JPBM Spring meeting

4/29/2013

Attendees:

Irene Fonseca (chair), David Levermore, Jim Crowley; Don McClure, David Vogan, Carla Savage; Ron Wasserstein, Steve Pierson, Marie Davidian; Michael Pearson, Bob Devaney, Barbara Faires , Joel Haack;

Guests: Michael Ledford, Harry Mayfield, David Bressoud, Sam Rankin, Linda Braddy

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Minutes of the fall Meeting were approved.

Washington Update.

Sam Rankin began with a discussion of recent issues coming out of the House Science Committee. He gave an update on the America Competes Act. He discussed the letter from Rep. Lamar Smith to NSF Acting Director Cora Marrett in which Smith asked to see referee reports for five grants in Social, Economic, and Behavioral Sciences Division. Sam reported that the "Gathering Storm principles" (Norm Augustine, Craig Barrett, and others) are putting together a response to this. "This is a bad precedent which we should not let happen without speaking up," said Rankin. In addition, Rep. Smith has introduced draft legislation that would require the NSF Director to affirm that each award "is groundbreaking and answers questions or solves problems that are of utmost importance to society at large." Michael Ledford pointed out that this legislation is being written by the political operatives at the top. There has been a notable response from the community and the mark-up is being delayed due to resistance. But Ledford said that a rational explanantion is not what is needed: "You can't reason your way out of this one; it is political."

Michael Ledford followed. While the 2013 budget has been resolved, it is unclear what will happen with sequester in 2014 and beyond. Every agency is handling sequester differently. Agencies have held back in the first half of the year; but the money will have to be spent in the second half of the year. On the whole, Congress is trying to do the right thing for research. Budgets are in the black. Research has been protected compared to other areas of the budget. Broad themes and initiatives have been driving the budget train. Clean energy, cybersecurity, advanced manufacturing/materials genome Big Data, and STEM Education are among these. "Arguing how we connect to these affects our bottom line," according to Ledford. Big Data has four agencies involved (NIH is now on board). NIST is becoming an extramural partner. 2013 is the year of graduate education; the Administration is looking at how to restructure it. It is likely that Congress won't give the Administration the STEM consolidation as proposed. He noted that the Administration is now looking at how to restructure graduate education (IGERT is one example of this).

There followed a brief discussion on the letter by Rep. Lamar Smith. Rankin stated that we should become part of a larger group to respond together. It was noted that the actions by Smith and others were motivated by a desire to eliminate social science research at NSF. Haack said that not every society

member feels we should be supporting social science research and therefore urged caution in our response.

Hank Warchall, NSF/DMS.

The FY13 money has still not been allocated down to the division level at NSF. The DMS budget experienced slight declines over the three years ending in FY2012. MPS did not fare well in the FY12 budget; Engineering and CISE did. OSTP and OMB have been asking for programs related to national priorities that deliver on a relatively short time-scale. Chemistry and Materials Science did well within MPS; DMS funding has been flat, while Physics and Astronomy declined. Division funding depended on how well the division played within the national priorities and initiatives. Median award size in DMS is $80,000; this compares to other divisions in MPS which have median award sizes closer to $120,000. NSF is still working under a CR at 80% of FY2012 money. FY2015 initiatives are being planned right now.

Three budgets are being worked on at any given time. Priorities come from OSTP and OMB. Divisions propose to Director in response to these and their own priorities. Within MPS, they reduced the MPS budget by 6% [in 2014] for every division, and then built back up based on participation in initiatives. DMS played a role in cyberinfrastructure (which includes Big Data) and CDS&E; it also participating in BioMaps and Secure and Trustworthy Cyberspace. DMS is also increasing its investment in Career awards. DMS has kept the base budget unchanged since 2010, although the purchasing power has gone down. The division can influence the process through budget-driving initiatives.

The community can also play a role -- by suggesting new areas. The NSF Director ultimately chooses what goes forward; the proposed initiatives are more likely to be successful if they match the Administration priorities.

DMS has been engaged in planning budget-driving initiatives. DMS consolidates programs (where proposal pressure is small). Warchall gave examples.

DMS views its role as supporting Discovery, Connections, and Community. 75% of grants are in single investigator/small group awards (mostly in the disciplinary programs). Institutes make up 13% of the budget. Workforce programs account for about 10%.

Workforce goals: to increase the number of individuals who pursue careers in the mathematical sciences or in other NSF-supported disciplines.

Graduate research fellowships. Our community is not doing well at submitting proposals to this program; since allocations are based on proposal pressure, this means that we are not getting our share of funds. Graduate research fellowships are somewhat protected from funding cuts because the graduate fellowship program is viewed as a valuable on the Hill.

