



UNITED STATES GOVERNMENT
M E M O R A N D U M

DIRECTORATE FOR MATHEMATICAL AND PHYSICAL SCIENCES

Date: March 28, 2008
From: Assistant Director, MPS
Subject: **Response to the Division of Materials Research Committee of Visitors Report**
To: MPS Advisory Committee

Please find attached the MPS response to the Committee of Visitors (COV) report from the 6-8 February 2008 COV review of the Division of Materials Research. The review was thorough and insightful, and the findings will be very helpful to me and to the Division of Materials Research in fulfilling our responsibilities to the scientific community and to the nation.

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

Tony Chan
Assistant Director

Attachment: Response to Division of Materials Research COV Report of 2008

DMR Update for 2009

Division of Materials Research (DMR) Response to
Findings and Recommendations of the DMR Committee of Visitors
February 6 - 8, 2008

The Committee of Visitors (COV) met on February 6-8, 2008 at the National Science Foundation to assess the performance of DMR in two primary areas: (a) the integrity and efficiency of the processes related to proposal review and (b) the quality of the results of DMR's investments in the form of outputs and outcomes that appear over time. The COV also explored the relationships between award decisions and program/NSF-wide goals in order to determine the likelihood that the portfolio will lead to the desired results in the future.

The committee's report consists of two parts as follows:

1. A summary of the COV's most important observations communicated to Dr. Michael Witherell, Chair, MPS Advisory Committee, by Dr. Paul Percy, Chair, DMR Committee of Visitors, on March 5, 2008.
2. The compiled findings of the COV in the form of report templates for the four DMR Program Groups as follows:
 - A. Metals, Ceramics, Electronic Materials.
 - B. Instrumentation, Facilities, Materials Research Science and Engineering Centers (MRSECs), Office of Special Programs.
 - C. Condensed Matter and Materials Theory, Condensed Matter Physics.
 - D. Solid State and Materials Chemistry, Polymers, Biomaterials.

I. Response to the overall comments of the COV

We are pleased that the COV finds that "...DMR is an exceptional Division within NSF, with highly respected and successful programs that are centrally relevant to the implementation of the recommendations of the American Competitive Initiative (ACI)..." The report also finds that "DMR is one of the leading divisions within NSF in investing in transformative research and in developing new concepts and new management strategies."

The Division was also lauded for its positive response to the 2005 COV report, including the addition of staff to relieve an excessive workload. A concern of the 2005 COV was that support for individual investigator programs should not be diminished and the 2008 COV finds that "DMR has also been diligent in preventing the erosion of the fraction of individual investigator grants." The COV applauds the efforts of the Director in implementing diversity strategies for the Division and initiating international programs. The committee notes that "the process that DMR uses for determining which proposals to fund is excellent".... Also, "DMR program directors do an excellent job of ensuring participation of underrepresented groups in their portfolios."

The followings are the key areas in the COV summary where DMR is encouraged to consider new approaches and improvements.

Staffing and Workload.

The COV continues to be concerned about staff workload issues. The COV summary states that “the staff is an enormously valuable resource, but program directors are burdened with an increasing workload without commensurate staff increase”.

Comparable concerns are raised in most of the separate program group reports.

RESPONSE:

Earlier in the summary the COV lauded DMR for staff increases to reduce workload. Indeed, two new program director and two new administrative support staff positions have been added since 2005. The program director positions cover the new Biomaterials Program and the educational and outreach activities of the Office of Special Programs, respectively. In addition, the MRSEC program staff has been increased to three full-time and one part-time program directors. The administrative staff saw the creation of two new intermediate level staff positions. One administrative staff position is currently vacant and is soon to be filled. However, during this time of increased staffing there was a significant increase in the number of submitted proposals with the result that the workload during the past years remained approximately unchanged and at an unacceptably high level for both program directors and administrative support staff. DMR has submitted a personnel plan to the MPS Directorate with the following personnel requests: (1) that the current vacancy at the technical support level be filled immediately and permission granted for an additional program support position, (2) two new program director positions be added to DMR: one to relieve the excessive workload in the Condensed Matter and Materials Theory Program, and the second position to help manage the increasing complexity and size of DMR’s Office of Special Programs (OSP), including oversight of the International Materials Institutes and the growing Partnerships for Research and Education in Materials (PREM) Program. The vacancy (as of April 3, 2008) in the Solid State and Materials Chemistry Program is expected to be soon filled. Two candidates have been already invited for interviews in April 2008. In order to allow for a smooth transition period for this important position, the retiring program director, Dr. David Nelson, was invited and has agreed to serve on a part-time basis for one year to work with the newly hired program director. Meanwhile, Dr. Joe Akkara was appointed as Acting Program Director starting April 3, 2008 while waiting for this position to be filled by a new program director.

11/03/08: We continue working towards reducing DMR staff workload. Due to caps in the allowed number of FTEs (full-time equivalent) for DMR, we have not received approval of our request to fill the technical support level vacancy or to recruit two additional program directors as described above. We have been able to ameliorate the situation at the administrative/program support level by recruiting a STEP (Student Temporary Employment Program) and we hope to recruit a second one very soon. We filled the Solid State and Materials Chemistry Program Director position in September 2008 (Dr. Linda Sapochak). Several DMR vacancies opened up in the Division in the last 8 months. In September 2008 we hired a new Program Director, Dr. Daniele Finotello, to

fill a vacancy created in the Office of Special Programs when Dr. Carmen Huber took the position of Acting Executive Officer following Dr. Ulrich Strom's retirement. We have recruited an individual that will fill a vacancy created in the Metallic Materials and Nanostructures (MMN) program upon Dr. Harsh Chopra's end of his rotation term and return to his home institution. Dr. Chopra will stay on a part-time basis to assist and guide the new MMN program director. We are currently recruiting for a program director position in the Condensed Matter and Materials Theory program (CMMT) to fill the vacancy created by Dr. Michael Lee's sudden departure and his move to DoE in October 2008. While the CMMT search takes place, we are hiring two program directors to work part-time in CMMT. We have also been actively recruiting for a program director in the Materials Research Science and Engineering Centers program to fill a vacancy that Dr. Maija Kukla created when she moved to the NSF EPSCoR office. We have interviewed several candidates for this position and selected a candidate to fill this position as soon as possible.

