



NATIONAL  
SCIENCE  
FOUNDATION

FISCAL  
YEAR

2013

BUDGET  
REQUEST



Edward Seidel, Assistant Director  
Directorate for Mathematical and  
Physical Sciences

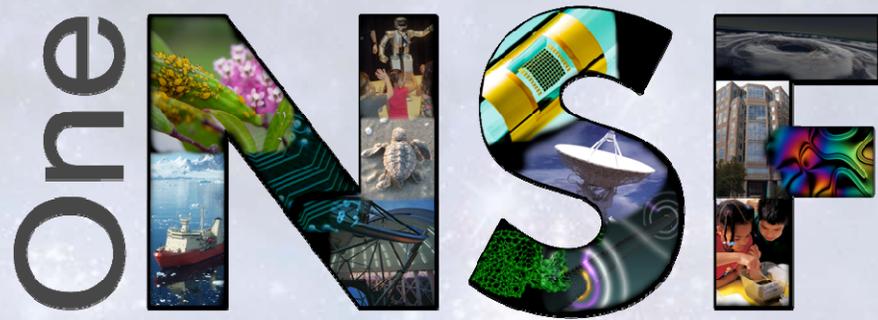
# One NSF

- Transform the Frontiers
- Innovate for Society
- Perform as a Model Organization

# One NSF

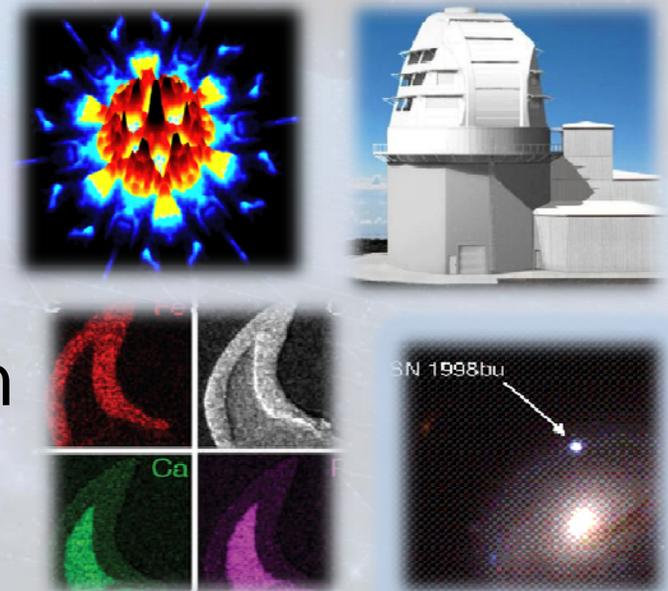
- Transform the Frontiers
- Innovate for Society
- Perform as a Model Organization

- CEMMSS
- CIF21
- E<sup>2</sup>
- INSPIRE
- I-Corps
- SaTC
- SEES



## Directorate for Mathematical and Physical Sciences

- Advancing Discovery
- Building Blocks for Innovation
- Forefront Facilities
- Educating the Next Generation



# Advancing Discovery

- 2011 Physics Nobel Prize

*Discovery of the accelerating expansion of the universe through observations of distant supernovae*

- 2011 National Medal of Science

*Theory of large variations; probability of rare events*

**NOBEL  
PRIZE**



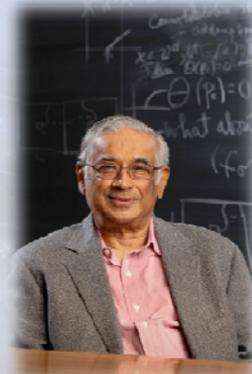
Schmidt



Perlmutter



Riess

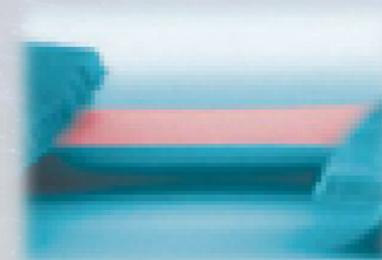
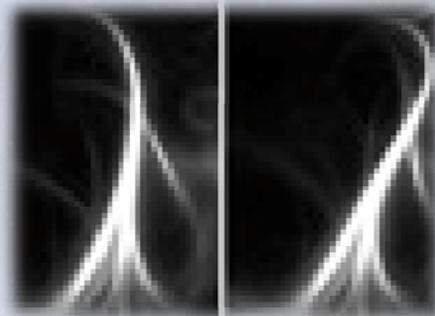