The Future. RTG and RPG have been around for several years. They were formed around the VIGRE concept. DMS thinks it is time to rethink this. There is a workforce workshop to discuss the needs for future workforce training. What kinds of things would be most useful for the community? DMS is

interested in educational program that involve research activities; this is what separates DMS programs from those in EHR.

How can the community help? Develop budget-driving ideas. Help with leadership development. We have trouble finding people for top administrative positions (like DMS division director or institute directors).

What can the community do? Hank noted that CISE created the CCC, which provides a voice for the computing community. They feed budget-driving initiatives and help create leadership. The math sci community needs to engage forcefully to have an impact.

REU leadership initiative. A group of people who are now running REUs are discussing things like best practices, and they can provide advice to others who want to REUs. Vogan asked about transition of people from REUs to graduate fellowship programs. He asked whether anyone has studied that. Hank said that DMS has not done a longitudinal study.

StatsNSF

Fonseca summarized what this committee is about. Sastry had proposed a change in the DMS name. That did not happen, but MPS AD Ed Seidel created a committee to look at broader issues related to statistics at NSF. Fred Roberts and Ian Johnstone were appointed to co-chair the committee.

The working groups are still getting their material together. They will look at whether structural changes are needed at NSF. By May 3, the working groups will have some recommendations and conclusions to discuss and will have a report for the next MPSAC.

Davidian reported that the ASA solicited feedback from their membership and proposed a Chief Statistical Scientist for NSF. The rationale was to make science at NSF better. In 2011 *Science* devoted an entire issue to data science, and the word "statistics" appeared only twice. Alan Leshner, Executive Director of the AAAS, responded to an ASA letter by saying that most scientists think of statistics as a "bag of tools." Davidian visited Fleming Crim, AD for MPS, who began by talking about actuarial science as if it were part of statistics. The point is that statistical sciences are not well understood even within science. There is a need to integrate the statistical sciences into research within the NSF-supported disciplines. This is *not* about funding. It's about making science better.

Fonseca said that she discussed this issue with several statisticians. The NIH has a new associate director for data science. She said she could see such a position at NSF. Could this person be chief data scientist (say, a mathematician or computer scientist, as well as a statistician)?

Pierson said that StatsNSF was set up because of the problems that Seidel foresaw but also because of opportunities in big data. Data science includes statistics, data mining, machine learning, applied mathematics and related areas.

Levermore noted that computer science has been effective in data science because of the language they use. We need to craft our message so that we convey our messages in a positive and effective way.

Lee Zia on behalf of Susan Singer (**NSF/DUE).**

The Administration has committed to creating 1 million additional STEM graduates over the next ten years as well as increasing STEM teachers. DUE is committed to a healthy STEM enterprise and a diverse and competent STEM workforce. Mathematical sciences is a critical part of this because the other disciplines rely on mathematics and statistics.

The President's Budget is a policy document. It has a stated goal to increase STEM teachers. There is a comprehensive reorganization of STEM investments across the government in the budget. Undergraduate education, graduate fellowships are part of this reorganization that involves NSF.

Improving teaching and learning through evidence-based reforms. There are three pillars: learning environments; broadening participation in STEM; and the STEM professional workforce. NSF has an intentional goal to inject R&D into the STEM education cycle. This touches on the evidence-based reform -- ideas need to be tested.

Levermore asked about the metrics and how they are chosen. Zia noted a report on *Evidence-based Research*. This was an NRC effort.

Vogan asked what "evidence-based research" means. Zia responded. Chemistry had a program in peer-involved learning. The idea is to engage students more in their learning. There is pretty compelling evidence that it works. The use of concept tests -- physics' *force concept inventory* is another example (Eric Mazur, Harvard).

Zia described a new program – EHR Core Research ($25 million in FY2014).

Learning and Learning Environments – this is part of the reorganization of STEM education. This is a place where the Math Sci community has tremendous opportunities.

STEM-C Partnerships for the 21st Century (an EHR-CISE collaboration). Data sciences is a big piece of this and should be another opportunity for parts of the mathematical sciences community.

The TUES program (Transforming Undergraduate Education in Science, Technology, Engineering, and Mathematics) is based on proposal pressure. Engineering does the most. The mathematical sciences are underrepresented. Zia expressed concern that there is a perception that unfairly blames mathematics for the problems in education. This is something we need to address.

Working group up on PCAST presentation (David Bressoud).

We were unable to get the May presentation date. PCAST member Jim Gates is working on getting us a slot at the July PCAST meeting. Sallie Keller's memos, which she forwarded for our use, added a great deal of information which was apparently not incorporated in the original report.

The Discipline-Based Education report makes no mention of what is happening in the mathematical sciences. There is a sense that the sciences and mathematics are separate. Perhaps we should build on

the Math Sciences 2025 report and show that mathematics is part of the sciences and not just a service organization for the sciences.

