

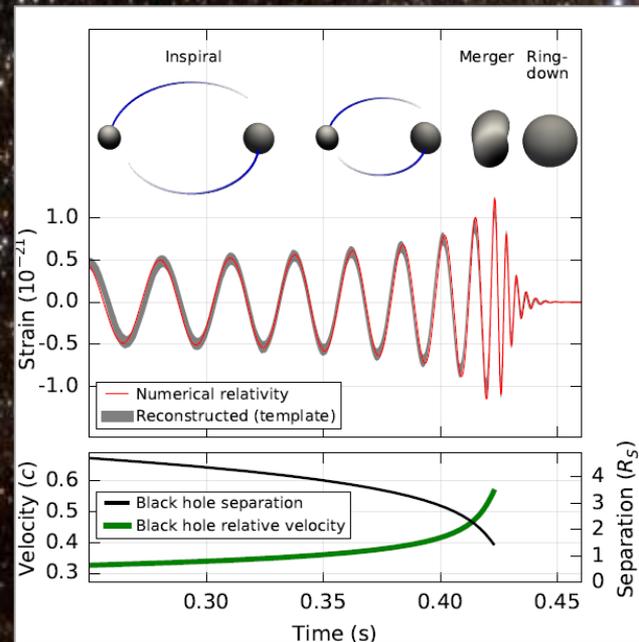
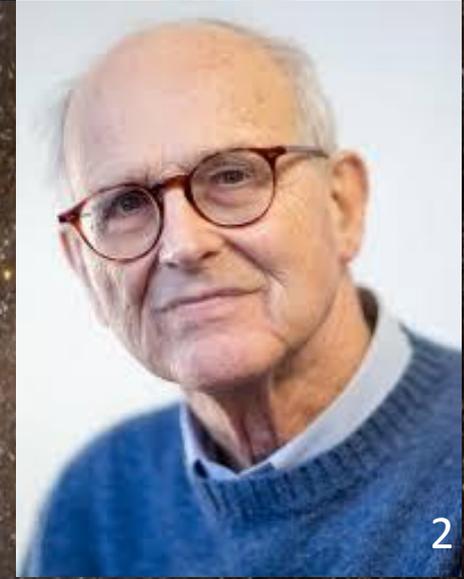
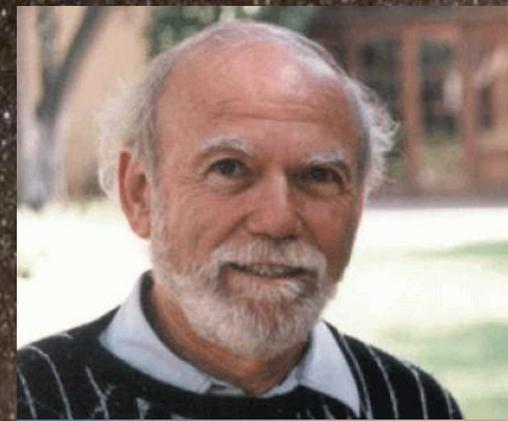
Perspectives from the National Science Foundation