12/29/09: We were able to secure one additional FTE early in 2009 which allowed us to handle increasing workload in the National Facilities (NAF) program. The position was allocated to a shared position between the Instrumentation for Materials Research (IMR) and the Materials Research Science and Engineering Centers (MRSEC) programs (including the Partnership for Research and Education in Materials – PREM - program); it was filled by Dr. Sean Jones. Dr. Charles Bouldin now has reduced responsibilities in the IMR program and shares responsibility with Dr. Guebre Tessema for the NAF program. We were also able to secure half an FTE for a shared position with the Division of Chemistry. We were able to hire a second STEP student to assist with administrative work. Ms. Carol Savory-Heflin, the Division's Program Support Manager, retired in the spring of 2009; she was replaced by Ms. Velma Lawson in August 2009. Dr. Carmen Huber completed her detail as Acting Executive Officer and returned to her position as program director with the Office of Special Programs (OSP) in November 2009. Dr. Janice Hicks is Acting Deputy Director of DMR as of November 2009 on a detail from the Division of Chemistry. In addition, several program director vacancies opened and/or were filled in 2009. MRSEC program: Dr. William Brittain joined the program in January 2009 and filled the vacancy left by Dr. Maija Kukla; he moved to the NSF Division of Chemistry in December 2009. Dr. Rama Bansil completed her rotation with the MRSEC program and returned to her home institution in September 2009. We are actively recruiting to fill the vacancies left by Drs. Brittain and Bansil; in the meantime, Dr. Charles Ying (Electronic and Photonic Materials) is working with Drs. Rieker and Jones in the MRSEC program. MMN (Metals and Metallic Nanostructures): Dr. Alan Ardell replaced Dr. Chopra in January 2009. Dr. Bruce McDonald, a part-time expert with the program, left in November 2009. EPM (Electronic and Photonic Materials): in anticipation of a potential vacancy due to retirement, Dr. Nadia El-Masry was hired in August 2009. CMMT (Condensed Matter and Materials Theory): Drs. Marco Fornari and John Mintmire worked half-time in the program from December 2008 through June 2009, while a search was conducted to replace Dr. Michael Lee who left in November 2008. The search resulted in Dr. Serdar Ogut's appointment in October 2009. CMP (Condensed Matter Physics): Dr. Roy Goodrich left in November 2008 and Dr. Oscar Bernal completed his rotation and returned to his home institution in August 2009; a search to replace them is under way. In the meantime, Dr. Daniele Finotello moved from OSP to

CMP and Dr. Udo Pernisz is working half-time in CMP. OSP: Dr. Uma Venkateswaran left for the EPSCoR office in March 2009; a search to replace her is under way.

Support for Instrumentation

The COV summary states: "In the area of research infrastructure, there appears to be an equipment funding gap in the \$30K to \$100K range, an amount which is impractical to seek support for in unsolicited proposals. The COV recommends that DMR should consider how this might be addressed."

RESPONSE:

DMR is aware that instrumentation requests less than \$100K are not eligible to submit to the Instrumentation for Materials Research (IMR) or the Major Research Instrumentation (MRI) programs. DMR is in agreement with the COV that such requests are not appropriate for stand-alone unsolicited proposals and will look for a solution to fill this funding gap in instrumentation.

11/03/08: We realize that support for instrumentation is critical to advancing materials research and education. For this reason, and in spite of almost a flat budget in FY 2008, DMR ran a solicitation for the Instrumentation for Materials Research (IMR) program in FY08 and is running a solicitation for Mid-Scale Instrumentation (MIP) program in FY09. These programs cover the gaps left by the NSF-wide Major Research Instrumentation (MRI) program at the low (IMR) and high (MIP) ends of the award size spectrum. DMR was fortunate to receive \$14.6 M to fund MRI proposals in instrumentation for materials research. We continue to examine the question of support for instrumentation costing less than \$100K. Requests for such type of instrumentation do not appear to merit self-standing proposals as noted before. The appropriate home for such requests would be in unsolicited proposals, as the nature of the equipment requested is tied to the research project proposed, and current DMR awards often include such support. Routine and extensive inclusion of such equipment requests in unsolicited proposals would translate in an increase in the average award size, which is almost impossible to achieve in times of flat budgets without decreasing the success rates.

12/29/09: Equipment requests for less than \$100K are often included in unsolicited research proposals; those requests are granted according to available funds in the program. An increase in the budget of individual investigator programs in FY09, as well as additional funds from the American Recovery and Reinvestment Act (ARRA), potentially allowed for funding more such requests. We have also presented this issue to selected members of the MPS Advisory Committee for their consideration and advice.

Balance Between Funding Modes and Support for Facilities

As part of its discussion on the balance between various funding modes in DMR the COV restates its interest for DMR not to reduce the support for individual investigator programs. As the COV notes, DMR has been able to retain current levels of support since 2005 and the Division seeks to do the same in the future. The COV notes that an important aspect of this issue is the degree of DMR support for Facilities. In particular, the COV questions why the operating costs for the National High Magnetic Field

Laboratory are born at a 95% level by DMR and recommends that NSF/DMR “evaluate this situation”. The issue of not reducing support for individual investigators was also raised in several of the program reports.

