV found that DMS directors worked effectively within this framework.

The DMS deserves credit for decommissioning programs that were underutilized. The program directors seem to be very good at collaborating within and outside DMS to take advantage of opportunities. One point made during discussions with DMS program directors is that DMS sometimes has trouble predicting how widely the math community will participate in any given new opportunity.

Prioritization.
It was COV's understanding that program planning and prioritization is done mostly at the level of the DMS Division Director. The program directors, both permanent and rotating, should probably be more involved in this.

Staff.
There seems to be a communication issue to be addressed between the program directors and the administrative staff, since the content of staff work has changed dramatically in the last few years. The program directors have started to do some administrative work themselves rather than giving it to the staff, and would like to have staff that could help with higher-level tasks, involving technical writing and other technical skills. The administrative staff feel that, in spite of the fact that the many tasks have been made easier by new technology, they are still overwhelmed by the existing work.

Decision-making.
The program directors emphasized the sensible flexibility they have in making decisions about which proposals to support. This is excellent and finds full support by the COV.

3.2 Response to previous COV report
The comments by the 2010 COV were partially addressed during the last

3 years. Some of them can still be improved, as there are the following points:

The mechanism of accessing data for the COV is still quite cumbersome and in severe need of improvement.

The panel reviews still need to give better explanation of how a decision was reached.

The reviewing of the Math Bio proposals has improved. Since the area is very broad with respect to both disciplines, the main mathematical field and the main biological question being addressed, the referees for each proposal should be chosen accordingly, some with expertise in the relevant area of biology and some with expertise in the relevant field of the mathematical sciences, rather than chosen generally out of the field of mathematical biology. Panels reviewing interdisciplinary proposals should include both types of expertise, but since it is difficult in many cases to have sufficient coverage, it should be supplemented by mail reviews where needed.

4. Portfolio

4.1 Appropriate balance across disciplines?
It appears to this panel that the portfolio is well balanced across the mathematical disciplines and sub-disciplines, and accurately reflects important developments in the various fields. It is a strength of the program that solicitations are *not* too closely targeted, and the most active areas tend to submit the most proposals.

4.2 Are the awards appropriate in size and duration?
For the panels we examined it appeared that the program directors made an appropriate distribution of the limited funds over the many excellent proposals. One comment was that in some cases two separate proposals from the same collaboration were funded in the same year. Committee members disagreed about whether this was appropriate; one thought that it might make sense to diversify the list of projects a bit more to avoid possible bias.

There is far too much unfunded excellence!!

4.3 Are there innovative or transformative awards?
Most of the important and significant results committee members were aware of in their fields were obtained by investigators supported by DMS. However, the panel could not thoroughly investigate the transformative nature of the awards in the time provided.

It was noted that some of the awards made by the programs were deemed to have a high potential impact by the reviewers. Several such cases were found among the projects funded under the CAREER program.

4.4 Inter-or multi-disciplinary awards?

The applied mathematics and mathematical biology portfolios contained many projects that reach across the boundaries of biology, physics and engineering.

4.5 Geographical distribution?
The EPSCoR program appears to spread funds to all states. Overall there are more proposals coming in from California and East Coast states, but the funding distribution looks appropriately tied to population distribution.

4.6 Distribution over types of institutions?
The committee remarked that there is a definite skew toward research intensive universities, which received 75% of all awards while submitting 62% of all applications during FY 2010-2012. Non-Ph.D.-granting academic institutions received 4% of all awards while submitting 7% of all applications during this time period. This may be appropriate in terms of funding excellence and potential returns. There was disagreement among the committee members about whether the community might be better served by having the funding more widely distributed, so we note this without making any recommendation.

4.7 Appropriate number of first-time awards?

While the funding rates are lower for new investigators, there is convincing evidence in the electronic jackets of a consistent attempt to fund new investigators among the "fund if possible" proposals and at equalization. The committee commends this practice.

4.8 Awards integrating research and education?
In the disciplinary programs a large portion of the funding is devoted to graduate student and postdoctoral training; the COV finds this appropriate.

4.9 Underrepresented groups?
The COV looked at the submissions and funding rate numbers for underrepresented groups in the topology, geometric analysis, applied mathematics and mathematical biology areas. The median numbers were in relatively small and consistent ranges and values respectively.

Median funding rates by females consistently exceeds other groups in all areas by several percentage points. In symmetric fashion, the median funding rates for underrepresented groups consistently lags other groups by several percentage points. Median proposal submissions are still dominated by males (5x over females for Applied Math, Geometric Analysis and Topology; 3x for Math Bio; underrepresented numbers range from 2-5 times smaller than female) perhaps indicating a significant need for additional pipeline projects.

