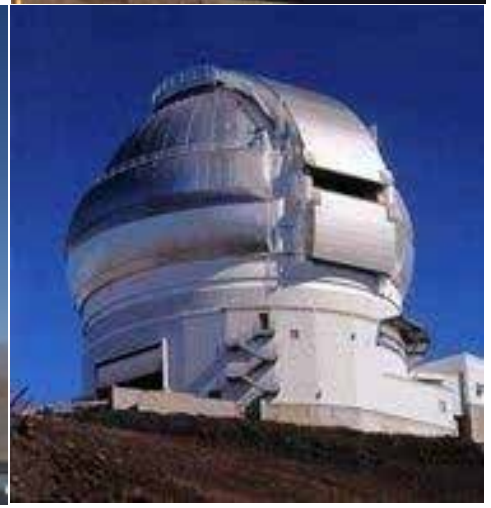
NSF Discussion with CAA

Ralph Gaume

Division Director, MPS/AST

November 26, 2019



Talk Outline

- AST Personnel
- AST Program Funding
  - FY 2019
  - FY 2020 prospects
- Facility life-cycle costs: Operations
- NSF's National Optical-Infrared Astronomy Research Laboratory
- LSST update
  - SpaceX/Starlink
- Astro 2020

AST Personnel

Division of Astronomical Sciences (AST)

Office of the Division Director


Ralph Gaume
Division Director


James Neff
Deputy Division Director (Acting)


Craig McClure
Program Support Manager


Donna O'Malley
Financial & Operations Specialist


Elizabeth Pentecost
Project Administrator

Administration


Matthew Viau
Program Analyst


Allison Farrow
Program Analyst


Renee Adonteng
Program Assistant

Individual Investigator Programs (IIP)


James Neff
Program Director
IIP Coordinator


Richard Barvainis
Program Director
Extragalactic Astronomy & Cosmology (EXC)


Glen Langston
Program Director
Galactic Astronomy


Harshal Gupta
Program Director
Astronomy & Astrophysics Postdoctoral Fellowships


Linda French
Program Director
CAREER; Planetary Astronomy; ESP


Nigel Sharp
Program Director
AAG; CDS&E; cross-NSF programs


Hans Krimm
Program Director
Stellar Astronomy & Astrophysics


Peter Kurczynski
Program Director
Advanced Technologies & Instrumentation; EXC; MRI


Matthew Benacquista
Program Director
REU; EXC; ESP


Kenneth Johnston
Expert
CAREER; AAG

Facilities, Mid-Scale, & MREFC Projects


Christopher Davis
Program Director
Gemini Observatory


Joe Pesce
Program Director
National Radio Astronomy Obs.; ALMA


David Boboltz
Program Director
National Solar Observatory; DKIST


Edward Ajhar
Program Director
Large Synoptic Survey Telescope


Ashley Zauderer
Program Director
Arecibo Observatory


Richard Barvainis
Program Director
Mid-Scale Innovations Program (MSIP)


