



**Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting  
April 19-20, 2023  
National Science Foundation  
Hybrid Meeting**

*AC Summary Minutes*

**Day 1, Wednesday, Apr. 19, 2023**

MPSAC Attendees:

|                           |                     |
|---------------------------|---------------------|
| Dr. Anna Balazs           | Dr. Cornelia Lang   |
| Dr. Tabbetha Dobbins      | Dr. Herbert Levine  |
| Dr. Miguel Garcia-Garibay | Dr. Jennifer Lewis  |
| Dr. Lynne Hillenbrand     | Dr. Jill Pipher     |
| Dr. Catherine Hunt        | Dr. Ed Thomas, Jr.  |
| Dr. Dan Jaffe             | Dr. William Tolman  |
| Dr. Eva Halkiadakis       | Dr. Roldolfo Torres |
| Dr. Yuri Tshinkel         | Dr. Suzanne Weekes  |

**Public Section Begins**

1.1

10:15 AM – 10:20 AM    **Call to Order and Official Opening of the Meeting**  
AC: Dr. Cornelia C. Lang, MPSAC Chair, University of Iowa

The meeting was officially opened at 10:15 am by Dr. Cornelia Lang. The minutes from the previous meeting, held in October 2022, were unanimously approved by a motion introduced by Dr. Lang.

1.2

10:20 AM – 10:50 AM    **MPS Update from the Assistant Director**  
NSF: Dr. Sean Liam Jones, MPS Assistant Director

Dr. 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.

- Thank you to AC Chair and Members and NSF Staff
- Introduction of the new directorate, TIP
- Announcement of changes in NSF leadership, upcoming retirement of Denise Caldwell
- A review of the major priorities of NSF
- Summary of the FY23 and FY24 budget
- Key program investments for broadening participation
- Emerging industries crosscuts
- Review of Partnerships for Research and Education in MPS
- Progress in artificial intelligence and quantum information science
- Announcement of upcoming MPS events

1.3

10:50 AM – 11:10 AM    **Science Highlight – AI, DMS**  
NSF: Dr. Stacey Levine, DMS Program Director  
NSF: Dr. David Manderscheid, DMS Division Director



**Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting  
April 19-20, 2023  
National Science Foundation  
Hybrid Meeting**

Dr. Stacey Levine discussed some of the recent scientific highlights on AI. It was noted that every MPS division is involved in the AI institutes and various MPS programs reflect the prioritization of AI. The discussion focused on cross-disciplinary applications including:

- Data democratization and responsible data sharing, particularly for AI tools in settings with inherent data scarcity.
- Deep neural networks that afford a geometric interpretation which provides a more accurate pattern recognition that is robust to adversarial attacks, particularly for image classification.
- Mathematical approaches to avoid data and algorithmic bias.
- ChatGPT, one of the largest current end-to-end ML models.

In summary, MPS seeks to build the foundations of AI as well as emerging domains for applications.

#### 1.4

#### 11:30 AM – 12:30 PM **PHY COV Report presentation and approval**

AC Chair of PHY Committee of Visitors:

Dr. Elizabeth (Betsy) Beise, University of Maryland

AC liaison: Dr. Lynne Hillenbrand, California Institute of Technology

Dr. Beise covered the PHY COV charge and process along with the PHY portfolio, subcommittees, and funding modalities. The following is a summation of the COV findings:

