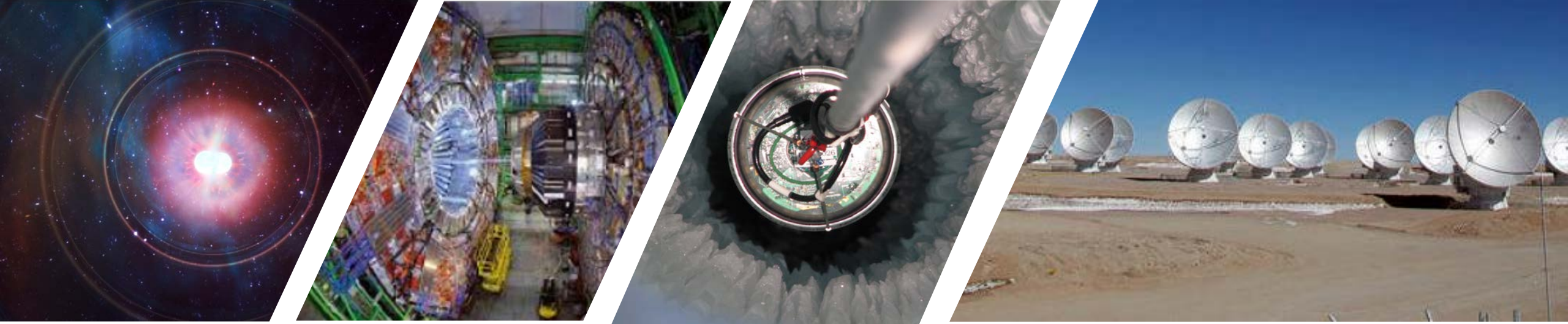




Astro 2020
October 22, 2019

Anne Kinney
Assistant Director
National Science Foundation

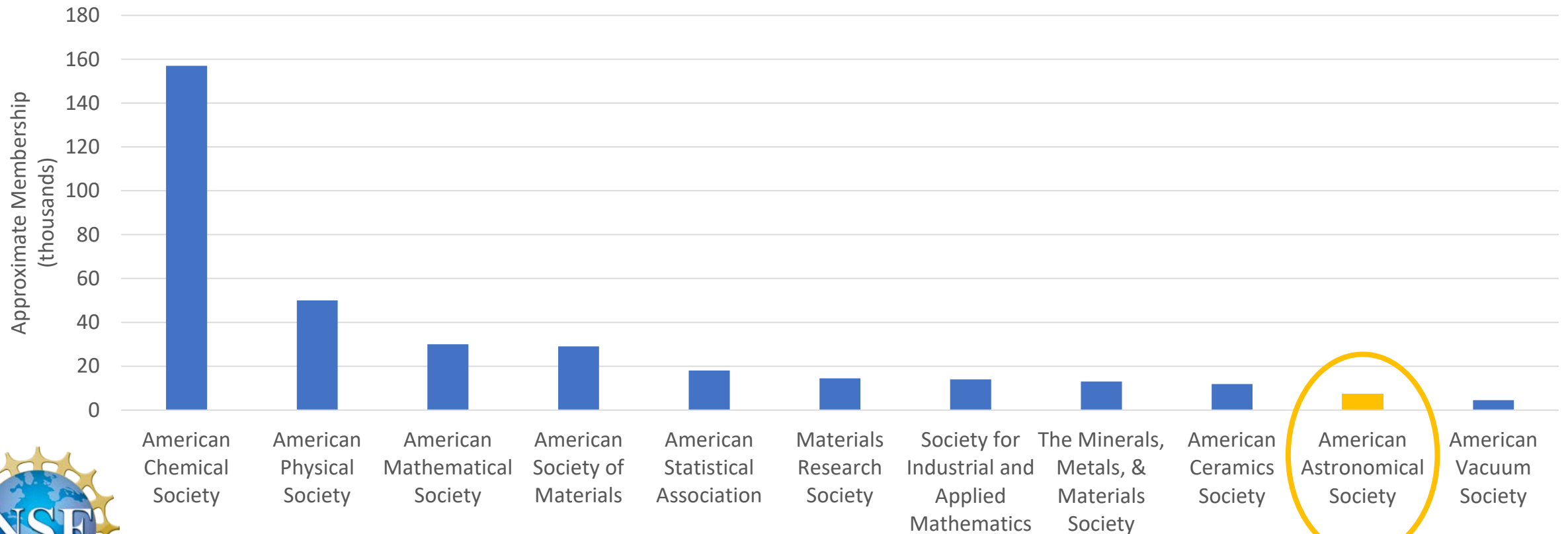


MPS Funding Distribution (Dollars in millions)

FY 2018 Actuals			
Astronomical Sciences (AST)	\$	311.16	
Physics (PHY)	\$	310.75	
Materials Research (DMR)	\$	337.14	
Chemistry (CHE)	\$	246.29	
Mathematical Sciences (DMS)	\$	237.69	
Office of Multidisciplinary Activities (OMA)	\$	60.39	
Total		\$1,503.41	