RESPONSE:

Balance between funding modes.

The 2008 COV credits DMR with “having been diligent in preventing the erosion of the fraction of individual investigator grants.” Because of nearly flat budgets, this implies that the balance between funding modes has not significantly changed during the last funding period. In regard to the balance between funding modes the 2005 COV concluded that “...the group as a whole views the distribution of funds between these different sectors as roughly appropriate”. DMR continues to evaluate the balance between funding modes and is committed not to reduce the fraction of funding for individual investigators.

Support for Facilities

DMR is the steward (providing major support) for the National High Magnetic Field Laboratory (NHMFL) and has been a steward of high magnetic field science for a very long time dating back to the Francis Bitter Magnetic Field Facility at MIT. DMR is also a partner, providing partial support for neutron and light source facilities. The NHMFL is currently co-supported by the NSF Chemistry Division at an annual level of \$1.5M. Given current budget expectations, DMR is hopeful that it will be able to meet its commitments over the current 5 year award initiated in January 2008. However, it is essential that new partnerships be developed to help meet the increasing costs of running such large major user facilities. DMR has initiated and expects to continue, a dialogue with other NSF directorates (e.g., the Biological Sciences Directorate) about potential co-support of NHMFL. There is precedence for such support for synchrotron radiation light sources that serve both the material and biological science communities. In addition, NHMFL has opportunities for other sources of funding. For instance, it is eligible to compete for large instrumentation grants through the DMR Major Research Instrumentation program (MIP). One large MIP award for magnet construction has already been made at another major user facility.

The COV’s recommendations to shift management of NHMFL to the Director’s level or to distribute it among NSF Divisions will be also considered. It will be explored among a number of other potential options. The role of construction and support for major research light source facilities is currently a topic of intense discussion at NSF. An expert panel is currently working on advising the Mathematical and Physical Science Directorate on the opportunities and appropriateness for NSF to support the construction and operation of large next generation light source facilities. This panel organized a light source workshop early this year, will be visiting major NSF-funded University-based and DOE-funded light source facilities, and will write a report with its findings and recommendations. This report is due early this summer (2008).

11/03/08: DMR continues to monitor the balance among funding modes very carefully. Such balance is taken into serious consideration when making funding decisions and was

a factor in DMR's decision not to provide the anticipated level of support for the NHMFL in FY 2008 when the Division did not receive its expected budget increase. DMR is also examining possible co-support for the NHMFL from other NSF units in addition to the Division of Chemistry. Along these lines, a possible workshop on the topic of applications of high magnetic fields to problems relevant to both biological and materials research is being considered jointly with the Directorate for Biological Sciences. In addition, DMR and MPS are looking very seriously into the role that they should play for supporting next generation light source facilities. An expert MPS panel was put together over a year ago who was tasked to look into this question. The final report from the expert panel that advises the Directorate for Mathematical and Physical Sciences (MPS) on light source facilities was delayed a bit but was finally delivered a few weeks ago. The final report will be made public after the chairman gives a briefing on it and presents it to the MPS AC. Upon acceptance by the MPS AC, the report will become public. The conclusions of such report, as well as the participation of potential funding partners to DMR and to MPS, will help guide the future role that DMR should play in terms of support and stewardship of next generation light source facilities.

12/29/09: The balance of various funding modes within DMR remains a challenge in view of increasing operating costs of large existing national facilities such as the NHMFL. We continue to explore possible co-support of the NHMFL from other NSF units. In response to the MPS Panel on future light source facilities, which recommended that NSF play an active role in such future light sources, in FY10 DMR assumes stewardship for the Cornell Electron Storage Ring (CESR). As of FY10 CESR phases out high energy physics research and is instead fully dedicated to providing charged particles for the operation of the Cornell High Energy Synchrotron Source (CHESS), also funded by DMR. CHESS/CESR serve as a national user facility for X-ray studies in a wide range of disciplines, as well as a platform for research and development of next generation light sources (energy recovery Linac). At the same time, we are phasing out support for the Synchrotron Radiation Center as the U. of Wisconsin. The DMR facilities portfolio calls for increased efforts at developing partnerships within (e.g. the Directorate for Biological Sciences) and outside (e.g. the Department of Energy and NIH) NSF in support of these facilities, and we are working with upper NSF management along these lines.

DMR Program Taxonomy

The COV recommends that "DMR examine the program taxonomy of the division to see how well-aligned it is with the changing materials community."

RESPONSE:

During the last 20 years DMR has tried to stay current, and align itself with the changing world of materials research and education. As a result, the following restructuring and changes occurred:

- (1) the creation of the Condensed Matter and Materials Theory (CMMT) Program. This was made possible by collecting current awards and future proposal submissions from other DMR programs into the current CMMT Program.

- (2) the creation of the Condensed Matter Physics (CMP) program, which was possible by combining the former Solid State Physics and Low Temperature Physics programs.
- (3) the creation of the Materials Research Science and Engineering Center program from the former Materials Research Laboratory and Materials Research Group programs.
- (4) the creation of the Biomaterials program, which was started from existing awards in related programs as well as from new unsolicited proposals.
- (5) the expansion of the Solid State Chemistry program to Solid State and Materials Chemistry.
- (6) the grouping of programs into “clusters” that proved useful for management and COV oversight purposes.
- (7) the scope and focus of the programs, often guided by National Academy of Sciences studies and reports from NSF held workshops, were changed. In addition, other changes and emphases were implemented by newly hired program directors that brought novel ideas and energy to DMR.