Luke Sollitt
Program Director
Planetary Astronomy


Harshal Gupta
Program Director
Green Bank Observatory

ESM


Jonathan Williams
Program Director


Ashley Zauderer
Program Director

AST Program Funding

FY2019 enacted and FY2020 prospects

AST Division Programs

Individual Investigators

- AAG
- * CAREER
- AAPF
- ATI
- * MRI
- * REU

* NSF Wide

Mid-scale

- MSIP
- * MSRI

Education and Special Programs

Facilities

- ALMA
- NRAO
- Gemini
- NOAO
- LSST
- Arecibo
- NSO & DKIST
- GBO

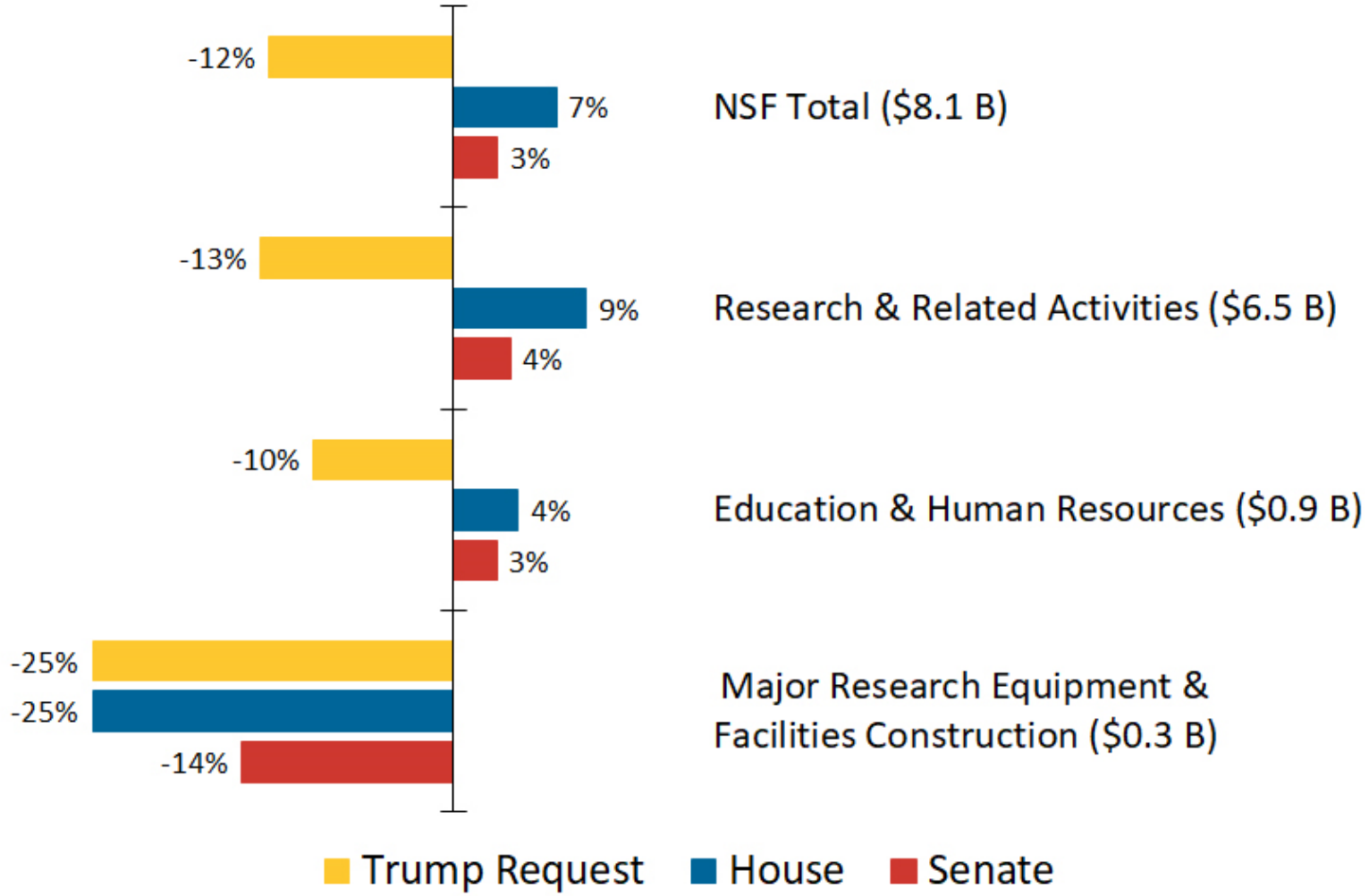
} NSF's OIR Lab

NSF FY 2019 Budget

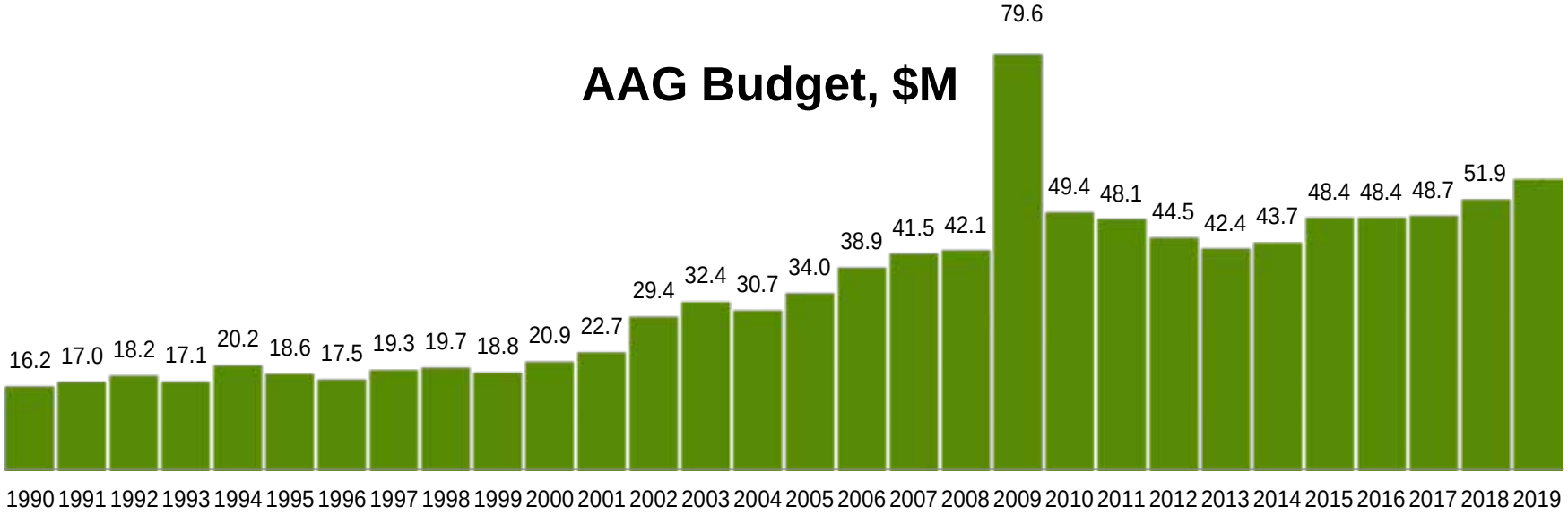
- Enacted Foundation appropriation increases R&RA by 3%.
- MREFC line re-incorporates Antarctic infrastructure; DKIST (final year, Ops begin June 2020) and LSST at requested levels.
- NSF's bill was not under consideration for passage before the end of FY 18, so operations after October 1, 2018 were under a Continuing Resolution until Dec 21st.
- Major 35-day shutdown challenge for NSF was maintaining flow of funds to facilities awardees, particularly those with Chilean labor contracts. OMB allowed cash draws for previously allocated funding, unlike the 2013 shutdown.
- FY 2019 detailed AST budget will be released late CY2019 or early CY2020 once budget accounts are reconciled and validated.