Anne Kinney
Assistant Director
Mathematical and Physical Sciences

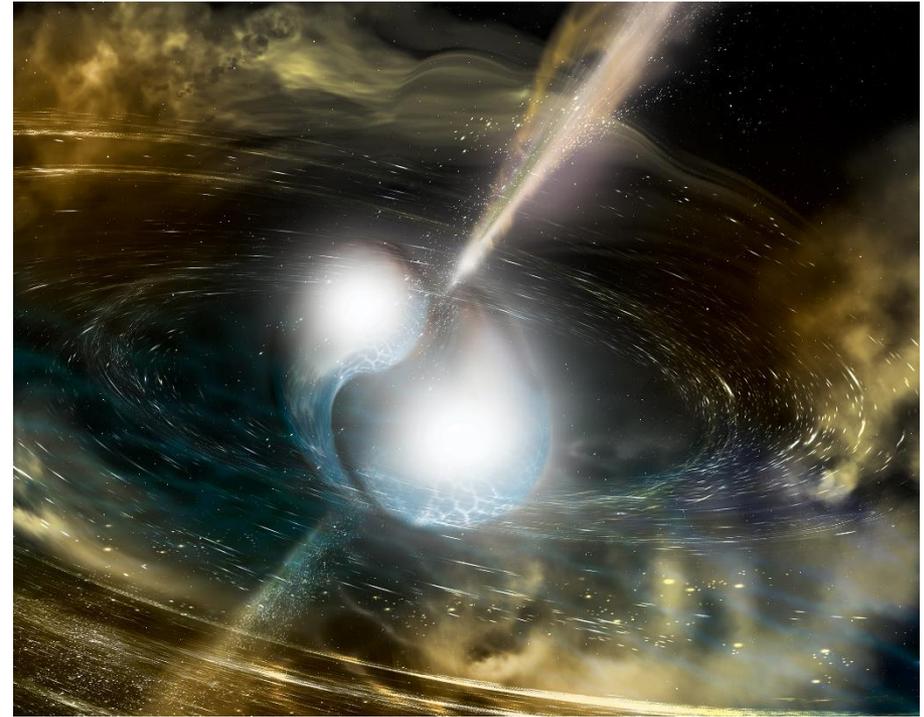
NSAC Meeting
March 12, 2018



LIGO Pioneers Win 2017 Nobel Prize in Physics for Detecting Gravitational Waves



August 2017: LIGO and Virgo make first detection of gravitational waves produced by colliding neutron stars

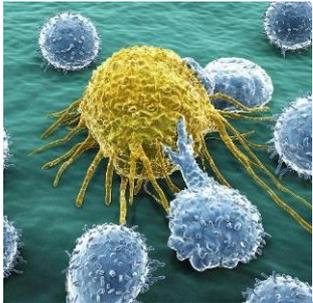


MPS Transitions

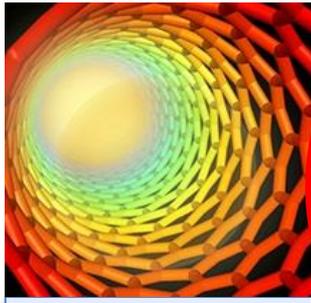
- Anne Kinney began as Assistant Director on January 2, 2018
- Jim Ulvestad, former Acting Assistant Director, is now NSF's Chief Officer for Research Facilities



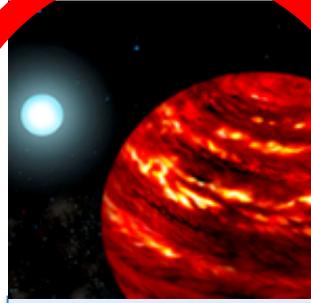
NSF Funds Research and Education across All Fields of Science and Engineering



Biological Sciences



Engineering



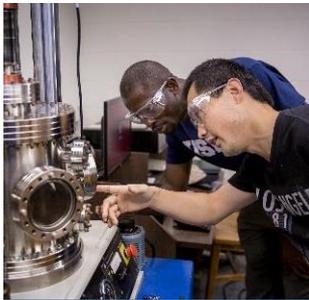
Mathematical & Physical Sciences



Computer & Information Science & Engineering



Geosciences (including Polar Programs)



