

MPSAC Meeting November 8-9, 2012

The meeting began at 1:02 PM. NSF representatives, Chairman Jim Berger (Duke) and member Paul Butler (Carnegie Institution) were present in the room (1235 Stafford). Other members participated remotely. See Appendix 1 for details.

Introductions

Celeste Rohlfig: State of MPS

- Q: Status of midscale?
 - Building with PHY, AST, DMR

Jim Ulvestad: AST update (response to portfolio review; slides posted)

- Q: Current IIA success rate?
 - 1990 > 40%; 2007 20%; 2012 14.7% (declining budgets + ARRA impact)
- Q: Why does divestment need Congressional approval?
 - Divestment costs money, Congress needs to approve; can take years to realize savings
- Q: Status of #2 and #3 decadal priorities?
 - Still considering; impact of midscale can skew program; #3 will need to wait until end of decade
- Q: LSST status?
 - Working for state of readiness as MREFC; NSB voted in favor; could now appear in future budget requests

Elsa Reichmanis (EHR AC) and Bryant York (MPS AC): Report from the Joint Working Group on Expeditions in Education (E²)

- Key recommendation: promote collaboration between content experts in STEM disciplines and education researchers.
- Strategy: transform the first and second year STEM experience in higher education, because that is where the attrition rate is greatest. E² should be based on research that is already under way or already completed in EHR and MPS.
- Recommend a new, CAREER-like (CAREER-2) program to support mid-career scientists with institutional commitment targeting change. Not for assistant professors.
- Vigorous discussion:
 - The CAREER program has not led to institutional change and CAREER-2 may not be any more successful in that regard.
 - The ADVANCE program might be a better model for the new program than the CAREER program.
 - The new program should not be limited to a single STEM discipline.
 - MPS must partner with EHR on assessment.
 - What we learn in improving college/university retention might have an impact at the K-12 level.

- Many students view STEM majors as a means to an end, “the end” being admission to a professional school in the health fields.
- Many/most students drop out of STEM because they realize they will not get into medical school and need to major in a subject that will lead to employment.
- We should revisit the Pimentel Report of the 1970s “What can you do with a STEM degree?”
- We need more industrial role models.
- We need to improve the preparedness of college freshmen; poor preparation leads to discouragement.
- Many students are simply bored with traditional teaching methods; we need new software to engage them.
- The report was accepted by the MPS AC with the additional comments that followed.

➤ **Prepare for meeting with Office of the Director**

- The committee chair led a discussion on possible questions for the Director.

➤ **Meet with the Director and Deputy Director**

- Dr. Suresh and Dr. Marrett each thanked the MPS AC for their service and opened the floor for advice and questions.
- Q1 concerned the FY13 budget and possible sequester.
 - Dr. Suresh reminded the MPS AC that the President had requested a 4.3% increase, the Senate committee a 4.2% increase and the House committee a 3.5% increase. Dr. Suresh speculated that based on history one might expect a ~4% increase but made clear that he had no inside information. He noted that sequestration would mean 1000 fewer NSF awards made in FY2013. Dr. Suresh made the point that the administration has been enormously supportive of the NSF although a 2004 study concluded that NSF would have needed a \$19B budget in 2004 dollars to meet all of its obligations and that we are now in a fiscal environment where doing something new means giving up something we have traditionally done.
- Q2. Will there be a new or renewed emphasis on climate change?
 - Dr. Suresh stated that the SEES initiative was the largest NSF initiative and that climate change has always been a big part of SEES.
- Q3. What was the rationale for the OCI/CISE merger?
 - Dr. Suresh stated that the current NSF organizational chart was based on history and that the structure was no longer well suited to serve the NSF mission. A proliferation of direct reports to OD had become unmanageable. OCI is the size of many NSF divisions and making it a division in CISE created more uniformity in the NSF structure.
- Q4. OD's thoughts on travel rule changes.
 - Dr. Suresh reminded the MPS AC that the move to virtual panels started well before the current mandate to reduce expenses. The initial motivation was to improve family friendliness, reduce travel time for panelists and to help NSF gain access to the best people. He mentioned that the NSF and NIH have

brought their concerns regarding the new mandate directly to the White House. Dr Suresh remarked that the cost of two panels equals one year of support of a new investigator and that virtual panels are certainly “greener” than traditional ones.