FY20 Budget Proposals: National Science Foundation

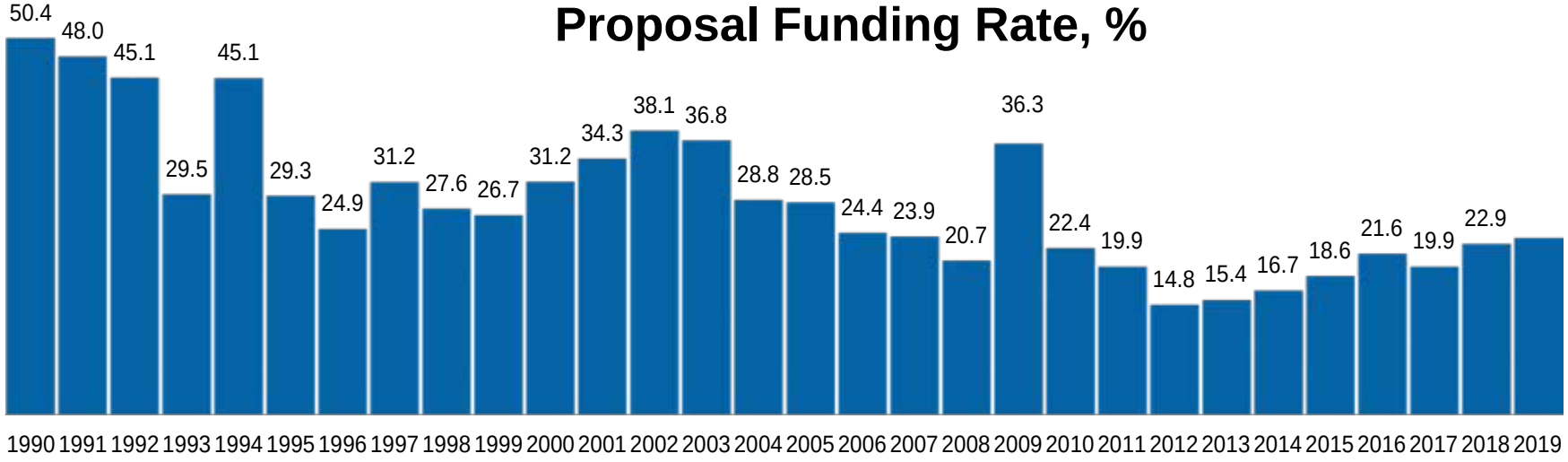
$ in ( ) are the FY19 enacted



AAG Budget, $M



Proposal Funding Rate, %



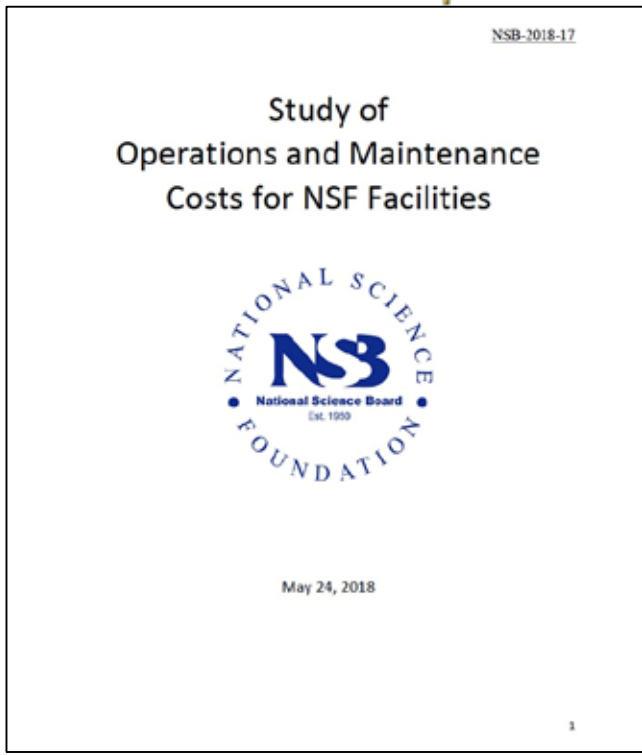
Facility Life-cycle Costs

NSF Major Facility Life-Cycle Costs

- Initial Facility Development work may be funded by individual NSF programs: e.g. LSST, ngVLA, etc., by AST.
- Facility Construction funded by MREFC account.
- Heretofore, Operations new Facilities were entirely the responsibility of individual NSF programs (e.g. AST).
- Previous operations funding policy transitioning.

NSF Major Facility Life-Cycle Costs

- NSB: Study of O & M costs for NSF Facilities May 2018
- Responds to a request from Congress
- Recommendations:
  - Enhance Agency-level ownership of the facility portfolio
  - Reexamine the budget share devoted to research infrastructure
  - Develop model funding and governance schemes for the next generation of partnerships


NSB-2018-17

Study of
Operations and Maintenance
Costs for NSF Facilities

May 24, 2018

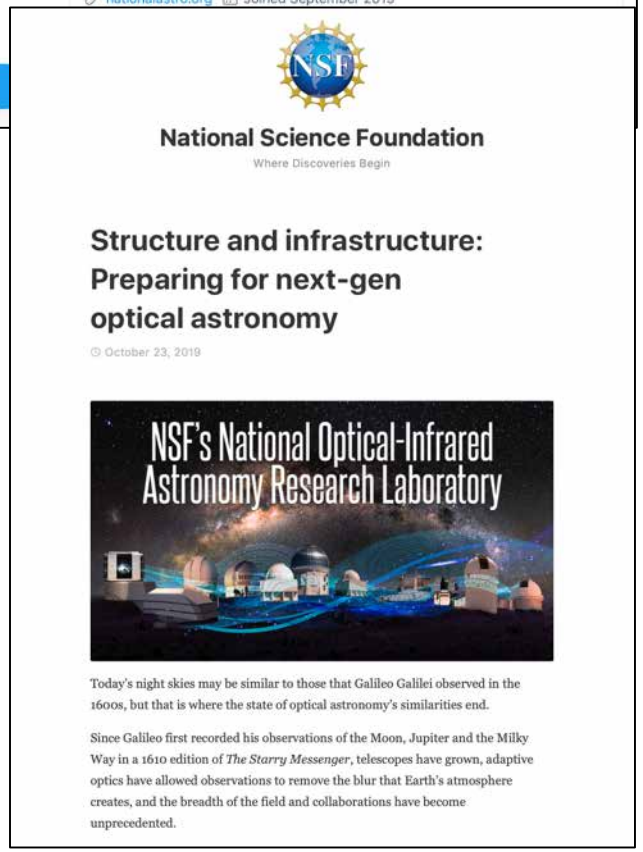
- Notional O&M funding wedge through FY 2030 presented in Astro 2020 section of this briefing.