- Division leadership should keep doing all in its power to **make the Program Director positions as appealing as possible** to fresh talent. It is advised to continue to stress the intended broad meaning of "broader impacts" and the significance of paying attention to it with the ad hoc reviewers.
- The Division should consider options to **document the practice of follow-up**, particularly with declined proposals and first-time PIs, keeping in mind the impact of additional workload on the Program Directors.
- The COV also discussed possible avenues for **garnering wider input from the community** on the review process, and to augment the COV's review of eJackets, but did not come to consensus on an approach. Suggested that this be considered at the Division leadership level for future COV reviews.
- COV members support the practice of **ensuring that at least 50% of the Division's funding** goes toward the research program as this largely supports the development of a strong scientific workforce at all levels.
- Program areas should have some **flexibility to adopt the length of cycle** that best fits the proposal. Program Directors could use help from both the Division and Directorate in fostering sustained opportunities for cross-division and cross-directorate collaboration.
- For large projects that cross agency boundaries, **early adoption of inter-agency MOUs** is strongly encouraged, combined with jointly held operations reviews with agreed-upon metrics
- It is encouraged that every effort be made to **minimize adverse impacts of the "Big Ideas" program ending** for projects and PIs that were supported through the initiative.
- Division leadership should consider avenues for more coherence between IAP's portfolio and efforts within the science program areas to support the **fostering of an inclusive community at all levels of participation**, as well as to better align the language describing IAP with the initiatives it supports.

Dr. Beise then discussed considerations for the next PHY COV before concluding the presentation.

The MPS AC Chair, Dr. Lang, called for a vote to accept the PHY COV report. The AC members voted unanimously to accept the report.



**Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting  
April 19-20, 2023  
National Science Foundation  
Hybrid Meeting**

1.5

2:00 PM – 2:30 PM

**Research Security**

NSF: Dr. Sarah Stalker-Lehoux, Deputy Chief Research Security Strategy and Policy

Dr. Sarah Stalker-Lehoux gave a presentation on research security and responsible internalization. NSF is now standing up an office to look at the research security issues within the agency as well as across the US government. Some implementation activities include harmonizing disclosure formats and improving research security training modules and research security program standards.

- Apart of the CHIPS and Science act, there is requirement to establish a Research Security and Integrity Information Sharing and Analysis Organization (RSI-ISA).
- NSF is in the process of developing a DCL to get formal input from the community on the duties of the new office.
- NSF will establish an RSI-ISA center; however, it will be run by a non-governmental entity through an agreement with the agency.
- NSF asked JASON, an independent group of scientists which advises the U.S. government on matters of science and technology, to consider what a research program on research security might entail. The [report](#) notes that the definition of research integrity differs across cultures and national interest.
- JASON recommends the products of a research program on research security must not be used to disadvantage anyone based on their ethnic background or country of origin. The NSF program should emphasize research on effective methods for informing and training Principal Investigators about potential risks in international collaborations by country and, where appropriate, by institution.

1.6

2:30 PM – 3:15 PM

**Budget Update and Drivers**

NSF: Dr. Caitlyn Fife, Division Director of Budget Division  
NSF: Dr. Amanda Greenwell, Head of Office of Legislative and Public Affairs (OLPA)

Dr. Amanda Greenwell discussed the current state of public affairs within NSF. Focus is on policymakers/public/internal and research communities, which OLPA utilizes to develop an annual strategic communications plan. The objectives are as follows:

- Policymakers - to understand the importance of NSF investments.
- Public - to shine a light on NSF and the positive impact of NSF-funded research which benefits all of us via our taxpayer dollars.
- Internal – to engage staff as brand ambassadors and provide them with compelling stories highlighting exciting research results to capture the imaginations of the next generation of scientists, as well as policymakers.

NSF's three-year plan (2023-2025) is supported by 3 foundational pillars – infrastructure, missing millions, and innovation. The agency continues to engage with members of Congress and research stakeholders as well as the general public (i.e. South by Southwest 2023) to create more visibility for NSF as a federal agency.

Dr. Caitlyn Fife discussed various aspects of the FY 24 budget, which can be found at <https://beta.nsf.gov/about/budget/fy2024>. For FY24, there is a \$11.3 billion request which is a significant dollar and % increase. In this budget, NSF's focus is on curiosity-driven research, inspiring missing millions, and technology and innovation partnership. Dr. Fife encouraged the AC members to look at the budget document in detail and follow up with questions.



Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting  
April 19-20, 2023  
National Science Foundation  
Hybrid Meeting

3:30 PM – 4:15 PM      **Preparation for discussion with NSF COO, COS**

MPS AC Chair Cornelia Lang led the discussion with the MPS AC members on preparation for the next day's session with NSF COO and COS. Topics to prioritize in the next day's discussion included: (1) FY24 Budget Request, (2) Research Security, and (3) MPS Partnership Programs in addition to a summary of other meeting highlights.

4:15 PM – 4:30 PM      **Closing Remarks and Adjourn for the Day**

At 4:17 pm MPS AC Chair Cornelia Lang thanked the AC members and NSF for a wonderful first day and adjourned for the day with the reminder of timing for Day 2.

**Day 2, Thursday, Apr. 20, 2023**

MPSAC Attendees:

|                           |                     |
|---------------------------|---------------------|
| Dr. Anna Balazs           | Dr. Cornelia Lang   |
| Dr. Tabbetha Dobbins      | Dr. Herbert Levine  |
| Dr. Miguel Garcia-Garibay | Dr. Jennifer Lewis  |
| Dr. Lynne Hillenbrand     | Dr. Jill Pipher     |
| Dr. Catherine Hunt        | Dr. Ed Thomas, Jr.  |
| Dr. Dan Jaffe             | Dr. William Tolman  |
| Dr. Eva Halkiadakis       | Dr. Roldolfo Torres |
| Dr. Yuri Tshinkel         | Dr. Suzanne Weekes  |

Public Section Begin

2.1

9:00 AM – 9:05 AM      **Welcome and Overview of Agenda**

AC: Dr. Cornelia C. Lang, MPSAC Chair, University of Iowa

The meeting was opened at 9:00 am by Dr. Cornelia Lang and began with a reminder from Dr. Michelle Bushey on the policies of the Federal Advisory Committee Act from the previous day's briefing. Dr. Lang then provided a brief overview of the day 2 agenda.

2.2

9:05 AM – 9:25 AM      **Science Highlight- Designing Materials to Revolutionize and Engineer our Future (DMREF)**

NSF: Dr. Paul Lane, DMR Program Director

NSF: Dr. Germano Iannacchione, DMR Division Director

Dr. Paul Lane discussed the importance of the program, DMREF, a cross-directorate and cross-agency effort that seeks to accelerate materials design and deployment.

- Overview of a DMREF project Organic Semiconductors by Computationally Accelerated Refinement (OSCAR). The award's purpose is to accelerate the development of new electronic



**Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting  
April 19-20, 2023  
National Science Foundation  
Hybrid Meeting**

and energy materials by developing computational models to predict solid-state order for a common class of high-performance materials.

- OSCAR produced Organic Crystals in Electronic and Light-Oriented Technologies (OCELOT) which is an open access material science database. Link <https://oscar.as.uky.edu/database/>
- Overview of Grant Opportunities for Academic Liaison with Industry (GOALI) project on Tetrahedral Ferroelectrics as an additional example of a successful DMREF project.
- DMREF plans to expand on future opportunities of workforce development, materials data, and uses of AI.

## 2.3

9:25 AM – 10:25 AM

### **MPS Facilities:**

#### **Portfolio Overviews and Updates followed by Discussion.**

NSF: Dr. Chris Smith, MPS Senior Advisor.

NSF: Dr. David Berkowitz, CHE Division Director

NSF: Dr. Debra Fischer, AST Division Director

NSF: Dr. Germano Iannacchione, DMR Division Director

NSF: Dr. C. Denise Caldwell, PHY Division Director

The MPS Facilities team gave an update of the facilities portfolio describing major facilities within each division. Discussed updates to the facilities' lifecycles and cost. **A quarter of the MPS budget is invested in facilities.** It was noted that NSF is no longer using the word “divestment” to describe the end of facility life cycle and is instead using “disposition”.

### CHE Facilities

- ChemMatCARS: partnership with DOE, dedicated to static and dynamic structural measurements of condensed matter chemistry and materials science.
- National Extreme Ultrafast Science Facility (NeXUS): watching electrons move in molecules and materials at time scales as fast as attoseconds and on length scales as small as angstroms. New site that will be in operation starting Fall 2024.
- ChemMatCARS and NeXUS provide state-of-the-art instrumentation that enables research in NSF priority areas, including QIS, energy technologies and sustainability, semiconductor research, and biotechnology.