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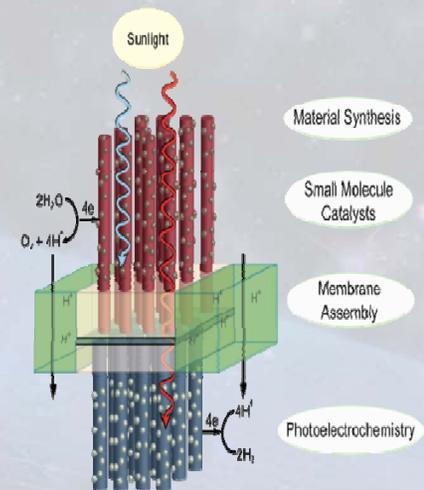
# Building Blocks for Innovation

- Catalyze advances in science impacting innovation in medicine, industry, and technology
- Green Chemistry
  - SusChEM
- Materials Genome Initiative
  - DMREF



# Science, Engineering, and Education for Sustainability (SEES)

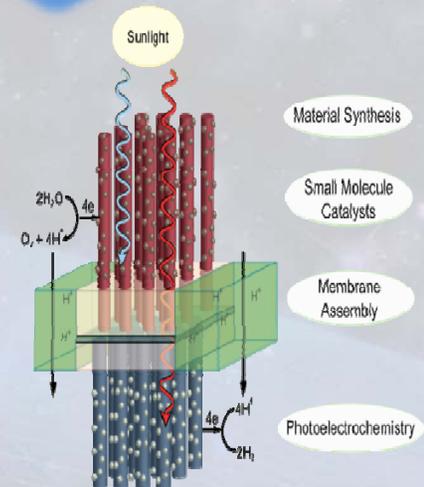
- Inform the societal actions needed for environmental and economic sustainability and sustainable human well-being
  - Resilience to natural and technological disasters
  - Coastal and Arctic systems
  - Sustainable Chemistry, Engineering and Materials
  - Improvements in IT energy efficiency



# Science, Engineering, and Education Sustainability (SEES)

MPS: \$27.2M in  
FY 2013

- Inform the societal actions needed for environmental and economic sustainability and sustainable human well-being
  - Resilience to natural and technological disasters
  - Coastal and Arctic systems
  - Sustainable Chemistry, Engineering and Materials
  - Improvements in IT energy efficiency



# Cyberinfrastructure Framework for 21<sup>st</sup> Century Science and Engineering (CIF21)

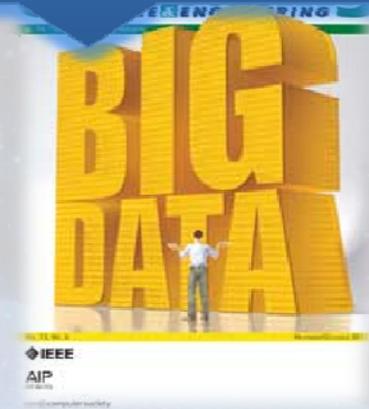
- Cyberinfrastructure to transform research, innovation, and education
- Involves all directorates and offices
- Major components
  - Computational and Data-enabled Science
  - Core Technologies, Tools, Algorithms
  - Big Data Projects
  - Workforce Development



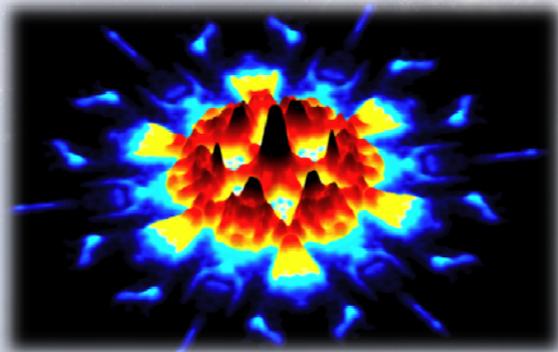
# Cyberinfrastructure Framework Century Science and Engineering