There is clear and consistent evidence that DMS funds women at a slightly higher rate primarily due to the action of the program directors after the panel review and at equalization. The committee commends this effort. The demographics of funded proposals from female investigators reflects the gender imbalance of the mathematical

sciences as a whole, so we see DMS's efforts as actively promoting research by women in mathematics. Based on self-reported underrepresented minority status, the funding rates of all categories of grants for PI's from underrepresented minorities are almost identical with that for all PI's. The small number of total awards with minority PIs suggests that DMS should aggressively continue to explore ways to support outreach and professional development targeting these communities

4.10 Relevance to national priorities, agency mission, relevant fields, constituent needs?

DMS's first priority must be to maintain the high level of fundamental research in the mathematical sciences done in the United States. The COV feels that this priority is well addressed by DMS's support of basic individual investigator awards, which are relatively free of constraints on direction or structure.

In addition, NSF has dedicated several recent research initiatives specifically to address areas of national priority identified by the President. A timely response by the NSF to such calls and its ongoing efforts to adapt to the nation's needs is important and should be commended.

In addition to core mathematics, mathematical applications to biology have become increasingly important, and the support of the NSF is critical for encouraging contributions of the mathematical biology community.

4.11 Additional comments on quality or balance?
Biostatisticians may be less aware of NSF funding opportunities than those in mathematical statistics departments. DMS may want to do some outreach to biostatistics departments to indicate NSF's interest in funding this area, but with as much clarification as possible as to what types of research would be most appropriate for DMS programs (as opposed to research more appropriate for funding through NIH or other agencies).

5. Other topics

5.1 Areas in need of improvement
In using the eJacket system it became clear that the primary purpose of this system is to eliminate paper. It is not clear that workflow or even extensive data query features have been introduced into the system. In the latter case, the chair of the committee pointed out the value of a relational database for data queries. We recommend that the IT support systems begin to evolve towards supporting workflow and data/data mining queries. Although the Assistant Director for MPS was proud of the 6% administrative overhead within NSF, a small investment in modernizing the IT infrastructure may lead to a greater net productivity and efficiency of both panels and the NSF staff.

SUBCOMMITTEE B: Algebra & Number Theory; Combinatorics, Foundations, Probability; Statistics

SUBCOMITTEE ROSTER
James A. Carlson, University of Utah
Henry Cohn, Microsoft Research New England
Mirna Dzamonja, University of East Anglia
Sheldon Katz, University of Illinois UC
Donald R. King, Northeastern University
Steven Lalley, University of Chicago
Diane Lambert, Google
Nancy Reid, University of Toronto
Javier Rojo, Rice University, Chair
Kannan Soundararajan, Stanford University

The review process is seen in general as satisfactory. The process requests that reviews from panelists be submitted ahead of the panelists' arrival to NSF for a two-day meeting to discuss the written evaluations and formulate a ranking and a set of recommendations. The discussion of the reviews by the panelists is considered a crucial component of the process to achieve a fair ranking of proposals.

The committee noted that the review of interdisciplinary proposals that are evaluated by two or more panels is inherently problematic since these panels tend to be independent and non-interacting disciplinary panels. Since disciplinary panels tend to lack the diverse expertise needed to assess the merits of inter/multi-disciplinary work, these proposals may suffer from a larger than usual declination rate. The committee does not have specific recommendations at this stage, but see the final remarks at the end of the section on special research projects, and it encourages DMS to experiment with alternative modes for review for proposals in this category. For example, this might be done by constituting panels with the necessary disciplinary diversity to provide a better assessment of the merits of such proposals.

The mandated criteria for assessing the proposals seems not to always be evaluated uniformly across panels. Partly this is because different types of proposals legitimately need to be judged differently, but more generally there seems to be little consensus on how to calibrate broader impact. Some reviews or panels seemed a little more demanding than others in terms of assessing this aspect of the proposals.

The level of the quality of individual reviewers' reports varies significantly but it is deemed to be on the whole useful. In the case of negative reviews, they could offer more constructive criticism for the investigators, especially in those cases of proposals submitted by new investigators.

The panel summaries generally provide the rationale for the panel consensus when consensus exists, or explain the differing perspectives when consensus is not achieved. In the latter case, the summaries typically do a good job of synthesizing differing viewpoints. Panel summaries that give additional information not available from the individual reviews such as the relative ranking of the proposals, are more useful than the panel summaries which merely repeat information from the individual reviews.