The key purpose for a taxonomy review of DMR is to determine the following:

- (1) Does the taxonomy of DMR reflect the 21st century world of Materials Research & Education?
- (2) Based on this taxonomy, is DMR supporting frontier, cutting edge areas in Materials Research & Education? Are there any missing important areas of Materials Research & Education not supported by DMR?
- (3) To what extent does the DMR structure serve or does not serve the needs of the changing world of Materials Research & Education, and its community?

The DMR research and education community is very broad and extends from the traditional materials science and engineering disciplines to the frontiers of condensed matter chemistry and physics, to novel nanostructured and hybrid materials, and to new inter- and multi-disciplinary areas at the interfaces of the physical, chemical and biological sciences.

DMR will try to seek advice in this regard and will engage in a dialogue and discussions with its research and education community as well as members of the MPS Advisory Committee. The recommendations that the biomaterials, polymers and, solid state and materials chemistry Programs need to maintain their individual homes within DMR will be honored.

11/03/08: We will be examining the DMR taxonomy in the next few years. We have already started by eliminating the four clusters that grouped several programs together. Those clusters were not well balanced since three encompassed all the individual investigators' programs and one very large cluster included the activities of the office of special programs, and the programs on centers, facilities and instrumentation. The latter cluster created quite an imbalance since it had programs with over 50% of the Division's budget. We also started looking into the content and description of several programs and made some changes. The synopsis of the new Biomaterials program has been modified to make it more current with state of the art areas of research in this field. Similarly, the

Metals program's description has been greatly modified to bring it to the 21st century and has been renamed as the Metallic Materials and Nanostructures program. Likewise, the synopsis for the Electronic Materials program has been modified and the program has been renamed as the Electronic and Photonic Materials program.

12/29/09: We continue to examine the DMR taxonomy. The program descriptions of each of the eight DMR individual investigator programs in the NSF web page have been updated to more closely reflect the status of the respective fields. The Metallic Materials and Nanostructures program was renamed Metals and Metallic Nanostructures to further clarify the program connection with metals and metallic materials. Efforts are under way, jointly with the National Academy of Sciences, to examine the current status, challenges and opportunities in the metallic and ceramic materials fields.

The Role of "Theory" in DMR

The COV summary recommends that "the Director examine the accessibility of theory to all areas of the DMR portfolio."

RESPONSE:

The Condensed Matter and Materials Theory (CMMT) Program supports primarily proposals that are entirely theoretical or computational in nature, with a broad portfolio representing all areas of materials theory, and extends, through co-review, with other divisions and directorates. Proposals which have a theoretical component, but are based primarily on experimental research, are generally supported by other DMR programs, which include single and multi-investigator's projects, research groups, MRSECs, user facilities, and institutes.

The DMR Director will review the theory program and seek potential improvements if needed in this regard. Renaming the Condensed Matter and Materials Theory Program to just Materials Theory will be considered. DMR will also ensure that this program portfolio will include areas such as biomaterials, polymers and, solid state and materials chemistry. DMR will look into hiring a program director, with both experimental and theoretical expertise. In addition, the possibility of co-review and co-funding between CMMT and other DMR programs will be re-examined and encouraged.

11/03/08: Considering that the CMMT program was earlier named Materials Theory program and the name was changed to Condensed Matter and Materials Theory in 2006, we are examining very carefully the suggestion of changing the name back to Materials Theory. We are currently conducting a search for a CMMT program director; highest priority will be given in the selection process to candidates with a broad background and with combined theoretical and experimental expertise. We are also looking into conducting a NAS study on this program.

12/29/09: We continue looking into the matter of accessibility of theory to all areas of the DMR portfolio, and strongly encourage co-review and co-funding between the

theory and experimental programs in DMR. A program director with combined theoretical and experimental expertise continues to be of very high priority, but we have not been able to recruit such person yet.

II. Response to specific additional issues raised in the program group reports

Issues raised in several program groups:

Broader Impacts

A.1.2 Are both merit review criteria addressed? (In MCEM and SSMC)

Even though the COV response is YES, there is a recommendation to further clarify what constitutes broader impacts. This same recommendation is repeated in section C.3.

RESPONSE:

In the summary statement the 2008 COV complimented DMR on “educating their community of reviewers through workshops and a ‘Dear Colleague’ Letter on the web. The result is a significant improvement in the responsiveness (96%-level) of the reviewers to this issue.” DMR will continue to educate and mentor, in particular, new reviewers and principal investigators in the area of “broader impacts.” The DMR division director has reviewed and updated the “Dear Colleague Letter,” and included a more detailed description of the broader impact themes. This letter has been posted on the DMR website.

11/03/08: We are making a special effort to further clarify and to provide examples of broader impacts in a proposal in presentations by DMR staff at venues that include workshops, conferences, and panel review meetings. We have also published a Dear Colleague Letter (DCL) on the DMR website which explains in great details what is meant by “Broader Impact.”

12/29/09: We continue to clarify and exemplify the broader impacts review criterion in all presentations by DMR staff. The DMR Division Director has participated in sessions exclusively dedicated to this topic at the annual meetings of the Materials Research Society.

Representation of underrepresented groups in program portfolios and as reviewers of proposals

Although success rates for members of underrepresented groups are generally at or above the DMR average, several COV program reports urge that DMR continue its efforts to promote submissions from these groups. In addition, the COV urges use of reviewers from underrepresented groups, including primarily undergraduate serving institutions.