Professional Organizations Served by NSF/MPS



*overlaps in membership not accounted for



Astronomy: Small Community, Big Discovery Space

Of 54 Physics Nobel Laureates since 2000:

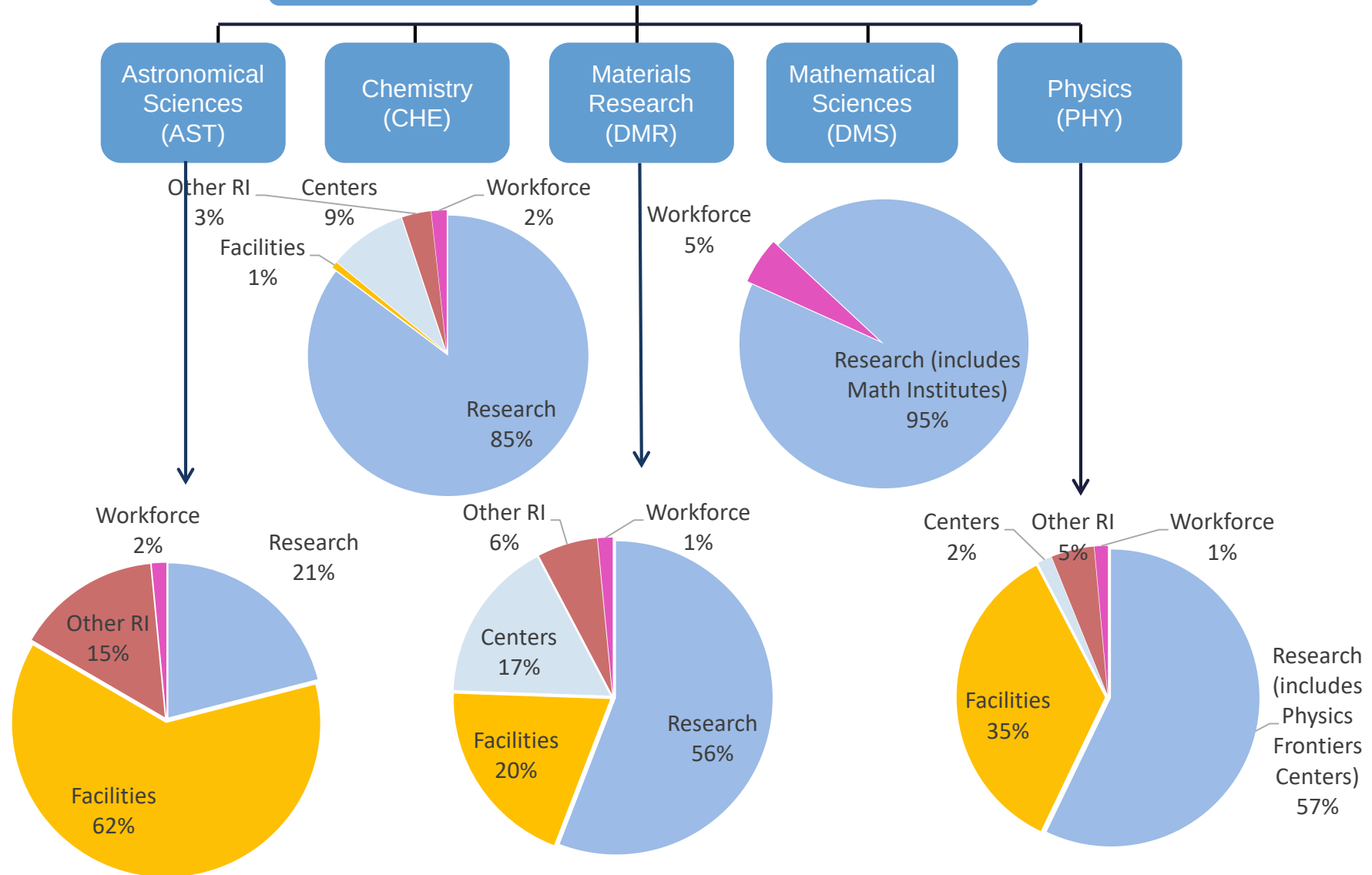
32 supported by NSF (59%)

13 awards for astrophysics (11 with NSF support)



FY 2018

Mathematical and Physical Sciences (MPS)

