



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

DIRECTORATE FOR MATHEMATICAL AND PHYSICAL SCIENCES

Date: March 31, 2011
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 9-11 February 2011 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.

MPS and DMR have prepared this response. I hope the full MPS Advisory Committee finds this COV review and the response useful and acceptable.

H. Edward Seidel
Assistant Director

Attachment: Response to Division of Materials Research COV Report of 2011

MPS Response to the FY 2011 Division of Materials Research Committee of Visitors Recommendations

MPS and DMR are grateful to the Committee of Visitors (COV) and its chair Prof. Murray Gibson for their hard work at the 9-11 February 2011 COV review of the Division of Materials Research, and for the very thoughtful and clear COV report. Please find attached the MPS response. 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. I hope the full MPS Advisory Committee finds this COV review and the MPS response useful and acceptable.

In the response below, the first seven points will provide DMR's focus for the coming years and DMR will report annually on them. The second section of this response will provide comment on other areas of the report; DMR may update these items again before the next COV but not annually.

- 1. Facilities and Instrumentation: DMR should make a larger share of their facilities/instrumentation funds available for instrumentation for all scales from \$30K to \$10M+. Efforts should be made in program solicitations and review to see that large instruments are appropriately shared. NSF should develop a facilities stewardship strategy with the materials community in the context of its mission and the role of other NSF divisions and agencies. The previous COV recommended moving the facilities to the NSF Director's level; this was not implemented. The current COV does not recommend this but they do recognize the critical need to gain support for the facilities from other NSF divisions and not at the expense of either the instrumentation program or other parts of DMR.**

DMR plans to develop a full strategic plan for its facilities and instrumentation programs addressing these issues as well as balance with respect to the rest of the portfolio. The plan will be created through broad community input, use of recent community reports, attention to national priorities and consultation with our advisory groups, as well as internal and external partners. It will include exploring the possibility of joint stewardship and funding of facilities with other NSF divisions and agencies. The plan will examine the helpful suggestions in part C question 2 of the COV report. There will be a preliminary DMR plan within one year to be presented to the DMR subset of the MPS-Advisory Committee Spring 2012, with followup at the DMR retreat in fall 2012.

- 2. The COV is concerned that broader impacts are not consistently reviewed or assessed. The COV recommends that the NSF develop clearer guidelines for both reviewers and proposers, with emphasis on effectiveness. The COV does not recommend to take the responsibility from the individual (even new) PI, but they encourage institutions and centers to provide support to outreach activities and assessment. The COV encourages DMR to emphasize quality and effectiveness of**

DMR will form an internal team consisting of Program Directors to look at more effective ways to educate the community about broader impacts and to develop clear guidelines and encourage the Materials community to build upon successes at their institutions and elsewhere. An important aspect is how to educate PIs and reviewers to respond in beneficial ways, and to train new Program Directors so that there is consistency. The issue of how to assess the broader impacts success of projects will be included in the charge to the team. The team will coordinate with the major National Science Board study currently being conducted on this topic, and will consider the suggestions in part C question 4 of the COV report. This group will work with the entire division and present at the Fall 2011 DMR retreat; DMR will report initial progress to the DMR subset of the MPS-Advisory Committee Fall 2011 and continue to implement in the coming year.

- 3. The COV endorses the creation of a Materials Directorate within NSF, provided that proper attention is given to seamless connections with areas of materials research within other directorates or divisions. Any reorganization must be consistent with the long-term research horizons and the full breadth of DMR. The current internal structure of DMR was considered to be well-matched to its mission.**

This is a thought-provoking recommendation that would require deep and broad dissemination with many constituents to develop. DMR will engage the DMR subset of the MPS-Advisory Committee in Fall 2011 as well as internal and external communities in order to explore the implications of such a recommendation. Once management establishes that such a transition, or variant such as this is desirable or feasible, DMR will put together a team to explore it. The team will examine the helpful suggestions in part C question 1 of the COV report. For a transition to be effective, suitable input from the community and other groups in NSF would be needed.

