



**Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting  
March 29-30, 2022 (all times EDT)  
National Science Foundation  
Virtual Meeting**

**Summary Minutes**

**Tuesday, March 29, 2022**

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

Dr. David Awschalom	Dr. Cornelia Lang
Dr. Susanne Brenner	Dr. Herbert Levine
Dr. Tabbetha Dobbins	Dr. Jennifer Lewis
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 12:00 pm by MPS AC Chair Katie Hunt, who asked for introductions around the room. The minutes from the November 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 description of leadership changes within MPS and NSF since the last meeting.
- The state of FY 22 budget and priorities for the FY 23 budget.
- The official announcement of the new Directorate for Technology, Innovation, and Partnerships (TIP).
- An update on MPS activities to Broaden Participation, including the following funding opportunities: Expand QISE, MPS-Ascend External Mentoring solicitation, PREP: Partnerships for Research and Education in Physics, PREC: Partnerships for Research and Education in Chemistry, PAARE: Partnerships in Astronomy & Astrophysics Research, and the DCL: MPS-High.
- Highlights from the divisions, including the launch of operations at DKIST on February 23<sup>rd</sup>, the inaugural MRSEC Science Slam reaching a record number of participants on an



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NSF webinar, and the joint release of the Molecular Foundations of Biotechnology solicitation in partnership with the BIO, CISE, and ENG Directorates.

**Science Highlight: QSEnSE**—Alexander Cronin, PHY PD, and Deputy Director of National Quantum Coordination Office

Alexander Cronin discussed some of the recent scientific highlights from the Quantum Systems through Entangled Science and Engineering ([QSEnSE](#)) project. The presentation described measurements of gravitational time dilation using highly precise optical lattice atomic clocks.

QSEnSE is one of [three](#) Quantum Leap Challenge Institutes (QLCI) awarded in July 2020. [Two](#) additional awards QLCI awards were made in September 2021, bringing the total number of QLCI awards to five. These awards address the National Quantum Initiative Act.

**MPS and the Living World Subcommittee Report – AC Vote**

Chair: Ka Yee Lee, University of Chicago

AC: Jennifer Lewis, Harvard University, Herbert Levine, Northeastern University, William Tolman, Washington University in St. Louis

NSF: Linda Sapochak, DMR DD and Leighann Martin, OAD

Dr. Lee shared the work of the Living World Subcommittee, and she thanked her colleagues for their time and effort. The subcommittee worked in subgroups to address the following topics.

- Tools
- Emerging Theories,
- Critical Applications/Problems
- Human-Biotechnology Interface.

Each group identified areas within the topic that could benefit from more focused research. Overall, the subcommittee determined that NSF needs to launch more interdisciplinary research and training centers in biotechnology, to foster cross-disciplinary collaborations, as well as training. Training the next generation of biotechnologists is key to promoting a diverse and extensive workforce as well as furthering the field. The AC thanked Dr. Lee for her report out and enthusiastically endorsed the work the subcommittee did. Dr. Hunt called for motion to accept the report, and the report was accepted unanimously.

**MPS Facilities Portfolio Overview and Discussion**

NSF: Chris Smith, OAD, Denise Caldwell, PHY DD, Linda Sapochak, DMR DD, Debra Fischer, AST DD

Dr. Chris Smith began the presentation by highlighting the importance of large facilities to the scientific community and to MPS. He noted their impact, scale, and the reach of the science they enable. He introduced Division Directors for Physics, Dr. Denise Caldwell, Materials Research,



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Dr. Linda Sapochak, and Astronomy, Dr. Debra Fischer, to present their division's large facilities portfolios.

Dr. Caldwell presented an overview of the major PHY facilities including Large Hadron Collider, IceCube, and Laser-Interferometer Gravitational Wave Observatory (LIGO); she said that she would like an AC Subcommittee to look into the future of a next generation LIGO. Dr. Sapochak presented an overview of the National High Magnetic Field Laboratory, highlighting the scientific priorities and the key challenges it has for the future. Dr. Fischer presented an overview of the portfolio of AST including: The National Radio Astronomy Observatory, Arecibo Observatory, Greenbank Observatory, National Solar Observatory (NSO), NSO's Daniel K. Inouye Solar Telescope, NOIRLab, and Vera C. Rubin Observatory. Dr. Fischer highlighted the challenges of finding programmatic balance in budgets for these large facilities and the needs of new facilities. Dr. Smith closed out the presentation by discussing the process of developing and lifecycle of an MREFC and the costs of MREFCs over time. The AC had a lively discussion with the presenters discussing the importance of balancing grants and facilities and listening to the needs of the communities.