MPS: \$19.5M in  
FY 2013

- Cyberinfrastructure to transform research, innovation, and education
- Involves all directorates and offices
- Major components
  - Computational and Data-enabled Science
  - Core Technologies, Tools, Algorithms
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  - Workforce Development



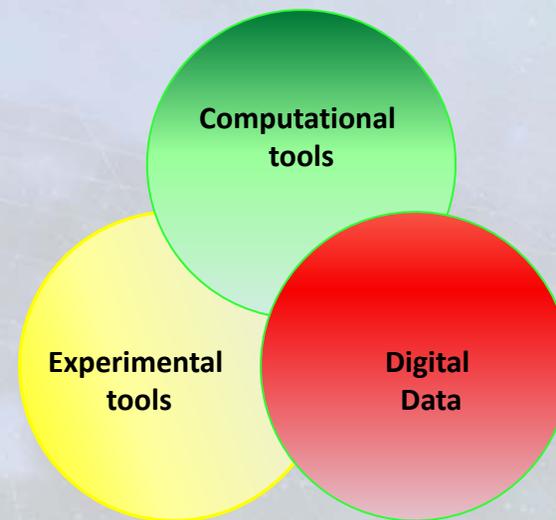
# Cyber-Enabled Materials Manufacturing and Smart Systems (CEMMSS)



- Partnership with ENG and CISE
- Advanced Manufacturing
- DMREF

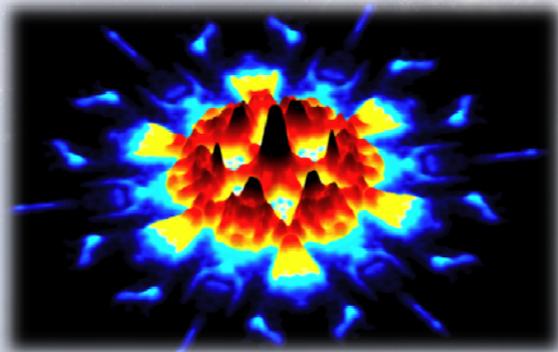
- Fundamental research for discovering, making, modeling, optimizing, and manufacturing with new materials and material systems

## Materials Innovation Infrastructure



# Cyber-Enabled Materials Manufacturing and Smart Systems (CEMMS)

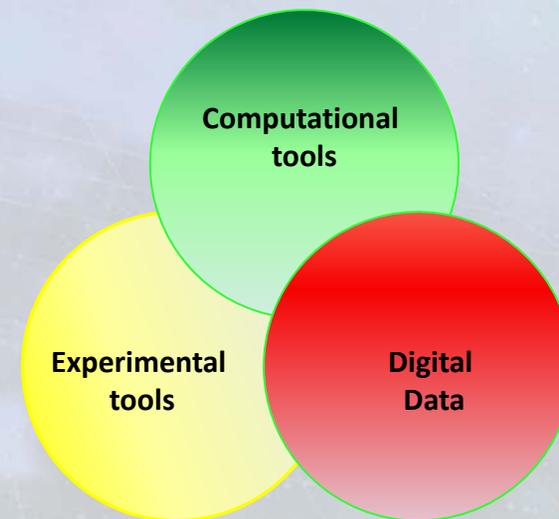
MPS: \$50.0M in  
FY 2013



- Partnership with ENG and CISE
- Advanced Manufacturing
- DMREF

- Fundamental research for discovering, making, modeling, optimizing, and manufacturing with new materials and material systems

## Materials Innovation Infrastructure



# Secure and Trustworthy Cyberspace (SaTC)

- Cross-foundation partnership to build a cybersecure society
- Produce high-quality digital systems and a well-trained cybersecurity workforce
- *Strategic Plan for the Federal Cybersecurity Research and Development Program*
- Comprehensive National Cybersecurity Initiative



# Secure and Trustworthy Cyberspace

MPS: \$2.0M in  
FY 2013

- Cross-foundation partnership to build a more cybersecure society
- Produce high-quality digital systems and a well-trained cybersecurity workforce
- *Strategic Plan for the Federal Cybersecurity Research and Development Program*
- Comprehensive National Cybersecurity Initiative



# Expeditions in Education (E<sup>2</sup>)

- Transform STEM learning for the Nation through cognitive research and frontier science
  - Transforming Learning for STEM Undergraduates
  - People and the Planet
  - Cyberlearning and Big Data

