



**Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting  
November 3-4, 2021 (all times EDT)  
National Science Foundation  
Virtual Meeting**

**Summary Minutes**

**Wednesday, November 3, 2021**

**Advisory Committee Members in Attendance (All Virtual):**

Dr. David Awschalom	Dr. Cornelia Lang
Dr. Anna Balazs	Dr. Herbert Levine
Dr. Susanne Brenner	Dr. Jennifer Lewis
Dr. Tabbetha Dobbins	Dr. Andrew Millis
Dr. Miguel Garcia-Garibay	Dr. Jill Pipher
Dr. Lynne Hillenbrand	Dr. Edward Thomas
Dr. Catherine Hunt	Dr. William Tolman
Dr. Daniel Jaffe	Dr. Rodolfo Torres
Dr. Robert Kirshner	

**Call to order and official opening of meeting, FACA Briefing** – Catherine “Katie” Hunt, MPS AC Chair, Sean L. Jones, Assistant Director, MPS; Michelle Bushey, Staff Associate, MPS

Immediately prior to the meeting being called to order, Michelle Bushey briefed the AC members on policies of the Federal Advisory Committee Act regarding conflicts of interest and reminded them that the meeting was open to the public and occurring under the guidelines of FACA.

The meeting was opened at 11:30 am by MPS AC Chair Katie Hunt, who introduced the new members of the MPS AC. The minutes from the July 2021 meeting of the MPS AC were approved unanimously without amendment.

**Update: MPS** – Sean L. Jones, Assistant Director, MPS

Sean L. Jones, Assistant Director for Mathematical and Physical Sciences, provided an update on the state of the MPS directorate. Sean Jones covered the following topics in his remarks.

- A welcome to Cornelia Lang as the new AC Vice Chair, and a welcome back to AC member Daniel Jaffe.
- An announcement of new members of the MPS Senior Staff as well as upcoming departures.
- A review of MPS by the numbers of people supported, proposals, awards, and dollars.
- Updates on facilities construction and operations.
- Notable awards in Quantum Information Science.
- The NSF response to the COVID pandemic.
- Update on FY 21 MPS investments in LEAPS and Ascend.
- An overview of NSF and MPS priorities for FY 22.



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**Science Highlight: Windows on the Universe** –Jean Cottam Allen, PHY DDD, and Jim Neff, AST DDD

Jim Neff and Jean Cottam discussed some of the recent scientific highlights from the Windows of the Universe (WoU) program, which focuses on multi-messenger astrophysics.

- LIGO/Virgo/KAGRA reported the first confirmed detection of mergers between black holes and neutron stars.
- Researchers at the Physics Frontiers Center NANOGrav observed the first evidence of gravitational wave signals from supermassive black holes.
- Scientists at the IceCube Neutrino Observatory observed a high-energy antineutrino at the Glashow resonance, one of the highest energy particles observed.
- Major new or upgraded observatories coming online at the Vera C. Rubin Observatory, Advanced LIGO Plus (A+) and the IceCube Phase-1 Upgrade.

**Joint MPS and BIO AC Meeting**

The joint session between the MPS and BIO advisory committees was recorded and the video is available at <https://www.youtube.com/watch?v=t8AS3lCGZjU>.

MPS Assistant Director Sean Jones and BIO Assistant Director Joanne Tournow opened the joint session and provided welcoming remarks.

MPS AC Chair Katie Hunt introduced the principals of the discussion and described the goals of session. She noted that the overarching goal is to further collaborations between the BIO and MPS communities on biotechnology.

Ka Yee Lee, Professor of Chemistry at the University of Chicago and a member of the MPS AC Subcommittee on MPS and the Living World, provided an overview of the subcommittee's report. The presentation included the following topics.

- The subcommittee charge and organization
- Workshop on June 29-30, 2021
- Key observations and findings
- Recommendations

Following the presentation, David Berkowitz (DD for CHE) and Thera Good (DD for the Division of Molecular & Cellular Biosciences) moderated a discussion between the members of the two advisory committees.



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**Discussion with the MPS AC: Technology, Innovation, and Partnerships (TIP).**

MPS AC Chair Katie Hunt opened the session with a reminder about the TIP presentation at the July 2021 MPS AC meeting. She noted that there was not time at the July meeting to gather feedback on the presentation or have a question and answer session. Today's discussion is about how MPS and TIP might partner to "fast forward our shared mission".

Katie introduced Graciela L. Nacho, Senior Advisor in the Office of the Director, and asked her to start the discussion. Nacho explained her experience working at NSF and her ongoing work with Erwin Gianchandani, Senior Advisor in the Office of the Director, to prepare for the potential launch of the TIP Directorate.