Integrative Activities



Education & Human Resources



Social, Behavioral & Economic Sciences

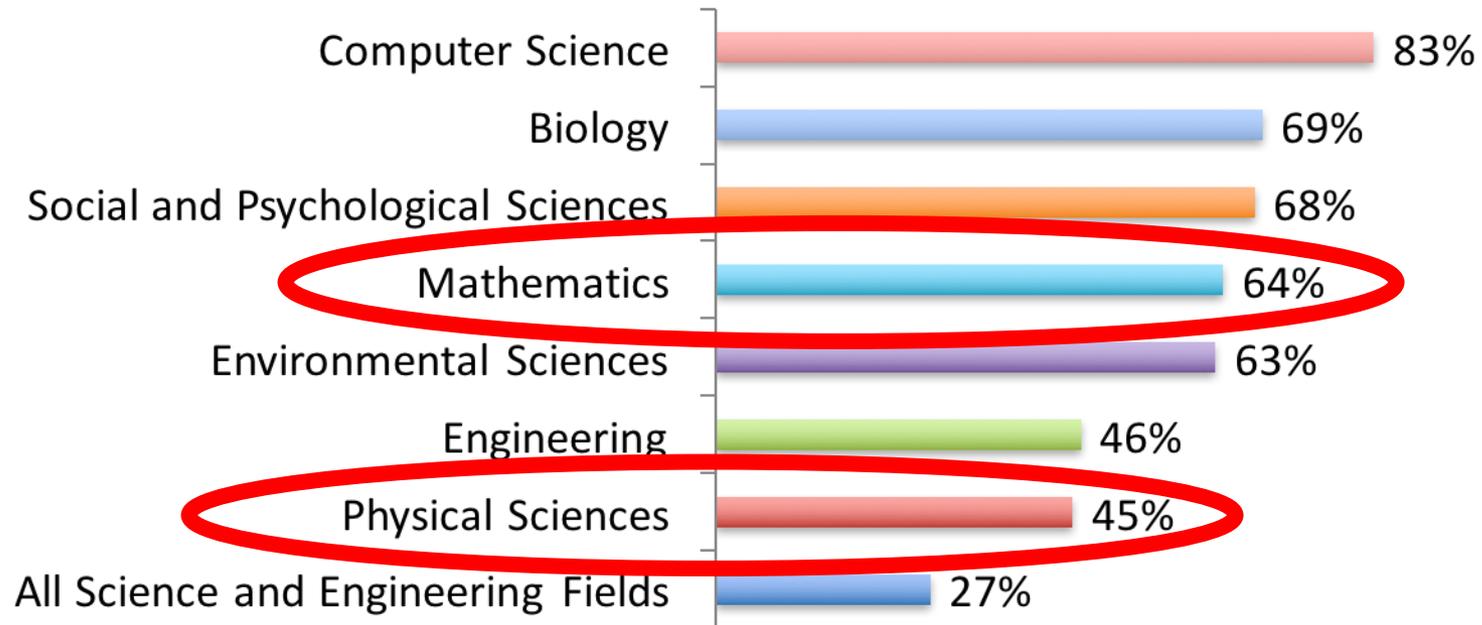


International Science & Engineering



NSF Support of Academic Basic Research in Selected Fields

(as a percentage of total federal support)



Note: Biology includes Biological Science and Environmental Science. Biology and Psychological Sciences exclude National Institutes of Health funding from the total amount of federal support.

Source: NSF/National Center for Science and Engineering Statistics, Survey of Federal Funds for Research and Development



NSF's 10 Big Ideas

RESEARCH IDEAS

- Harnessing the Data Revolution** (circled in red): A word cloud featuring terms like MATHEMATICAL, STATISTICAL, COMPUTATIONAL, FOUNDATIONS, OPEN, EDUCATION, WORKFORCE, ANALYTICS, DATA SCIENCE, FUNDAMENTAL RESEARCH, MACHINE, LEARNING, DATA, CYBERINFRASTRUCTURE, MODELING, DATA MINING, and INTERNET OF THINGS.
- Work at the Human-Technology Frontier: Shaping the Future** (circled in red): Illustrates people interacting with digital screens and data.
- Windows on the Universe: The Era of Multi-messenger Astrophysics** (circled in red): Shows an aerial view of an astronomical observatory.
- The Quantum Leap: Leading the Next Quantum Revolution** (circled in red): Features a quantum circuit diagram with qubits.
- Harnessing Data for 21st Century Science and Engineering**: Shows a close-up of a stone tablet.
- Navigating the New Arctic**: Shows a satellite dish and a snowy landscape.
- Understanding the Rules of Life: Predicting Phenotype**: Shows a hand holding a small green plant seedling.

PROCESS IDEAS

- Mid-scale Research Infrastructure** (circled in red): Shows a large steel truss bridge over the ocean.
- NSF 2026**: Shows silhouettes of human heads with gears and icons representing cognitive processes.
- Growing Convergence Research at NSF**: Shows a network of glowing nodes and connections.
- NSF INCLUDES: Enhancing STEM through Diversity and Inclusion**: Shows a large group of diverse people forming a map of the United States.

The Quantum Leap

Can we go fully quantum?

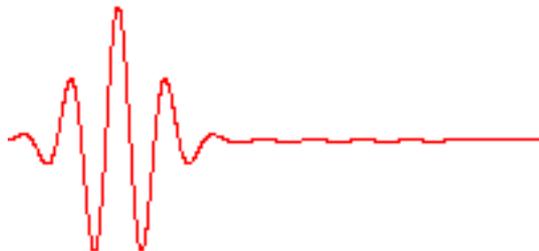
Can we overcome coherence?

