Update on the Directorate for Mathematical and Physical Sciences

Anne L. Kinney
Assistant Director
August 14, 2018
HELLO
my name is

Anne L. Kiriny
My Vision for the MPSAC-MPS Relationship

- MPS → Community
- MPS ← Community
Science hors d'oeuvres
NSTC Subcommittee on Quantum Information Science

This is MPS...
MPS exists in the context of...

**NSF Support of Academic Basic Research in Selected Fields**
(as a percentage of total federal support)

- Computer Science: 83%
- Biology: 69%
- Social and Psychological Sciences: 68%
- Mathematics: 64%
- Environmental Sciences: 63%
- Engineering: 46%
- Physical Sciences: 45%
- All Science and Engineering Fields: 27%
MPS supports over 28,000 people...

- Undergraduate Students: 6,248
- Graduate Students: 8,804
- Postdoc Associates: 1,988
- Senior Researchers: 8,236
- Other Professionals: 3,124

Total: 28,400

Data Source: FY 2017 Actuals
<table>
<thead>
<tr>
<th>Month</th>
<th>Revenue</th>
<th>Expenses</th>
<th>Profit</th>
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<tbody>
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<td>Jan</td>
<td>$1000</td>
<td>$500</td>
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<tr>
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## FY 2019 President’s Budget Request: $1.345 Billion

### MPS Funding

**Dollars in Millions**

<table>
<thead>
<tr>
<th></th>
<th>FY 2017</th>
<th>FY 2018</th>
<th>FY 2019 Request</th>
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<tbody>
<tr>
<td>Astronomical Sciences (AST)</td>
<td>$252.05</td>
<td>$307.26</td>
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<tr>
<td>Chemistry (CHE)</td>
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<td>Materials Research (DMR)</td>
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<td>Physics (PHY)</td>
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<td>Office of Multidisciplinary Activities (OMA)</td>
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<td><strong>$103.45</strong></td>
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<td><strong>Total</strong></td>
<td>$1,362.43</td>
<td>$1,497.93</td>
<td>$1,345.32</td>
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Principles Applied to FY 2019 Request

• MPS Budget Request: $1.345 B

• Emphasis on Big Ideas
  • MPS stewardship: Quantum Leap & Windows on the Universe
  • Joining: Harnessing the Data Revolution, Mid-Scale & Understanding the Rules of Life

• Strategic investments in:
  • Fundamental research in all MPS disciplines
  • MPS research facilities
  • Mid-Scale
  • Next generation researchers and workforce
  • External partnerships
Mathematical and Physical Sciences (MPS)

Astronomical Sciences (AST)
- Facilities: 28%
- Workforce: 62%
- Midscale: 8%

Chemistry (CHE)
- Facilities: 15%
- Workforce: 3%
- Midscale: 4%

Materials Research (DMR)
- Facilities: 12%
- Workforce: 6%
- Centers: 23%

Mathematical Sciences (DMS)
- Workforce: 9%
- Institutes: 15%

Physics (PHY)
- Facilities: 35%

Source: EIS, FY 2017 Actuals Data
—What’s That?

Google search for “what does NSF stand for?”

National Sanitation Foundation

Regulatory Resources. NSF was originally established as the National Sanitation Foundation in 1944 at the University of Michigan School of Public Health as an independent, non-governmental, not-for-profit organization.

Regulatory Resources - NSF International
www.nsf.org/regulatory
Progress on NSF Branding...
NSF Leadership Working On The Hill
ABBREVIATED AGENDA

• Big Ideas I: Quantum Leap
• Big Ideas II: Windows on the Universe
• Prep for meeting with NSF Director

-----------------------------------------------Tomorrow-----------------------------------------------

• Policy on Sexual Harassment
• Big Ideas III: Harnessing the Data Revolution
• Big Ideas IV: Understanding the Rules of Life
• Synthetic "Materials" Biology
• Subcommittee on Physics Frontiers Centers
• Working lunch: The NSF 2026 Idea Machine (creating the Big Ideas of the future)
• Discussion with NSF Director and Chief Operating Officer
• Wrap-up Discussions
Key Questions We’ve Asked the MPSAC:

- What sort of response have you been hearing from your scientific communities about these Big Ideas, in general?
- What is a reasonable expectation for the scientific outcomes for each Big Idea, for the $30M/year level of strategic investment?
- Is there any discovery threshold that could be crossed by a somewhat increased level of investment?
- How can NSF best leverage its engagement with the basic research community to make unique gains under Quantum Leap, in the context of the developing national quantum initiative?
- To what extent is mid-scale investment critical to the two MPS-based Big Ideas, and to other aspects of the MPS programs?
- What are cross-cutting key topics for the next tranche of NSF Big Ideas that are germane to the MPS disciplines?
- How does investment in our longstanding core research programs relate to our new investments in the Big Ideas?
Cross-Cutting Topics:

- Post-Quantum Cryptography (DMS, CISE)
- Exo Solar Planetary Atmosphere (BIO, GEO, MPS/AST)
- Materials Sustainable Development (BIO, ENG, MPS/DMR)
- Sustainable Chemistry (BIO, ENG, GEO, MPS/CHE)
- Multi-messenger Astrophysics (AST, GEO, MPS/AST, PHY)
- Opioids (BIO, ENG, GEO, MPS/CHE, SBE)
- Precision Measurement (DOE, MPS/CHE, PHY, NIST)
- Math of Deep Learning (MPS/DMS, CISE)
- Synthetic “Materials” Biology (Air Force, BIO, ENG, MPS/CHE, DMR, PHY)
END
Directorate for Mathematical and Physical Sciences (MPS)
Anne Kinney, Assistant Director
Deborah Lockhart, Acting Deputy Assistant Director
Tel: (703) 292-8800  Fax: (703) 292-8151

Division of Astronomical Sciences (AST)
Richard Green, Division Director
Ralph Gaume, Deputy Div. Director
Tel: (703) 292-8820

- Advanced Technologies and Instrumentation (ATI)
- Astronomy & Astrophysics (AAG)
- Astronomy & Astrophysics Postdoc Fellowships (AAPF)
- Educational & Special Programs (ESP)
- Electromagnetic Spectrum Management (ESM)
- Mid-Scale Innovations (MSIP)
- Facilities and MREFC Project Development

Division of Chemistry (CHE)
Sean Jones, Division Director (Acting)
Lin He, Deputy Div. Director (Acting)
Tel: (703) 292-8840

- Chemical Catalysis (CAT)
- Chemical Measurement & Imaging (CMI)
- Chemical Structure, Dynamics, & Mechanisms (CSDM)
- Chemical Synthesis (SYN)
- Chemistry of Life Processes (CLP)
- Environmental Chemical Sciences (ECS)
- Integrative Chemistry Activities (ICA)
- Macromolecular, Supremolecular, & Nanochemistry (MSN)
- Chemical Theory, Models, & Computational Methods (CTMC)

Division of Materials Research (DMR)
Linda Sapochek, Division Director
Clark Cooper, Deputy Div. Director (Acting)
Tel: (703) 292-8819

- Biomaterials (BMAT)
- Ceramics (CER)
- Condensed Matter and Materials Theory (CMMT)
- Condensed Matter Physics (CMP)
- Electronic & Photonic Materials (EPM)
- Metals and Metallic Nanostructures (MMN)
- Polymers (POL)
- Solid-state & Materials Chemistry (SSMC)
- National Facilities & Instrumentation
- DMR Centers & Teams

Division of Mathematical Sciences (DMS)
Juan Meza, Acting Division Director
Tie Luo, Deputy Division Director
Tel: (703) 292-8870

- Algebra & Number Theory
- Analysis
- Applied Mathematics
- Combinatorics
- Computational Mathematics
- Foundations
- Geometric Analysis
- Mathematical Biology
- Probability
- Statistics
- Topology
- Special Research Programs
- Training
- Career Development
- Research Institutes Infrastructure

Division of Physics (PHY)
Denise Calame, Division Director
Jean Cottram Adams, Deputy Div. Director (Acting)
Tel: (703) 292-9230

- Accelerator Science
- Atomic, Molecular & Optical Physics
- Computational Physics
- Elementary Particle Physics
- Gravitational Physics
- Integrative Activities in Physics
- Nuclear Physics
- Particle Astrophysics
- Physics of Living Systems
- Quantum Information Science
- Focused Research Hubs in Theoretical Physics
- Physics Frontier Centers
NSF Director inducted into STEM Leadership Hall of Fame
April 2018
Backup slides on mid-scale?