**MPS AC Subcommittee on Facilities and Infrastructure—AC Vote**

Co-chairs: Jill Pipher, Brown University and Roger Falcone, University of California-Berkeley  
NSF: Saul Gonzalez and Leighann Martin, OAD

Dr. Jill Pipher presented the findings of the first report of the MPS AC Subcommittee on Facilities and Infrastructure. The subcommittee was charged with developing a first report that articulates the importance of major and mid-scale facilities to NSF's scientific leadership, including the role of MPS, as well as provide advice on how to best "make the case" for the next generation of MPS's Major Facilities related investments. The chairs noted that MPS facilities are critical to securing U.S. leadership in cutting-edge research and instrumentation and are needed to further U.S. global leadership in high-resolution in astronomy, understanding quantum materials, and next generation discoveries. The report notes the need to continue the work of the subcommittee to address the increasing costs of facilities, investing strategically in MPS facilities, defining broader impacts criteria and more. Dr. Pipher and Dr. Falcone expressed their sentiment that NSF is a global competitor in facilities leadership. Dr. Hunt made a motion to accept this report and the report was accepted unanimously.

**MPS AC Subcommittee on Facilities and Infrastructure—Charge 2**

NSF: Chris Smith and Leighann Martin, OAD

Co-chairs: Jill Pipher, Brown University and Roger Falcone, University of California-Berkeley

Dr. Chris Smith introduced the second charge of the AC Subcommittee on Facilities and Infrastructure, which will focus on the framework for prioritization of new Major Facilities projects. The second charge includes multi-level strategic considerations, balancing current investments and future opportunities, and balancing risk and reward. The timeline for this second charge is to establish membership in April or May 2022, receive an interim draft report by October 2022 and a final report on February 2023. The AC discussed the timeline in comparison



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to the pace of science, but this timeline will give the committee time to thoroughly answer the questions and give substantive effort. Dr. Jaffe asked about the timing of the substantive effort. The subcommittee chairs and NSF leadership agreed that the process may be different for different projects and expressed hope that the AC recommendations could influence the shape and process.

### **CEOSE Updates**

MPS AC: Tabbetha Dobbins, Rowan University

Dr. Dobbins provided an overview of the mission of CEOSE as well as an update on recent activities. The theme of the 2021-22 Biennial CEOSE report is “Intersectionality in STEM”. Dr. Dobbins presented highlights from the February 2022 CEOSE meeting and requested feedback on the meeting topics to share later with the committee. The meeting topics:

- Envisioning the Future of EPSCoR
- Vision 2030: Expanding the Geography of Innovation
- NCSES: Women, Minorities, and Persons with Disabilities in Science and Engineering Report

Dr. Dobbins also noted her report to CEOSE from the MPS AC, in which she shared information about the panel presentations from LEAPS and ASCEND awardees at the November MPS AC meeting.

### **Preparation for Meeting with NSF Chief Operating Officer and Chief of Staff**

Dr. Hunt led the AC in developing the following topics to discuss tomorrow with the NSF COO and Chief of Staff.

- Facilities
- Partnerships
- Budget Priorities (Clean Energy, Climate Change, Emerging Technologies, and Broadening Participation)

The AC developed a theme across these topics—integration of these topics across scientific disciplines is key to NSF’s success. The AC will also share with the NSF COO and Chief of Staff that both subcommittee reports were unanimously accepted and will discuss how these reports will be used going forward. The AC will also discuss the future of TIP and the importance of MPS working in partnership with TIP.

### **Closing remarks and adjourning for the day**

At 4:50 pm MPS AC Chair Dr. Hunt thanked the AC members and NSF for their hard work and adjourned for the day.



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Wednesday, March 30, 2022

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

Dr. David Awschalom	Dr. Robert Kirshner
Dr. Anna Balazs	Dr. Cornelia Lang
Dr. Susanne Brenner	Dr. Herbert Levine
Dr. Tabbetha Dobbins	Dr. Jennifer Lewis
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

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

The meeting was opened at 12:05 pm by Dr. Hunt, who gave an overview of the Second Day's agenda. Dr. Michelle Bushey reminded the AC members of the policies of the Federal Advisory Committee Act from the previous day's briefing.

**Science Highlight- DMS/COVID**

NSF: Zhilan Feng, DMS PD

Dr. Zhilan Feng gave a presentation titled "Mathematics in response to COVID-19 pandemic." Dr. Feng described some highlights from projects submitted in response to [NSF 20-052](#), Dear Colleague Letter on the Coronavirus Disease 2019 (COVID-19). The awards made through the DCL illustrate the importance role of mathematics in understanding COVID-19 transmission and intervention. Examples noted by Dr. Feng include:

- Modeling insights into the outcomes of policy decisions
- Using mathematical models to forecast pandemic trends
- A sugar-coated test strip that detects COVID and its variants
- An NSF student conference on COVID-19 modeling.