On the whole the documentation in the jacket provides the rationale for the award/decline decision on a proposal. However, a significant number of proposals that panels did not strongly recommend, still received awards after an “equalization process” was carried out by program directors. The committee recognizes the usefulness of doing this, which is of necessity a fluid process in which multiple criteria are balanced, but this resulted in the committee finding it difficult to evaluate how well it has been done. Because proposals that sit at the boundary between being funded and not funded are those where understanding how decisions are made is the most essential, the subcommittee would like to see that a clearer explanation of the decision process in equalization be given to the next COV.

The subcommittee strongly recommends that the feedback provided to the principal investigator be augmented. Cases were observed where the only hard information provided to the PI seems to be the category in which the proposal was placed by the panel. This is especially problematic in cases where the proposal is placed in the middle ("recommended for funding if possible") category. Many such proposals receive top marks by the 3 reviewers and the reviews themselves only indicate that the proposal is excellent and worthy of funding. Program directors should perhaps be enjoined to insist that reviewers provide discussions of the strengths and weaknesses of the proposals.

The committee noticed two examples of good practices in the review process that might, at first glance, appear less than ideal. First, proposals that fell between two areas were sent out for mail reviews to get a fair hearing for their ideas. Second, reviews were sometimes delayed because program directors were aware that there might be additional funding that could be given to these proposals. These delays could only benefit the PIs.

The subcommittee congratulates the programs for their excellent selection of panelists for the review process. Even then, however, there may be rare cases when a rather specialized proposal comes in for which there is no real expertise in the panel. Program directors, however, have sent these rare proposals out for extra mail reviews and this has provided a fair review for such proposals.

The programs are very careful in recognizing and resolving conflicts of interests. While it is difficult to be sure that all conflicts have been eliminated, the evidence suggests that the process for recognizing and resolving conflicts is solid and robust. The distribution of reviewers from different types of institutions is satisfactory, and the committee applauds efforts to include young investigators and minorities and women in their review panels. Progress needs to be accelerated in some of these cases.

The program management seems strong. Despite a heavy workload, program directors display sound judgment and put considerable effort into documenting their decisions. The rotator program exposes many mathematical scientists to what is going on within DMS, and it brings in a steady supply of fresh perspectives. Of course, mentoring rotators and getting them up to speed is a difficult and important task. Some programs have long-serving permanent program directors, while others rely heavily on rotators; in the long run, hiring plans should take this into account.

Comments from both program directors and administrative staff suggest that high workloads may occasionally hamper communication, and that e-mail substitutes too often for face-to-face conversations about difficulties.

The subcommittee is satisfied with the response to the recommendations of the last COV that PIs be required to address intellectual merit and broadening impact clearly and directly in their proposals, and that reviewers pay careful attention to these aspects as well. Nevertheless, and in spite of NSF's efforts, there remains work to be done in this area, as the broader impact criteria is frequently given a rather superficial discussion in the proposal.

Most subcommittee members agreed that the allocation of awards within programs broadly reflects the variety of scientific activity within the program areas. Appropriate balance is, of course, harder to gauge in inter- and cross-disciplinary research areas, but the consensus of the panel is that the program directors generally exercise good judgment in making award decisions on cross-disciplinary proposals.

The shrinking budgets in DMS have had a negative effect by limiting the number of highly rated proposals that can be funded. While the most creative research deserves to be funded for longer periods, declining budgets and especially the instability of funding caused by phenomena such as sequestration, require a shift in the direction of shorter funding periods to maintain flexibility and to keep the level of excellence required for funding roughly independent of the particular year in which a proposal is submitted.

Innovative and potentially transformative proposals can be difficult to identify at the time, but looking back at some of the highlights of DMS funded research, a number of transformative and highly innovative contributions can be found. It is important to support a large portfolio of research, as these transformative developments can arise in any area of mathematical sciences, and often involve very unexpected applications of basic research. An example often mentioned is the Johnson-Lindenstrauss lemma, a technical result proved in 1984 that has resurfaced in recent years as being very important for new developments in the analysis of high-dimensional data, and in particular in the development of compressive sensing.

The portfolio contains a number of multi-disciplinary projects that were funded by several NSF programs. In particular a large grant to SIAM funds interdisciplinary conferences. Further the Focused Research Grants and Research Network programs help to attract interdisciplinary proposals.