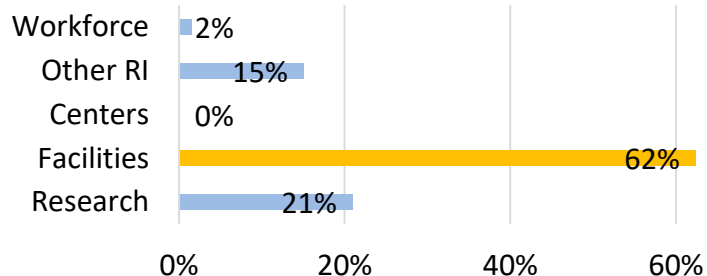


Source: FY 2018 Actuals Data

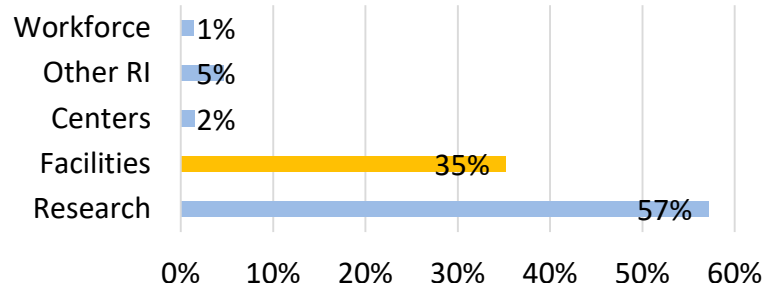


Facilities Portfolio Balancing (FY18)

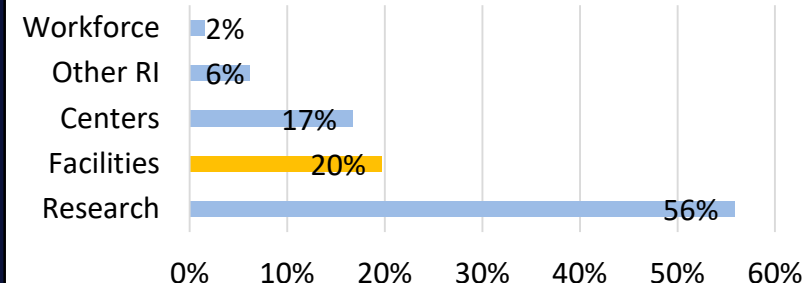
AST (\$311.16 million)



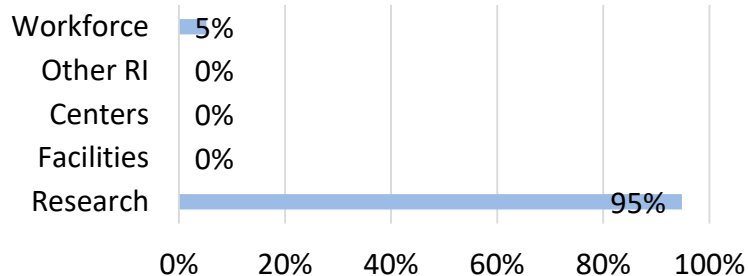
PHY (\$310.75 million)



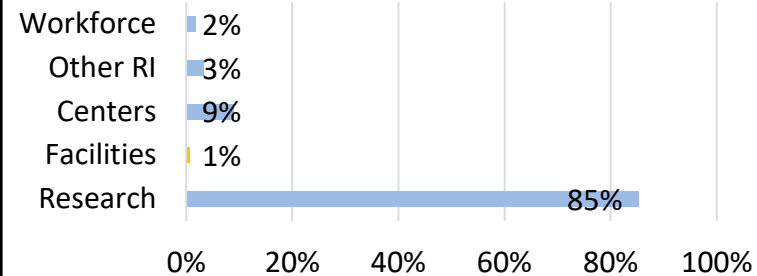
DMR (\$337.14 million)



DMS (\$237.69 million)