- Q5. OD's thoughts on PO workload.
 - Dr. Suresh agreed that this was a major issue, that 2008 was a tipping point, and that was why NSF had protected staff levels during flat and declining budgets. Dr Suresh lauded the PD WG and highlighted certain recommendations – too many mandated meetings, too many meetings that are not mandated, and too many unfunded mandates. Dr. Suresh called on the MPS AC to work with the community to reduce proposal pressure by reducing multiple submissions.
- Dr. Marrett told the MPS AC that they were expecting to receive advice from the AC and not expecting to just answer questions. She understood why the MPS AC needs to ask them questions to do its work but hoped for a better future balance between asking questions and giving advice.
- The MPS AC thanked Drs. Marrett and Suresh for their time and OD thanked the MPS AC for its service.

Tom Peterson: Overview of ENG directorate

- Tom (ENG AD) described the areas where MPS and ENG collaborate:
 1. Nano efforts, starting with the early solicitations and now through core programs and co-funding.
 2. Energy-related research, through SEP and core programs and co-funding.
 3. Materials Genome Initiative, through OSTP with DOE, NIST, NSF, and DOD; at NSF this manifests as Designing Materials to Revolutionize and Engineer our Future (DMREF). This past year, it was DMR and CMMI/CBET; 22 awards were made, half DMR and half ENG. This coming year, it will be DMR, DMS and CHE in MPS, CMMI/CBET/ECCS in ENG and CISE.
 4. Sustainability in Chemistry, Engineering and Materials (SUSCHEM), started as CBET and CHE, now includes CMMI, DMR and EAR in GEO.
 5. Memo of Understanding with EPA – ENG and CHE, will result in substantial multiyear investments.
 6. Optics and Photonics – to be discussed tomorrow, Charles Ying in DMR and Larry Goldberg in ENG are co-leads, could be part of Advanced Manufacturing.
 7. Advanced Manufacturing – summer 2011 there was an Advanced Manufacturing Partnership (AMP) report, led by Andrew Leveris, Susan Hopfield. The report went to PCAST. Partnership of ENG and DMR key.
 8. Additive manufacturing – an award was made as a pilot; next award could be in optics and photonics.
 9. iCorps – small amount of money plus curriculum for innovation for projects that may have commercial benefit. MPS has been a good player – 15 awards. ENG has had 85 awards.
 10. Big data – CDS&E has MPS, ENG and OCI under CIF21. BIGDATA proposals came in that are across MPS and ENG.

11. BioMaPSE – life/physical sciences and engineering, core programs and co-funding.

- Tom said it is important to have broad thinking and collaborative leaders of the divisions and directorates; he stressed it is the people who make the connections work. ENG has relied heavily on their AC for science input and industry outreach. The challenge is to balance unrestricted IIA programs and targeted programs.

Odds and Ends

- Celeste suggests that the AC may send comments to the NSF Office of Legislative and Public Affairs (OLPA) on the impacts of the NSF travel restrictions – AC, panels, program officer travel to meetings and other outreach.
- Mark requested suggestions for making the AC meeting better.
- Some discussion of merit review. Barbara Finlayson-Pitts warned that if NSF starts to triage proposals, the community needs to be informed well ahead of time; community input is needed. Hank Warchall, who was on the Merit Review Working Group, responded that there will be no “one size fits all” pilot. Celeste Rohlfing mentioned that BIO is using pre-proposals.