If you are not completely confused by quantum mechanics, you do not understand it. -John Wheeler

I do not like it, and I am sorry I ever had anything to do with it. -Erwin Schrödinger

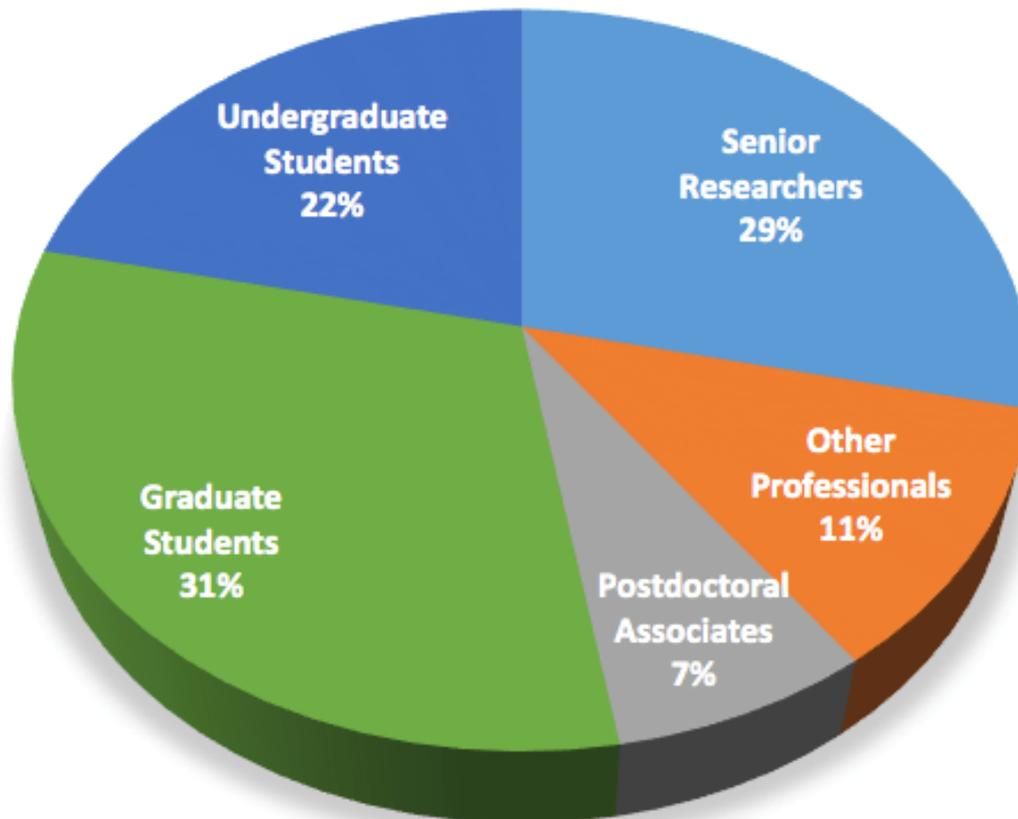
Spooky action at a distance. -Albert Einstein

It is safe to say that nobody understands quantum mechanics. -Richard Feynman



$$i\hbar \frac{\partial}{\partial t} |\Psi(\mathbf{r}, t)\rangle = \hat{H} |\Psi(\mathbf{r}, t)\rangle$$