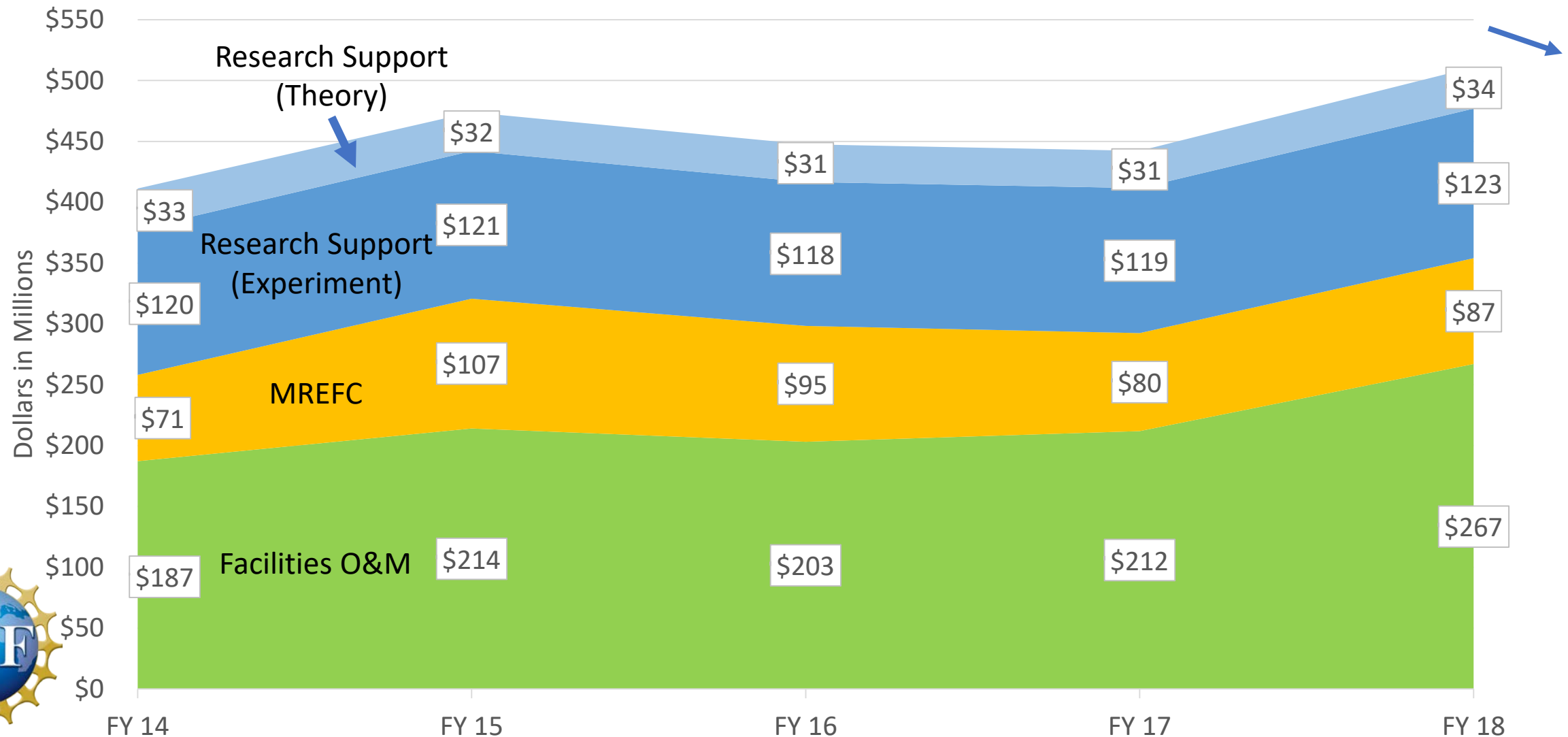


CHE (\$246.29 million)

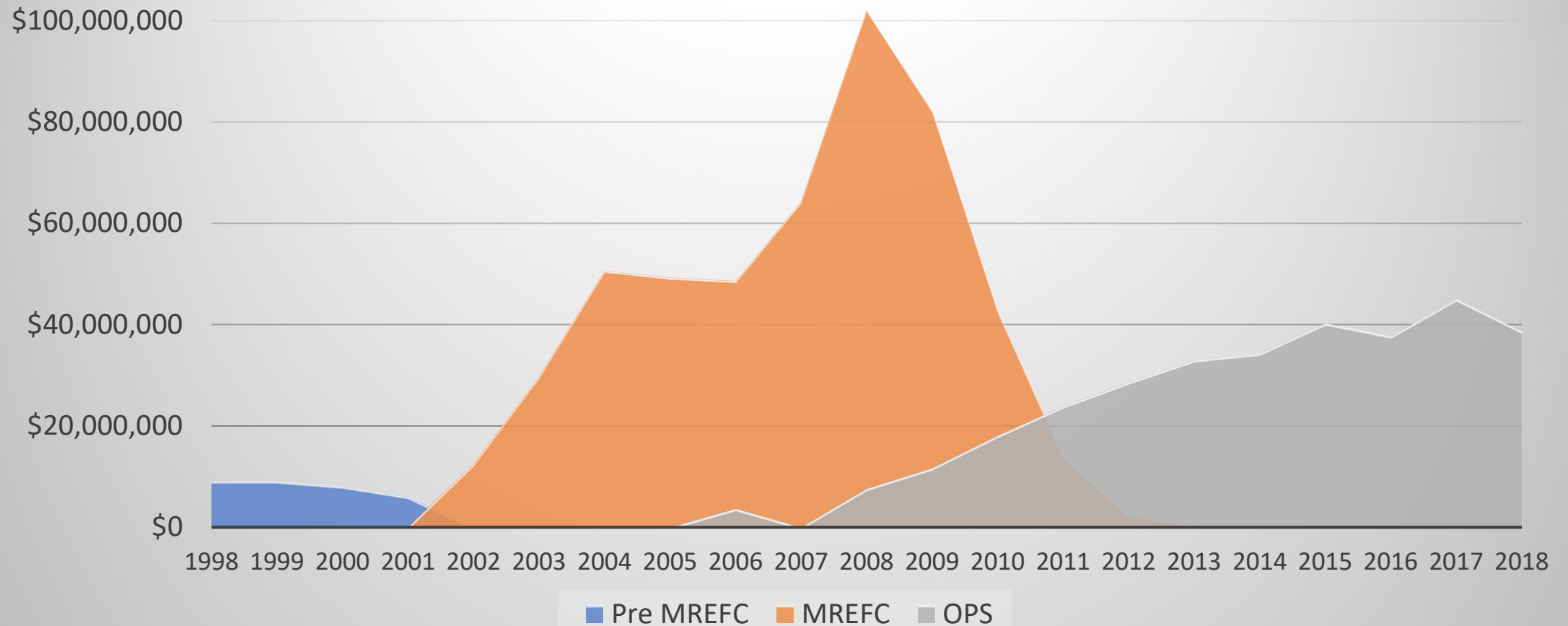


Total NSF Astrophysics Support (Combined data from AST/PHY/OPP)