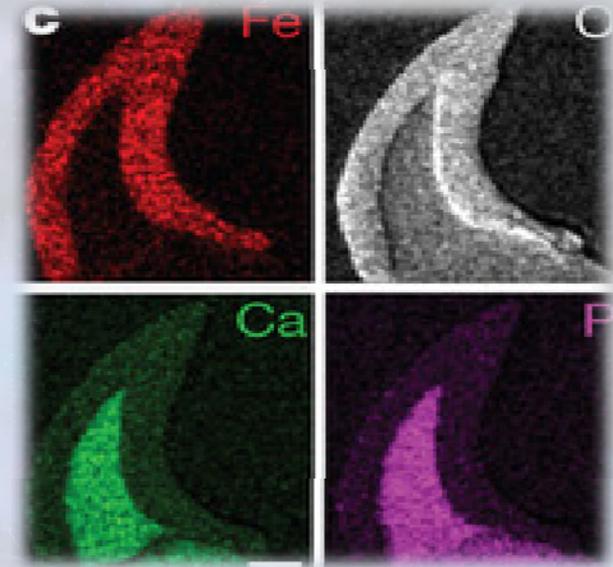


# Expeditions in Education (E<sup>2</sup>) MPS: \$5.0M in E<sup>2</sup> in FY 2013

- Transform STEM learning for the future through cognitive research and frontier science
  - Transforming Learning for STEM Undergraduates
  - People and the Planet
  - Cyberlearning and Big Data

# Research at the Interface of Biological, Mathematical, and Physical Sciences (BioMaPS)

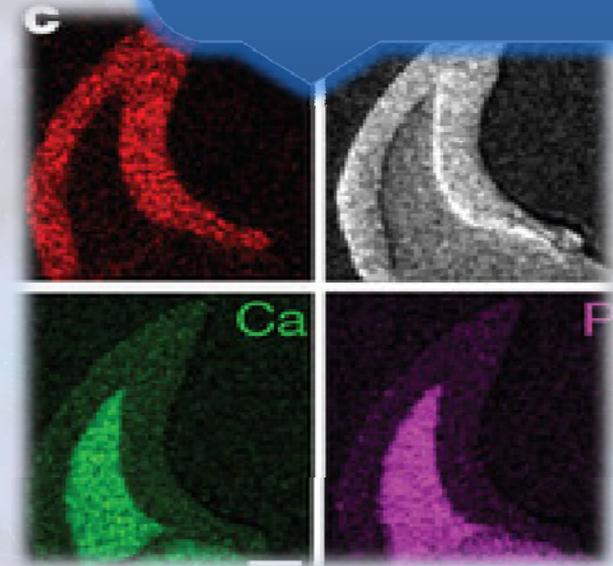
- Insight into and inspiration from the living world
  - Biological design strategy for better composite materials
  - Bio-imaging and bio-inspired sensors



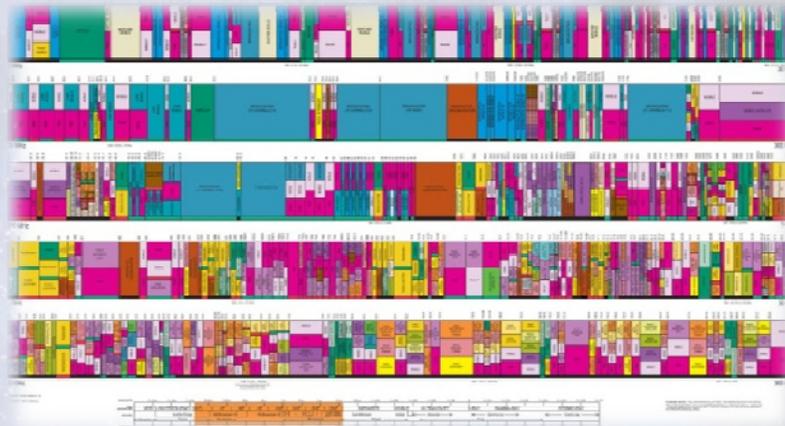
# Research at the Interface of Biology, Mathematics, and Physical Science (BioMaPS)

MPS: \$11.6M in FY 2013

- Insight into and inspiration from the living world
  - Biological design strategy for better composite materials
  - Bio-imaging and bio-inspired sensors