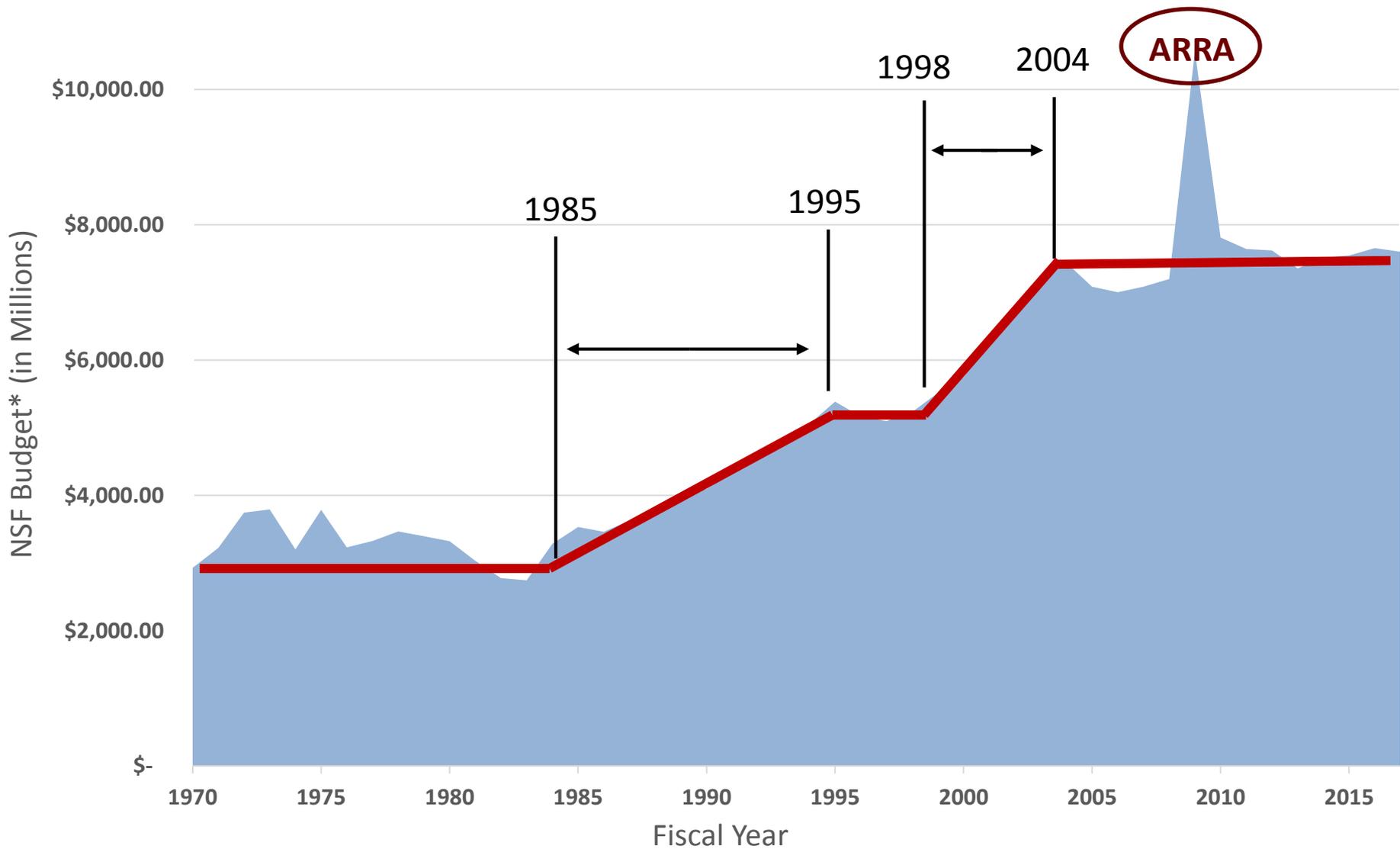
People Do Science: 28,400 People in MPS Activities



FY 2017 numbers



NSF Funding History



*Constant 2017\$

Mathematical and Physical Sciences



FY 2016 – FY 2019 Budget

\$M	FY 2016 Actual	FY 2017 Actual	FY 2018 Request	FY 2019 Request
NSF Total	7494	7504	TBD	7472
NSF R&RA	5998	6007	TBD	6151
MPS	1349	1362	TBD	1345
PHY	277	281	TBD	267



NATIONAL
SCIENCE
FOUNDATION

FISCAL
YEAR
2018

BUDGET
REQUEST



Dr. France A. Córdova
Director, National Science Foundation



wissenschaft sayansi
cia widenskab 科学



FY 2018 Request Update

- FY 2018 funding has been provided by a series of Continuing Resolutions (CR)
 - Current CR expires March 23
 - Operating under an “interim operating plan”
- Processing of awards delayed by late budget and financial closeout requirements



Selected Current Priority Investments: Physics

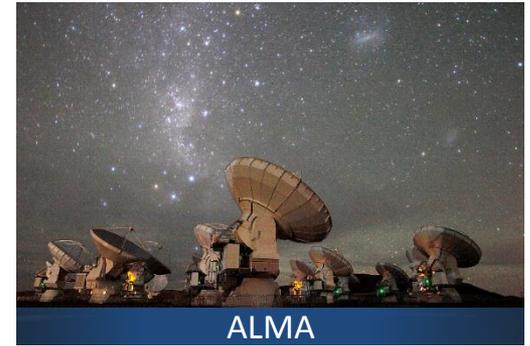
Quantum Leap: Ideas Lab: Agency-wide collaboration that will form teams to develop and operate a practical-scale fully-connected quantum computer for a well-defined science problem. MPS/PHY, ENG/ECCS, CISE/CCF