MPS Total Appropriation
FY 18: \$1,503.41 M
FY 19: \$1,475.34 M
△ -\$28.07 M



ALMA Funding Sources



Funding Models

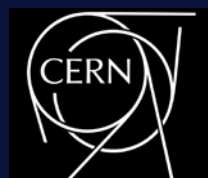
Partners in Astronomy and Astrophysics

Public

International



Private



Inter-agency Model (selected examples)

Shared expenses for ops of VERITAS

- NSERC (Canada) also contributes



- Ops of Mayall 4m telescope
- LSST Construction



- 7 year grant for planetary radar to Arecibo
- Collaboration on solar and space physics modeling
- Partnership on exoplanet science, NASA funding new spectrograph
- Plasma research with ISS



Support for VLBA antenna

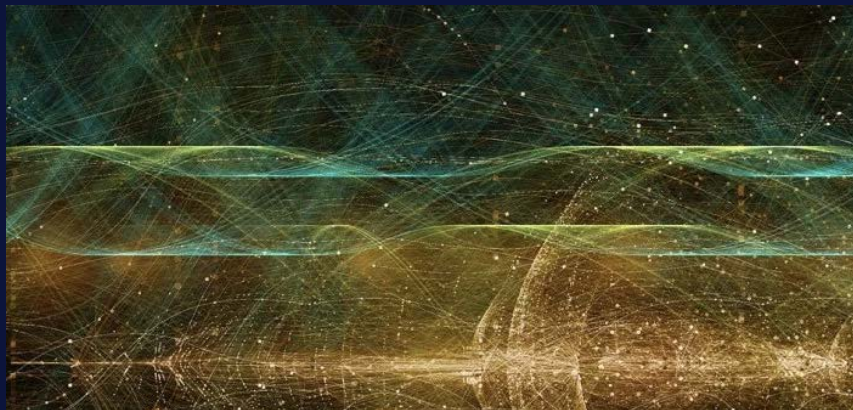


Support of GONG



Additional partnerships with and without formal agreements

Public-private Model



- **Breakthrough Foundation** contributes \$2 M (17%) of GBO costs with roughly 20% of available time on GBT dedicated to Breakthrough Listen (SETI)
- NSF partners with the **Simons Foundation** to support four Research Centers for Mathematics of Complex Biological Systems (MathBioSys)
- Starting in FY18, each partner contributes \$20M for a period of 5 years to support a total of \$10 M per center

International Model



- International shared facilities (Gemini, ALMA, LSST) require close partnerships
- Lead agency agreements
- LIGO-VIRGO network



Lead Agency Opportunities

U.S. and international researchers submit a single collaborative proposal that undergoes a single review process. All proposals must fall within the mission and funding parameters of NSF and the international funding counterpart.

Lead Agency Opportunities

- Typically agency with majority of research/funding reviews the proposal
- One-way – One agency accepts all proposals regardless of where the “weight” of the research/funding lies

Active Lead Agency Opportunities

- Germany
- Ireland
- Israel
- Japan
- United Kingdom



More information here: <https://www.nsf.gov/od/oise/IntlCollaborations/index.jsp>

Data Science Interactions

- Longstanding partnership between MPS and NSF's **Office of Advanced Cyberinfrastructure (OAC)** enables funding for data science, including projects in astronomy and astrophysics
 - FY18 DCL: Scalable Cyberinfrastructure to Accelerate Data-Driven Science and Engineering Research
- **Community Science and Data Center (CSDC)**, first created by NOAO, now part of NOARL represents 15 years of leadership in AST data initiatives (Data Lab, ANTARES...)



Data science solicitations available to astronomers

- National **Artificial Intelligence (AI) Research Institutes**: Accelerating Research, Transforming Society, and Growing the American Workforce NSF 20-503
- Cyberinfrastructure for Sustained Scientific Innovation (CSSI) NSF 19-548
- Training-based Workforce Development for Advanced Cyberinfrastructure (CyberTraining) NSF 19-524
- **Harnessing the Data Revolution (HDR)**: Institutes for Data-Intensive Research in Science and Engineering - Ideas Labs (I-DIRSE-IL) NSF 19-543
- **Harnessing the Data Revolution (HDR)**: Institutes for Data-Intensive Research in Science and Engineering - Frameworks (I-DIRSE-FW) NSF 19-549
- Big Data Regional Innovation Hubs: Establishing Spokes to Advance Big Data Applications (BD Spokes) NSF-17-546
- **Astronomy and Astrophysics Research Grants (AAG) NSF 18-575**



Examples of Astrophysics Data Science Support from NSF

Supplemental funds in FY 18 (\$7 M over 2 years) went to DKIST for creation of Level 2 data products

Approximately 50% of \$60 M O&M budget for LSST is allocated for data projects

6 years of support for **La Serena School for Data Science**



Related FY19 Awards

- \$2.8 M from OAC for **Scalable Cyberinfrastructure Institute for Multi-Messenger Astrophysics (SCIMMA)** (part of HDR and WoU programs)
- \$600 K to develop **code for multiphysics problems in astrophysics at exascale**
- \$900 K for **machine learning research on data from LIGO and LHC**

Future of Data Archiving

AAAC has recommended NSF develop a policy for data archiving and distribution for observatories beyond the lifetime of projects

NSF recognizes need to provide a careful examination of long-term curation/migration costs for data holdings like the LSST archive. Data curation/archiving is an issue in multiple disciplines, not just AST.