The proposals that the committee examined, contained funded proposals from different types of institutions, and the group of proposals came from geographically diverse areas and included a number of proposals from less research-active colleges and universities. Primarily undergraduate institutions and historically black colleges/universities were also represented. The committee noticed that institutional breadth varied somewhat between

programs. It is unclear whether this reflects random chance, systematic differences in the application pool between research areas, or judgment differences between panels.

Most awards incorporated training and education in their research project in some way. Beyond that, there were several funded research projects that contained substantial educational components.

The subcommittee notes that the program portfolios it examined have not yet attained an appropriate level of participation by underrepresented groups. The number of proposals received is low. Out of a total of 8659 competitive proposals received by DMS during 2010-2012, among those who self-reported gender and underrepresented minority status, only 15% were from female PI's and only 5.3% came from underrepresented minority PI's. The subcommittee recognizes NSF's efforts in this direction and encourages DMS's continuing efforts to foster diversity in the mathematical sciences community.

Given the growing importance of mathematical, statistical, and computational activities in key areas of the US economy and national security, it would seem that the answer is obviously and resoundingly "yes" to the question about relevance of DMS supported research to national priorities. Mathematical and computational innovations have played a central role in the birth and developments of key US industries -- for instance, Google -- and in the development of technologies crucial for others -- for instance, in the Human Genome Project. Demand for scientists with advanced degrees in mathematics, statistics, and computer science is growing at an unprecedented rate. Extended documentation of these developments is provided in the recent National Research Council report "The Mathematical Sciences in 2025."

SUBCOMMITTEE C: Analysis, Computational Mathematics

SUBCOMMITTEE ROSTER:
Bjorn Engquist, Univ. of Texas, Austin, Chair
Fariba Fahroo, Air Force Office of Sci. Research
Anne Gelb, Arizona State University
Bryna Kra, Northwestern University
Steve Lee, DoE Adv. Sci. Computing Research
William A. Massey, Princeton University
Juan Meza, University of California, Merced
Alex Nagel, University of Wisconsin
Fred Weissler, University of Paris XIII
Lai-Sang Young, New York University

Quality and Effectiveness of the Merit Review Process

1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?
Program directors mostly used in-person panel reviews. This seemed to be the most effective type of panel, especially when a large number of proposals were being

considered in a panel. Note that exceptions exist where mail-review is appropriate and may be necessary.

Are both merit review criteria addressed
(a) In individual reviews?
(b) In panel summaries?
(c) In Program Officer review analyses?

(a) Comments are too often sparse and/or vague.
(b) Panel summaries - the quality varies from panel to panel.
(c) The Program Officer "Review Analyses" address both merit review criteria and provide added-value to understanding the award/decline outcomes.

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?
The quality of individual reviewer written comments varies widely. Too many reviews are generic and lack critical assessments that are specific to the proposed research.

4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?
Most of the panel summaries do a good job of synthesizing the comments, discussion and consensus regarding the PI's proposal.

5. Does the documentation in the jacket provide the rationale for the award/decline decision?
The documentation in the jacket is thorough and provides a good basis for the award/decline decision.

6. Does the documentation to the PI provide the rationale for the award/decline decision?
We found that many program directors make great efforts to convey the review analysis to the PI and we encourage this practice in general.

7. Additional comments on the quality and effectiveness of the program's use of merit review process:
The overall documentation for the merit review process is detailed and reviewers are encouraged to provide substantive comments for the understanding and benefit of the PI. Reviewers that make substantive comments greatly improve the integrity and efficiency of the review process and we encourage program directors to continue this practice.

Selection of Reviewers

1. Did the program make use of reviewers having appropriate expertise and/or qualifications?
Many panels have senior reviewers who are international leaders in their fields. Most panels have a good balance between junior and senior members. For panels, to ensure that a given proposal is reviewed by specialists in that specific area, members of panels

are asked to list which proposals are closer to their specialty and proposals are assigned accordingly.

2. Did the program recognize and resolve conflicts of interest when appropriate? Conflicts of interest (COI) are identified, as much as possible, before proposals are assigned. For panels, COI issues which come up are treated as they arise. Panel reports give COI information. COIs are carefully documented. This system works well.

Additional comments on reviewer selection:
There is a good geographical distribution of panelists, and a good representation of women reviewers. Figures for the percentage of underrepresented minority reviewers were made less useful by the fact that a majority of reviewers did not self-report both their gender and whether they belonged to underrepresented minorities.

Management of the Program under Review

1. Management of the program.
In both programs, part of the budget (about 10 %) is set aside from the start for the final "equalization". In this final step, where funding decisions among many very good proposals must be made, questions of diversity (in all aspects) and portfolio balance, even over a period of years, are taken into account. Similarly, part of the budget is set aside for special programs (such as CAREER, FRG, conferences).