### AST Facilities

- Gemini-North repairs to the damaged area of the mirror completed 24 March; return to science operations in mid-May.
- Kitt-Peak's main power reinstated, fiber installation underway, road open to staff with some visitor access.
- ALMA's cyber-attack was contained, no science data or antennas were compromised. ALMA operations resumed in December (2-month shutdown). Celebrated its 10-year anniversary in March of 2023.
- Green Bank resumed operations Apr 12, operating at slower azimuth speeds while wheel breaks in, but initial receive check out shows that all is well – the telescope is working beautifully.
- Rubin Observatory's next major step is the installation and commissioning of the telescope's primary-tertiary mirror (M1/M3). The DOE-funded camera is now fully assembled and about to enter final testing before shipment to Chile later this summer.

### PHY Facilities

- Laser Interferometer Gravitational Wave Observatory (LIGO) – due to start in May of 2023 with an A+ upgrade on the way.
- ATLAS and CMS Detectors at Large Hadron Collider (LHC) - Construction on MREFC High-Luminosity Upgrade underway; instated IRIS-HEP award to address computational challenges.



**Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting  
April 19-20, 2023  
National Science Foundation  
Hybrid Meeting**

- IceCube – upgrade is on the way to add an additional 7 strings.
- Midscale Instrumentation Fund resources are intended to be one-time, non-renewable investments in the research effort and require that the project have a well-defined beginning and end. MSIF funds cannot be used to support R&D or operations. Proposals are submitted to the disciplinary program. Merit reviews proceed through the base programs or special reviews. Science must be high priority in program. Funding Levels begin at TPC of ~\$4.0M and can go up to TPC of ~\$20.0M – complements MRI and MSRI.
- Zetawatt-Equivalent Ultrashort pulse laser System (ZEUS); Highest peak power laser in the U.S. Operations beginning with first call for user proposals out now.

**DMR Facilities**

- National High Magnetic Field Laboratory (NHMFL): A world leading user program along with education and outreach activities. A new set of science drivers emerged from broad community input.
- CHEXS@CHESS: The QM2, FAST, PIPOXS, and HPBio beamlines and their science missions.
- Center for High Resolution Neutron Scattering (CHRNS): An NSF/NIST partnership to develop and operate world-class neutron scattering instrumentation.
- Key Challenges for DMR facilities management:
  - Recent MRI changes resulting in fewer awards.
  - Current funding levels are not keeping up with cost increases.
  - The need for long-term and coordinated funding mechanisms for interdisciplinary facilities.
  - Balancing the needs across a heterogeneous MPS facilities portfolio.

Chris ended the presentation by transitioning into the following agenda topics with facilities on the horizon.

10:25 AM – 10:40 AM

**AC Subcommittees**

NSF: Dr. Saul Gonzalez

**AC Facilities Subcommittee, Study 2 update by co-chairs:**

AC: Dr. Jill Pipher, Brown University.

Dr. Roger Falcone, U. California Berkeley

Dr. Pipher provided an overview of the Major Research Facilities Committee. This committee serves to provide a set of considerations for prioritization of major facility projects across the competing needs of the communities served by the Directorate. The considerations should incorporate the financial and societal realities of the scientific enterprise in the 2020s, and the current and future needs of MPS communities.

Anticipating, managing, and prioritizing community demand for investments that include a broad spectrum of astronomical telescopes, advanced light sources, leadership computational facilities, novel technologies for energy, and many others is an unprecedented challenge. A challenge that can and must be met.