NSF's Laser Interferometer Gravitational-Wave Observatory (LIGO): Continue building upon and expand learning from detection efforts. Funding of new mirror-coating center as part of enhancing LIGO's sensitivity

Large Hadron Collider (LHC): Design and development of High-Luminosity upgrade

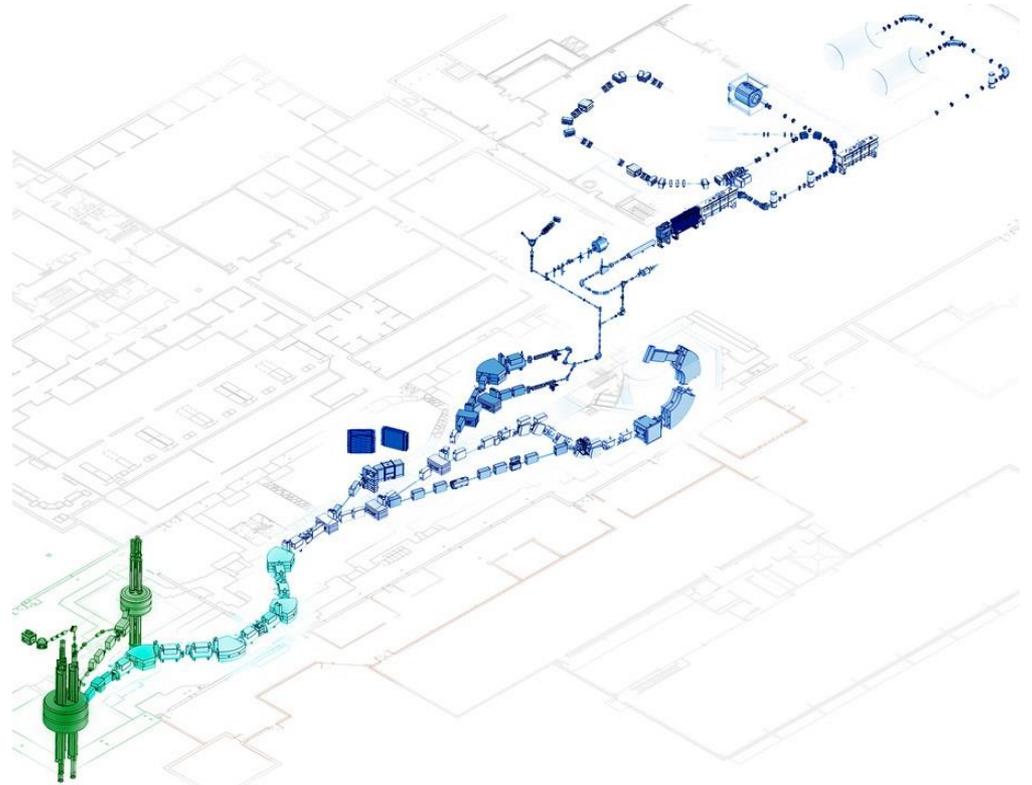


Continued Investment in NSF Research Infrastructure



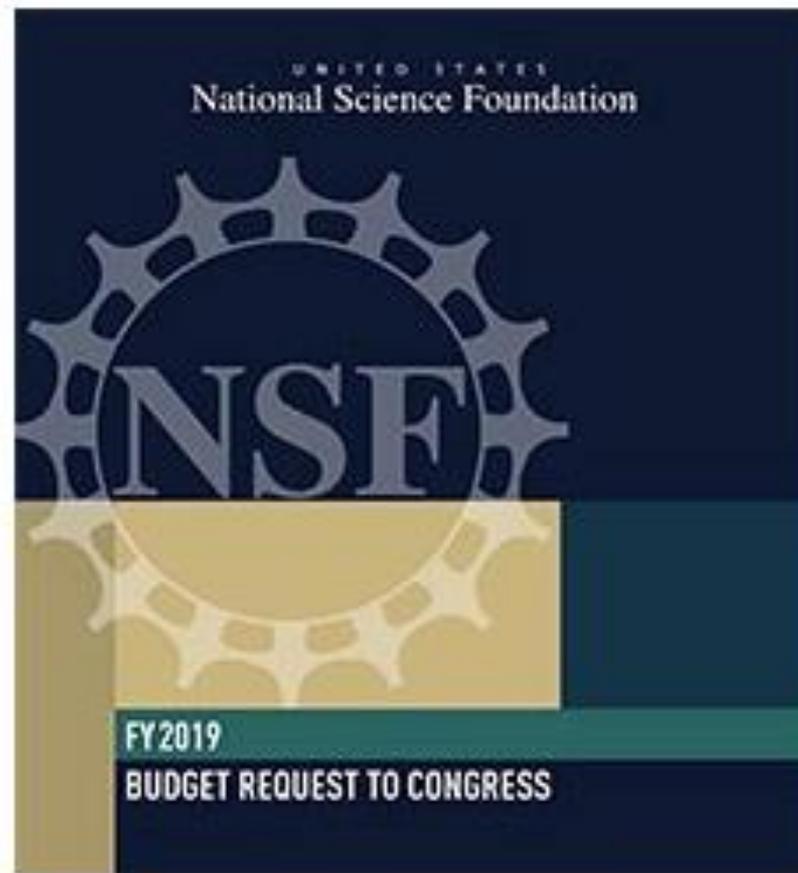
NSCL: Planning for Transfer to DOE FRIB Underway

- ▶ Operation & Maintenance
 - National User Facility
- ▶ Research Program of MSU Nuclear Science Faculty
- ▶ Smooth & Efficient Transfer from NSF/NSCL → DOE/FRIB
 - MOU in Place
 - Regular JOG Discussions
 - Target 2021 for Completion



FY 2019 President's Budget Request

NSF Overall Funding: \$7.47 B



FY 2019 President's Budget Request

- Emphasis on Big Ideas
 - MPS coordinating Windows on the Universe and Quantum Leap
 - Participating in Harnessing the Data Revolution and Mid-Scale
- Continued investment in NSF research infrastructure
- Continue to fund all S&E disciplines
- Support early career
- President's Budget Request: \$7.47 B
 - <1% below FY 17 levels
- International offices to close, but continued engagement



FY 2019 President's Budget Request: MPS Overall Funding: \$1.345 B

MPS Funding (Dollars in Millions)

	FY 2017 Actual	FY 2018 (TBD)	FY 2019 Request	Change over FY 2017 Actual	