Recommendations for funding in Analysis are based on a consensus decision reached by all the program directors in the program. This ensures budgetary integrity and portfolio balance.

In Computational Mathematics, a different approach is taken in which the budget is divided equally among the program directors at the start. This approach also seems to be effective.

The program maintains the flexibility of funding later years of a grant with money from future FY. This can allow funding of more proposals, but must be used carefully so as not to overspend money from future years.

Program directors recognize that not all proposals fit the established disciplinary categories. To account for this, joint panels are formed both within mathematics and with other scientific disciplines.

2. Responsiveness of the program to emerging research and education opportunities.
Program directors participate in working groups and research conferences in order to keep abreast of emerging opportunities. For example, Computational Mathematics has been successful in finding sources of co-funding from other parts of NSF and also outside of NSF.

We note that emerging research and education opportunities should not be at the expense of the core programs. Programs must be responsive, but carefully tailored approaches are needed.

Panels are a good resource for identifying emerging research areas. Panelists often make good suggestions as to which new areas of research are promising.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.
Funding balance is considered over a period of several years. Careful attention is given to changes in the proportion of proposals coming in, as an indicator of the development of new areas and change of priorities.

4. Responsiveness of program to previous COV comments and recommendations.
Not applicable at the level of the Analysis and Computational Mathematics programs.

Resulting Portfolio of Awards

1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity?
There is a good balance of awards across different areas.

2. Are awards appropriate in size and duration for the scope of the projects?
Most research projects are for 3 years and the size of the grants seem appropriate for the level of proposed effort. However, we believe that there is a strong need for flexibility in Computational Mathematics. If the budget would allow it, some larger and longer grants would be appropriate and, if a creative method of funding smaller grants is found, more small grants would be appropriate.

3. Does the program portfolio include awards for projects that are innovative or potentially transformative?
Yes. It appears some of the more risky, cutting edge topics that may not lead to immediate results or applications still get noticed by the review panels and the program directors. Numerous major advances have come out of these programs and some of these are highlighted in the annual reports.

4. Does the program portfolio include inter- and multi-disciplinary projects?
Yes. There are quite a few collaborative projects that are inter- and multi-disciplinary.

5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?
The geographical distribution seems reasonable.

6. Does the program portfolio have an appropriate balance of awards to different types of institutions?

A reasonable percentage of awards from RUIs were funded, but we note that there were a small number of proposals submitted from RUIs. We also note that there are few awards to researchers at non-RUI and non-research intensive universities.

7. Does the program portfolio have an appropriate balance of awards to new investigators?
There seem to be a good number of awards for young investigators. However, there seems to be a drop-off both in the number of proposals and the percentage of awards starting 10-15 years after the PhD and this looks like a potential area of concern.

8. Does the program portfolio include projects that integrate research and education?
Yes. The CAREER grants seem to do a good job for integrating research and education. Other funded proposals do not seem to be as strong in this area.

9. Does the program portfolio have appropriate participation of underrepresented groups?
Analysis seems to be pro-active in seeking to fund underrepresented groups, with a strong funding rate for minorities and women. In Computational Mathematics, funding seems to be proportionate to the percentage of minorities that applied and somewhat higher for women. While the overall funding rate for underrepresented minorities is better than the general funding rate, in Computational Mathematics there has been a steady erosion over the past three years in the funding rate for this group; this should be carefully watched.

In both programs, it seems wise to advertise these high funding rates to induce further applications from underrepresented groups.

10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports?
Yes. The list of recent national awards in these fields highlights the relevancy of the research being supported by the programs.

11. Additional comments on the quality of the projects or the balance of the portfolio:
There are not enough resources to fund all of the excellent research proposals.

Other Topics
1. Please comment on any program areas in need of improvement or gaps (if any) within program areas.
It would be useful to relate new initiatives and emerging subfields to the traditional disciplines in order to create a more seamless system.
2. Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.
None.
3. Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.

The highly unpredictable budget process is hindering planning and efficient use of resources. The process is mainly out of the control of NSF but procedures should be in place to minimize the damage for NSF and the entities supported by NSF.
In the allocation process within DMS, the number of successful proposals per PI should be as relevant as the funding rate per proposal.
4. Please provide comments on any other issues the COV feels are relevant.
We hope that DMS continues to point out the growing importance of the mathematical sciences in society within NSF to reverse the recent decline in mathematics funding.