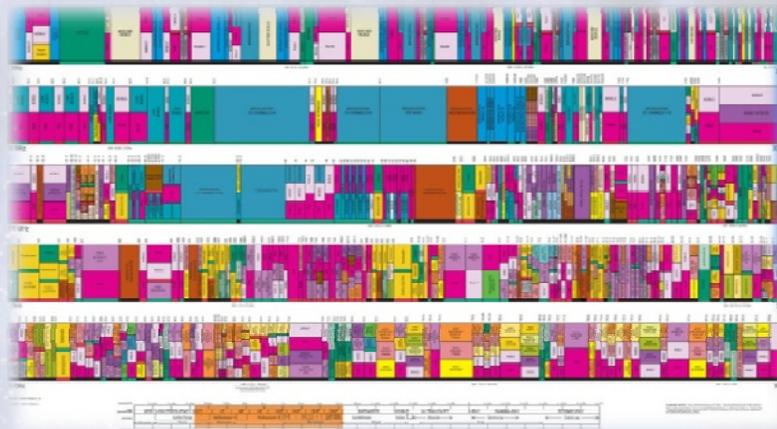


# Enhancing Access to the Radio Spectrum (EARS)



- MPS is home to electromagnetic spectrum management for NSF
- Cross-cutting research on efficient use of radio spectrum
- Technology, economics, social science, and public policy
- Responsive to national broadband plan

# Enhancing Access to the Radio Spectrum (EARS)



MPS: \$12.0M in  
FY 2013

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- Responsive to national broadband plan

# Supporting Multidisciplinary Research Across NSF

- INSPIRE
  - High-risk/high-reward research across disciplines
- Innovation Corps (I-Corps)
  - First NSF award in MPS: solar irradiation to dissolve oil contaminants in water
- Science Across Virtual Institutes (SAVI)
  - 2 of NSF's first 3 awards in MPS: Virtual Institute for Mathematical and Statistical Sciences with India, and Physics of Living Systems Student Research Network with Brazil, Israel, Singapore, and Europe



# Supporting Multidisciplinary Across NSF

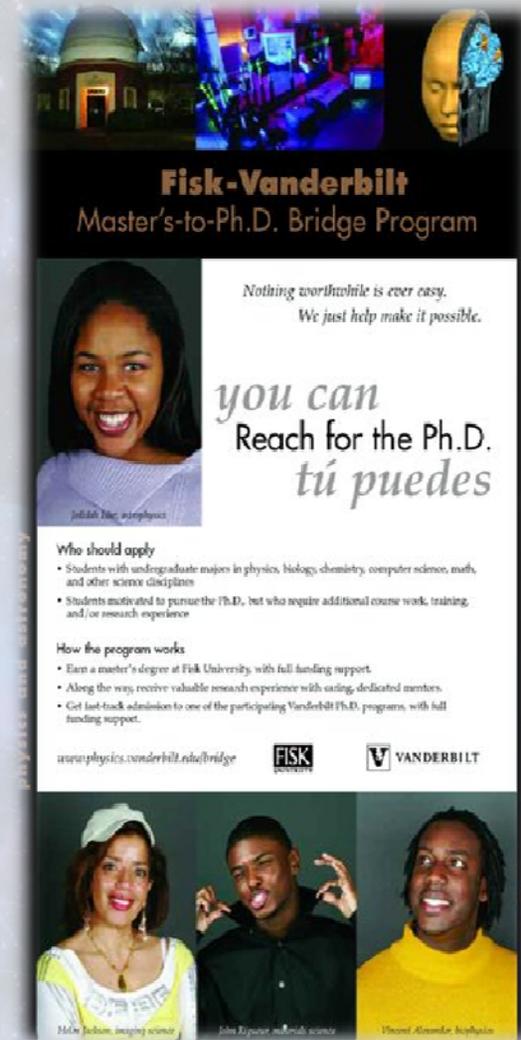
MPS: \$8.3M in FY  
2013 for INSPIRE  
and I-Corps

- INSPIRE
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# Building the Pipeline

- CAREER
  - MPS accounts for 25% of NSF CAREER awards
- MPS AGEP Graduate Research Supplements
  - MPS Dear Colleague Letter



**Fisk-Vanderbilt**  
Master's-to-Ph.D. Bridge Program

*Nothing worthwhile is ever easy.  
We just help make it possible.*

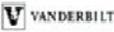
*you can*  
Reach for the Ph.D.  
*tú puedes*

**Who should apply**

- Students with undergraduate majors in physics, biology, chemistry, computer science, math, and other science disciplines
- Students motivated to pursue the Ph.D., but who require additional course work, training, and/or research experience

**How the program works**

- Earn a master's degree at Fisk University, with full funding support.
- Along the way, receive valuable research experience with caring, dedicated mentors.
- Get last-track admissions to one of the participating Vanderbilt Ph.D. programs, with full funding support.