				Amount	Percent
Astronomical Sciences (AST)	\$252.05	-	\$230.69	-\$21.36	-8.5%
Chemistry (CHE)	246.24	-	230.58	-15.66	-6.4%
Materials Research (DMR)	314.31	-	295.05	-19.26	-6.1%
Mathematical Sciences (DMS)	233.54	-	218.82	-14.72	-6.3%
Physics (PHY)	281.43	-	266.73	-14.70	-5.2%
Office of Multidisciplinary Activities (OMA)	34.86	-	103.45	68.59	196.8%
Total	\$1,362.43	-	\$1,345.32	-\$17.11	-1.3%



Our Mission from the Beginning



“To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes.”

Picture Credits

- Slide 2:
 - Background image: Geoffrey Lovelace, the Simulating eXtreme Spacetimes Collaboration
 - Graph: LIGO Scientific Collaboration
 - Thorne: <http://mashable.com/2014/11/11/interstellar-kip-thornes-book/#wOchnwdw0iq6>
 - Barish: Caltech
 - Weiss: Physics Today
- Slide 3:
 - Aerial photo: LIGO Laboratory
 - NSF/LIGO/Sonoma State University/A. Simonnet
- Slide 4:
 - Ulvestad: NSF
 - Kinney: NSF/Sandy Schaeffer Photography
- Slide 5: NSF
- Slide 7: NSF
- Slide 12: NSF/Nicolle Rager Fuller
- Slide 15:
 - DKIST: Tom Kekona, K.C. Environmental, Inc
 - LSST: <https://www.lsst.org/gallery/lst-and-calypso>
 - LIGO: LIGO Scientific Collaboration
 - ALMA: ALMA
 - NSCL: Gary Westfall, Michigan State, NSCL
- Slide 16: Michigan State University, National Superconducting Cyclotron Laboratory
- Slide 17: NSF
- Slide 20: NSF