NSF's National Optical-Infrared Astronomy Research Laboratory


AURA
HOME
CENTERS
NEWS
ABOUT
RESOURCES
CAREERS
DIVERSITY
Oct 1
NSF's National Optical-Infrared Astronomy Research Laboratory Launched
Major NSF Astronomy Initiative starts 1 October 2019
NSF's National Optical-Infrared Astronomy Research Laboratory
Telescopes from the five infrastructures Credit: National Optical-Infrared Astronomy Research Laboratory/AURA/NSF/P. Marenfeld
Leer en español
On 1 October 2019, the nighttime astronomy facilities supported by the National Science Foundation (NSF) transitioned to operating as one organization, NSF's National Optical-Infrared Astronomy Research Laboratory. The new organization operates five scientific programs: Cerro Tololo Inter-American Observatory, the Community Science and Data Center, Kitt Peak National Observatory (all formerly known as the National Optical Astronomy Observatory); Gemini Observatory and the upcoming Large Synoptic Survey Telescope, and is managed by the Association of Universities for Research in Astronomy.
The National Science Foundation (NSF) and the Association of Universities for Research in Astronomy (AURA) are proud to announce the launch of integrated operations of all of NSF's
Release Images
NSF's National Optical-Infrared Astronomy Research Laboratory


NSF's National Optical-Infrared Astronomy Research Laboratory
ABOUT
PROGRAMS
RESEARCH
NEWS
OUTREACH
DIVERSITY
Discovering Our Universe Together
About NSF's OIR Lab


Home
Explore
Notifications
Messages
Bookmarks
Lists
Profile
More
Tweet
NSF's OIR Lab
55 Tweets
NSF's National Optical-Infrared Astronomy Research Laboratory
Following
NSF's OIR Lab
@NatOIRLab
NSF's National Optical-Infrared Astronomy Research Laboratory is the US national center for ground-based, nighttime optical and infrared astronomy.
nationalastro.org
Joined September 2019


National Science Foundation
Where Discoveries Begin
Structure and infrastructure: Preparing for next-gen optical astronomy
October 23, 2019
NSF's National Optical-Infrared Astronomy Research Laboratory
Today's night skies may be similar to those that Galileo Galilei observed in the 1600s, but that is where the state of optical astronomy's similarities end.
Since Galileo first recorded his observations of the Moon, Jupiter and the Milky Way in a 1610 edition of The Starry Messenger, telescopes have grown, adaptive optics have allowed observations to remove the blur that Earth's atmosphere creates, and the breadth of the field and collaborations have become unprecedented.

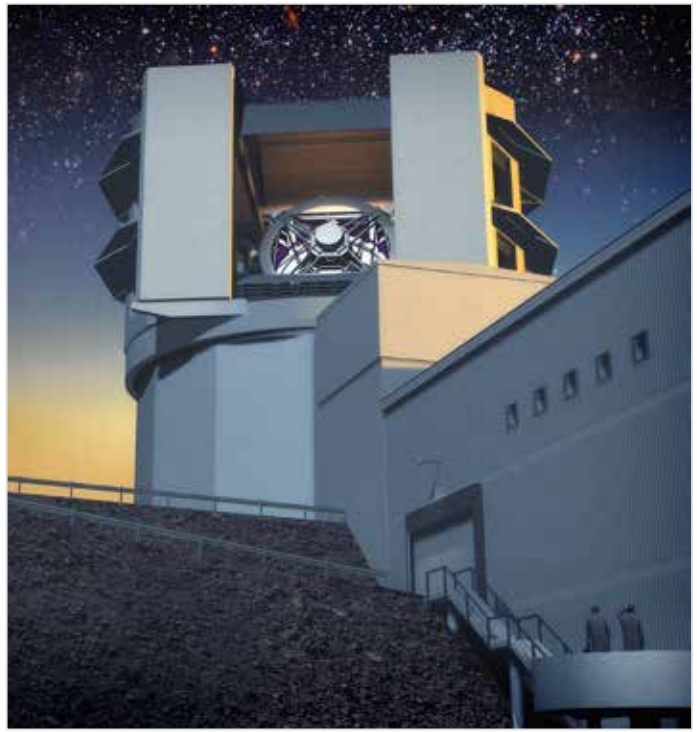

NSF's National Optical-Infrared Astronomy Research Laboratory-- National Optical Astronomy Observatory (NOAO), Gemini Observatory, and Large Synoptic Survey Telescope (LSST) operations -- under a single organizational framework, managed by one management organization as an FFRDC.
• Inauguration/kick off on 1 Oct 2019.
• Joint NSF/AURA press release to mark the event.
• LSST operations received initial funding in FY 2019.
• Pat McCarthy, Director