Fred Roberts: Report on the September meeting of the Advisory Committee for Environmental Research and Education (AC-ERE) (Slides posted)

- Report included an overview of the SEES program and activities, with very comprehensive slides.
- There was a question about climate change and the public and the group agreed this is an important topic.

The meeting adjourned at 5:20 PM, and reconvened at 10:30 AM on November 9.

Ian Robertson: Response to Materials 2022 Report (Slides posted)

- Dr. Robertson presented the report background and recommendations, as well as the DMR response (see slides).
- Dr. Crabtree, a member of the Materials 2022 Subcommittee, added some remarks on behalf of the Subcommittee.
- Additional comments and questions were brought forward by members of the MPSAC. These were primarily related to the Materials Discovery and Innovation Network. Items discussed included the following:
 - Merit-reviewed means of gaining access to the instruments
 - User support, professional staff, and expertise; long-term staff funding
 - Remote access
 - Distribution of capabilities among nodes
 - Linkage of grant proposals to allocation of instrument access time
 - Relation to MRSECs

Eugenia Paulus: Report from Committee on Equal Opportunity in Science and Engineering (Summary posted)

- Mark Suskin presented material from the June 19-20 2012 CEOSE meeting on behalf of Dr. Paulus, who was unable to attend the MPS AC. The notes from the CEOSE meeting, incorporated here by reference, were read by Mark.
- Statistics regarding underrepresented minorities indicated no recent improvement.
- A Career-Life Balance symposium was postponed by weather. Funding for future CEOSE symposia may be difficult.
- MPS AC members and NSF staff had an extended discussion, parts of which are captured here:
 - Lack of progress in earned degrees and hiring of women and underrepresented groups in STEM fields is disappointing.
 - Is there a potential for improvement through the NSF Expeditions in Education program?
 - Improvements can be realistically expected only on a long time scale.
 - Should the NSF bring in outside consultants on advertising of STEM careers to women and underrepresented groups?
 - The primary issue for women is life-work balance.
 - The primary issue for minorities is lack of advertising STEM careers to early age groups.
 - There are effective spokespeople for STEM careers, e.g., astrophysicist Neil deGrasse Tyson, but more minority role models are needed in other fields.
 - Lynette Madsen (DMR) noted that four years ago, ideas were assembled but have not been implemented.
 - Celeste Rohlving pointed out that Expeditions in Education emphasizes scalability of the proposed activities.
 - Differences in educational success between STEM disciplines are noted in NSF NCSES reports.
 - Claudia Rankins (OAD) indicated that for success, need whole-institution buy-in, e.g., Michigan State University program in physics for black female students.
 - "Best practices" should be on a web site.
 - Need incentive for institution-wide change.
 - Where is the drop-out level? K-8? 9-12?
 - Morris Aizenman suggested that Expeditions in Education should provide an opportunity to address how to involve community colleges (2- and 4-year colleges).
 - Lynette Madsen pointed out that DMR has a web site on diversity.
 - Argonne National Laboratory and DoE Basic Energy Sciences have interest in diversity.
 - Should some activity occur at the level of the OSTP?
 - A National Academies study (with "crossroads" in the title) was released relatively recently with several recommendations.
 - The effort needs a champion.
 - There has been a more recent workshop held on Women of Color by the National Academies.
 - Example of success and institutional commitment:

- Vanderbilt University astronomy program.
- Tufts University, where Arts and Humanities majors are going into Engineering.