During the ensuing discussion with the MPS AC members, the topics raised included the following:

- Intellectual property concerns
- Workforce development
- The geography of innovation and its connections to diversity, equity, and inclusion
- Partnerships with other agencies
- The potential role for the TIP directorate to work on the K-12 level and addressing the 'pipeline.'

**MPSAC Facilities Subcommittee Report Out—Jill Pipher & Roger Falcone, co-chairs**

The MPSAC subcommittee on MPS Facilities and Major Research Infrastructure shared a draft of their first interim report. The subcommittee was asked to articulate the importance of major and mid-scale facilities, and to provide advice on how to make the case for these next-generation investments.

The subcommittee discussed the MPS large facilities and looked at examples to illustrate impact. They identified identified seven major topics of interest for future deliberations, including increasing costs, lifecycle stewardship, criteria, balance of investments, partnerships, broader impacts, and other topics.

The subcommittee also reiterated five key ideas: (1) access (broadening participation), (2) training/education of students by expert staff and users, (3) benchmarking globally, both before and during investment, (4) understanding full costs, (5) uniqueness of MPS facilities, as illustrated by LIGO.

The subcommittee then engaged in a question and answer session with the MPS AC. The topics discussed included the following.



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- The role of international partnerships and competitiveness.
- The importance of cradle-to-grave stewardship.
- The unique role of facilities in the workforce development ecosystem.
- The role of philanthropic partnerships.
- Connections to the new TIP Directorate.

**MPSAC Facilities Subcommittee New Charge**— Robert “Chris” Smith, Senior Facilities Advisor, MPS/OAD

Chris Smith, the Senior Advisor for Facilities in MPS, opened with a recap of the key issues for research infrastructure, a review of the five-year charge for the subcommittee, and the instructions for the first interim report. He noted the following:

- Research infrastructure investments are strategic, large, long-term, cross-cutting, and multi-scale.
- We do not have the luxury of a “one-at-a-time” approach for major facilities; we are looking at several competing demands.
- The subcommittee is charged to look at long-term, large-scale strategic issues involved in MPS investments in Major Research Infrastructure. Recommendations and evaluations are needed for specific large facilities projects that take into account a broad range of strategic issues.

Chris Smith then outlined the charge for the second report of the subcommittee. The focus will be the criteria for supporting new facilities projects that are responsive to the current and future needs of the MPS communities.

**Preparation for Meeting with NSF Director and Chief Operating Officer**

MPS AC Chair Katie Hunt led the discussion with the MPS AC members. Topics discussed included:

- A brief recap of the day’s activities, and a prioritization of topics for discussion with the Director and COO.
- There was broad agreement that the Joint Session with the BIO AC was a success.
- The group decided that the current and future work of the Facilities Subcommittee should be a priority for discussion with the NSF Director.

**Closing remarks and adjorning for the day**

At 4:45 pm MPS AC Chair Katie Hunt thanked the AC members and NSF for a wonderful first day and adjorned for the day.



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**Thursday, November 4, 2021**

**Advisory Committee Members in Attendance (All Virtual):**

Dr. David Awschalom	Dr. Cornelia Lang
Dr. Anna Balazs	Dr. Herbert Levine
Dr. Susanne Brenner	Dr. Jennifer Lewis
Dr. Tabbetha Dobbins	Dr. Andrew Millis
Dr. Miguel Garcia-Garibay	Dr. Jill Pipher
Dr. Lynne Hillenbrand	Dr. Edward Thomas
Dr. Catherine Hunt	Dr. William Tolman
Dr. Daniel Jaffe	Dr. Rodolfo Torres
Dr. Robert Kirshner	

**Call to Order, FACA Briefing, and Official Opening of the Second Day**

The meeting was opened at 11:40 am by Catherine Hunt and gave an overview of the Second Day's agenda.

**Reflections on Canvassing Working Group**—William “Bill” Tolman, MPS AC Member, Washington University in St. Louis, Ed Thomas, Jr., Auburn University

Bill Tolman noted that the Canvassing Working Group was a great idea for the community, but that they started too late in the year for the fall submission. He believed that they can start now for the next year's Waterman Award Submission and they can do more. The working group is led by Bill Tolman and consists of Robert Kirshner, Susanne Brenner, Edward “Ed” Thomas, David Awschalom, and Anna Balazs.

**LEAPS and Ascend Panel**—Michelle Bushey, MPS/OAD, Tabbetha Dobbins, Rowan University, Ed Thomas Jr., Auburn University

**MPS LEAPS Awardees 12:00-12:45pm**

MPS Staff Associate Michelle Bushey opened the session. She explained the structure and purpose of the MPS LEAPS program. Three LEAPS awardees made brief presentations.