The other thing that came out PCAST and DBER (Discipline-Based Education Research; see National Academy Press) is evidence-based focus. There is a lot of evidence that is coming out of the mathematical sciences, and studies on inquiry-based learning. The Calculus Concept Inventory (Jerry Epstein) is a good way of measuring whether students are getting the concepts we are teaching. MAA also has the Calculus Concept Readiness Project.

McClure noted that it's hard to find information in the published literature on the Calculus Concept Inventory. These aren't publicized well enough.

Calculus for bioscience majors. Student going into the biological sciences make up the largest component of students studying calculus in the fall. About 42% of women taking calculus are headed to the biological sciences. Calculus wasn't designed for the biological sciences.

Research in Undergraduate Mathematics Education (RUME). It's important to talk about this in the PCAST discussion as well. MAA is creating a journal in this area. PCAST and DBER seem unaware of what is happening here.

Levermore noted the E.O. Wilson piece that appeared in the Wall Street Journal (essay, April 5, 2013). When you read the PCAST report, the fact that many of requirements are set by the disciplines (and not us) is not mentioned. They require us to set the bar high and filter out students. That did not come across in the PCAST report.

The curriculum foundations workshops are not very well known. The 2004 curriculum guide was based on a series of workshops with various disciplines to talk about what they needed from mathematics education. These showed how the mathematical sciences are involved in trying to meet the needs of other disciplines.

PCAST and DBER are pushing for large-scale change. It's not sufficient to do a small-scale project and hope that it catches on. We have a number of things we can discuss.

This is a quick overview of the ideas that we could include.

McClure suggested that we should broaden the view of what we are talking about. The CBMS 2010 survey was recently completed. The data on 2-year colleges shows the depth of the problem. Two-year colleges represent 42% of the total undergraduate enrollment. This is a rapidly growing population. Most of the enrollment is in pre-college education – well over half the enrollments are in pre-college math. This population is very different from the population in college. We need to make PCAST aware of this. Readiness and preparedness is a big part of the problem.

Vogan also had a question about we want to do in the presentation. PCAST only cares about science policy for the federal government. They might care about readiness. But it's not clear that the things that Bressoud mentioned matters to them.

Levermore said that the PCAST feels that we (the math sci community) are teaching the same way we did 200 years ago. He mentioned a conversation with Brit Kerwin in which it was reported that biologists and computer scientists expect more discrete math in the college sequence. One could argue it should be more probability or statistics. We should be more touch with programs that address curriculum reform.

Vogan suggested that perhaps the presentation should not be entirely about education. Levermore offered that should use the Math 2025 glossy to show how mathematics connects with problems of national interest. Levermore stated that there appears to a diminished role for math in the PCAST vision of the future -- this is what we need to address.

Drawing on Math Sci 2025 examples, Vogan noted that Google and the human genome project were done by people who understood mathematics as a living discipline.

McClure noted that not everything is in decline -- there has been a 45% increase in people enrolled in higher mathematics.

Math 2025 Reactions and Future. (Levermore)

Levermore described how the committee that wrote the Math Sciences 2025 report was assembled; the goal was to use a high-level person from outside the community to chair it. The committee included a Vice Chair of the Fed, members from computer science, and other non-mathematicians in order to give a wide perspective to the study and credibility to the report.

The glossy has been well received by those on the Hill who have read it. The glossy was also presented at the Carnegie meeting; the Carnegie Foundation will buy 20,000 copies. NAP (National Academies Press) keeps score of downloads; 3 of the top ten were math reports. The glossy Math Sciences 2025 was one of them.

Fonseca noted that Sastry insists that math sciences chairs are unaware of the report.

Levermore proposed that we should be able to use these reports. What should we do with this report?

Rankin felt that the report (even the smaller glossy report) is too big for staffers; they won't read it.

The Carnegie Foundation is holding a meeting with Phil Griffiths, Mark Green, Uri Treisman (among others). This is part of a discussion of this report by our community. They have also requested 20,000 copies of the report. Carnegie has not discussed yet what they will do with their 20,000 copies.

Vogan noted that we need talk about what we do. While the items in the glossy report are aimed outside, they also give our communities ideas that can be used for outreach.

Levermore stated that we need to educate our own community about we do. This report (the glossy) is an easy read. Undergraduates can appreciate it.

Savage said that it was nice to hear a presentation at the Joint Math Meeting on the 2025 report. Perhaps short presentations posted on a web page on the report would help.

Levermore suggested sending a letter from all four societies to department chairs with a few copies of the report. Can we do this? Invite linkages and downloads from NAP.

ACTION ITEM: Draft a letter to circulate among the group. Propose to Carnegie to give us copies.