NSF-wide **Strategy Committee for Cyberinfrastructure** is being convened to identify and address areas of cross-cutting need for CI and provide input on (re)structuring NSF investments in CI

2019 NSF Workshop on Connecting Large Facilities and Cyberinfrastructure

September 16-17, 2019
The Alexandrian Hotel
480 King St, Alexandria, VA 22314



Home



Surveys



Steering
Committee



Agenda



Attendees



2017
Workshop

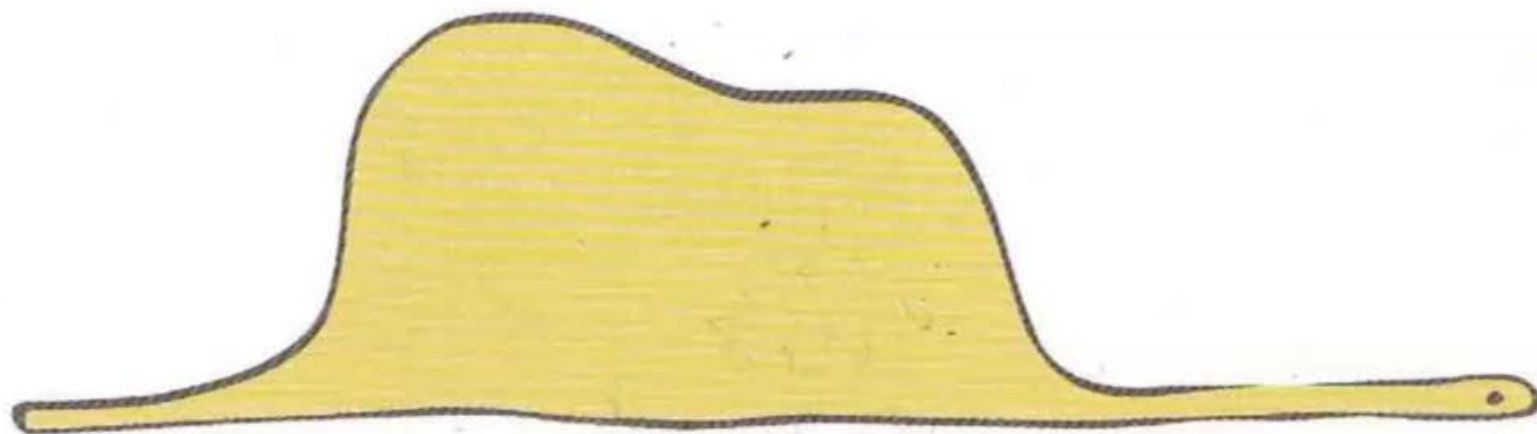
Workshop Goals

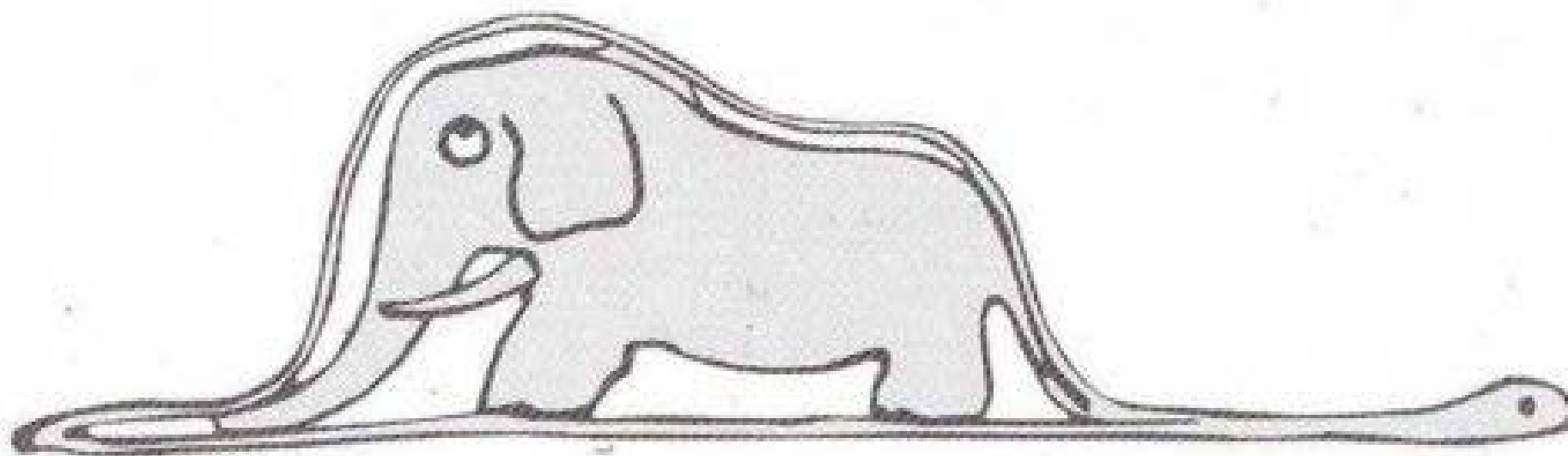
- Identify common CI challenges for facilities
- Understand the facility data lifecycle and issues
- Build a facility-aware CI community
- Exchange experience and practices.
- Explore opportunities for joint training of CI staff.