- 4. Staffing in DMR should be increased to reflect its budget and responsibilities. Virtually every breakout group commented on this in their sub-reports.**

Realizing that arguments for more staffing have not yielded the desired results in the past decade, DMR will continue efforts to increase staffing but will also seek ways to improve efficiency. Possible new ways to utilize staff to support PDs and ways of reducing the workload will be explored. An internal team on the topic of staffing and improving efficiency has been formed and will engage the whole division in preparation for work at the fall 2011 retreat. The team will explore the several good suggestions made by the COV in this regard, calling upon the NSF Policy Office and others. Steps towards implementation will follow this retreat.

- 5. Funding balance: The COV has concerns about the relative balance of funding for the various modes (centers, facilities, individuals, teams) and within one mode, the interplay of grant size, duration and success rate. The COV advises to prevent erosion of support for individual investigators, centers, or mid-scale instrumentation, to restore and balance funding for instrumentation at the mid-scale and to maintain the relative proportion of individual awards at current levels (or even increase if the opportunity arises). The COV feels that the current funding rate and award size are a reasonable compromise, however, many outstanding proposals are unfunded and the award value is dropping. The COV also feels it is important not to let the acceptance rate for proposals fall below the current already-low levels. There is a significant need to increase REU funding as the program provides extremely valuable experiences to students. At the current funding level many qualified students must be turned away from sites across the country. As for Centers the COV was concerned that the flat MRSEC budget over the last 10 years – amounting to a 15% decrease when adjusted for inflation - makes it increasingly harder for MRSECs to accomplish their missions.**

With the ongoing phase-out of NSF-wide NSECs and NIRTs, the MRCT program will fill a unique role. The COV foresees strong budgetary pressure on a program that has been flat-funded for years. The previous COV was concerned by the limited funds for PREM and this COV notes that the award size has not been substantially changed (excluding ARRA money.)

DMR Management is tasked with building the overall DMR budget through interactions with MPS and NSF-wide working groups and with leading DMR in developing budget drivers. The internal advisory team in DMR established by the new Division Director will be tasked with studying funding balance each year when the division's budget number is announced, paying particular attention to balance across the various funding modes. The team will provide best practices of program balance within each funding mode (centers, facilities, individuals and teams), taking advantage of the experience of all of DMR as well as other NSF Divisions. The team will explore the suggestions in part C question 3 of the COV report. The funding data and current best practices will be posted in the update of this response to the COV report in spring 2012.

- 6. The COV advises to develop instrumentation networks, as has been done very well by the MRSECs, and to make sure that instrumentation is shared between institutions as much as reasonably possible. The opening of MRSEC facilities to outside users, and the creation of a national network (MRFN) were very positive steps and should be expanded into the instrumentation and national facilities programs.**

DMR agrees with this concept and is moving in the direction of networks for centers, facilities, instrumentation, PREMs and international institutes. DMR will consider the models such as the National Nanotechnology Infrastructure Network (NNIN) and the solicitation Research Coordination Networks for work in areas such as sustainability science, and will consider efforts to network instrumentation for remote use. Progress in

this area will be reported on by an internal team to the DMR subset of the MPS-Advisory Committee Spring 2012.

- 7. The COV advises increased effort in targeted outreach to diversify the pool of applicants further. The Centers panel encourages DMR to research discipline-specific data to benchmark MRSEC diversity with respect to women and underrepresented minorities.**

DMR will charge a new Diversity Working Group with the effort to increase outreach with the goal of diversifying the pool of applicants to all DMR programs. The team will provide best practices within each funding mode (centers, facilities, individuals and teams), taking advantage of the experience of all of DMR as well as other NSF Divisions; will include social science research on equity issues; and will seek community input. The team will also research discipline-specific data (not limited to the top 50 research institutions) to benchmark various aspects of DMR's portfolio. Finally, the team will provide input to the Division Director by October 2011 for use in the allocation of DMR travel funds. The funding data and current best practices will be posted in the update of this response to the COV report in spring 2012.

Other topics that we will respond to here initially, and possibly before the next COV, but not annually:

- A. The COV is supportive of the recent re-organization of the Materials Research Centers and Teams (MRCT) program, but had some concerns: they think it is important that MIRTs can be incubated into CEMRIs so that the program does not become two tier. The COV thinks that the MIRTs may need longer than 3 years to bring their research to fruition and asks DMR to consider a longer duration. The COV agrees with DMR's decision to limit the number of proposals to one CEMRI or MIRT per institution, and also to one PREM per institution, as an appropriate means of encouraging geographic diversity and intra-institutional prioritization. The COV suggests that the original name for Centers, MRSEC, be retained because it was a successful brand name.