Workforce Project (Michael Pearson)

Following recent CBMS meeting, and following the PCAST phone call, CBMS dropped the idea of doing an undergraduate study. The MAA wanted to take a leadership role. CBMS has no independent plans for such a forum. There was some sentiment on the PCAST teleconference to talk about this idea to see if we (the JPBM societies) should do something in this area.

McClure said that MAA had put together a good planning group and favored seeing the CBMS accept the original plan.

Fonseca asked about how this forum related to INGenIoUS.

Pearson noted that the PCAST presentation is another thing that has come up since then., and that has been a priority.

McClure gave a bit of context. The CBMS has been talking about common core standards for several years and was seeking new topics. The first two years of college mathematics was suggested. This led to the idea of a forum.

Levermore wondered about the impact of a small group of societies doing a forum. Forums at AAAS meeting often lack representatives from our community. If we really want to have impact, then the AAAS national meeting is where we should be present. Bressoud is the incoming chair of Section A of AAAS.

As the structure of the PCAST presentation evolves, we should draft a message that we can use for other groups.

Ingenious. Investing in the Next Generation through Innovative and Outstanding Strategies. (Fonseca)

This project started at DMS, leading to a workshop that will take place at ASA HQ in July. Paul Zorn will be the director for the workshop. The first online panel discussion takes place on Wednesday. Six different areas will be covered. A report will be submitted to NSF at the end. There is only space for fifty people at the workshop.

We need to encourage involvement. 200 people have signed up thus far.

Coordinating CNSF exhibits.

The suggestion was made to circulate suggestions among JPBM members. Having students there is helpful (graduate or undergraduate).

Warchall suggested that have people serve as greeters for the staff. The young staffers could benefit from someone greeting them and explaining to them what the exhibit is about.

Report from the Societies.

AMS. McClure talked about Open Access. The agencies are developing their plans for open access for funded research projects. Central repository or distributed model?

Various groups are making presentations to the interagency working group. They are taking information now.

The AMS Council has endorsed the AMS launching two open access journals. These will be companion journals of existing AMS journals (Proceedings and Transactions of the AMS). The fee will probably be a $1,500 charge for authors, with a big discount initially.

ASA. Pierson talked about joint MAA-ASA resolution on the teaching of statistics which stated that teachers must have a deep knowledge of statistics. Wasserstein presented a bit on the International Year of Statistics. Organizations world-wide have been invited to participate. They come from 122 countries around the world. The project got support from the UN. Goals include increasing public awareness and promoting research. Future of Statistical Sciences will meet in London in the fall; this is a major workshop to talk about the current and future state of the discipline. Web page: statistics2013.org

MAA. Pearson noted that 2013 is also the year of Math of Planet Earth and the MAM theme focused on sustainability. The MAA has had Carriage House lectures on this theme. The audio synched with slides will be put on the web. MAA sponsored a team in the Romanian masters in math and the girls Olympiad, and the teams placed first in both of these.

SIAM. Crowley also talked about open access options and efforts to rewrite copyright agreements to spell out author rights. Also covered was the attempt to reduce review times. Fonseca mentioned the growth of student chapters and the expository writing award. Fonseca also talked about plans for ICIAM 2015 in Beijing.

Business Meeting.

Math Awareness Month.

2012. The JPBM discussed the issue with Travelers' Insurance. Wasserstein reported that if we change the color (but not to green) on the umbrella Travelers' will be happy with us.

MAM 2013 is on the theme of Mathematics of Sustainability. There was a problem here too with one of the images. The AMS got permission to use all the images in the poster. However, the rights for the agricultural picture did not include the rights to posting on the web (this would cost an additional $500 per month it is posted). A replacement image will appear.

Mathematics of Sustainability. Twenty-one essays were produced and are on the web. McClure asked about impact. What effect does MAM have? We know partners (college and university departments) use this. Google analytics should say what was visited.

The 2014 MAM project is led by the MAA. The MAA presented a set of possible titles. Each used the fact that 2014 is the centennial of Martin Gardner. Paul Zorn and Colm Macahy have worked on this. Mathematics, Magic and Mystery received good support from those present. Some also liked Puzzles and Creativity in Mathematics. Mathematics, Magic and Mystery was preferred. Additional names to serve on the committee were suggested, including: John Conway, Persi Diaconis, Peter Winkler, and Richard Guy.

MAM 2015. Topics were suggested by JPBM members. These included Math and movies; math and crime; and math and the brain. Levermore noted that quantification of forensics had high hits on the BMSA site. Given the Administration priority in research in brain mapping, Crowley suggested a topoic related to mathematics and cognitive science.

JPBM Communication Awards.

David Levermore will chair the committee. Carla Savage will represent the AMS. Last year there was no luncheon; we can do the same this year.