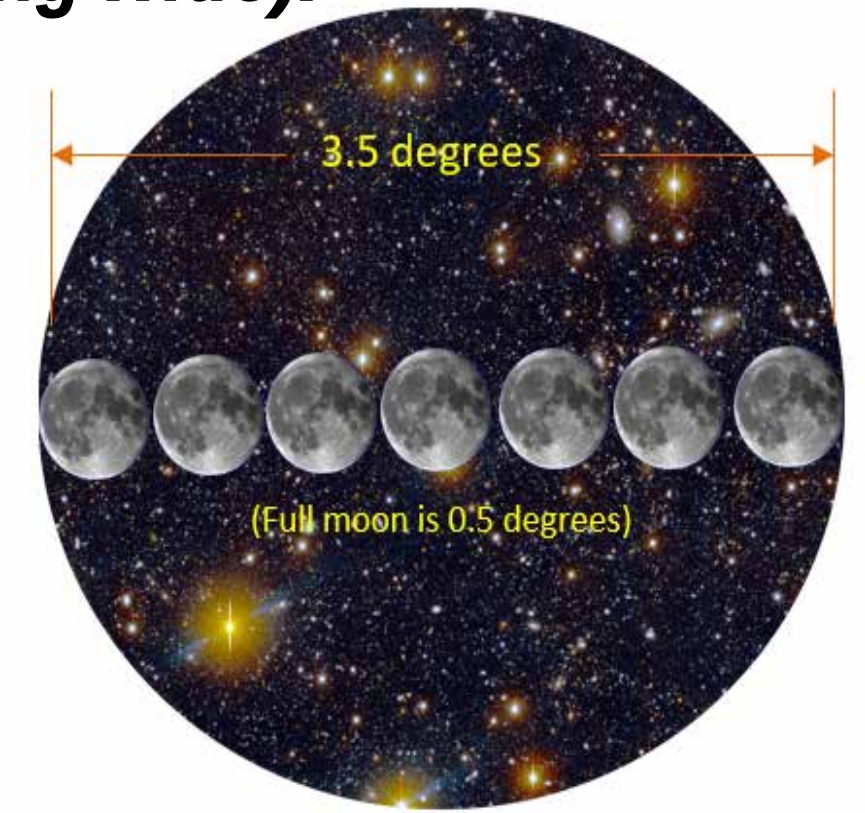
LSST Update

LSST: Opening a Window of Discovery on the Dynamic Universe

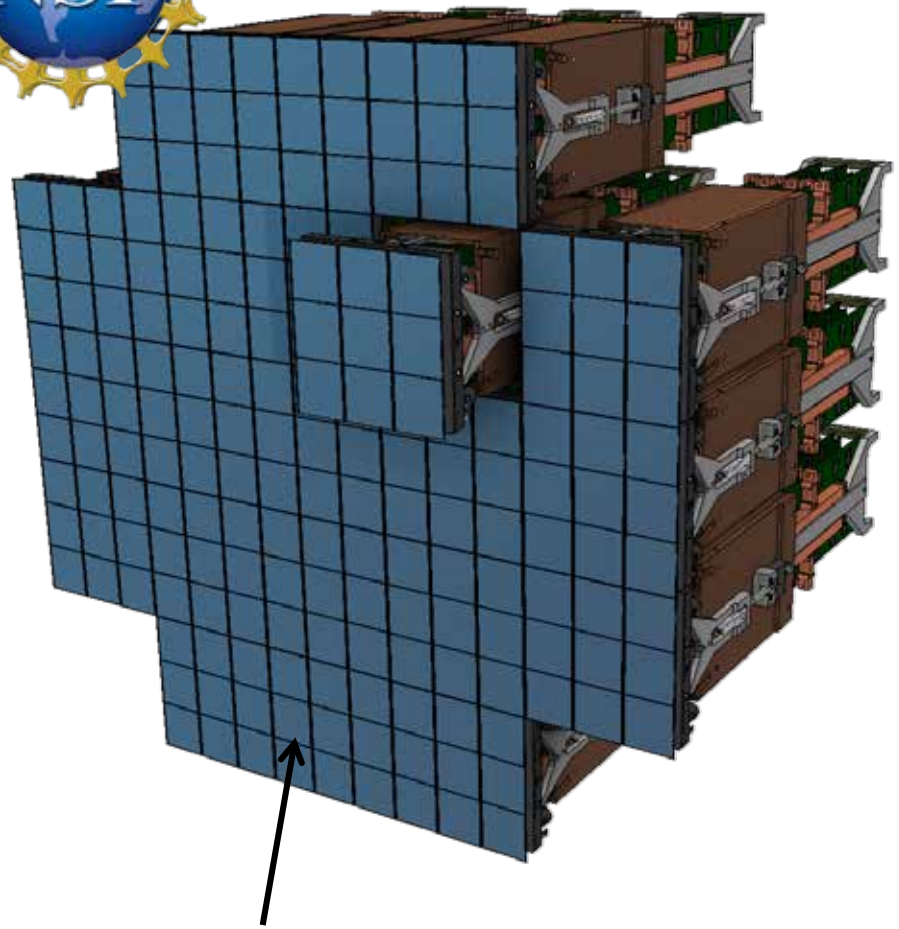
What Makes LSST a Discovery Engine?

Large primary mirror allows ***going deep (faint)***.
Large Field of View allows rapid surveying of the entire sky every few nights ***(going wide).***





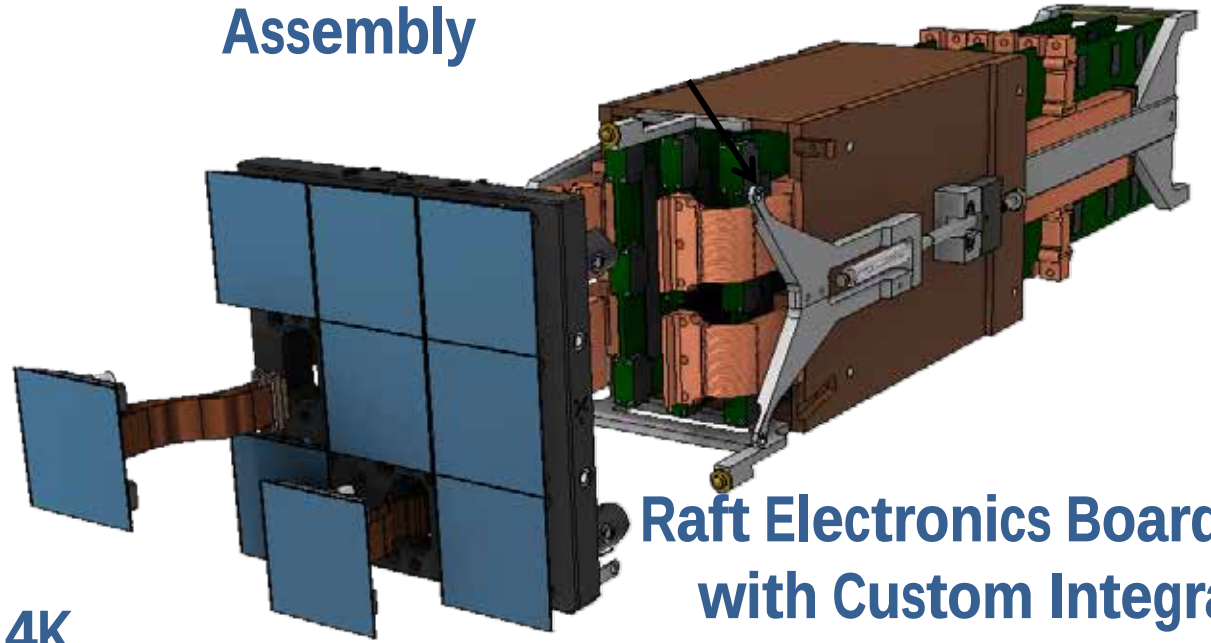
What Makes LSST a Discovery Engine?