RESPONSE:

DMR is committed to enhance in its program portfolios the participation of those groups that are underrepresented in particular women, minorities and scientists with disabilities

as DMR PIs, as reviewers, and as program directors. DMR has developed a diversity strategy that impacts all aspects of DMR both within and external to NSF. A working group on diversity was established in 2007, which continues to monitor DMR's progress and approaches. This group recommends alternative practices whenever and wherever appropriate. For instance, a recent recommendation made by this group, and immediately implemented by the DMR division director, was the inclusion of a member of the diversity working group in each DMR search committee for new program directors. In another area, an increase in funding of the PREM program is anticipated. This program has and continues to be a powerful mechanism to increase the pool of potential PIs from underrepresented groups including women, minorities and scientists with disabilities. A PREM competition is planned for 2009 which could see an increase in the number of current awards. Another tool for enhancing participation from underrepresented groups will be implemented in FY08 which will take advantage of the (American Competitiveness Initiative) ACI Fellows program. The goals of this program include supporting projects that promise transformative research and identify outstanding candidates from underrepresented groups. An ACI pilot project has been initiated in DMR which will focus on rising stars and underrepresented groups. The creativity extension award mechanism will be utilized for the ACI pilot project in FY 2008, with a vision for extension in 2009 to include other modes of funding individual early career investigators, in particular women, minorities and scientists with disabilities.

11/03/08: We are trying to pay particular attention to this deficiency. In FY 2008, we have awarded twelve America Competitiveness and Innovation (ACI) Fellows by giving them two-year creativity extension awards. Six of these ACI fellows are female, and three are underrepresented minorities in science and engineering. We are in the process of developing a mechanism for selection of FY 2009 ACI fellows with a continued emphasis on broadening participation. We are examining possible ways of increasing the participation of members of underrepresented groups and of faculty at predominantly undergraduate institutions in the review process.

12/29/09: Enhancing participation of underrepresented groups remains high on the DMR agenda, both through awards as well as through the review process. In FY09, DMR awarded six highly visible ACI Fellowships to individuals at the early stages of their professional careers who excel in research as well as in broadening participation efforts. Three of the FY09 fellows are female, two are underrepresented ethnic minorities in science and engineering, and two are or have been faculty at predominantly undergraduate institutions.

Award Size and Duration

A.3.3. Are awards appropriate in size and duration for the scope of the projects? The COV response was NO/YES. One sub-panel concludes that "the size of the awards is often insufficient to carry out many of the projects at a reasonable level....As a result the scope of the project is reduced and/or experiments are limited, thus missing opportunities for important scientific discoveries." Another sub-panel recommends that "DMR should consider longer term awards to reduce the burden on reviewers and DMR staff"

RESPONSE:

The increase in DMR award sizes for research proposals noted by past COVs has leveled off. Although annual median awards sizes for 2005 (\$111.7K), 2006 (\$110.0K), 2007 (\$117.7K) increased modestly, the mean annual award sizes decreased going from 2005 (\$133.5K) to 2006 (\$127.8K), and 2007 (\$125.1K). The mean award durations are also slightly decreasing at 3.50, 3.45, and 3.24 years for 2005, 2006 and 2007, respectively. The severe budget constraints facing DMR during this three-year period most likely account for these results. Over this same time period the overall success rate for research proposals has leveled off at near a historic low of 20%. DMR is committed to increase award sizes and duration periods provided that success rates will not be further reduced. This is only possible with the availability of increased funding. DMR division director promises to increase the size and duration of the most successful projects if the FY09 requested budget materializes.

11/03/08: Our efforts to increase award size and duration are still hampered by essentially flat budgets – the FY 2009 budget request has not materialized so far and under the current continuing resolution we are operating at 90% of our FY 2008 budget level until early March 6, 2009.

12/29/09: An FY09 budget increase for DMR, as well as additional ARRA funds available in FY09, allowed for increases in the mean annual award size from \$ 115.2 in FY08 to \$151.2 K in FY09. The mean award duration is 3.3 years in FY09, about the same as in FY08. While we continue to be committed to increase award size as well as award duration, budget constraints call for a balance between these two factors. (Note that the ARRA funds were a one-time phenomenon and so the mean award size is not expected to sustain in 2010.)

Support for New Investigators

Several sub-panels raise the issue of increasing the support for new investigators. For example, this issue is raised in the context of question A.3.7. Program Group B (centers, etc) responds that “the overall perception ... is that there is room for improvement in funding to new investigators.” The same sub-panel also praises the use of seed funding in MRSECs to support new investigators.

RESPONSE:

The success rate (ratio of number of awards to total number of proposal submissions) for new investigators is at historically low levels, and much lower than that for more established investigators. For the period 1998 – 2004 the average success rate for new investigators for all of DMR was 20%. For the past COV reporting period 2005 – 2007, the success rate for new investigators for all of DMR was 13%. DMR is committed to avoid further reductions of average success rates for new investigators, and its program directors will develop novel approaches to mentor new investigators so they can learn to write more competitive proposals.

11/03/08: Active mentoring of new investigators was undertaken by several DMR program directors which was extremely beneficial. We are intensifying our efforts

towards recruiting and involving new investigators in the review process since their participation is a very good learning experience of the review process and assists in understanding the basic elements of a good proposal.

12/29/09: Support for new investigators is of a high priority in DMR. The success rate for new investigators increased from 13% for the period 2005-2007 to 14.5% for the period 2006-2008. In FY09 DMR allocated ARRA funds preferentially to CAREER awards, thus increasing the number of CAREER awards by 80% over the previous years. Additional efforts to promote and enhance the participation of junior researchers by recognizing their achievements through ACI fellowships have been implemented.

A. Program Group for Metals, Ceramics, and Electronic Materials

Reviewer Balance

A.2.2 Did the program use reviewers balanced with respect to characteristics such as geography, type of institution, and underrepresented groups?