Website: <http://facilitiesci.org/>

Workshop report later this fall.







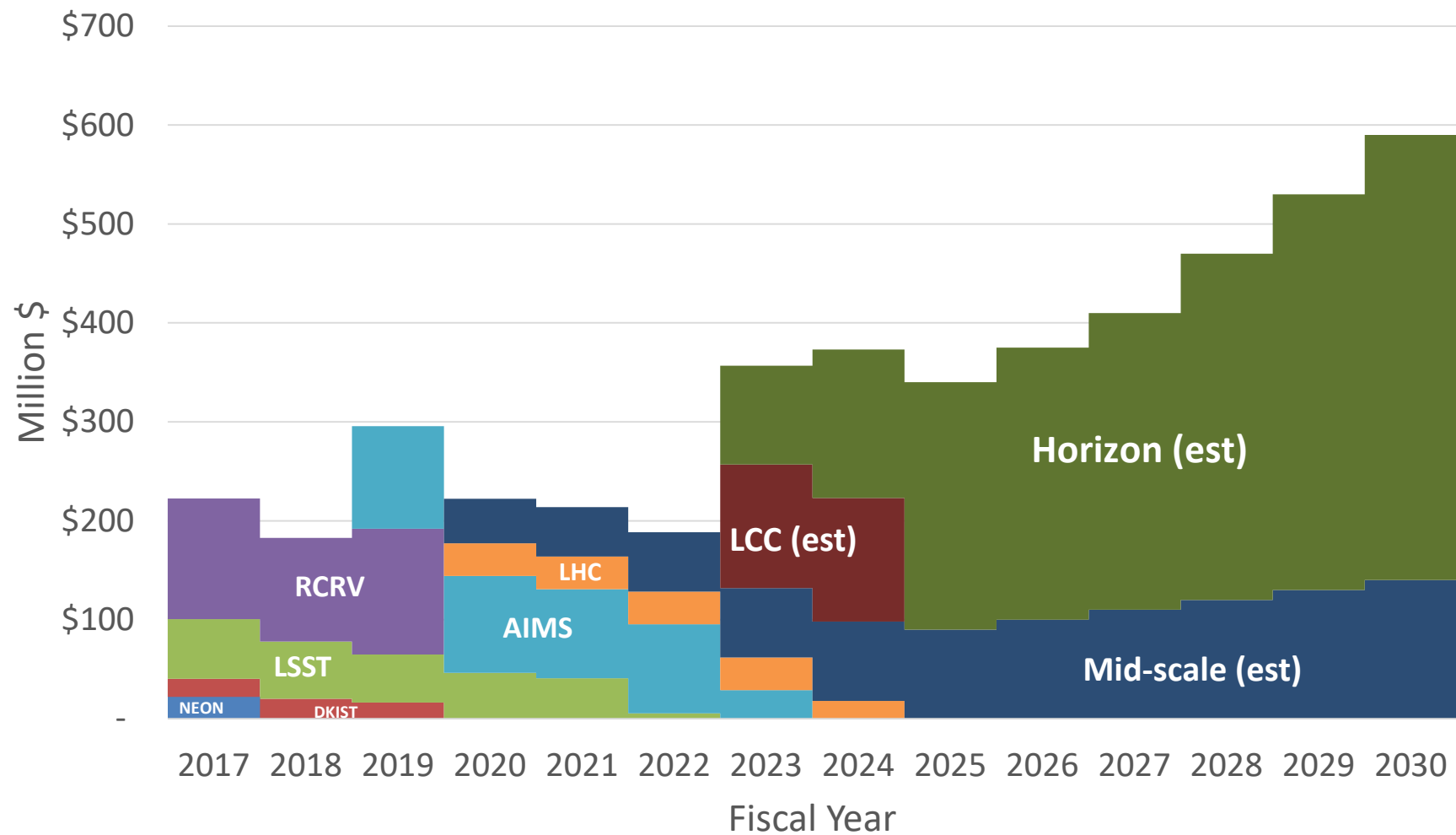
Credit: Soonthorn Wongsaita/Shutterstock.com