Earlier COV reviews discuss understaffing of program directors and administrative staff. This is still an issue. The character of the work is evolving and the skills of the administrative staff also need to evolve by continued education and new appointments. For example, it might be relevant to explore the use of "science assistants" within DMS.

CORE QUESTIONS and REPORT TEMPLATE
for
FY 2013 NSF COMMITTEE OF VISITOR (COV) REVIEWS

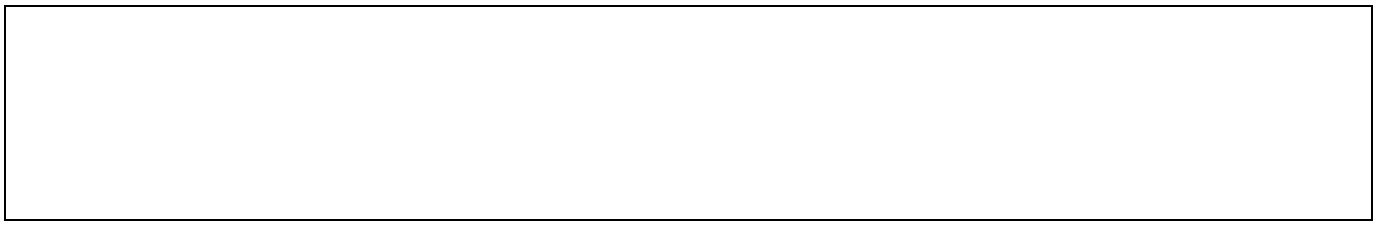
Guidance to the COV: The COV report should provide a balanced assessment of NSF's performance in the integrity and efficiency of the ***processes*** related to proposal review. Discussions leading to answers for Part A of the Core Questions will require study of confidential material such as declined proposals and reviewer comments. ***COV reports should not contain confidential material or specific information about declined proposals.*** The reports generated by COVs are made available to the public.

We encourage COV members to provide comments to NSF on how to improve in all areas, as well as suggestions for the COV process, format, and questions. For past COV reports, please see http://www.nsf.gov/od/oia/activities/cov/covs.jsp.

FY 2013 REPORT TEMPLATE FOR NSF COMMITTEES OF VISITORS (COVs)

The table below should be completed by program staff.

Date of COV: 20 – 22 February 2013
Program/Cluster/Section:
Division: Division of Mathematical Sciences
Directorate: Directorate for Mathematical and Physical Sciences
Number of actions reviewed: **Awards: 450 (estimate)** **Declinations: 450 (estimate)** **Other:**
Total number of actions within Program/Cluster/Division during period under review: **Awards: 2833** **Declinations: 5800** **Other:**
Manner in which reviewed actions were selected: **For large programs, 10 award actions and 10 declination actions were selected per fiscal year under review (a total of 60 per large program). Half of these were selected randomly (by computer algorithm); half were selected by DMS program directors to ensure that the selection provides a representative sample of the program's activities. For smaller programs, such as the DMS Infrastructure program, in which a 60-proposal selection would constitute a large fraction of proposals handled, fewer were selected.** **The 2010 Committee of Visitors suggested that "it would help if the COV could be provided access to all jackets associated with one or two panels from each disciplinary program, giving each group a columnar list of applicants (and links to all the jackets) reviewed by a panel along with separate columns designating the panel rating of each applicant and the ultimate decision by program officers about funding the applicant." This suggestion was implemented in 2013, greatly enlarging the number of jackets (beyond the initial 60-proposal selection) that was presented to the 2013 Committee.**



COV Membership

	Name	Affiliation
COV Chair or Co-Chairs:	**Dr. Mark Green**	**University of California, Los Angeles**
COV Members:	**Dr. Alejandro Adem** **Dr. Andrew Bernoff** **Dr. Anthony Bloch** **Dr. James A. Carlson** **Dr. Jeanne Clelland** **Dr. Henry Cohn** **Dr. Mirna Dzamonja** **Dr. Susan Ellenberg** **Dr. Maria Emelianenko** **Dr. Bjorn Engquist** **Dr. Fariba Fahroo** **Dr. Anne Gelb** **Dr. Sheldon Katz** **Dr. Donald R. King** **Dr. Nancy Kopell** **Dr. Bryna Kra** **Dr. Diane Lambert** **Dr. Steven Lalley** **Dr. Steve Lee** **Dr. William A. Massey** **Dr. Juan Meza** **Dr. Alex Nagel** **Dr. Nancy Reid** **Dr. Javier Rojo** **Dr. Jeff Saltzman** **Dr. Kannan Soundararajan** **Dr. Angela Stevens** **Dr. Karen Vogtmann** **Dr. Fred Weissler** **Dr. Lai-Sang Young**	**University of British Columbia** **Harvey Mudd College** **University of Michigan** **University of Utah** **University of Colorado** **Microsoft Research New England** **University of East Anglia** **University of Pennsylvania** **George Mason University** **University of Texas, Austin** **Air Force Office of Scientific Research** **Arizona State University** **University of Illinois, Urbana-Champaign** **Northeastern University** **Boston University** **Northwestern University** **Google** **University of Chicago** **DoE Adv. Scientific Computing Research** **Princeton University** **University of California, Merced** **University of Wisconsin** **University of Toronto** **Rice University** **AstraZeneca** **Stanford University** **University of Muenster** **Cornell University** **University of Paris XIII** **New York University**

INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, and withdrawals) that were *completed within the past three fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

I. Questions about the quality and effectiveness of the program's use of merit review process. **Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question**.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	**YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE**
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? **Detailed answers to the questions are contained in the reports of the 6 subcommittees.**	Yes
2. Are both merit review criteria addressed a) In individual reviews? b) In panel summaries? c) In Program Officer review analyses?	(a)Yes (b)Yes (c)Yes

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?	Yes
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?	Yes
5. Does the documentation in the jacket provide the rationale for the award/decline decision?	Yes

6. Does the documentation to the PI provide the rationale for the award/decline decision?	Yes
7. Additional comments on the quality and effectiveness of the program's use of merit review process:	

II. Questions concerning the selection of reviewers. **Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question**.

SELECTION OF REVIEWERS	YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Did the program make use of reviewers having appropriate expertise and/or qualifications?	**Yes**
2. Did the program recognize and resolve conflicts of interest when appropriate?	**Yes**
Additional comments on reviewer selection:	

III. Questions concerning the management of the program under review**. Please comment on the following:**

MANAGEMENT OF THE PROGRAM UNDER REVIEW
1. Management of the program. Excellent
2. Responsiveness of the program to emerging research and education opportunities. Excellent
3. Program planning and prioritization process (internal and external) that guided the development of the portfolio. Excellent
4. Responsiveness of program to previous COV comments and recommendations. Very Good

IV. Questions about Portfolio. **Please answer the following about the portfolio of awards made by the program under review.**

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity?	Appropriate
2. Are awards appropriate in size and duration for the scope of the projects?	Appropriate
3. Does the program portfolio include awards for projects that are innovative or potentially transformative?	Appropriate
4. Does the program portfolio include inter- and multi-disciplinary projects?	Appropriate
5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?	Appropriate
6. Does the program portfolio have an appropriate balance of awards to different types of institutions?	Appropriate
7. Does the program portfolio have an appropriate balance of awards to new investigators?	Appropriate
8. Does the program portfolio include projects that integrate research and education?	Yes
9. Does the program portfolio have appropriate participation of underrepresented groups[1]?	Appropriate

[1] NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience

10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports? Comments: Yes. The list of recent national awards in these fields highlights the relevancy of the research being supported by the programs.	Appropriate
11. Additional comments on the quality of the projects or the balance of the portfolio: There are not enough resources to fund all of the excellent research proposals.	

suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.

OTHER TOPICS

1. **Please comment on any program areas in need of improvement or gaps (if any) within program areas.**
2. **Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.**
3. **Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.**

   The highly unpredictable budget process is hindering planning and efficient use of resources. The process is mainly out of the control of NSF but procedures should be in place to minimize the damage for NSF and the entities supported by NSF.

   In the allocation process within DMS, the number of successful proposals per PI should be as relevant as the funding rate per proposal.

4. **Please provide comments on any other issues the COV feels are relevant.**

   We hope that DMS continues to point out the growing importance of mathematics in society within NSF to reverse the recent decline in mathematics funding.

   Earlier COV reviews discuss understaffing of program directors and administrative staff. This is still an issue. The character of the work is evolving and the skills of the administrative staff also need to evolve by continued education and new appointments. For example, it might be relevant to explore the use of "science assistants" within DMS.

5. **NSF would appreciate your comments on how to improve the COV review process, format and report template.**

   The COV review process still needs improvement.