Larry Goldberg and Charles Ying (DMR): Optics and Photonics Working Group

(Slides posted)

- MPS support of work in optics and photonics has a long history, including support of work that led to Nobel Prizes. Recent interest in targeted support is predicated on reports from the National Academy of Sciences:
 - 1998: "Harnessing Light: Optical Science and Engineering for the 21st Century"
 - 2012: "Optics and Photonics: Essential Technologies for Our Nation"
- There will be a presentation on the latter report at the NSF on November 29 at 11 AM (room 110). The report contains a number of recommendations for funding agencies, including:
 - Development of mechanisms for seamless integration of photonics and electronics.
 - Development of technologies for capacity increases in optical networks.
 - Development of efficient, economical LEDs for general purpose lighting.
 - Generating light beams with prearranged photonic structure.
 - The report also calls for a National Photonics Initiative.
- The Optics and Photonics Working Group comprises representatives from all 5 MPS Divisions and two ENG Divisions. The group was recently charged with developing a roadmap for a possible FY 2015 initiative. The group has met only a few times to date.
- MPS AC members found the idea promising and pointed out that if the report's recommendations are followed, a national effort should ensue.
- Possible access to DoD technology not yet available in the civil sector was discussed.
- Celeste Rohlifing indicated that conversations with other federal agencies have begun.

➤ **Wrap-Up Discussion**

- The MPS AC is dissatisfied with the logistics involved in providing reference and background material for this meeting. Are e-mail servers bouncing messages from MPS with large-size attachments? SharePoint is not considered preferable to a password-protected web site.
- Celeste Rohlifing pointed out three items for follow-up:
 - Community concerns about travel cost reduction mandates
 - Community issues and expectations in connection with pilot activities for novel proposal processing mechanisms
 - Need for a CEOSE representative in future meetings
- The MPS AC commented on the virtual meeting format. Experiences were generally favorable, although it was noted that the format cannot be considered as effective as an in-person meeting. MPS AC members requested that an annual face-to-face meeting be held.

The meeting adjourned at 12:30 PM.

APPENDIX I ATTENDEES

MPSAC Members Present at NSF

James Berger, Duke University
Paul Butler, Carnegie Institution of Washington

MPSAC Members Present via WebEx

Daniela Bortoletto, Purdue University
Emery Brown, Massachusetts Institute of Technology
Emily Carter, Princeton University
Eric Cornell, JILA and the University of Colorado
George Crabtree, Argonne National Laboratory
Bruce Elmegreen, IBM
Barbara J. Finlayson-Pitts, University of California, Irvine
Irene Fonseca, Carnegie Mellon University
Juan Meza, Lawrence Berkeley National Laboratory
Elsa Reichmanis, Georgia Institute of Technology

MPSAC Members Absent

Juan de Pablo, University of Wisconsin-Madison
Francis DiSalvo, Jr., Cornell University
Naomi Halas, Rice University
Elizabeth Lada, University of Florida
Dennis L. Matthews, University of California, Davis
Michael Norman, University of California, San Diego
Eugenia Paulus, North Hennepin Community College
Esther Takeuchi, SUNY, Buffalo
Geoffrey West, Santa Fe Institute

MPS Staff

Jean Cottam Allen, PHY
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Dana Lehr, AST
Lynette Madsen, DMR
Sastry Pantula, DMS
Matt Platz, CHE
Claudia Rankins, OAD
Tom Rieker, DMR
Ian Robertson, DMR

Celeste Rohlfig, OAD
Paul G. Spyropoulos, OAD
Mark Suskin, OAD
James Ulvestead, AST
Henry Warchall, DMS
Francis Wodarczyk, CHE

Visitors

Morris Aizenman
Beth Blue, NSF/BFA
Mark Coles, NSF/LFO
F. Fleming Crim, University of Wisconsin – Madison
Sean Liu, NSF/BIO
Jose Munoz NSF OD/CTO
James Murray, University of Southern California
Bettina Schuffert, DFG
Phil Schwartz, NSF/LFO
Naomi Webber, Lewis Burke

February 1, 2013

Dr. Fleming Crimm, Assistant Director
Directorate for Mathematical and Physical Sciences
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Fleming:

I have reviewed the final version of the minutes of the Directorate for Mathematical and Physical Sciences Advisory Committee meeting that was held November 8-9, 2012 (attached), and am pleased to certify the accuracy of these minutes.

Sincerely,

Jim Berger
Chair, Mathematical and Physical Sciences Advisory Committee