**AC ngGW Subcommittee update**

Dr. Vicky Kalogera, Northwestern University



**Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting**  
**April 19-20, 2023**  
**National Science Foundation**  
**Hybrid Meeting**

Dr. Kalogera provided an overview of the newly established Next Generation Gravitational Wave (ngGW) Detector Concept Subcommittee to assess and recommend a set of concepts for new GW observatories in the U.S. The committee is charged with an overarching goal to identify configurations that can operate at approximately an order of magnitude greater than the sensitivity of LIGO A+ by the mid-2030s. While the outcome of this subcommittee will be to recommend an optimal ngGW concept, the expectation is that as that concept matures into an MREFC-scale detection network, the findings of this subcommittee will inform future deliberations of the existing MPSAC Subcommittee on Facilities and Major Research Infrastructure.

Call for white papers that address the committee's charge were due by June 12<sup>th</sup>, 2023.

## 2.4

10:55 AM – 11:15 AM      **AC ERE**

AC ERE members Dr. Kimberly Jones of Howard University and Dr. Ben McCall of the University of Daytona provided background on the advisory committee for environmental research and education (ERE). The main purposes of the AC are:

- To provide advice, recommendations, and oversight.
- Be a base of contact with the scientific community to inform NSF of the impact of its research support and NSF-wide policies on the scientific community.
- Serve as a forum for consideration of interdisciplinary environmental topics as well as environmental activities in a wide range of disciplines.
- Provide broad input into long-range plans and partnership opportunities.
- Perform oversight of program management, overall program balance, and other aspects of program performance for environmental research and education activities.

The AC ERE is devoted sections of last two meetings to discussing environmental impacts of research. This spawned an “interest group” to explore this in more detail, and the group established a broad consensus that more awareness of the environmental impacts of research is needed amongst PIs, their institutions, and NSF. The ERE interest group discussed common themes regarding environmental impacts of research including:

- PIs do have some influence on the environmental impacts of their work (e.g., travel decisions, participation in green lab programs).
- Many elements of impacts are outside PI control (e.g., institutional energy procurement).
- Concern about placing additional burdens on PIs in the proposal process.
- Concerns about inequitable impact on PIs from less-resourced institutions.

At the end of the presentation Drs. Howard and McCall called for an open dialogue about NSF's impacts on the environment and asked for input from not only NSF personnel, but the MPSAC as well.

## 2.5

11:15 AM – 12:15 PM      **Partnerships Programs: PREM, PREC, PAARE, PREP**  
NSF: Dr. Sean Liam Jones, MPS Assistant Director

Dr. Jones provided an introduction on partnerships and summarized each partnership program



Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting  
April 19-20, 2023  
National Science Foundation  
Hybrid Meeting

within the MPS division. The introduction was followed by visual overviews of each partnership program.

**PREM DMR 2122178: UTRGV-UMN Partnership to Strengthen the PREM Pathway**

NSF: Dr. Debasis Majumdar, Dr. Shadi Mamaghani, DMR PDs

NSF: Dr. Germano Iannacchione, DMR DD

*Virtual: Dr. Karen Lozano, University of Texas Rio Grande Valley. PI*

*With Alexa Villarreal, UTRGV, master's student*

*With Narcedalia Anaya, UTRGV, undergraduate*

*Dr. Tim Lodge, University of Minnesota, coPI*

[PREM DMR Video: UTRGV-UMN Partnership to Strengthen the PREM Pathway](#)

**PREC CHE 2216807: Partnership for Research and Education in Chemistry-Sustainable Polymers**

NSF: Dr. Anne-Marie Schmoltner, CHE PD

NSF: Dr. David Berkowitz, CHE DD

*Virtual:*

*Dr. Issifu Harruna, Clark Atlanta University. PI*

*With Zakiya Barnes, CAU graduate student*

*Dr. Eric Mintz, Clark Atlanta University. coPI*

*With Aanesa Watson, CAU graduate student*

*Dr. Mark Hillmeyer, University of Minnesota. CoDirector*

*Dr. Jessica Lamb, University of Minnesota*

[PREC CHE Video: Partnership for Research and Education in Chemistry-Sustainable Chemistry](#)