DMR agrees for the most part with these suggestions and the Centers program is tasked with taking them into consideration for the future of the MRCT program. DMR will update this post as decisions are made.

- B. It would be great to see more instrument development proposals and the COV invites NSF to make PIs aware of this. Development of innovative research equipment often takes many years and a mechanism to fund these long term (greater than 5 yrs.) project should be developed.

The Office of Materials Instrumentation and National Facilities will be tasked with examining this important question and will make a recommendation to the MPS AC in spring 2012, along with the strategic plan referred to in part 1 above. Particular attention

will be paid to the role that the NSF-wide Major Research Instrumentation program plays in instrument development with respect to materials research.

C. NSF as a whole, and DMR in particular, presently has no program for accommodating instrumentation/facilities with construction budgets within the range of \$10M to \$100M; the lower boundary may be slightly flexible. Proposals for instrumentation enabling transformative research that fall into this window must presently be rejected without review. Given the challenges of providing funding at this level, it might be appropriate to consider an NSF-wide program to fill the gap.

This is recognized as a major issue for the entire Foundation, and is acutely felt in MPS. The Office of Materials Instrumentation and National Facilities in DMR will be tasked with examining this important question and working with the MPS front office and the cognizant National Science Board representatives who are also working on a solution for the NSF as a whole. OMINAF will make a recommendation to the MPS AC in spring 2012, along with the strategic plan referred to in part 1 above.

D. Extend MRI grant period to five years or two years beyond instrument qualification: this will allow adequate time for research and broader impact so proper credit can be realized.

MRI diversity statistics are in general very good but they should also include statistics based on submissions in addition to other pools due to prescreening by submitting organizations.

While DMR must adhere to the NSF-wide MRI rules, the Division can certainly advocate for changes with the Office of Integrative Activities (in charge of the MRI program). DMR will consider these comments when revising its own Instruments for Materials Research solicitation. OMINAF will make a recommendation to the MPS-AC in spring 2012, along with the strategic plan referred to in part 1 above.

E. The COV members suggest that some portion of the Program Director's review analysis could be included in the declination decision letter to help the PI understand better the rationale for the decision. Alternatively, as is currently done by at least several Program Directors, the PIs could be asked to read the reviews and then call the PD for more clarification. In this manner the PI is provided more information helping them understand the weaknesses of their proposal and suggestions on how to improve the proposal.

DMR Program Directors have the option of placing some appropriate portion of their review analysis in the "PO Comments" section of Fastlane for PI review. This places additional workload in an already overburdened system (including the DD approval step), but it may work for some programs. DMR Program Directors are encouraged to tell

proposers to call them for discussion of the reviews once they receive them. These practices will be discussed at a Division staff meeting and implemented as possible.

F. The funding level for individual REU awards is relatively low, but this allows more sites to be funded in diverse areas of research. The administrative burden to run an REU site is high, hence a higher funding level per award would allow more students to take advantage of the infrastructure and research opportunities. However, the COV felt strongly that this should happen only if the overall budget for the REU program can increase, so that the number of awards is not reduced. There is a high demand by undergraduate students for these NSF funded research experiences, and an increasing number of graduate schools are requiring that Ph.D. applicants have research experience.

These considerations about funding for the REU program will be included in the deliberations described in section 5.

G. Questions were raised about the size of the IMI awards. The NSF might consider more awards of smaller amounts in future competitions and require awards to focus only on networking and international research opportunities. The IMI projects that were awarded were of high quality. Concerns were raised about the awareness in the broader community of the current IMI programs and opportunities for participation. Hence, such opportunities for participation from outside the immediate collaborators can be limited. Better publicity of all international opportunities for summer schools, workshops, etc. on an NSF website to alert the broader community of these opportunities would be helpful (similar to the REU website that lists links to all the REU opportunities).

Considerations about funding for the IMI program will be included in the deliberations described in section 5. The Office of Special Programs will be tasked to examine the question about grant size, as well as the question about accessibility of IMI's activities to the general community. These topics will be discussed at Division staff meetings with implementation before the next IMI competition (scheduled for 2014).