SIGNATURE BLOCK:

_____

For the 2013 Committee of Visitors of the Division of Mathematical Sciences
Mark L. Green
Chair

Appendix 1: Agenda of the Committee of Visitors

Wednesday, February 20

9:00 am Continental Breakfast (Room II-555)

9:30 am Welcome and Charge to the Committee
Dr. Celeste Rohlfing
Deputy Assistant Director, Directorate for Mathematical and Physical Sciences

9:45 am Welcome
Dr. Mark Green
Chair, DMS Committee of Visitors

9:50 am Conflict of Interest Briefing
Dr. Kelsey Cook
Staff Associate, Directorate for Mathematical and Physical Sciences

10:05 am Overview of Division of Mathematical Sciences
Dr. Sastry Pantula
Division Director, DMS

11:00 am Move to Breakout Rooms
Subcommittee A: II-565
Subcommittee B: II-575
Subcommittee C: II-585
Overview of Disciplinary Programs
Various Program Officers

11:30 am How to Read an Award/Declination Jacket
Various Program Officers

12:00 pm Working Lunch; Begin Review of Disciplinary Programs

1:15 pm Welcome (Room II-555)
Dr. Fleming Crim
Assistant Director, Directorate for Mathematical and Physical Sciences

1:30 pm Resume review of Disciplinary Programs in Breakout Rooms

3:00 pm Meeting with DMS Administrative Professional Staff members (Room II-555)

3:30 pm Coffee Break

4:00 pm Meeting with DMS Program Directors

4:30 pm Resume Review of Disciplinary Programs in Breakout Rooms

7:00 pm Dinner in groups (locations to be announced) Thursday, February 21

8:30 am Continental Breakfast (Room II-555)

9:00 am Committee of the Whole (Room II-555)
Informal progress reports; Q&A

9:30 am Move to Breakout Rooms
Overview of Institutes/Interdisciplinary/Infrastructure/Workforce Programs
Various Program Officers

10:00 am Begin Review of Institutes/Interdisciplinary/Workforce Programs

12:00 pm Working Lunch

1:30 pm Committee of the Whole (Room II-555)
Discussion of Procedure and Timing

2:00 pm Discussion and Drafting of Subcommittee Reports (Breakout Rooms)

3:30 pm Coffee Break

6:00 pm Reception (Room II-555)

7:00 pm Dinner (on your own)

Friday, February 22
8:30 am Continental Breakfast (Room II-555)

9:00 am Presentation of Draft Reports by Subcommittee Chairs (Room II-555)

9:45 am Continue Discussion and Drafting of Subcommittee Reports (Breakout Rooms)

10:30 am Committee of the Whole (Room II-555)
Continue Discussion of Subcommittee Reports and Overall Report

11:30 am Briefing of Dr. Fleming Crim, AD/MPS, by Committee of Visitors

12:15 pm Closed session of Committee of Visitors with Dr. Fleming Crim, AD/MPS

12:30 pm Move to Breakout Rooms
Working Lunch, Further Discussion with DMS Staff, Revisions to Report

4:00 pm Adjourn

Appendix 2: Diversity and Conflict of Interest Report

The Division of Mathematical Sciences held its triennial Committee of Visitors (CoV) on February 20-22, 2013. The CoV was composed of 31 members from the scientific community chosen for their scientific expertise and awareness of developments in their respective fields of the mathematical sciences, as well as a sense of issues, perspective, and balance across the mathematical sciences. The 31 CoV members composed a diverse committee with respect to geographic, institutional, gender, ethnicity, age, private sector, and scientific representation. The following table describes the main features of the CoV with respect to these issues:

Category	**Number**
Member of MPS Advisory Committee	1
Academic Institutional Type	
Research	26
4-Year	1
U.S. Public	10
U.S. Private	11
Industry	3
Government Agency	2
Outside of U.S.	5
U.S. Academic Institution Location	
Eastern	7
Midwestern and Southwestern	8
Western	6
Female	13
Underrrepresented Minority	6
No DMS Proposal in Past Five Years	14

The CoV was briefed on issues of Conflict of Interest for the purpose of one of the CoV's statutory responsibilities, namely the reading of proposals, reviews, and

recommendations, and commenting on the handling of actions and the appropriateness of recommendations. Each CoV member completed an NSF Conflicts of Interest form. Known conflicts of interest, such as those involving the home institutions of CoV members were entered into the Electronic Jacket Committee of Visitors system prior to the start of the meeting. Other conflicts of interest were entered as they became known over the course of the meeting. Entering these conflicts of interest prevented CoV members from electronically accessing proposals with which they were conflicted. None of the CoV members was involved in the review of a program in which he or she had a pending proposal. The DMS COI officer was available at all times during the CoV meeting to answer questions and resolve issues regarding conflicts of interest.