- **Michelle Gaines** – (Spellman College) Funded by DMR (2137578) “*Surface Morphological Effect on Biomolecular Attachment to Responsive Microgels for Tunable Biomimetic 3D-Cell Culture Scaffolds.*”
- **Lindsey-Kay Lauderdale** (Towson University) Funded by DMS (2136890) “*Applications of Algebraic and Topological Methods in Graph Theory Throughout the Sciences.*”



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- **Joseph Badillo** (Seton Hall University) Funded by CHE (2137600) “*Development of New Photoacid Catalyzed Reactions for Organic Synthesis*”

Following the presentations from the awardees there was a question and answer session with the MPS AC members. The questions included:

- What do you expect to achieve in the next 2 years with the Leap award?
- Are you using the award to get release time?
- Can you each tell a little more about where your students are at now coming through the pandemic and how are they thinking about in their STEM area?
- You are mentors for your students but do you yourselves have mentors?

### **MPS Ascend Fellows 12:45-1:30pm**

MPS Staff Associate Michelle Bushey opened the session. She explained the structure and purpose of the MPS Ascend program. Three of the MPS Ascend Fellows gave brief presentations describing their background and work:

- Jacob Bernal, University of Arizona
- Ranthany A.C. Edwards, Ohio State University
- Fernando Flor, University of Houston

Following the presentations from the Fellows there was a question and answer session with the MPS AC members. The questions include:

- Where do you see your careers path in the next 5-7 years where the fellowship can help you down that path?
- What did you learn about applying for funding from NSF?
- Can you describe your experience as a mentee?

### **CEOSE Outbrief - Alicia Knoedler, OIA/OH**

Alicia Knoedler, the Head of the Office of Integrative Activities, gave a presentation on the work of the Committee on Equal Opportunities in Science and Engineering (CEOSE). The topics covered in the presentation included the following:

- The CEOSE mission
- NSF investment in Broadening Participation
- CEOSE Activities in 2019-2020
- The CEOSE Biennial Report to Congress
- Broadening Participation Exemplars
  - The Computing Alliance of Hispanic-Serving Institutions (CAHSI)
  - The Cultivating Indigenous Research Communities for Leadership in Education and STEM (CIRCLES) Alliance



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- The CULTivating socially Responsible ATmospheric scientists through Education, Leadership, and Action (CURATE) GOLD-EN EAGER project
- Recommendation of the 2019-2020 CEOSE report.

**White Paper Discussion**—Sean L. Jones, MPS AD, Katie Hunt, MPS AC Chair

Sean Jones indicated that he is hoping to gauge ideas from the community in terms of new white papers. He noted the series of white papers developed by the MPS AC about ten years ago, and asked if it would be worth updating them. He described some of the many changes in NSF during the past ten years, including the new TIP Directorate.

MPS AC member Cornelia Lang provided comments on her review of the MPS AC white paper on Broadening Participation. She noted the following:

- The theme of broadening participation continues to be highly relevant.
- Focusing on equity and inclusion is going to be more important than just diversity moving forward.
- The connection between broadening participation and leveraging interdisciplinary work.
- Looking at where projects overlap between other agencies and private agencies is going to be crucial moving forward.

MPS AC member Rodolfo Torres provided comments on his review of the white paper on Clean Energy. He noted the following:

- We now face a greater energy for clean energy, including pressure to meet certain deadlines.
- Policy making around clean energy is another area in need of development.

MPS AC member Anna Balazs reviewed the 2011 MPS/ENG Climate Change White Paper.

**ASTRO2020 Report**—Debra Fischer, AST DD

Astronomy DD Debra Fischer provided remarks on the release of the ASTRO2020 report. She noted the following:

- ASTRO2020 is the 7<sup>th</sup> decadal survey, and it highlights science, people and tools.
- Investment in facilities is critical for astronomy.
- The ambitious scale exceeds the MPS AST budget, meaning cross-foundation support is necessary.
- Private industries are jumping into the game and we are seeing new growth of data science and artificial intelligence.
- Science is not a zero sum game, advances and discoveries in one area always are to the benefit of science as a whole.
- She looks forward to facilitating the recommendations that are possible.



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**Preparation for discussion with NSF Director and COO**

**Meeting with NSF Director and COO**

MPS AC Chair Katie Hunt introduced new AC member, Daniel Jaffe to the NSF Director, COO, and Chief of Staff. AC members emphasized that the Joint Session with the NSF BIO AC was a success and would like to capitalize on this partnership in the future. The members also noted the importance of the first interim report of the MPS AC Facilities Subcommittee, along with the need for the second report. MPS AC members Tabbetha Dobbins and Ed Thomas talked about the success of the MPS LEAPS and Ascend solicitations and the great panels that were held today.

**Closing remarks and adjourn**

At 5:00 pm MPS AC Chair Katie Hunt thanked everyone for joining the MPS AC meeting. She claimed that this was a wonderful AC meeting and hoped everyone will join the next AC meeting in the spring.