The response was YES, but the COV recommends that “to enable a more systematic analysis of diversity, it would be useful to collect data from a larger fraction of reviewers.”

RESPONSE:

The available NSF data base is limited because ~70% of the reviewers do not self-identify their gender, minority, and/or type of institution status. Some DMR program directors collect their own reviewer data, but this places a burden on their already high workloads. DMR director has tasked a member of the administrative unit with exploring an efficient ways to collect these statistics, and he is already working with other NSF directorates that can help in this regard. Meanwhile DMR will also seek additional support personnel to collect other relevant data.

11/03/08: Work is in progress to collect reviewer data and, with the assistance of DMR program directors, develop reviewer statistics as accurate as possible. DMR sponsored a workshop on Gender Equity in Materials Science and Education (MS&E). A report is due this fall which will include some demographics about gender distribution in MS&E.

12/29/09: Our ability to collect reviewer data within DMR remains limited by staffing and workload issues. We will continue to explore the possibility of collecting and analyzing such statistics centrally through NSF.

Portfolio Balance

A.4.6 Does the program portfolio have an appropriate balance considering, for example, award size, single and multi investigator awards, or other characteristics as appropriate for the program?

The response is “Appropriate” but the COV subcommittee urges that “the portion of individual investigator awards is nearing the lower advisable limit and, along with the

acceptance rate of highly regarded proposals, needs to be monitored carefully for adjustments as future budgets permit.

RESPONSE:

DMR is fully committed to the balance between individual and group investigators, and other larger programs. The 2008 COV summary states that DMR was successful in this regard during the last review period. However, tight budgets have not allowed a significant increase in success rates across individual investigator programs. The current FY 2009 budget request may lead to a significant increase in the number of awards for individual investigators.

11/03/08: We continue to monitor the balance between single-, multiple-investigator and other large awards. We will be especially careful in doing so under the present budget constraints resulting from the current continuing resolution for FY 2009.

12/29/09: Consistently with our commitment to support research by individual investigators and small groups, the DMR internal allocation of FY09 and ARRA funds raised the funding rate of individual investigators and small groups from an average of 24% in FY08 to an average of 30% in FY09.

B. Program Group for Instrumentation, Facilities, MRSECs, Office of Special Programs

Partnering in Construction and Operation of Facilities

C.1. Comment on any program areas in need of improvement or gaps (if any) within program areas.

The COV states: “There are many strong programs within the area of review by this sub-panel. Of great concern is sustaining these excellent areas and growing their reach and scope of their success in the future. The sub-panel recommends that DMR consider increasing the role of partnering in the construction of instrumentation and operation at the facilities.”

C.3. Identify agency-wide issues that should be addressed by NSF to help improve the program’s performance.

The COV states that “Part of DMR’s remarkable success is due to its strong support of facilities. As this is a great financial responsibility, it would be reasonable to explore possibilities for distributed funding within NSF for construction and operations of unique facilities. Such partnerships are emblematic of the existing relationships between individual investigators and the instrumentation they need for frontier research. As operations costs escalate, a creative solution will have to be found or we risk the loss of these world-class capabilities.”

RESPONSE:

The discussion about facilities in the summary of the COV report reflected the perceived need to balance the DMR portfolio, i.e. individual investigator support should not be jeopardized for the need to meet escalating support costs of major facilities. The sub-

panel report comes to the same conclusion but highlights the need for facilities as being essential for advancing frontier materials research of individual investigators. Potential solutions have been discussed under the “Facilities” section of this response to the COV summary. This issue clearly extends beyond DMR to other MPS divisions and other NSF directorates. The MPS Advisory Committee is currently taking up this issue and a report is expected in the summer of 2008. Current expectations are that DMR will need to explore additional partnerships for support of large user facilities such as NHMFL. Initiation of an additional large scale project under DMR stewardship, such as a major new light source, will require very careful examination of the potential impact on DMR programs and capabilities.

11/03/08: Development of interagency partnerships as well as those within NSF divisions and directorates to support current and future facilities is being explored. Examples have been given in section “Balance between Funding Modes and Support for Facilities” above.

12/29/09: As noted in the section “Balance Between Funding Modes and Support for Facilities” above, we continue to explore potential intra- and inter-agency partnerships in support of the facilities stewarded by DMR.

Reviewer Selection

A.2.4. Additional comments on reviewer selection: The sub-panel recommends that “DMR should consider developing a mechanism for formal recognition of excellent reviewers. In addition, it would be helpful if it is possible to provide some level of reviewer training particularly for new reviewers. “

RESPONSE:

DMR programs have for some time established informal mechanisms for identifying new reviewers and for mentoring them. Possible new approaches focusing on underrepresented groups have been proposed by the recently established DMR diversity working group. DMR will examine the possibility of reviewer training, further mentoring, and recognition.

11/03/08: We are examining ways to increase the number of new reviewers, especially in panels, as direct participation in the review process is an effective way to develop good reviewing skills. Active mentoring of new reviewers by several DMR program directors has been quite beneficial.

12/29/09: DMR program directors continue to emphasize the recruitment and mentoring of new reviewers through reviewer/panelist selection as well as through presentations and participation in ad-hoc sessions at professional societies meetings.

Cost Sharing

C.1. Comment on any program areas in need of improvement or gaps (if any) within program areas.

This sub-panel of the COV commented on cost sharing: “The recent removal of cost sharing of up to 30% by universities (or the States) has affected DMR in a negative way. We understand that the NSB is looking at the possibility of reinstating it. After observing the effect of removal, this sub-panel would recommend bringing it back. Unfortunately, this would negatively affect minority-serving institutions, and a compensating process may be necessary in this area.”