189 sensors packed in 21 rafts of 9 sensors = 3.2 Gpix

Exquisite sampling of the Field of View with World's Largest Astronomical Camera

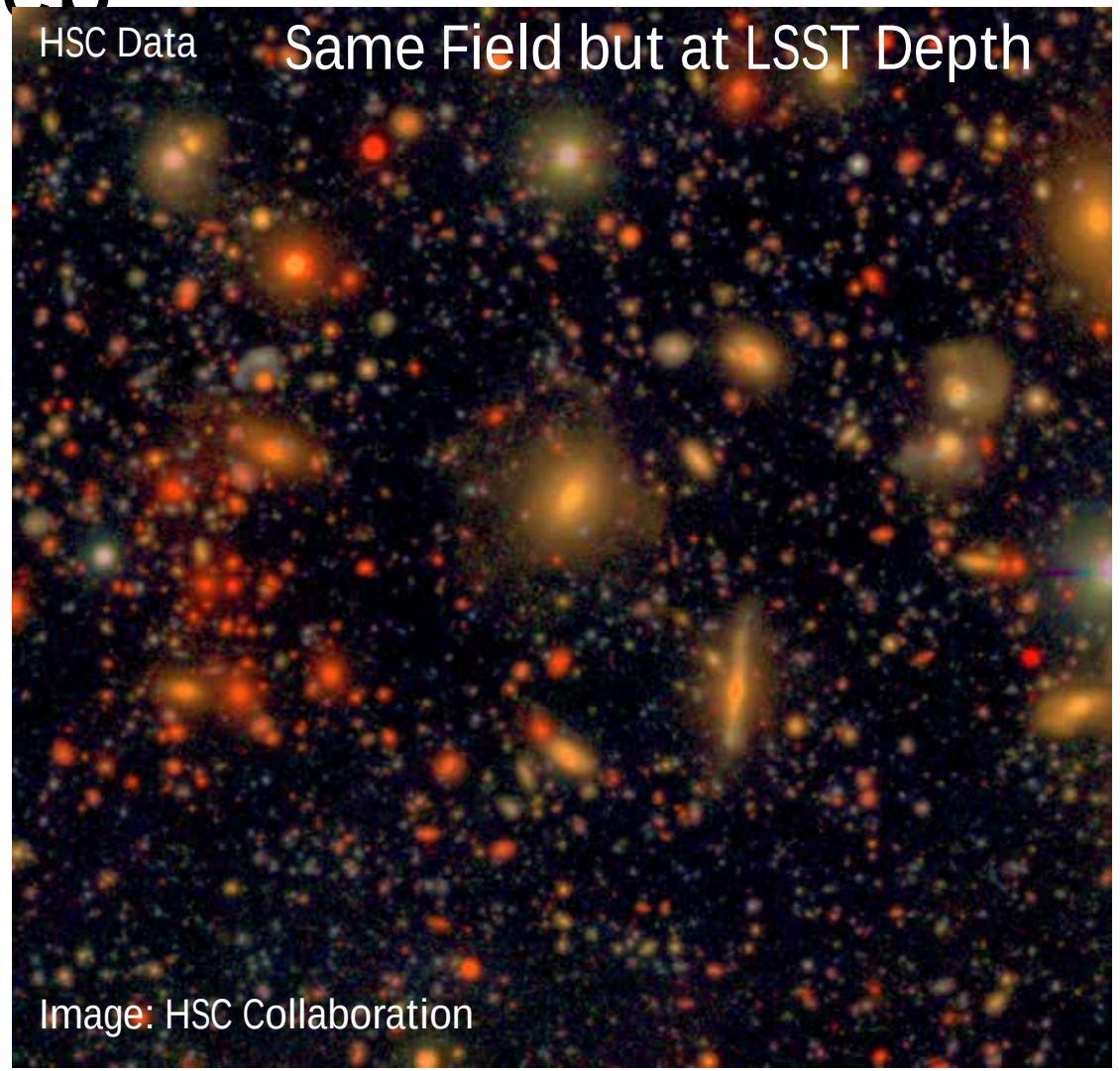
Raft Sensor Assembly



4K x 4K Science Sensor

Raft Electronics Board (REB) with Custom Integrated circuit

LSST Going Wide and Deep



Four Science Goals

Dark Matter, Dark Energy

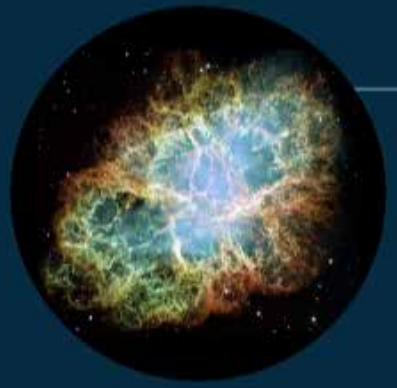
Mapping Galaxies through space and time

Cataloging the Solar System

Potentially Hazardous Asteroids

Milky Way Structure & Formation

Understanding our home galaxy



Exploring the Transient sky

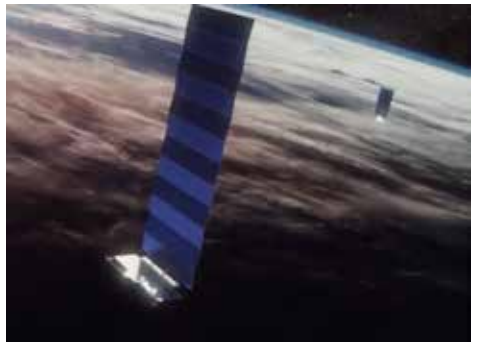
Revolutionizing time domain astrophysics