**PAARE AST 2219109: The CSUF-led Partnership for Inclusion of Underrepresented groups in Gravitational-wave Astronomy**

NSF: Dr. Hans Krimm, AST PD

NSF: Dr. Debra Fisher, AST DD

*Virtual:*

*Dr. Geoffrey Lovelace, Cal State Fullerton. PI*

*Dr. Jocelyn Read, Cal State Fullerton. Co-PI*

*Marlo Ramo Morales, Washington State University. PhD student*

*Andrea Ceja, Cal State Fullerton. Undergraduate*

[PAARE AST Video: The CSUF-led Partnership for Inclusion of Underrepresented groups](#)

**PREP PHY 2216824: FIU-JULA Partnership for Research and Education in AMO Physics**

NSF: Dr. Kathy McCloud, PHY PD





**Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting  
April 19-20, 2023  
National Science Foundation  
Hybrid Meeting**

NSF: Dr. Denise C. Caldwell. PHY DD

*Virtual:*

*Dr. Hebin Li, Florida International University. PI*

*Dr. Eric Cornell, JILA, University of Colorado. Co-PI*

*Dr. Jin He, Florida International University. Co-PI*

*With Navin, Prajapati, FLU. Graduate Student*

*Lexter Savio Rodriguez, FLU. Graduate Student*

*Alejandra Zavala, FLU. Graduate Student*

*Patricia Hector Hernandez, FLU. Undergraduate*

[PREP PHY Video: FIU-JULA Partnership for Research and Education in AMO Physics](#)

2.6

1:15 PM – 1:45 PM

**CEOSE**

NSF: Dr. Alicia Knoedler, Office of Integrative Activities

AC: Dr. Tabbetha Dobbins, Rowan University

NSF: Dr. Sandra Richardson, Section Head of the Established Program to Stimulate Competitive Research (EPSCoR)

Dr. Knoedler provided an update of Committee on Equal Opportunities in Science and Engineering (CEOSE). CEOSE provides a biennial report to the NSF Director comprised of prior two years activities and proposed recommended/suggested activities for upcoming two years. The Director then transmits this report to Congress unaltered--but with additional comments as the director deems appropriate. The 2021-22 Biennial Report will focus on Intersectionality in STEM. CEOSE's current recommendation to NSF is to demonstrate and promote bold leadership actions to create, integrate, and make visible elements within and across its programs to enhance broadening participation of underrepresented groups in STEM. CEOSE encourages NSF to:

- Demonstrate leadership and empower leadership within its staff, advisors, and the communities it serves.
- Increase knowledge and awareness of invisibility issues in STEM communities.
- Identify the participation and advancement of underrepresented groups in the scientific enterprise and acknowledge meaningful leadership actions for transformational change.

For more information, please see <https://www.nsf.gov/od/oia/activities/ceose/index.jsp>

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

Members reviewed questions document prepped for meeting with NSF Director, Chief Operation and Chief of Staff Officer to ensure accuracy

2:30 PM – 3:00 PM

**Discussion with COO and Chief of Staff**

Chief Operating Officer, Dr. Karen Marrongelle

Chief of Staff, Dr. Brian Stone

MPS AC Chair Cornelia Lang introduced AC members to the COO, and Chief of Staff, and provided a summary of topics that were discussed over the two-day AC.

- FY24 Budget Request.
- Ongoing discussion about the importance of facilities and research infrastructure in the MPS



**Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting  
April 19-20, 2023  
National Science Foundation  
Hybrid Meeting**

portfolio.

- Research Security and implications for principal investigators (especially at universities).
- Strong support for MPS partnerships programs and their positive impact on broadening participation.

The session was closed with a farewell acknowledgement to Dr. Lynne Hillenbrand

3:00 PM – 3:05 PM

**Closing Remarks**

AC: Dr. Cornelia C. Lang, MPSAC Chair

NSF: Dr. Sean Liam Jones, MPS Assistant Director

At 3:06 pm MPS AC Chair Cornelia Lang thanked everyone for joining the MPS AC meeting. She stated that this was a wonderful AC meeting and hoped everyone will join the next AC meeting in the fall.