[www.physics.vanderbilt.edu/bridge](http://www.physics.vanderbilt.edu/bridge)  

*Johnnie Mae, astrophysics*

*Melvin Jackson, imaging science* *John Kijouru, materials science* *Theresa Alexander, biophysics*



# Building the Pipeline

- CAREER
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MPS: \$56.7M in CAREER in FY 2013

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*Melvin Jackson, imaging science* *John Kijour, materials science* *Theron Alexander, biophysics*



# MPS Large Facilities in FY 2013

## MPS Funding for Facilities

(Dollars in Millions)

	FY 2012 Plan	FY 2013 Request	Change Over	
			FY 2012 Estimate Amount	Percent
<b>Facilities (Total)</b>	<b>\$260.24</b>	<b>\$263.01</b>	<b>\$2.77</b>	<b>1.1%</b>
Advanced Technology Solar Telescope (ATST)	2.00	2.00	-	-
Atacama Large Millimeter Array (ALMA)	28.61	32.92	4.31	15.1%
Cornell High Energy Synchr. Source (CHESS)	19.67	20.00	0.33	1.7%
GEMINI Observatory	22.07	18.15	-3.92	-17.8%
IceCube Neutrino Observatory (IceCube)	3.45	3.45	-	-
Large Hadron Collider (LHC)	18.00	18.00	-	-
Laser Interfer. Grav. Wave Observatory (LIGO)	30.40	30.50	0.10	0.3%
Arecibo Observatory	5.50	5.00	-0.50	-9.1%
Nat'l High Magnetic Field Laboratory (NHFML)	25.80	31.75	5.95	23.1%
Nat'l Nanotechnology Infra. Network (NNIN)	2.98	2.58	-0.40	-13.4%
Nat'l Optical Astronomy Observatory (NOAO)	25.50	25.50	-	-
Nat'l Radio Astronomy Observatory (NRAO)	43.14	41.00	-2.14	-5.0%
National Solar Observatory (NSO)	9.10	8.00	-1.10	-12.1%
Nat'l Superconducting Cyclotron Lab (NSCL)	21.50	21.50	-	-
Other MPS Facilities <sup>1</sup>	2.52	2.66	0.14	5.6%

Totals may not add due to rounding.



# MPS Large Facilities



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# MPS FY 2013 Budget Request

	FY 2011 Actual (\$M)	FY 2012 Current Plan (\$M)	FY 2013 Request (\$M)	Change FY 2012 to FY 2013 (%)	Change FY 2012 to FY 2013 (\$M)
Division of Astronomical Sciences (AST)	\$236.78	\$234.55	\$244.55	4.3%	\$10.00
Division of Chemistry (CHE)	\$233.55	\$234.06	\$243.85	4.2%	\$9.79
Division of Materials Research (DMR)	\$294.91	\$294.55	\$302.63	2.7%	\$8.08
Division of Mathematical Sciences (DMS)	\$239.79	\$237.77	\$245.00	3.0%	\$7.23
Division of Physics (PHY)	\$280.34	\$277.37	\$280.08	1.0%	\$2.71
<b>MPS Total</b>	<b>\$1,312.42</b>	<b>\$1,308.94</b>	<b>\$1,345.18</b>	<b>2.8%</b>	<b>\$36.24</b>



# MPS FY 2013 Budget Request

OMA: \$30.0M in  
FY 2013

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# Performing as a Model Agency

- Career-Life Balance
  - MPS Dear Colleague Letter
    - No-cost extensions
    - Flexible start dates
    - Supplements for additional personnel
    - Virtual participation in NSF activities
  - Community Outreach and Engagement



One



# One NSF

Questions?