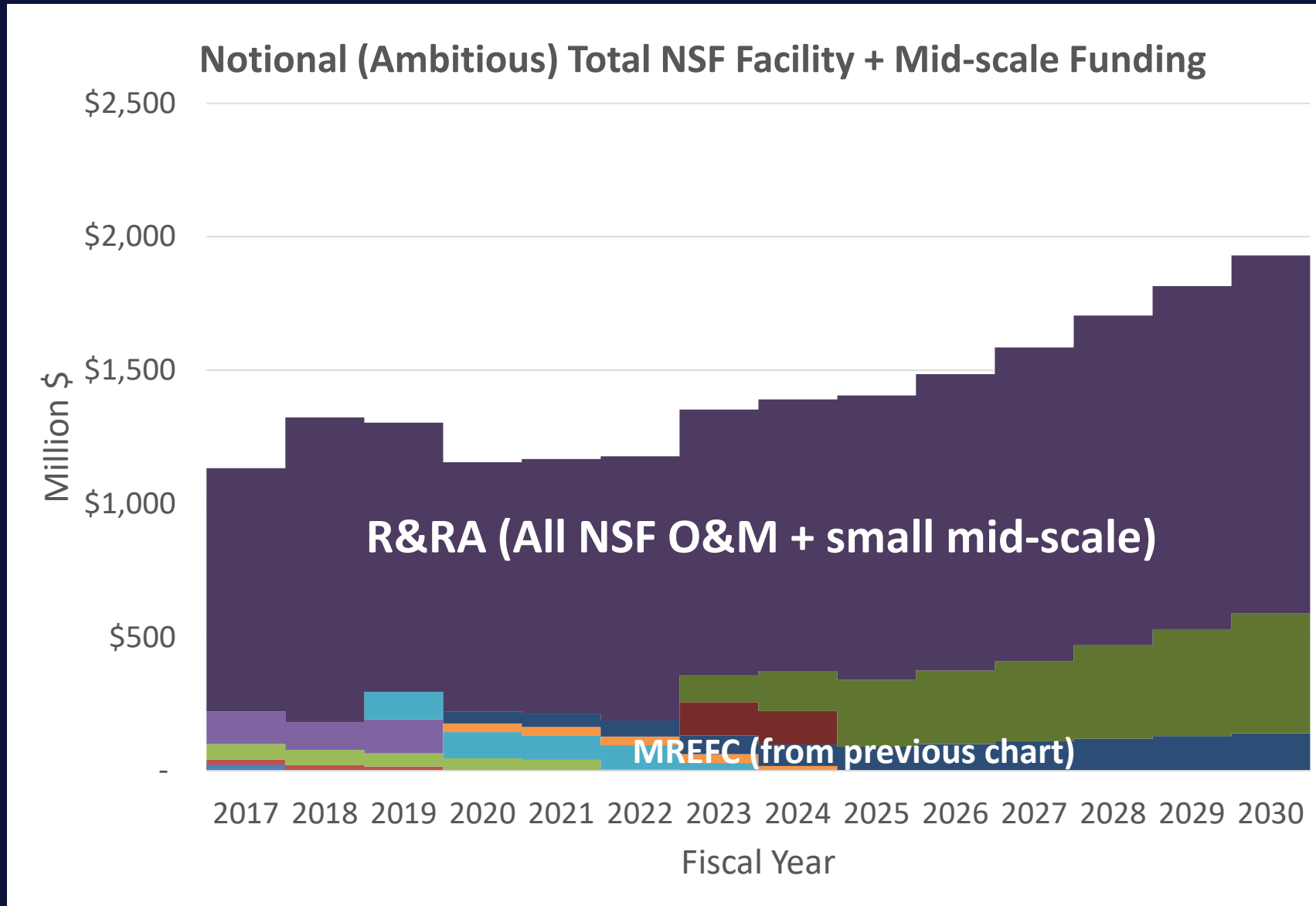
Backup Slides





Notional (Ambitious) Future NSF MREFC Account Profile





NSF 20-503, October 8, 2019

National Artificial Intelligence (AI) Research Institutes: Accelerating Research, Transforming Society, and Growing the American Workforce



- The National AI Research Institutes program – a joint effort of NSF, USDA-NIFA, DHS S&T, DOT FHWA, and the VA – will fund Institutes comprising scientists, engineers, and educators united by a common focus on advancing the research frontiers in AI.
- Submissions to the **Planning** track are encouraged in any areas of foundational and use-inspired research appropriate to NSF and its partner organizations. Proposals for the **Institute** track must have a principal focus in one or more of the following themes
 - Trustworthy AI;
 - Foundations of Machine Learning;
 - AI-Driven Innovation in Agriculture and the Food System;
 - AI-Augmented Learning;
 - AI for Accelerating Molecular Synthesis and Manufacturing; and
 - AI for Discovery in Physics.
- Proposal Deadlines:
 - **January 28, 2020** (for Institute proposals in one of the six specified themes)
 - **January 30, 2020** (for Planning proposals)