LSST Sept 20, 2019

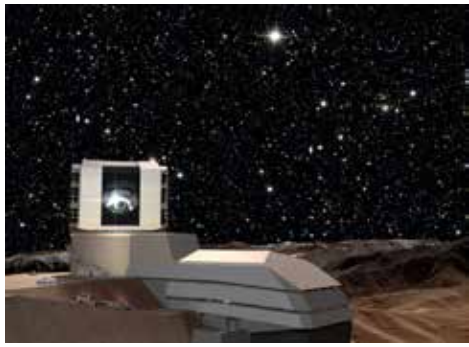
Evolution of Operations Planning

- Original funding operations model revised
  - Originally included 25% international cash contributions
  - New model eliminates foreign cash contributions
  - New model will consider in-kind contributions
- Revised operations proposal to be submitted spring 2020
  - Will baseline approx. 50/50 split between NSF and DOE for operations
- AURA and SLAC in consultation with NSF and DOE developing details of process to obtain, evaluate, consider, and approve in-kind contributions from international participants
  - Letter of Intent for in-kind contributions (November 2019)
  - Invited full proposals recommended to NSF and DOE (Spring 2020)
  - Deadline to convert original monetary contributions to in-kind (June 2021)

Starlink and LSST



- AAS, IAU, LSST project, NSF all working the issue of satellite light pollution.
  - Regulatory process exists for radio spectrum mgmt
- Tony Tyson NAS BPA presentation to NAS Nov 21.
  - All Observatories affected, but LSST is the limiting case.
  - Starlink trails near saturation can induce multiple orders of CCD crosstalk plus other effects.



- SpaceX has initiated an active dialogue with the astronomical community aimed at characterizing, measuring and minimizing the light pollution effects of the Starlink constellation on optical astronomy
- In the near term, LSST is working directyly with SpaceX to measure the effects of various mitigation techniques, both operational and design-related

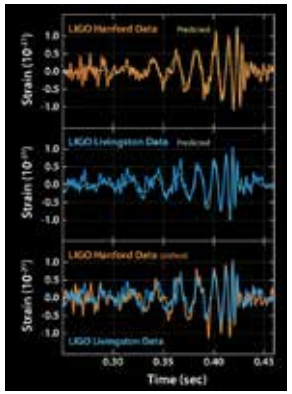
Astro 2020

Astro 2020 decadal survey

- Planning is now well underway for input to the next Astronomy & Astrophysics Decadal Survey.
- NSF/AST and NASA Astrophysics Division are the primary sponsors of the survey. DOE Cosmic Frontier in the Office of Science is also a sponsor.
- NSF is including all ground-based astrophysics (i.e., gravitational wave detection and astro-particle detection) for scientific consideration, not limited to AST.
- AST is supporting development of three major projects, two through activities in national centers, and one through a continuing series of grants. OPP/PHY support a fourth.
- AST does not explicitly support preparation of mid-scale proposals for Decadal submission via a dedicated solicitation, but may support this through the AST MSIP solicitation and/or the MSRI program

NSF: Astro 2020

Ralph Gaume
Saul Gonzalez
Vladimir Papitashvili



NSF Goals for Astro2020

- Astro2020 will be most effective if it is *aspirational, inspirational,* and *transformative.*

- Astro2020 will be most effective if it is based on *community consensus science priorities*.

- The agencies are the *customers*. Astro2020 will be conducted independently of the customer, but must provide *recommendations, clear priorities,* and *actionable advice* to the customer.

NSF Goals for Astro2020

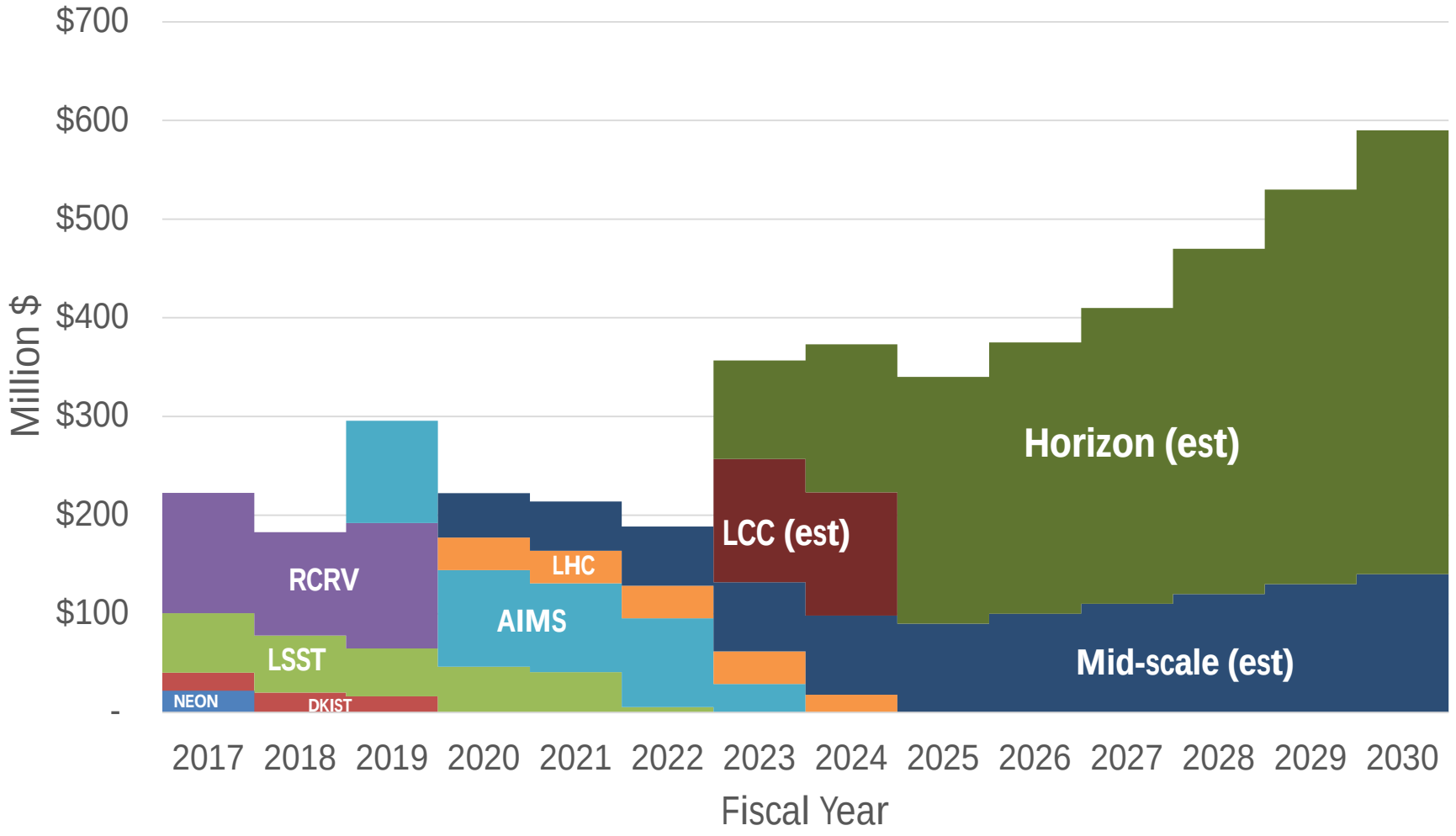
- NSF wants to know:
  - What are science priorities for next decade?
  - What projects address these priorities?
  - Which projects are ready to go now and later? When?
  - What are costs, risks, development needs of projects?
  - What is the priority order for these projects?
  - What budgets are needed to support the priorities, and are they realistic?