Dr. Feng concluded with a brief discussion of the newly released Dear Colleague Letter: Incorporating Human Behavior in Epidemiological Models (IHBEM), [NSF 22-054](#).

**Environmental Research and Education (ERE) AC Presentation and Panel**

MPS AC: Rodolfo Torres, University of California, Riverside

NSF: Dave Berkowitz, CHE DD, Amanda Haes (CHE PD), Anne-Marie Schmoltner (CHE PD)

ERE AC: Lora Billings, Montclair State University, Andres Clarens, University of Virginia, Vicky Grassian, University of California, San Diego, Kimberly Jones, Howard University



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AC ERE Chair Dr. Kimberly Jones opened the session with an overview presentation on the activities of the Advisory Committee for Environmental Research and Education (AC ERE).

Dr. Jones discussed two recently completed reports:

- Environmental Change and Human Security: Research Directions (June 2021)
- Environmental and Human Health: Research Priorities (June 2021)

Dr. Jones also noted two reports currently in development:

- Engaged Research to Advance Discovery and Societal Impacts in Environmental Research and Education.
- Opportunities and Challenges of Green Innovation.

Following the presentation by Dr. Jones there was a presentation by Dr. David Berkowitz (CHE DD), Dr. Amanda Haes (CHE PD), Dr. Anne-Marie Schmoltner (CHE PD), and Dr. Vicky Grassian (University of California, San Diego) describing some MPS-funded research related to Environmental Research and Education. The topics of the presentation include the following:

- The metaprogram Critical Aspects of Sustainability (CAS)
- Interagency collaborations in sustainable chemistry
- The Technology, Innovation, and Partnerships (TIP) Directorate
- The Dear Colleague Letter: Critical Aspects of Sustainability (CAS): Innovative Solutions to Climate Change, [NSF 21-124](#).
- CAICE: NSF Center for Aerosol Impacts on Chemistry of the Environment

The remainder of the session was devoted to a discussion between members of the two advisory groups that was moderated by Dr. Kimberly Jones (AC ERE) and Dr. Rodolfo Torres (MPS AC). The following questions served to frame the discussion.

- How can MPS scientists make a difference in clean water, air and sustainable energy?
- How can state-of-the-art methods on data collection, modeling and analysis help address the issues above?
- How can industry and other stakeholders beyond academics be best engaged (TIP Opportunity)?
- How do we promote interdisciplinary research in the ERE/MPS space (educational innovation; workshops to connect researchers from disparate communities; possible new collaborative mechanisms)?
- Can any of the answers to the questions above be linked to CAS and become a funding priority for NSF?

### **Strategy and MPS Impacts**

MPS AC: Dan Jaffe, University of Washington

NSF: Steve Meacham, Section Head for Integrative Activities, OIA



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MPS AC member Dan Jaffe opened the discussion by introducing Steve Meacham (OIA). Steve gave a presentation on the NSF Strategic Plan 2022-26. The presentation covered the NSF mission, vision, core values, and the goals and objectives of the strategic plan. MPS AC members raised questions and engaged in a discussion with Dr. Meacham. There was agreement among the AC members that they would update the previous MPS AC white paper on the importance of basic research.

**Preparation for discussion with NSF COO and Chief of Staff**

MPS AC Chair Katie Hunt led the discussion with the MPS AC member, which included:

- A brief recap of the 2-day meeting activities.
- A prioritization of topics for discussion with the COO and Chief of Staff.
- A decision that MPS Facilities, budget, and building partnerships across NSF should be topics for discussion with the COO and Chief of Staff.

**Meeting with NSF COO and Chief of Staff**

MPS AC Chair Katie Hunt led the discussion on behalf of the MPS AC. She briefed the COO and Chief of Staff on several themes that emerged across the 2-day meeting, including

- MPS's role in stewarding basic research
- Building partnerships across NSF
- White House budget priorities (clean energy, climate change, emerging technologies, and broadening participation)
- Recommendations from the MPSSLW report.

Additional topics were addressed by other members of the MPS AC, including:

- Highlights from the subcommittee report on facilities and infrastructure.
- Concerns about the MPS budget in the context of the pressures of inflation and the launch of a new NSF Directorate.
- The work of CEOSE and its connections to MPS.
- The discussion between the MPS AC and the AC ERE.

**Closing remarks and adjourn**

At 4:40 pm MPS AC Chair Katie Hunt and MPS Assistant Director Sean Jones thanked everyone for their hard work and for joining the MPS AC meeting. They noted that this was a wonderful AC meeting and hoped everyone will join the next AC meeting in the fall.