RESPONSE:

Cost-sharing has had a primary affect on proposals submitted to the instrumentation, facilities, and centers programs. NSF has enacted changes for cost sharing for the Major Research Instrumentation solicitation but these have not been extended to other programs. DMR is providing input when requested on the perceived impact of the removal of cost sharing and will continue to monitor the situation.

11/03/08: We continue to follow the status of the NSF resolutions on cost-sharing. We agree on the importance of cost-sharing for certain types of large proposals such as those for centers, institutes, large instrumentation, and facilities.

12/29/09: Our limited ability to impose cost-sharing requirements on large projects such as facilities has a negative impact on the vigorous development of those projects.

International Activities

C.1. The COV sub-panel comments on DMR’s Materials World Network Program (MWN) as follows: “This sub-panel of the COV recommends that the materials world network be continued and broadened to include more research in Asia and Africa. We are pleased to recognize that DMR is already working toward this goal.”

RESPONSE:

We are pleased with the COV’s endorsement of this important and timely activity. The past results of encouraging research connections in Africa and Asia have been limited because of a variety of factors, which have not entirely been under DMR’s control. Recent personal contacts made with principals of funding agencies in these regions will be followed up and strengthened. Early numbers on proposal submissions look encouraging, but there is considerable room for improvement. Shortly after assuming her new position, the DMR division director traveled to Asia and later on to North Africa with the sole purpose of promoting collaborations between the USA, and these two continents. As a result numerous funding agencies from Asia and Africa were identified. Several of them agreed to participate in the MWN Program. New international activities such as jointly held workshops and summer institutes are being planned for the near future. For instance, a joint NSF-NSFC (China) workshop will be held yearly and, alternating between the USA and China. These workshops will focus on different hot topics in materials research. The first one will be on “Nanostructured Materials for Global Energy and Environmental Challenges,” and will be held this year (2008) in the USA.

11/03/08: Efforts towards developing a US-Asia materials network include a preliminary discussion among representatives from relevant funding agencies that took place in Australia in the summer of 2008, to be followed up by another meeting/workshop to take place in Singapore in 2009. The first of a series of US-China workshops jointly sponsored by NSF and NSF-China took place in Evanston in September 2008; the topic was nanostructured materials for energy and environmental challenges. The second workshop of the series, on the same topic, will take place in Shanghai in 2009 on New Materials for Renewable Energy. In 2008, JST, NEDO and NIMS from Japan agreed to participate in the MWN joint activity. We continue working with Africa not only through the Materials World Network activity but also by providing support for conferences and workshops held in Africa. We strengthened our cooperation in North Africa and we will be exploring new possible modes in the Middle East.

12/29/09: We continue strengthening our interactions with Asia. A second US-China workshop on materials for energy and the environment jointly sponsored by NSF and NSF-China took place in Tianmu Lake, China, in October 2009. A workshop of NSF/NSF-China joint grantees is being planned for 2010/2011. The newly created National Research Foundation of Korea joined the Materials World Network activity in 2009. We are planning a US-Africa winter school that will bring together junior researchers from the US and Africa, to be held in sub-Saharan Africa in 2010/2011.

C. Program Group for Condensed Matter and Materials Theory, Condensed Matter Physics

Annual Performance Goal - Time to Decision

A.1.7. The annual performance goal is that for at least 70% of the proposals the applicants are informed about the funding decision within six months of the proposal receipt or deadline date, whichever is later.

The COV notes that the CMP program met its goal in 2007 and was very close to the goal in 2005 and 2006. On the other hand, the CMMT program was close to meeting its goal in 2005 but not in 2006 and 2007. The COV attributes the problem with meeting the performance goal in recent years for and to deal with the number of proposals from an increasing broad array of sub-disciplines.”

A.4.1. Management of the program

The COV sub-panel notes that program management is strong but if trend of increasing number of proposals continues “more help will be necessary for both the CMP and CMMT programs”.

RESPONSE:

The CMMT program is very complex covering a large amount of the theoretical aspects of essentially all DMR programs and intersects with many other programs outside DMR and MPS. This makes program management inherently more complex and more time is required to handle each proposal. The newly created Cyber-enabled Discovery and Innovation (CDI) initiative required the expertise and participation of CMMT program directors.

In addition, the following occurred within the last three year COV reporting period: (a) the number of proposals coming to the CMMT program increased dramatically(e.g., nearly 40% in 2006), (b) a long-time permanent program director retired in late 2006, leaving the program with only one person, and recruitment of a replacement took longer than expected.

Better planning to avoid this unnecessary gap will be undertaken in the future, and will also ensure overlap between leaving and incoming program directors in order to maintain continuity within a given program. Currently, there are two full-time (one permanent and one IPA), and one part-time program director. DMR is examining the work load for all programs and expects to make recommendation to MPS management concerning long term staffing needs. The proper staffing level for the CMMT program will be part of that recommendation. The current work load for CMP will also be studied and compared to other programs. Here again the complexity of the overall program plays an important additional role in relating workload beyond the mere numbers of proposals processed by the program.

11/03/08: We are examining the workload resulting from not only the number of proposals considered but also their increasing topical breadth within both CMMT and CMP. We are considering ways to more effectively manage these programs within the constraints imposed by a cap on the number of FTEs in the Division.

12/23/09: Staffing of CMP and CMMT is consistent with staffing of other DMR programs in terms of numbers of proposals handled by a program. On the other hand, as noted earlier, the breadth of these programs brings added complexity to program management. An FY09 search for CMP program directors was unsuccessful. We are conducting another search in FY10. Within limitations imposed on our FTE allowance, we continue to look into how to best handle the large breadth of these programs, including possible ways of restructuring the programs.