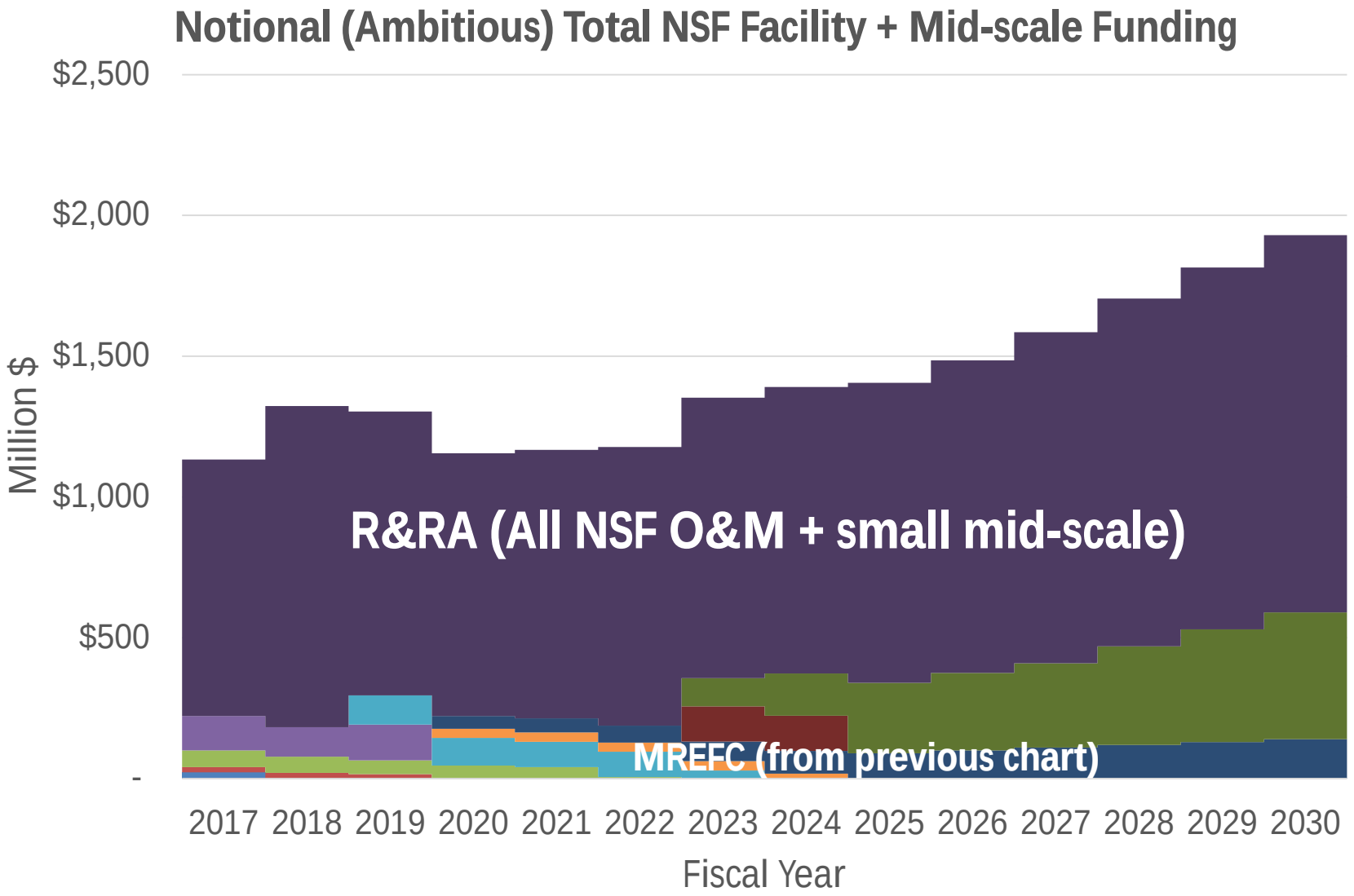
NSF Goals for Astro2020

- NSF wants to know (continued):
  - How does the current NSF portfolio address priorities?
  - What is the state of the profession?
    - Recommendations for the agencies.
  - Division specific:
    - AST: Decision rules for MSIP.
    - PHY: Welcome recommendations on promising Technology R&D for next gen. facilities
- Let NSF sweat implementation details.
  - One NSF Astronomy/Astrophysics program
- Provide clear priorities with explanatory decision rules leading to the priorities.

Notional NSF Budgets: Construction and Operations

Notional (Ambitious) Future NSF MREFC Account Profile




Notional (Ambitious) Total NSF Facility + Mid-scale Funding
$2,500
$2,000
$1,500
$1,000
$500
-
Million $
R&RA (All NSF O&M + small mid-scale)
MREFC (from previous chart)
2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030
Fiscal Year