Transformative Projects

A.3.4 Does the program portfolio have an appropriate balance of innovative/potentially transformative projects?

The COV sub-panel answered YES to this question, but pointed out that one panelist recommended “to set aside a small fraction of the budget for high risk/high pay-off projects, labeled that way from the start.”

RESPONSE:

DMR currently uses the Division Reserve as a means to encourage the funding of potentially “transformative” proposals on a 50% cost basis to the programs. Such proposals are coded because of the specific reserve action. Other potentially transformative awards can be supported by the current form of Small Grants for Exploratory Research (SGER). NSF has established a working group to study the possible revision of the SGER type grants. Such grants are currently coded and can be tracked over time. DMR will take the sub-panel’s recommendation into consideration for

a more uniform coding of other potentially transformative awards. DMR will also reexamine the extent of support of present individual investigator projects and MRSECs with regard to transformative and high-risk type research.

11/03/08: We are considering increasing support for high risk/high payoff projects. Mechanisms under consideration include the DMR Division Reserve, aggressive participation in the new NSF EAGER (EARly-concept Grants for Exploratory Research) program, and ACI fellows.

12/29/09: DMR program directors make aggressive use of existing mechanisms to support of high risk-high payoff research, such as EAGER awards and creativity extensions. In FY10 a small fraction of the DMR budget is explicitly allocated to support potentially transformative research.

Study of Individual/Small Group Funding Modes

C.3. Identify Agency wide issues

The sub-panel recommends that NSF consider “studying the effectiveness of the individual/small group funding mode, similar to the NAS/NRC study of the MRSEC funding mode”. Such a study “could help to elucidate the “right balance” between individual/small group funding and center- (and solicited) oriented funding.

RESPONSE:

DMR will explore interest of other divisions in such a study. Some information on the relative impact of center and individual grant support is available from the above cited MRSEC NAS study. It is generally agreed that balanced support for individuals, small groups, instrumentation, centers and facilities is essential for support of a modern research enterprise. The exact balance between funding modes will be reexamined under this light.

11/03/08: We are exploring the possibility of such a study and whether other NSF Divisions are interested in participating. We also have a new joint solicitation on SOLAR between three divisions DMR, DMS and CHE which requires three principal investigators with expertise in materials research, mathematics, and chemistry.

12/29/09: Support for unsolicited proposals from individual investigator and from small groups is at the heart of DMR’s business philosophy. We continue developing ways of highlighting the outcome of such research, e.g. through dissemination of research highlights, and giving such research its due credit and financial support.

Liquid helium shortage

C.3. The COV sub-panel points out that a world-wide shortage of helium has developed over past several years. The COV is very concerned that this is impacting a large number of investigators. A positive response from DMR to help alleviate the situation would be appropriate.

RESPONSE:

DMR is very much aware of this problem which is primarily affecting the condensed matter physics community. CMP program directors are researching the overall impact on awardees in their portfolio and will make recommendations to the division for possible supportive measures. Other alternatives to liquid He such as closed-cycle refrigerators whenever and wherever appropriate will also be explored.

11/03/08: DMR former acting executive officer, Dr. Ulrich Strom has participated in a discussion on the Helium Reserve at the National Academy of Sciences (NAS). Dr. Wendy Fuller-Mora, Condensed Matter Physics program, has provided information on helium usage for the study the NAS is conducting on helium shortage. We are also looking into increasing support for acquisition of closed-cycle refrigerators or helium liquefying and recycling systems.

12/29/09: We continue to work with the NAS and with professional societies to address this issue. We encourage the use of closed-cycle refrigerators whenever possible, as well as the installation of helium recycling systems.

D. Program Group for Solid State and Materials Chemistry, Polymers, and Biomaterials

Biomaterials

A.4.1. Overall quality of the research and/or education projects supported by the program.

The sub-panel responds to the above question as Appropriate and adds that for the overall program group “The quality was exceptionally high”. But, the panel recommends that for the BMAT program “the research funded is not uniformly high-risk innovative research.” The panel adds that “however, this is a new program in a state of evolution and its quality will certainly improve in time, given the number of investigators interested in the subject. Because of the vitality of the field, it is important to pay specific attention to funding cutting edge, novel ideas and reduce support of incremental improvements on biomaterials systems that are well known and even utilized”.

C.1. Comment on any program areas in need of improvement or gaps (if any) within program areas.

The sub-panel stresses that “research in this field will create new opportunities in technological innovation related to health, energy, national security, and protection of the environment. Innovation in these areas will not be possible without our fundamental understanding of the underlying principles in the formation and function of biological materials. The value of this rigorous approach to materials has been widely appreciated in traditional areas of materials science, and must now be extended to biomaterials.”

RESPONSE:

We are in full agreement with the COV assessment that the fraction of support of “high-risk innovative research” proposals should be increased. BMAT program directors will work closely with DMR program directors and management, to create and ensure a Biomaterials Program that is noted for its world-class, cutting edge research and

education. In addition, DMR has made a commitment to substantially increase the current investment in the Biomaterials program initiated in 2006, and expand the scope of the program to include the frontier, cutting-edge areas of biomaterial research.

11/03/08: BMAT is in its third year of operation as a program. DMR intends to fulfill its commitment to increase support for BMAT to a level that is consistent with those of other DMR programs. DMR is also monitoring the evolution of this new program to make sure that support for high-risk innovative research takes highest priority within the program. For this reason, a new description of the program has been posted on the NSF website.

12/29/09: BMAT is the fastest growing program in DMR in terms of proposals received and we continue to support the growth of its budget. We are aware of the need for this program to address fundamental and cutting-edge research on the underlying principles in the formation and function of biological materials and continue to monitor this aspect of the program.